



**RESEARCH PAPER**

**Checking the Validity of Ricardian Equivalence Hypothesis: Analysis from Developed and Developing Countries**

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PAPER INFO	ABSTRACT
<p><b>Received:</b> March 22, 2022</p> <p><b>Accepted:</b> June 25, 2022</p> <p><b>Online:</b> June 27, 2022</p> <p><b>Keywords:</b> Budget Deficit, G7, Government Debt, SAARC Tax Revenue</p> <p><b>*Corresponding Author:</b></p> <p>rakianasir1@gmail.com</p>	<p>The existence of the Ricardian Equivalence Hypothesis (REH) in the case of the Group of Seven (G7) and the South Asian Association of Regional Cooperation (SAARC) nations is investigated in this study. The objective of this study is check the idea that combining the cases of industrialized and emerging economies will demonstrate REH. General Government Revenue, Government Budget Deficit, General Government Gross Debt, Household Final Consumption Expenditure, Disposable Income, General Government Total Expenditure, and Wealth are all measured using a panel data set from 2001 to 2021. Five distinct unit root tests were used to validate the stationarity of selected variables. Considering the Hausman test, researcher estimate the random effect model before Panel Least Squares (PLS). The Wald test has rejected all restrictions applied to verify the presence of REH in developed and emerging economies after applying PLS. According to the Findings the Fiscal policy should be one of the stabilizing measures in this understudied economic world to regulate income and expenditures.</p>

**Introduction**

A fiscal imbalance occurs when government spending exceeds its receipts. The government has three options for funding the deficit: raising taxes, borrowing, or printing more money (Gumus, 2003). Each source has unique economic effects. Since the government cannot choose the best policy to accomplish its objectives if it does not evaluate the implications of fiscal policy actions, this is especially true in the case of debt. To stabilize the economy, the government can take a variety of fiscal policy initiatives. Fiscal policy consists of two tools: taxation and government expenditure. The government's goal in the Ricardian case is to raise consumption and reduce the budget deficit by offering consumers debt-financed tax cuts, but this goal is not achieved since consumers are forward-looking. Consumers keep the additional tax savings for future tax liabilities rather than increasing government spending. Therefore, fiscal policy is ineffective in this circumstance (Drakos, 2001; Mushtaq, et. al 2017). Although the Keynesian model of fiscal policy is successful because consumers don't worry about the future or the generations after them and consume this greater tax cut (Giorgioni & Holden, 2001). As a result, aggregate demand increases, private consumption increases, and the budget deficit decreases. The government's goals were met as a consequence. As a result, it's crucial to evaluate the effects of fiscal policy initiatives so that the government may select the best course of action

to achieve its objectives. If the following suppositions are true (Malengier & Pozzi, 2004), Ricardian equivalence holds:

- **Consumers are Infinitely Lived:** When the government grants consumers debt-financed tax cuts, they do not use these tax savings to benefit future generations.
- **Rationality:** This assumption suggests that consumers are rational in the sense that they expect future tax rates to rise.
- **No Liquidity Constraints Faced by Consumers:** There are no limitations on household lending or market borrowing. Consumers will not raise their spending and preserve this tax reduction if the government grants them debt-financed tax cuts since they can borrow from capital markets whenever they need it.
- **Taxes are Lump sum:** When taxes are paid in one lump sum, the Ricardian Equivalence Hypothesis (REH) holds since the tax rate does not alter based on the individual's income and everyone is required to pay the same amount. As a result, there are no distortion effects on the economy, and tax cuts have no influence on consumption.
- **Perfectly Informed:** REH considers that customers are completely aware of their future earnings, taxes, and inheritance. Because uncertainty about future income, taxes, and legacy will induce consumers to shift their spending habits.

Our main goal is to see if REH exists in the economies of the Group of Seven (G7) and the South Asian Association for Regional Cooperation (SAARC) (SAARC). These are the economies of the developed and developing worlds, respectively. As a result, we have a null hypothesis that the REH occurs in both developed and developing countries. If both situations exhibit distinct behavior, we may identify the causes and factors that influence how individuals in industrialized and developing countries behave. Another goal is to look at the link between household consumption, government budget deficits, tax revenue, government expenditures, disposable income, and wealth.

### **Literature Review**

Kazmi and Shabbir (1992) demonstrated the validity of the Ricardian equivalence hypothesis using several macro-econometric tests. The work is divided into three different sections: the REH composite model, the REH deconstructed model, and the Euler Equation models. Pakistani data is collected during the years 1960 to 1988. All these models rejected the REH and demonstrated the debt neutrality hypothesis' absence.

Barro's seminal paper (1974) looked at the impact of government debt on family net worth and found that as the public debt grows, so does the uncertainty about future taxation. Following the publication of this report, numerous researchers attempted to investigate the existence of REH in other nations. Some research looked at REH's theoretical validity, while others looked at it practically. Time-series and panel data were employed in certain investigations, while cross-sectional data sets were used in others. Some research employed different types of consumption functions, while others estimated using saving functions. Most of the research refuted the presence of REH in industrialized and developing nations, while some confirmed it.

Cardia (1997) tested the Ricardian equivalence by simulating a variety of consumption functions. Because the actual studies had some flaws and produced mixed findings, this research indicated that taxing has only a little impact on consumption. The produced series was subjected to Ordinary Least Square (OLS) regression. According to the report the simulated model was likewise unable to provide a clear endorsement of Ricardian equivalence.

Kazmi (2001) explain that to confirm the presence of REH, this study conducted empirical research in the Pakistani economy. He made use of the Blanchard-Evans Model,

which covered the period from 1960 to 1988. The OLS regression analysis was used to evaluate the reliability of REH. This study refuted the existence of REH in Pakistan.

Giorgioni (2001) and Holden looked on the prevalence of REH in underdeveloped countries. Ten developing countries represented in the sample were Pakistan, Sri Lanka, Burundi, India, Morocco, El Salvador, Honduras, Nigeria, Ethiopia, and Zimbabwe. Panel data from 1975 to 1999 was used to get the estimate. Three different methodologies—OLS, random effect, and fixed effect—were used to examine the applicability of Ricardian equivalence in emerging countries. While estimates for impoverished countries confirmed Ricardian equivalence, theoretical research produced contradictory results.

Malengier and Pozzi (2004) investigated the evidence for the REH hypothesis. Panel data from 1980 to 1997 was used. The Organization for Economic Co-operation and Development (OECD19)'s member countries are the subjects of the data collection (OECD). They created two distinct client categories with a nonlinear consumption function. The results show that the first group of consumers did not accept the Ricardian Equivalence assertion, and the second group did not accept the hypothesis that people would spend less and save more if the government encouraged them to do so as a safeguard against losing their permanent source of income.

Cuaresma and Reitschuler (2007) tested the Ricardian Equivalence Hypothesis using a theoretical dynamic model for the EU-15 nations (REH). They used cointegration breakdown tests and discovered evidence of individual fiscal behavior change over the previous decade. Individual behavior was shown to be varied among EU nations because of the Maastricht criteria. They discovered no evidence of REH in the EU.

Afonso (2008) looked at how private consumers reacted to government debt in the European Union (EU). The goal was to see if the debt neutrality theory was true in EU nations. The study uses panel data from 1970 to 2006 and an approximated Euler equation. The article refutes the existence of the debt neutrality hypothesis in EU nations, concluding that high government debt reduces private spending.

Waqas and Awan (2011) looked at the recognition of REH in Pakistan as well as the factors that led to this rejection. As a time series, they utilized data from 1973 through 2009. The factors considered in this analysis were private consumer spending, public expenditures, public debt, public budget deficit, disposable income, tax revenue, and wealth. They used GMM to estimate the model. They concluded that REH fails in Pakistan due to the limitless horizon and lack of money.

Keho (2016) discovered that in the long run, the budget deficit and GDP per capita have large positive effects on private consumption, but inflation has a negative impact in the West African Economic and Monetary Union (WAEMU) member nations,

Ofori-Abebrese and Pickson (2018) studied five Sub-Sahara African countries: Botswana, Ghana, Gambia, Nigeria, and Kenya between 1981 and 2014. They investigated the evidence of REH using the panel Autoregressive Distributed Lag Approach (ARDL). They found that GDP per capita and interest rates had considerable beneficial effects on government expenditure and private consumption. Interest payments made by the government on outstanding debt have a negative influence on private spending. Their findings disproved REH's presence in Sub-Saharan African countries.

Kusairi et al. (2019) used heterogeneous panel data analysis to uncover evidence of REH in eighteen Asia Pacific nations. They used data from a panel from 1990 to 2017. Private consumption has a positive impact on government spending, inflation, real interest

rates, capital accumulation, and income, according to the researchers. They concluded that REH does not exist in all nations.

Umar et al. (2020) looked at panel data from 2000 to 2017 and focused on West African nations. To fit Panel Least Squares, they used pooled OLS, fixed-effect model, and random effect model (PLS). The random effect model was found to be accurate for the investigation. Only GDP and Foreign Direct Investment (FDI) among the independent variables had a positive and substantial impact on trade balance, according to PLS. In addition, FDI has a favorable impact on the trade balance. They concluded that FDI is a critical macroeconomic factor that has a beneficial impact on West African trade policy.

Hameed et al. (2020) investigated the presence of the Ricardian Equivalence Hypothesis (REH) in SAARC. They used data from 1990 to 2018 that spanned 29 years. They used a fixed effect model as well as panel cointegration. They discovered that government debt and private consumption have a long run cointegrated relationship. Their research ruled out the presence of REH in SAARC. People do not reduce current expenditure in anticipation of higher taxes and government debt. The conclusion advised fiscal policy to keep the economy stable.

The conclusions of the existing empirical data are obvious for developed and developing economies individually, but confusing for mixed developed and developing economies, according to the critical examination of the literature. This conversation adds to the body of knowledge in the field and provides information to policymakers so that they may monitor economies through their fiscal policy measures.

**Material and Methods**

**Selected Variables and their Data Sources**

The data has been taken from two different groups the first one is the south Asian association (SAARC) which is based on the developing nations and the second one is the Group of Seven (G7) which is composed of wealthy nations. The selected seven variables addressed in this study include general government total expense, government budget deficit, quasi money (M2), disposable income money , government gross debt, household final consumption expenditure , and government revenue (Tax Revenue).Nineteen years are represented in these variables (2001-2021) Annual panel data from fourteen countries, including the United States of America ,Germany, Maldives Bhutan, the United Kingdom, Pakistan, , Nepal, Canada, Italy, France, India, Japan, Bangladesh, , and Sri Lanka, from both clusters, except for Afghanistan, which has no data due to war and other circumstances. We collected the data from the International Monetary Fund, World Bank Indicators, United Nations Statistics Division, Bank of Canada, Bank of Italy, Bank of France, and Deutsche Bundesbank.

**Model**

In the literature, many forms of consumption and saving functions are employed to check for the presence of REH in developed and developing nations. The following consumption function was employed in this investigation (Waqas & Awan, 2011).

$$HC_{i,t} = \beta_0 + \beta_1 DI_{i,t} + \beta_2 GD_{i,t} + \beta_3 GTE_{i,t} + \beta_4 TR_{i,t} + \beta_5 W_{i,t} + \beta_6 GBD_{i,t} + v_i + u_i \dots\dots\dots(1)$$

$$HC_{i,t} = \beta_0 + \beta_1 DI_{i,t} + \beta_2 GD_{i,t} + \beta_3 > E_{i,t} + \beta_4 TR_{i,t} + \beta_5 W_{i,t} + \beta_6 GBD_{i,t} + v_i + u_i$$

Where i indicate the cross-sectional (country) and t indicates the time.

In this structural function, the abbreviations HC, DI, GBD, GTE, GD, TR, and W stand for Household Final Consumption Expenditure (Private Consumption), Disposable Income, Government Budget Deficit, General Government Gross Debt, General Government Total Expenditure, and General Government Gross Debt, respectively (M2). Under the null hypothesis, we imposed five limitations to equation (1). These conditions must be met; else, the null hypothesis would be rejected; REH holds in the G7 and SAARC economies.

The restrictions are:

$$\beta_1 + \beta_6 = 0, \beta_2 = 0, \beta_3 < 0, \beta_5 = \beta_2$$

The first constraint is that when disposable income and the government budget deficit are added together, the outcome must equal zero. The second constraint is that if the government borrows money, people's consumption expenditures are unaffected. The third constraint is that after borrowing, government spending must not increase, since if government spending rises, household consumption would fall. The fourth constraint describes the consumer's maturity: if the government pays its budget deficit by borrowing rather than raising taxes, consumers will not increase their spending and instead buy the same amount of bonds to grow their savings.

### **Hausman Test**

Under the null hypothesis that the variables are not linked with regressors or that the model has random effect, the study employed Jerry Housman's (1978) Housman test. When the error term  $u_i$  and the regressors  $x_i$  are correlated, the fixed effect holds, but when there is no confirmation of their linkage, the random effect holds.

The Instrumental Variable (IV) and Ordinary Least Square (OLS) models were used in the Hausman test (OLS).

$$\hat{\beta}^{ols} = \frac{\sum xy}{\sum x^2} = \beta + \frac{\sum ux}{\sum x^2} \tag{02}$$

$$Var(\hat{\beta}^{ols}) = \sigma^2 \frac{\sum x^2}{(\sum x^2)^2} = \frac{\sigma^2}{\sum x^2} \tag{03}$$

Where normality  $\frac{\sum ux}{\sum x^2} = 0$ . But if  $\hat{\beta}^{ols}$  is biased, then it is not.

For instrumental variables

$$\hat{\beta}^{IV} = \frac{\sum zy}{\sum z^2} = \beta + \frac{\sum uz}{\sum xz} \tag{04}$$

$$Var(\hat{\beta}^{IV}) = \sigma^2 \frac{\sum z^2}{(\sum xz)^2} \tag{05}$$

From equation (03) and (04) we get

$$Var(\hat{\beta}^{IV}) - Var(\hat{\beta}^{ols}) = \sigma^2 \frac{\sum z^2}{(\sum xz)^2} - \frac{\sigma^2}{\sum x^2} = \frac{\sigma^2}{\sum x^2} \left[ \frac{\sum z^2 \sum x^2}{(\sum xz)^2} - 1 \right] \tag{06}$$

Now the correlation coefficient  $r_{xz}$  is

$$r_{xz} = \sqrt{\frac{(\sum xz)^2}{\sum z^2 \sum x^2}} \tag{07}$$

$$Var(\hat{\beta}^{IV}) - Var(\hat{\beta}^{ols}) = \frac{s^2}{\sum x^2} \left( \frac{1}{r_{xz}^2} - 1 \right) \tag{08}$$

$$m = \frac{(\hat{\beta}^{IV} - \hat{\beta}^{ols})^2}{Var(\hat{\beta}^{IV}) - Var(\hat{\beta}^{ols})} \tag{09}$$

The matrix algebra view of this will be

$$\chi^2 = (\beta_c - \beta_e)' [Var(\beta_c) - Var(\beta_e)^{-1}] (\beta_c - \beta_e) \tag{10}$$

Where  $\beta_c$  is the IV estimate and  $\beta_e$  is the OLS estimate. The test statistic is distributed as  $\chi^2$  with  $k_{endog}$  degrees of freedom, the number of endogenous variables.

**Wald Test**

Once we've decided on a form of asymptotic variance, we can easily do Wald tests. We have a null hypothesis to test the Q restrictions:

$$H_0: c(\theta_0) = 0$$

We can test it form the Wald statistic

$$W = c(\theta)' (CVC)^{-1} c(\theta) \tag{11}$$

Where  $V^\wedge$  is an asymptotic variance matrix estimator of  $\theta$ ,  $C = C(\theta)$ , and  $c(\theta)$  is the  $Q \times P$  Jacobian of  $c(\theta)$ . The estimator  $V$  can be chosen to be fully robust. Also,  $V$  can be chosen to account for two-step estimation, when necessary. Provided  $V$  has been chosen appropriately,  $W \square \chi_Q^2$  under  $H_0$ .

A couple of practical restrictions are needed for  $W$  to have a limiting  $\chi_Q^2$  distribution. First,  $\theta^2$  must be in the interior of  $\phi$ ; that is,  $\theta_0$  cannot be on the boundary. If, for example, the first element of  $\theta$  must be non-negative, and we impose this restriction in the estimation, then expression (4.37) does not have a limiting chi-square

distribution under  $H_0; c(\theta_0) = 0$ . The second condition is that  $C(\theta) = \nabla_{\theta} c(\theta_0)$ , must have rank  $Q$ .

## Results and Discussion

### Unit Root Results

Time series data are non-stationary and lead to false conclusions (Asteriou & Hall, 2011). We used five different individual unit root tests to evaluate the stationarity of the variables: Im, Pesaran and Shin, Fisher and Choi base Augmented Dickey Fuller, and Fisher and Choi base Phillips-Perron. Almost all time series have an intercept and a trend. For this reason, we tested the data using trends. Table 1 shows that in all five tests, the variables under consideration are not stationary at their level, except for GBD in the ADF-Fisher example. As a result, we used first difference to arrive at stationary. All factors are significant at the first level in all five stationary tests. As a result, we may deduce that GBD, DI, W, GD, TR, GTE, and HC share the same integration order.

**Table 1  
Unit Root test Results**

Variable	Notation	Shin W-stat and Im, Pesaran		ADF - Fisher Chi-square	
		Level	1st Difference	Level	1st Difference
Disposable Income	DI				
Money and Quasi Money (M2)	W	4.787	-6.714*	7.531	87.101*
Household Final Consumption Expenditure	HC	2.900	-7.156*	2.651	67.211*
General Government Gross Debt	GD	6.163	-5.197*	9.111	45.709*
General Government Total Expenditure	GTE	1.919	-7.000*	9.111	9.201
General Government Revenue	TR	1.674	-9.911*	2.117	117.515*
Government Budget Deficit	GBD	-1.544	-6.019*	22.531	66.180*

### Hausman Test Results

Before we can use regression to our panel models, we must first choose whether our model is affected by a fixed or random impact. To determine the right impact, we utilise the Hausman test. The null hypothesis is either that the process is random or that the individuals are not connected with the other regressors. Since the p-value is greater than 0.05 and the null hypothesis is not rejected, Table 2 demonstrates that our models have a random effect. Inferring that our model has a random influence, we may infer that the cross-sectionals in these models do not correlate with residuals. We can now utilise PLS since we know what the genuine effect is that is affecting our model.

**Table 2  
Hausman Test**

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000	5	1.0000

Significant at ( $p < 0.05$ )

**Panel Least Square Results**

The results of Panel Least Square Regression are shown in Table 3, there is a negative association between GD and HC, implying that they have an inverse relationship. HC, on the other hand, is dependent on DI and W in a favorable way. Furthermore, when M2 rises, consumption rises with it. GTE, TR, and GBD, the independent variables, are negligible and have no influence on raising or lowering household consumption. Table 3 also includes the coefficient of determination and F-statistic values. We can determine how well our model explains the variance in the dependent variable by looking at the R-squared number. It has a lot of high values, like 0.87. This is a high score that explains how well our models match the regression lines. The significance of F-statistics has also been found.

**Table 3  
Panel Least Squares**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	41.66	66.53	0.626	0.5
LOGDI	17.18	6.71	2.560	0.0
LOGGD	-0.09	0.01	-9.811	0.0
LOGGTE	103.61	7.619	13.595	0.0
LOGTR	-287.51	119.7	-2.417	0.0
LOGW	0.19	70.611	0.090	0.0
GBD	2711.21	114.11	23.179	0.0
<b>R-squared</b>	0.879		F-statistic	109.71
<b>Adjusted R-squared</b>	1.861		Prob(F-statistic)	0.0

**Wald Test Results**

After the estimation of the PLS, we estimate the Wald test to check if the limits we put to the model to evaluate REH in rich and emerging economies are valid. In all three models, the Wald test fails to demonstrate the validity of constraints, and the Chi-square value in Table 4 is significant. As a result, in the combined situation of the G7 and SAARC economies, our null hypothesis, that all limitations hold, is fully rejected. These findings reveal a discrepancy between our theory and our findings. As a result, we can conclude that REH fails in the G7 and SAARC cases, and monetary policy has no influence in both developed and developing nations, but fiscal policy strengthens differ from developing to developed countries due to various economic situations.

**Table 4  
Wald Test**

Test Statistic	Value	Prob.
F-statistic	27.91	0.000
Chi-square	101.01	0.000

**Null Hypothesis:**  $C(1)+C(6)=0, C(2)=0, C(3)=-C(3), C(5)=C(2)$

Significant at ( $p < 0.05$ )

**Conclusion**

The rationality of the Ricardian Equivalence Hypothesis in the G7 and SAARC was investigated in this study. From 2001 to 2019, we used yearly panel data. The presence of REH coupled in the G7 and SAARC, which are typical clusters of industrialized and developing nations, is investigated using a consumption function. One dependent variable,)



Government Budget Deficit (GBD) and six independent variables, Disposable Income (DI General Government Total Expenditure (GTE)), Household Final Consumption Expenditure (HC), General Government Revenue (TR), General Government Gross Debt (GD), and Wealth are included in this model (W). For this situation, the Hausman test suggests a random effect (RE) model. The coefficients were calculated using Panel Least Squares (PLS). PLS shown that HC is unaffected by GTE, TR, or GBD, emphasizing the relevance of fiscal policy. Under the null hypothesis, the Wald test rejects all constraints that were used to provide evidence of REH. Our research found parallels between European (Cuaresma & Reitschuler, 2007) and SAARC (Hameed, Ahmed, & Salman, 2020) literature. As a result, this study did not reject the null hypothesis and does not rule out the presence of REH in the situation of mixed economies.

### **Recommendations**

In the mixed situation of developed and emerging economies, the analysis demonstrates that fiscal intervention is required. Consumption increased, resulting in more disposable money and wealth for consumers. Taxes should be raised as part of fiscal policy to restrict consumer spending. To regulate income and expenditures, fiscal policy should be one of the primary stabilizing policies in established and emerging regions.

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