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Asymmetry Effect of Tax and Public Debt on Private Consumption Spending in Russia

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ABSTRACT

According to the Ricardian Equivalence theory, private consumption spending is unaffected by the debt vs tax mode of deficit financing. The study re-examines the “Ricardian Equivalence” hypothesis in Russia by using private consumption spending as the dependent variable and government expenditure, government borrowing, tax, and income as the independent variables. The Ricardian position offers an intriguing issue in the Russian setting. If the Russian economy exhibits Ricardian equivalence, the private sector will shift its spending habits and boost its savings, rendering the policy reforms ineffectual. The ARDL and NARDL models used yearly time series data between 1988 and 2022. The results refute the Ricardian Equivalence and support the Keynesian perspective that financing the fiscal deficit (debt vs tax) does affect private consumption spending. The estimates support a strong long-run and short-run link between the variables. Estimates confirm that tax and borrowing mode of deficit financing negatively influences Russia’s consumption spending. It shows that short-run disequilibrium converges to long-run equilibrium in the ARDL model at a rate of 85.3% and in the NARDL model at a rate of 28.6%. The study concludes that the deficit financing strategy should be carefully devised and supported. Implementing an expansionary fiscal policy will influence the overall private demand of Russia. A tendency to rely too much on tax and borrowings as a financing technique negatively influences private consumption spending. This study contributes to the pool of literature on “Ricardian Equivalence” and deficit financing by providing new data on how to formulate fiscal policies that are efficient at financing deficits and sustainable by making prudent expenditures without endangering the nation’s private consumption.




KEYWORDS

ARDL, NARDL, consumption spending, deficit financing, Ricardian equivalence, government borrowing, fiscal policy, fiscal deficit, Russia

JEL H3, H5, H6, H62, F31, F63


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Влияние асимметрии налогов и государственного долга на расходы на личное потребление в России

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АННОТАЦИЯ

Согласно теории рикардианской эквивалентности, расходы на частное потребление не зависят от соотношения государственного долга и налогов при финансировании дефицита бюджета. В данном исследовании гипотеза

«рикардианской эквивалентности» пересматривается для России с использованием в качестве зависимой переменной расходов на личное потребление, а в качестве независимых переменных – государственных расходов, государственных заимствований, налогов и доходов. Рикардианская гипотеза ставит интригующую проблему в российских условиях. Если российская экономика демонстрирует рикардианскую эквивалентность, то частный сектор изменит свои привычки в отношении расходов и увеличит сбережения, что сделает политические реформы неэффективными. В моделях ARDL и NARDL использовались данные временных рядов с 1988 по 2022 г. Полученные результаты опровергают рикардианскую эквивалентность и подтверждают кейнсианскую точку зрения, согласно которой финансирование бюджетного дефицита (долг по сравнению с налогами) действительно влияет на расходы на личное потребление. Оценки подтверждают наличие сильной долгосрочной и краткосрочной связи между переменными. Также расчеты подтверждают, что налоговый и заемный способы финансирования дефицита отрицательно влияют на потребительские расходы россиян. Показано, что краткосрочное неравновесие сходится к долгосрочному равновесию в модели ARDL со скоростью 85,3%, а в модели NARDL – со скоростью 28,6%. В исследовании делается вывод о том, что стратегия финансирования дефицита бюджета должна быть тщательно продумана. Проведение экспансионистской фискальной политики окажет влияние на совокупный частный спрос в России. Тенденция слишком сильно полагаться на налоги и заимствования в качестве метода финансирования негативно влияет на расходы на личное потребление. Данное исследование вносит вклад в литературу по «рикардианской эквивалентности» и финансированию дефицита, предоставляя новые данные о том, как проводить фискальную политику, эффективную для финансирования дефицита и устойчивую за счет разумных расходов без угрозы для частного потребления страны.

КЛЮЧЕВЫЕ СЛОВА

ARDL, NARDL, потребительские расходы, финансирование дефицита, рикардианская эквивалентность, государственные заимствования, фискальная политика, бюджетный дефицит, Россия

1. Introduction

Private consumption has accorded a multitude of emphasis in modern economics. Private consumption is a result of the involvement of the government and other market participants [1]. The essential and fundamental for the country's progression to sustainable economic expansion is private consumption, which corresponds to an economy free of deficits and in equilibrium [1; 2]. An important concern in macroeconomics is how the budget deficit affects private consumption [2; 3].

There are three different viewpoints regarding the effect of deficit financing on private consumption. According to the Keynesian school of thought, private consumption is affected by fiscal deficits and the way they are financed [4]. According to the Ricardian Equivalence theory, private consumption is unaffected by the fis-

cal deficit and the resources often used to finance it. However, according to neoclassical viewpoints, the rise in interest rates and the debt financing of the deficit might reduce private spending [5–8].

In the endogenous growth theory context, contemporary theoretical ideas on the effects of fiscal policy parameters and macroeconomic variables are largely based on R. Barro's work [5; 9; 10]. According to the endogenous growth model, government spending boosts economic growth by, on the one hand, managing domestic demand and, on the other, cutting production costs or increasing the utilisation efficiency of production inputs [11].

At the same time, expansionary fiscal policy (maintaining high government expenditures) requires a corresponding level of tax or debt burden which, in turn, has a negative effect on growth. Since the

method used to finance deficits determines a fiscal policy's overall impact, the Ricardian equivalence hypothesis – also known as “Barro-Ricardian Equivalence” by Buchanan in his paper “Barro on the Ricardian Equivalence Theorem” – must meet certain requirements [12].

In the public finance literature, there are divergences of opinion on how to fund the deficit and its consequences. Others contend that increasing domestic government debt via debt financing increases interest rates. Foreign debt is undesirable since it puts a country's solvency in danger. Other adverse effects will result from the alternative ways to pay for government expenses using money [13]. In developing countries, one of the cornerstones of short-term stabilisation and medium-term adjustment strategies is reducing the amount of the deficit [2; 3].

Ricardian and Keynesian schools of thought have different policy consequences; if Ricardian Equivalence is valid, fiscal policy will be ineffectual. Contrary if the Ricardian Equivalence does not hold, it does matter how the government finances its expenditures. As deficit financing would raise domestic interest rates, create inflation, and increase private consumer spending, it would displace private investment and impede growth [14].

Around the world, fiscal policy has been a major factor in fostering stability and economic progress. If the Ricardian equivalence is valid for the Russian economy, households will shift their expenditure patterns and increase their savings, rendering the policy reforms ineffectual [15–17].

The primary objective of the research is to provide empirical evidence to support the Ricardian equivalence in the Russian context.

Which can be further *hypothesized* in the Russian context.

Ricardian Equivalence Proposition:

$H0_A$: Government Borrowing has no impact on private consumption spending.

$H0_B$: Government Tax policy has no impact on private consumption spending.

Keynesian Preposition:

$H1_A$: Government Borrowing will impact private consumption spending.

$H1_B$: Government Tax policy will impact private consumption spending.

If $H0_A$ and $H0_B$ hold when the private sector of Russia behaves according to the Ricardian theory. Contrary, if private sector alters its consumption spending due to a change in government borrowing and tax policy, then Keynesian proposition holds ($H1_A$ and $H1_B$ will be confirmed).

2. Literature Review

A growing number of studies have examined the efficacy of these hypotheses. However, the findings of these empirical investigations are inconsistent and debatable across nations, data, and techniques. Most of this research focuses on industrialised nations [2].

2.1. Russia's Fiscal Imbalance

Initially, productivity was lower in countries like Russia (excluded from global integration). Russia's economic development began its upward trend in 1998 after the Union of Socialist Soviet Republics (USSR) collapsed in 1991, which diminished GDP per capita. However, there was significant fluctuation along the way [18; 19].

The root of Russia's economic issues lies within itself; in 2014's first half, the Russian economy slowed down even more than in 2013, when it had the lowest GDP growth at 1.3%. The problem was made worse in 2017 when the GDP growth rate continued to shrink, and the workforce decreased by 0.5% to 0.7% annually during the decade prior, posing a further danger to slow economic development by 0.5 percentage points. Russia's GDP growth rate was 2.8% in 2018, 2.12% in 2019, 2.12% after COVID-19, and 2.6% in 2020 before rising to 4% in 2021 [11].

Russia's discretionary fiscal policy involves altering taxes and expenditures for the government. In order to boost or decrease its domestic demand, the government implements either expansionary or constricting fiscal policies. In 2000,

Russia’s Structural Balance¹ as a percentage of GDP was 2.6%; by 2004, it had increased to 4.7% of GDP. In 2015 and 2017, the structural Balance was -3.07% and -1% of GDP, respectively. In 2022, it increased to 0.07% of GDP due to high government spending and the special military operations in Ukraine (Figure 1).

Such a trend in Russia’s structural balance creates pressure on macroeconomic variables like domestic consumption, savings, and general price levels [20]. Increasing taxes or borrowing will be necessary to cover this fiscal imbalance (from the domestic market or international institutions). Russian government debt as a percentage of GDP decreased from 44% in 2001 to 9.9% in 2009, and it will reach 16% in 2022 (see, Figure 1). The average debt from 1999 to 2022 was 21.3% of GDP. With an average revenue from taxes of 34.5% of GDP from 1999 to 2022, the tax revenue ex-

hibits a trend that is the reverse of the government debt from 2009 on (see Figure 1).

Russia has gradually put into operation several measures that support fiscal stability. As a former superpower rose from hibernation, Russia aimed to progressively strengthen its economy [21]. Since 2014, Russia has been in a globalisation stage but has faced two challenges. The first was that trade and commerce in Russia were heavily impacted by the drop in commodity prices, with curves declining in many industries. The second was the Russia’s special military operations in Ukraine the worsened its relations with the West, which included sanctions and countersanctions. Russia has been progressively improving since 2019 due to deliberate budgetary measures which led to a steady decline in domestic inflation, fiscal deficit and increase in tax revenue [20; 22; 23].

Around the world, fiscal policy has been a major factor in fostering stability and economic progress. If the Ricardian equivalence is valid for the Russian economy, households will shift their expenditure patterns and increase their savings, rendering the policy reforms ineffectual [15–17]. The primary objective of the research is to provide empirical evidence to support the Ricardian equivalence in the Russian context.

¹ The IMF calculates and reports structural Balance as a percentage of GDP. Structural balances are expressed as a percentage of potential output/Actual output less prospective output expressed as a percentage of potential output is the output gap. The impacts of transitory fiscal initiatives, the impact of changes in interest rates and debt-service costs, as well as other non-cyclical changes in net lending/borrowing, all affect the structural balance. (<https://www.imf.org/en/Publications/WEO/weo-database/2022/October>)

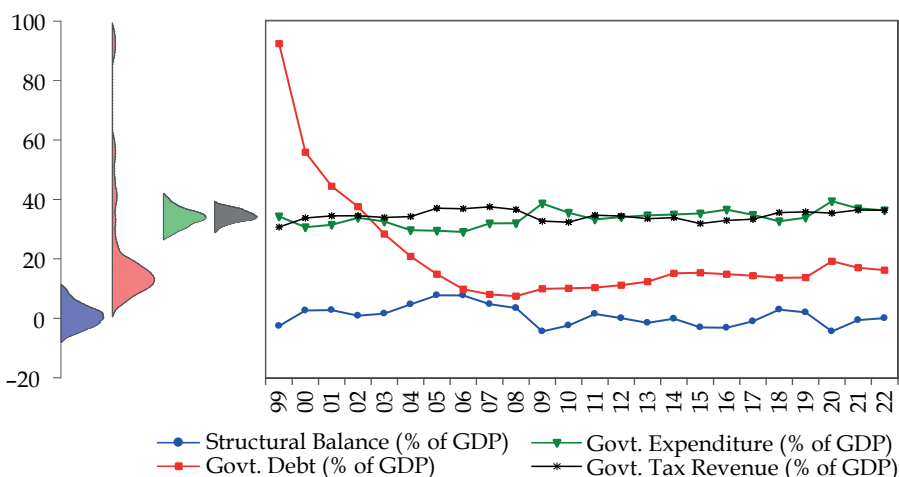


Figure 1. Trends of Russian Structural Balance, Government Revenue and Government Expenditure as per cent of GDP

Source: World Economic Outlook data by International Monetary Fund (IMF). Available at: <https://www.imf.org/en/Publications/WEO/weo-database/2022/October>

2.2. Imperial Studies

Early studies [24], demonstrated that financing a deficit will significantly affect private consumption [7], suggested that the standard approach does not consider people's rational expectations and would support Ricardian equivalence. Consumption-saving behaviour is based on a person's rational expectations about the impact of fiscal measures. Kormendi's consolidated method received several comments and replies [25–31].

Modigliani & Sterling [30; 31] criticized Kormendi [7] contended that Ricardian equivalence and the life-cycle theory were incompatible with Kormendi's definition, and that wealth, taxation, and government spending all had an impact on consumption.

Seater & Mariano [32] have estimated the consumption function and their findings are consistent with the Ricardian equivalence hypothesis.

Kormendi & Meguire [8] eased the constraints imposed by Modigliani & Sterling and therefore dismissed the restrictions.

Feldstein & Elmendorf [26] concluded that the increase in taxes had a significant impact on consumer expenditure and that the increase in government spending would have no impact on consumption, which would invalidate the Ricardian equivalence. In addition, they argue that the results of Kormendi's study favour the Ricardian equivalence due to the inclusion of the Second World War years. These were years characterized by scarcity, rationing, and patriotic self-restraint appeals, which led to an abnormally high rate of savings at a time when government budget deficits were huge.

Butkus et al. [33; 34] found that increase in public debt to GDP ratio is more likely to result in a positive debt effect on private consumption and investment.

A positive relationship between public debt and private consumption and economic growth was found in China [35]. Sardoni [36] rejects Ricardian Equivalence on two grounds first is the economic role of the state as merely 'parasitic'. Second the unwarranted extension of the microeco-

nomical analysis of debts to the macro-economic level. Further, Bandy & Aneja [37] and Pickson & Ofori-Abebrese [38] add found that government may help increase the rate of economic growth and guarantee a steady and sustainable ratio of the public debt to GDP by reorganising its spending.

Study done by Magazzino [39] found no evidence of Ricardian proposition in Russia. Contradicting to the results of Magazzino, a study by Polbin & Sinelnikov-Murylev [40] measure the impact of fiscal policy on aggregate consumption of Russia. Study uses simultaneous equation model on time series data from 1999 to 2019 and the estimates supports Ricardian equivalence hypothesis.

Molefe & Mah spanning the period 1995 to 2019, which was derived from OECD and IMF, this current study discovered a positive and significant relationship between both short- and long-term interest rates in BRICS economies. Moreover, the results of the study revealed a negative and significant relationship between GDP and fiscal deficits. These results confirmed that fiscal deficits hypothetically crowd out private investment and consumption through increased effects on interest rates. Therefore, the implementation of policy mix (interaction between monetary policy and fiscal policy [41] rejects Ricardian hypothesis in all BRICS countries. They found that results confirmed that fiscal deficits hypothetically crowd out Russia's private investment and consumption through increased effects on interest rates.

Joy & Panda [42] studies measured the sustainability of public debt among BRICS (Brazil, Russia, India, China, and South Africa) countries. They concluded that the region's nations must take the essential steps to manage their debt and finances efficiently in order to enhance their primary balance. In adding, regardless of their ideology and political obligations, governments must prioritise economic responsibility [43].

Based on a brief review of the literature, the empirical study that tried to determine how deficit financing affected

private consumption came up with conflicting findings, possibly as a result of the technique, research duration, and sample size. Furthermore, there are very clear gaps that the studies conducted in the Russian context to examine the impact of deficit financing on the economy empirically have also yielded mixed results [39-44]. This study explores the connections between Russia’s deficit finance, trade openness, and private consumption using the ARDL and NARDL approaches.

3. Methodology

The Keynesian and Neoclassical viewpoints assert that the private sector is short-sighted, and that deficit financing will consequently have an effect on private consumption [6; 8; 14].

Contrarily, the Ricardian equivalence postulates that because the households are discerning and forethoughtful, deficit financing will not have an influence on consumption expenditure [5]. This is so that households can account for the potential tax that the present debt will entail. They will also evaluate the fact that because debt financing is being used in its place by the government, the future tax’s present value is equal to the current tax advantage [5; 6].

The lifetime utility function of the life cycle income hypothesis states that the individual lifetime utility ω will be the accumulation of utility $\sigma(PCS_t)$ from consumption throughout the duration of a consumer’s life (where t is the time range from 1 to T):

$$\omega = \sum_{t=1}^T \sigma(PCS_t). \tag{1}$$

With the caveat that any outstanding debt must be settled at the end of the individual’s life, it is thus assumed that individuals could borrow funds and invest it at an exogenous rate. Each person’s budget will therefore be constrained by:

$$\sum_{t=1}^T PCS_t \leq \tau_0 + \sum_{t=1}^T Y_t, \tag{2}$$

where, τ_0 , represents an individual’s wealth, while Y_t represents their income. According to Eq. (2) everyone will adhere

to the spending limit evenly and since consumption will have a positive marginal utility, the Lagrangian maximisation function will be:

$$\mathcal{L} = \sum_{t=1}^T \sigma(PCS_t) + \lambda \left(\tau_0 + \sum_{t=1}^T Y_t - \sum_{t=1}^T PCS_t \right). \tag{3}$$

Eq. (4) represents the overlapping generation prepositions of Ramsey [45] and Diamond [46] for rational individual [5]:

$$PCS_t + \frac{PCS_{t+1}}{1 + \phi} = Y_t + \frac{Y_{t+1}}{1 + \phi}. \tag{4}$$

Where, ϕ is the discounting rate; $PCS_{t+1} / (1 + \phi)$ and $Y_{t+1} / (1 + \phi)$ represents the present value of private consumption spending and income respectively. By incorporating tax impact in Eq. (4) we get Eq. (5):

$$PCS_t + \frac{PCS_{t+1}}{1 + \phi} = (Y_t - TAX_t) + \frac{(Y_{t+1} - TAX_{t+1})}{1 + \phi}. \tag{5}$$

However, if there is a budget deficit at time t , where $TAX_{t+1} < TAX_t =$ Government Spending (GS) and $\Delta TAX = TAX_t - TAX_{t+1}$ and if we consider $GOVB_t$ to represent the government borrowing, the rise in an individual’s disposable income will be equal to $GOVB_t = \Delta TAX$.

Assuming that the debt would mature in the following year, TAX_{t+1} is the tax due, and it is also the case that the individual will earn interest in addition to the principal amount of $GOVB_t$, i.e. $(1 + \phi) GOVB_t = GOVB_{t+1}$:

$$PCS_t + \frac{PCS_{t+1}}{1 + \phi} = (Y_t - TAX_t) + \left(\frac{Y_{t+1} - TAX_{t+1}}{1 + \phi} \right) + (1 + \phi) GOVB_t. \tag{6}$$

LHS of eq. (6) shows that an individual’s consumption spending includes current as well as future consumption. RHS of eq. (6) equates the total tax revenue (current + future tax revenue), receipts of interest, and principal amount of government debt.

The government budget constrain can be written as follow:

$$\int_{t=0}^{\infty} e^{-\phi t} GOVEXP_t dt \leq \tag{7}$$

$$\leq -GOVB(0) + \int_{t=0}^{\infty} e^{-\phi t} TAX_t dt.$$

Where, government expenditure ($GOVEXP_t$) is less than equal to the government borrowings debt ($GOVB$), and the present value of tax at ($e^{-\phi t}$) and government borrowings.

The budget deficit is the change in rate of stock of debt $GOVB_t$, (see, Eq. (8)):

$$GOVB_t = [GOVEXP_t - TAX_t] + \tag{8}$$

$$+ \phi(GOVB) \cdot GOVB_t.$$

The overlapping generation model of government budget will be (see, Eq. (9)):

$$TAX_t + \frac{TAX_{t+1}}{1 + \phi} = GOVEXP_t + \tag{9}$$

$$+ \frac{GOVEXP_{t+1}}{1 + \phi} + (1 + \phi)GOVB_t.$$

The private sector faces challenge for temporal optimization i.e. $MAX \omega = \sigma(PCS_t PCS_{t+1})$, Subject to Eq. (6) and Eq. (9), the choice of optimization based on Eq. (6) and Eq. (9) for private and government respectively. A fiscal deficit today will result in future tax obligations as the burden of the deficit falls on the next generation, which in turn lowers their welfare.

According to the Ricardian equivalence hypothesis, government borrowing cannot change private consumption spending (as they are rational and far-sighted). The private sector may predict future government spending by substituting Eq. (9) into Eq. (6) we get Eq. (10):

$$\left\{ PCS_t + \frac{PCS_{t+1}}{1 + \phi} \right\} = \left\{ Y_t + \frac{Y_{t+1}}{1 + \phi} \right\} + \tag{10}$$

$$+ \left\{ GOVEXP_t + \frac{GOVEXP_{t+1}}{1 + \phi} \right\} -$$

$$- \left\{ TAX_t + \frac{TAX_{t+1}}{1 + \phi} \right\} + (1 + \phi)GOVB_t.$$

The real budget constraint on the private sector is demonstrated in Eq. (10); taxes and deficits are not taken into account. Ac-

cordingly, the private sector’s optimal conduct is akin to the Ricardian equivalence in that it depends on new revenue, financial restrictions, and government spending but not on deficit or taxation. Current private consumption spending (PCS_t), as defined by Keynesian school of thought, will alter as a result of changes in government spending and the method used to fund it (taxes vs. debt). By shifting the responsibility for debt repayment on the next generation, the present generation will benefit at their expense.

Private consumption spending may be determined to be a function of government expenditure, borrowing, tax revenue, and income [5; 7; 17; 24; 47] is as follow:

$$PCS_t = f(GOVEXP_t, GOVB_t, TAX_t, Y_t), \tag{11}$$

where, PCS is private consumption spending at time t , $GOVEXP$ is government expenditure at time t , $GOVB$ is government borrowing at time t , TAX is tax revenue at time t , and Y as domestic income at time t .

3.1. Econometric Model

The study investigates the relationship between the private consumption spending and mode of deficit financing. We used the Auto-Regressive Distributed Lag (ARDL) and Non-linear Auto-Regressive Distributed Lag (NARDL) for the investigation [48]. Hence, Eq. (12) represents the ARDL and NARDL long-run equation of private consumption spending:

$$PCS_t = \gamma_0 + \gamma_1 GOVEXP_t + \tag{12}$$

$$+ \gamma_2 GOVB_t + \gamma_3 TAX_t + \gamma_4 Y_t + \epsilon_t.$$

We estimate the ARDL model (see Eq. (13)) for private consumption spending in order to look into the cointegration between the variables given in Eq. (12):

$$\Delta PCS_t = \alpha_0 + \sum_{t=1}^n \alpha_{1i} \Delta PCS_{t-i} + \tag{13}$$

$$+ \sum_{t=1}^n \alpha_{2i} \Delta GOVEXP_{t-i} + \sum_{t=1}^n \alpha_{3i} \Delta GOVB_{t-i} +$$

$$+ \sum_{t=1}^n \alpha_{4i} \Delta TAX_{t-i} + \sum_{t=1}^n \alpha_{5i} \Delta Y_{t-i} +$$

$$+ \beta_1 PCS_{t-1} + \beta_2 GOVEXP_{t-1} +$$

$$+ \beta_3 GOVB_{t-1} + \beta_4 TAX_{t-1} + \beta_5 Y_{t-1} + \epsilon_t.$$

In this case, Δ stands for the first difference operator. The ARDL model's short-run and long-run coefficients are represented by $\alpha_1 \dots \alpha_5$ and $\beta_1 \dots \beta_5$; ε_t represents the white noise terms.

The Eq. (14) presents the error correction model to represent the rate of adjustment to the long-run equilibrium, as shown below:

$$\begin{aligned} \Delta PCS_t = & \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta PCS_{t-i} + \\ & + \sum_{i=1}^n \alpha_{2i} \Delta GOVEXP_{t-i} + \\ & + \sum_{i=1}^n \alpha_{3i} \Delta GOVB_{t-i} + \sum_{i=1}^n \alpha_{4i} \Delta TAX_{t-i} + \\ & + \sum_{i=1}^n \alpha_{5i} \Delta Y_{t-i} + ECT_{t-1} + \varepsilon_t. \end{aligned} \tag{14}$$

The ARDL establish only linear relationship. Hence, we further estimate the NARDL model [49; 50] to capture the long-run and short-run asymmetric relationship of government borrowing and tax on the private consumption spending in the presence of other explanatory variables specified in Eq. (12):

$$\begin{aligned} PCS_t = & \theta_0 + \theta_1 GOVEXP_t + \\ & + \theta_2^+ GOVB_t + \theta_3^- GOVB_t + \\ & + \theta_4^+ TAX_t + \theta_5^- TAX_t + \theta_6 Y_t + \varepsilon_t. \end{aligned} \tag{15}$$

Eq. (15) divides the GOVB and TAX into two categories: positive and negative effects of GOVB and TAX on PCS. Here, our parameters are $\theta_0, \theta_1, \theta_2^+, \theta_3^-, \theta_4^+, \theta_5^-, \theta_6$; $GOVB_t = GOVB_0 + GOVB_t^+ = GOVB_t^-$ and $TAX_t = TAX_0 + TAX_t^+ = TAX_t^-$ are the vector of unknown LR parameters. Where + and - signify the "partial sum of positive and negative variation" in GOVB and TAX, respectively:

$$\begin{aligned} GOVB_t^+ = & \sum_{j=1}^t \Delta GOVB_t^+ = \\ = & \sum_{j=1}^t Max(GOVB_j, 0) | GOVB_t^- = \\ = & \sum_{j=1}^t \Delta GOVB_t^- = \sum_{j=1}^t Min(GOVB_j, 0). \end{aligned} \tag{16}$$

$$\begin{aligned} TAX_t^+ = & \sum_{j=i}^t \Delta TAX_t^+ = \\ = & \sum_{j=1}^t Max(TAX_j, 0) | TAX_t^- = \\ = & \sum_{j=i}^t \Delta TAX_t^- = \sum_{j=1}^t Min(TAX_j, 0). \end{aligned} \tag{17}$$

Where $\Delta GOVB_t^+, \Delta GOVB_t^-, \Delta TAX_t^+, \Delta TAX_t^-$ are computed as positive and negative shocks of government borrowings and tax. By pursuing the approach of Patel & Mehta and Shin et al. [49; 50] the following equation represents a non-linear ARDL model that incorporates the short-run and long-run asymmetric relationship between PCS, GOVB and TAX in the presence of other explanatory variables:

$$\begin{aligned} \Delta PCS_t = & \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta PCS_{t-i} + \\ & + \sum_{i=1}^n \alpha_{2i} \Delta GOVEXP_{t-i} + \\ & + \sum_{i=1}^n \alpha_{3i} \Delta GOVB_{t-i}^+ + \\ & + \sum_{i=1}^n \alpha_{4i} \Delta GOVB_{t-i}^- + \sum_{i=1}^n \alpha_{5i} \Delta TAX_{t-i}^+ + \\ & + \sum_{i=1}^n \alpha_{6i} \Delta TAX_{t-i}^- + \sum_{i=1}^n \alpha_{7i} \Delta Y_{t-i} + \\ & + \beta_1 PCS_{t-1} + \beta_2 GOVEXP_{t-1} + \\ & + \beta_3 GOVB_{t-1}^+ + \beta_4 GOVB_{t-1}^- + \\ & + \beta_5 TAX_{t-1}^+ + \beta_6 TAX_{t-1}^- + \\ & + \beta_7 Y_{t-1} + \varepsilon_t. \end{aligned} \tag{18}$$

Where n denotes optimal lag order and

$$\sum_{i=1}^n \alpha_{1i} \text{ to } \sum_{i=1}^n \alpha_{7i}$$

denotes the short-run relationship of explanatory variables with positive and negative shocks of GOVB and TAX on PCS. Whereas β_1 to β_7 measure the long-run relationship of the same. After estimating Eq. (18), the short run and long run asymmetries can be estimated using Wald test.

Now, the restricted error correction model for NARDL is proposed as follows:

$$\begin{aligned} \Delta PCS_t = & \sum_{i=1}^n \psi_{1i} \Delta PCS_{t-i} + \\ & + \sum_{i=1}^n \psi_{2i} \Delta GOVEXP_{t-i} + \\ & + \sum_{i=1}^n (\psi_{3i}^+ \Delta GOVB_{t-1}^+ + \psi_{3i}^- \Delta GOVB_{t-1}^-) + \\ & + \sum_{i=1}^n (\psi_{4i}^+ \Delta TAX_{t-1}^+ + \psi_{4i}^- \Delta TAX_{t-1}^-) + \\ & + \sum_{i=1}^n \psi_{5i} \Delta Y_{t-i} + ECT_{t-1} + \varepsilon_t. \end{aligned} \tag{19}$$

Where ψ_{1i} to ψ_{5i} are the short-run coefficients, whereas ψ_{3i}^+ , ψ_{3i}^- and ψ_{4i}^+ , ψ_{4i}^- denotes the positive and negative shocks of GOVB and TAX respectively.

3.2. Data and Variables

The analysis takes into account the time series data of the variables from 1988 to 2022; the variable representation and descriptions is presented in listed in Table 1. The GDP deflator deflates the nominal variables into real ones (2004-05 constant price).

4. Results

The average PCS, GOVEXP, GOVB, TAX, and Y values are 69.201, 18.023, 18.455, 13.238 and 3.202, respectively (Table 2). Each underlying variable’s standard deviation is lower than its mean value, indicating steady variance across

the sample period. The Jarque-Bera test statistic supported the normal distribution of all the variables. Primary evidence of the relationship between private consumption expenditure, government borrowings, tax, and income is asserted by the correlation estimates between private consumption expenditure (PCS) and GOVEXP (0.0.847), GOVB(-0.284), TAX(-0.663), and Y(0.870) [24; 26; 33–36].

In order to determine the magnitude and trajectory of the relationship between private consumption spending, modes of financing the deficit, government expenditure and income, the ARDL and NARDL is used. The main restriction of ARDL and NARDL states that the series shouldn’t be integrated at order 1(2) in order to prevent spurious results [49; 51]. The stationarity of the series is examined using the ADF and PP. The outcomes of the unit root test are shown in Table 3.

The stationary at I(1) is confirmed by the ADF and PP findings at a 1% level of significance. No series is I(2), which meets the first criterion of ARDL and NARDL, according to the findings of unit root testing.

Table 4 displays the test estimates for the ARDL and NARDL bound test. The ARDL and NARDL estimated F-Statistics exceed the 99% upper bound, suggesting that the null hypothesis of no cointegration is rejected and that there is both linear and nonlinear cointegration among the variables being studied [49; 51].

Table 1

Variable Representation and Description

Variable	Variable representation	Dependent/ Independent	Description
Private Consumption Spending	PCS	Dependent	Final consumption expenditure is the sum of private final consumption expenditure as a percentage of GDP
Government Expenditure	GOVEXP	Independent	Total expenditure of central government percentage of GDP
Government Borrowings	GOVB	Independent	Total of government debt (domestic) as a percentage of GDP
Tax Revenue	TAX	Independent	Tax revenue refers to compulsory transfers to the central government for public purposes as a percentage of GDP
Income	Y	Independent	The annual percentage growth rate of GDP

Source: World Economic Outlook data by International Monetary Fund (IMF) Retrieved from <https://www.imf.org/en/Publications/WEO/weo-database/2022/October>

Table 2

Descriptive Statistics and Correlation Matrix					
	PCS	GOVEXP	GOVB	TAX	Y
Mean	69.201	18.023	18.455	13.238	3.202
Median	69.102	17.916	13.891	13.244	4.300
Maximum	75.423	20.786	48.983	16.622	8.499
Minimum	65.821	16.435	6.495	9.183	-7.799
Std. Dev.	2.436	0.977	13.463	2.223	3.064
Skewness	0.603	1.222	1.232	0.021	-1.033
Kurtosis	3.065	4.854	3.006	2.096	3.991
Jarque-Bera	1.278	8.237	5.059	0.682	4.595
Probability	0.527	0.162	0.796	0.710	0.100
Correlation Matrix					
PCS	-				
GOVEXP	0.847*	-			
GOVB	-0.284**	-0.333	-		
TAX	-0.663*	0.486*	0.021	-	
Y	0.870*	0.800	0.259	-0.626*	-

Note. *, **, *** indicates significant at 1%, 5% and 10% level of significance, respectively.

Source: Authors' calculations from EViews

Table 3

Results of Unit Root Tests				
Variables	ADF		PP	
	Level form			
	Intercept and trend	Intercept	Intercept and trend	Intercept
PCS	-3.3624	-3.3104	-3.2848	-3.3926
GOVEXP	-3.9119**	-3.8135*	-3.8763**	-3.5047*
GOVB	-1.3316	-2.1492	-1.1476	-2.5418
TAX	-3.1264	-1.4466	-2.3209	-1.4466
Y	-3.8768	-3.1625	-3.7854	-3.1625
	First Differenced			
	Intercept and trend	Intercept	Intercept and trend	Intercept
	PCS	-4.8869*	-4.9927*	-10.5773*
GOVEXP	-5.3261*	-5.5067*	-10.6185*	-10.8624*
GOVB	-3.8717*	-3.0801*	-4.0595*	-3.0806*
TAX	-3.6051*	-3.8641*	-3.9031*	-3.9577*
Y	-5.5550*	-5.7536*	-11.8796*	-12.1089*

Note. *, **, *** indicates significant at 1%, 5% and 10% level of significance, respectively.

Source: Authors Calculation using EViews

Table 4

ARDL and NARDL Bound test Results				
F-Statistics	ARDL		NARDL	
	7.832*		8.983*	
Significance	Lower Bound	Upper Bound	Lower Bound	Upper Bound
10%	2.2	3.09	1.99	2.94
5%	2.56	3.49	2.27	3.28
1%	3.29	4.37	2.88	3.99

Note. *, **, *** indicates significant at 1%, 5% and 10% level of significance, respectively.

Source: Authors Calculation using EViews

The estimations of the long-run and short-run coefficients of the ARDL and NARDL co-integrating equations, namely Eqs. (12), (14), and (15), and (19), are shown in Table 5 accordingly.

The ARDL estimates shows significant and positive long-run as well as the short-run relationship between government spending (GOVEXP) and private consumption spending. The coefficient of government expenditure shows that 1% increase in government expenditure will lead to 0.98% (in the long-run) and 0.27% (in the short-run) increase in private consumption spending respectively. The long-run coefficient value of government borrowing (GOVB), which is negative and significant, indicates that a 1% rise in government debt entails 0.07% (in the long-run) and 0.13% (in the short-run) decrease in private consumption spending. The private sector will substitute its current spending with investments in secured government debt securities.

It is clear that private consumption spending of Russia rejects the Ricardian proposition and is not unconcerned with the debt-based method of funding the fiscal deficit [33–35; 42]. A 1% rise in tax will result in a 0.04% fall in private consumption spending in long-run, and 0.31% in short-run.

The findings corroborate earlier research that found that using taxes to finance the fiscal deficit will lower private sector consumption [24; 26; 39; 41]. The positive and significant coefficient value of income asserts that 1% increase in income will increase consumption spending in the long-run as well in short-run by 0.39% and 2.04% respectively.

Table 5 also reports the results of the NARDL estimation indicating the short-run (Eq. (19)) and long-run (Eq. (15)) coefficients. In terms of the asymmetric impact of government borrowings (GOVB) on private consumption spending, the results show that positive shocks in GOVB lead to a decrease in PCS and negative shocks increase in PCS.

Furthermore, every 1% increase in GOVB leads 0.42% decrease in PCS and 1% fall in GOVB will increase PCS by 0.02% in

the long-run and 0.34% in the short-run, this clearly indicates government borrowing from domestic debt market lead to crowding out effect and will also negatively impact the private consumption spending, which asserts Keynesian proposition in Russian context [33; 42; 43].

Every 1% increase in TAX results in a 0.89% reduction in PCS in long-run and 2.54% reduction in PCS in the short-run. Furthermore, any reduction in TAX will not necessary will increase PCS in the long-run (as the coefficient in insignificant) a result, the magnitude and direction of causality between negative TAX and PCS obviously warrants additional investigation. In short run negative shock in TAX will increase the PCS by 0.04%. The results of other explanatory variables are similar to the ARDL model.

The error correction term in the dynamic model represents the adjustment rate to long-run equilibrium. For both ARDL and NARDL models, the error correlation term (ECM) is significant (statistically) and negative indicating a stable long-term association between variables [52]. It shows that short-run disequilibrium converges to long-run equilibrium in the ARDL model at a rate of 85.3% and in the NARDL model at a rate of 28.6%. This shows that the ARDL model offers a faster adjustment to the equilibrium of long-run relationships.

In Table 5, the model's diagnostics are also presented. Both models are determined to be compatible by the model diagnostic estimates. With an R-Square of 0.96 and an adjusted R-Square of 0.86, the NARDL model fits the data better. The R^2 of the estimated consumption function in line with the previous studies on the Ricardian equivalence. These studies have estimated the aggregate consumption function and have observed similar R^2 values: Kormendi [7] adjusted $R^2 = 0.999$; Bernheim & Bagwell [53] adjusted $R^2 = 0.91$; Moore [13] adjusted $R^2 = 0.9917$; and Feldstein & Elmendorf [26] adjusted $R^2 = 0.99$. The LM test and Jarque-Bera support no serial correlation amongst the residuals. In Ramsey functional form, the model fits well and has no heteroscedasticity.

Table 5

Results of short-run and long-run relationship using ARDL and NARDL model

Variables	ARDL	NARDL
	Coefficient (Prob.)	Coefficient (Prob.)
Long Run Coefficients		
GOVEXP	0.983 (0.012*)	0.807(0.004*)
GOVB	-0.017 (0.000*)	-
GOVB_POS	-	-0.420 (0.040**)
GOVB_NEG	-	0.025 (0.017**)
TAX	-0.048 (0.046**)	-
TAX_POS	-	-0.892(0.026**)
TAX_NEG	-	1.165 (0.133)
Y	0.389 (0.066***)	0.313(0.000*)
Constant	45.430 (0.000*)	53.085 (0.067***)
Short Run Coefficients		
$\Delta(\text{PCS}(-1))$	0.052 (0.053**)	0.234 (0.014*)
$\Delta(\text{GOVEXP})$	0.247 (0.206)	0.011(0.009*)
$\Delta(\text{GOVEXP}(-1))$	-0.011 (0.989)	-
$\Delta(\text{GOVB})$	-0.138 (0.002*)	-
$\Delta(\text{GOVB}(-1))$	0.116 (0.895)	-
$\Delta(\text{GOVB_NEG})$	-	0.304 (0.003*)
$\Delta(\text{GOVB_NEG}(-1))$	-	0.271 (0.020**)
$\Delta(\text{TAX})$	-0.315 (0.000*)	-
$\Delta(\text{TAX}(-1))$	-1.529 (0.000*)	-
$\Delta(\text{TAX_POS})$	-	-2.544 (0.001*)
$\Delta(\text{TAX_POS}(-1))$	-	1.376 (0.217)
$\Delta(\text{TAX_NEG})$	-	0.047 (0.078***)
$\Delta(\text{TAX_NEG}(-1))$	-	0.271 (0.203)
$\Delta(\text{Y})$	2.043 (0.000*)	0.637 (0.000*)
$\Delta(\text{Y}(-1))$	0.637 (0.003*)	-
$\text{ECT}(-1)$	-0.853 (0.000*)	-0.286 (0.000*)
Diagnostic tests		
Wald _{LR} Asymmetry (GOVB)	-	34.689 (0.000*)
Wald _{SR} Asymmetry (GOVB)	-	4.319 (0.026**)
Wald _{LR} Asymmetry (TAX)	-	39.486 (0.000*)
Wald _{SR} Asymmetry (TAX)	-	6.184 (0.090***)
R-squared	0.8906	0.963
Adjusted R-squared	0.7894	0.869
Normality [Jarque-Bera (p-value)]	0.920 (0.631)	0.767 (0.681)
Serial correlation [LM Test F-statistic (p-value)]	0.291 (0.752)	2.368 (0.241)
Heteroscedasticity [Breusch-Pagan-Godfrey (p-value)]	0.809 (0.563)	1.207 (0.448)
Ramsey RESET Test [F-statistic (p-value)]	1.079 (0.319)	0.768 (0.430)

Note. *, **, *** indicates significant at 1%, 5% and 10% level of significance, respectively.

Source: Authors Calculation using EViews

Figures 2 and 3 for both models show the results of the CUSUM and CUSUMSQ tests used to determine the model's stability. Long-run estimates' stability is confirmed by the model's apparent resilience during structural breaks. To confirm the long-run and short-run asymmetry, we performed the Wald test. The significant

Wald test confirms the long-run and short-run asymmetric nexus between government size and trade openness. Further, the cumulative dynamic multiplier is used to assess the short- and long-run asymmetric influence of GOVB and TAX on PCS (see Figure 4). It estimates the percentage point change in PCS due to one percent positive

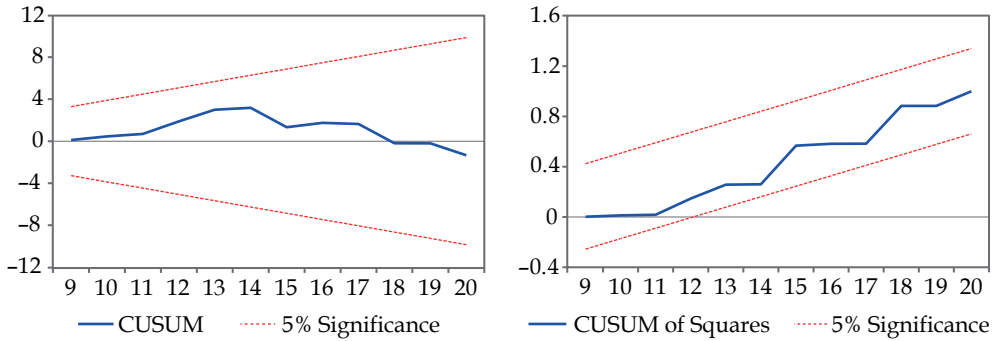


Figure 2. ARDL Plots of CUSUM, CUSUM of squares

Source: Authors Calculation using Eviews

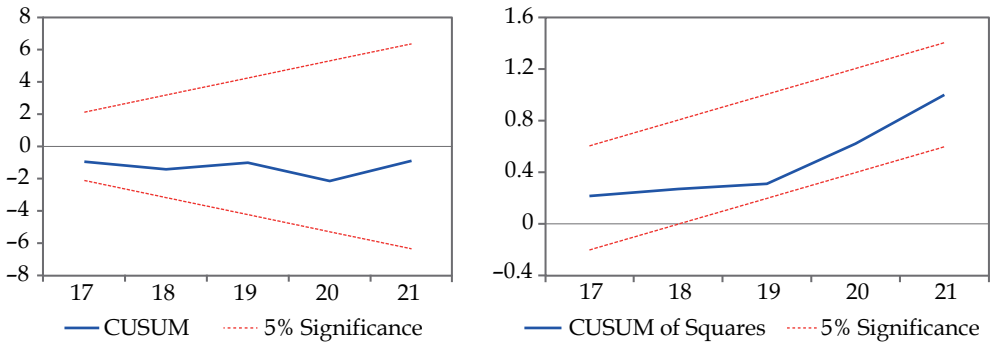


Figure 3. NARDL Plots of CUSUM, CUSUM of squares

Source: Authors Calculation using Eviews

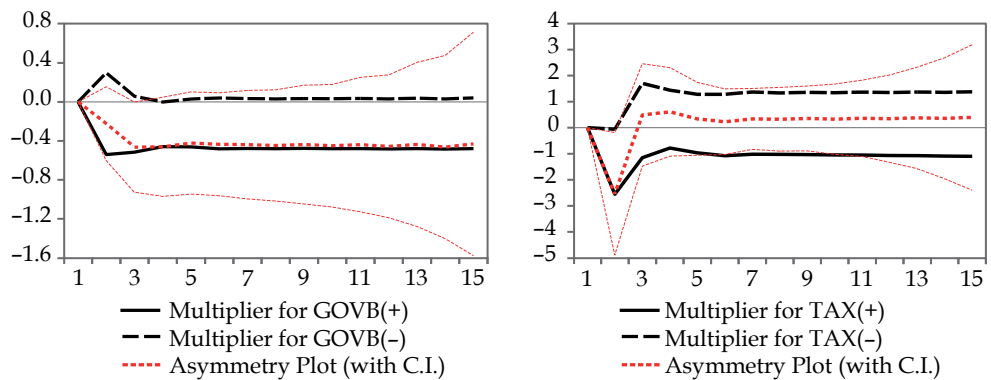


Figure 4. NARDL Dynamic Asymmetric Multiplier

Source: Authors Calculation using Eviews

and negative shocks in GOVB and TAX. It demonstrates that GOVB and TAX have negative impact on PCS. This finding is consistent with the long-run NARDL relationship. The net effect of GOVB and TAX (thick, red-dashed line) is negative.

5. Discussion

The current study examines the long-run and short-run relationship using yearly time series data on private consumption spending, government expenditure, government borrowing, tax, and income. At the I(1) order of integration. The long-run association among the variables is confirmed by the ARDL and NARDL bound test. The impact of deficit financing on private consumer spending in Russia is measured by aggregate consumption.

According to ARDL and NARDL, estimates indicate that increasing government expenditure will lead to increased private consumption, making increasing government spending an effective fiscal strategy for demand management. Since the government borrowing and tax coefficients are not zero (substitute), private consumption is not Ricardian (rejecting $H0_A$ and $H0_B$).

The coefficients of tax (of ARDL and NARDL models) show negative impact of tax policy on Russian private consumption function, which asserts Keynesian proposition by accepting $H1_A$.

Additionally, tax funding will affect people's consumption and reduce demand. Russian private sector is susceptible to the tax-based method of funding the deficit. Similarly, the negative coefficients of government borrowing (of ARDL and NARDL models) accepts $H1_B$ and supports Keynesian proposition.

It can be inferred from the study that the deficit financing strategy should be implemented with the required caution due

to the possibility of crowding out of private investment in Russia due to excessive government borrowing. Which, in turn, will obstruct economic development and capital accumulation. The Russian consumers' sensitivity to tax and debt financing methods supports the Keynesian proposition.

6. Conclusion

Implementing an expansionary fiscal policy will influence the overall private demand of Russia. A tendency to rely too much on borrowings as a financing technique negatively influences private consumption spending.

However, moving resources from the future to the present can be aided by carefully using public debt as a source of deficit financing. The Russian government intends to finance its deficit via tax revenue. If so, it will also have a negative effect on private consumption spending, rejecting $H0_A$ and $H0_B$.

This study contributes to the pool of literature on "Ricardian Equivalence" and deficit financing by providing new data on how to formulate fiscal policies that are efficient at financing deficits and sustainable by making prudent expenditures without endangering the nation's private consumption.

This study also provides a starting point for future research on the connection between consumption spending and deficit finance.

This study may be extended by considering the panel of comparable economies since a global analysis may be more insightful than a country-specific analysis. The aggregate consumption model used for the study can also be extended by incorporating the variables such as liquidity contains and the efficiency of the domestic debt market.

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