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Triggering economic growth to ensure financial stability: case study of Northern Cyprus

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Abstract

This study questions the importance of public debt in stable growth between 1980 and 2018, specifically, the Ricardian equivalence hypothesis and Keynesian view are questioned. This study used data obtained from the Northern Cyprus State Planning Office. A restricted vector autoregressive model is used to test the causal relationships between this model and public debt, government expenditure, total capital, consumption, investment, employment, net exports, exchange rate, and gross domestic product growth rate. To ensure financial stability, the variables that trigger economic growth through increased interactions were evaluated. Accordingly, unlike other studies, the Wald test results reveal that public debt does not have a direct effect on the gross national product but indirectly affects total capital, consumption, investment, and public expenditure, all of which influence real gross domestic product (RGDP). It has been observed that employment affects RGDP, consumption, government spending, and investment. There is also bidirectional causality between consumption, government spending, and RGDP. The estimates of the Ricardian equivalent hypothesis are important. However, today's changing economic policies, declining real incomes, and consumer behavior in the face of ever-increasing inflation require that the theory be redesigned. Therefore, contrary to theoretical predictions, consumers are concerned about maintaining their standard of living rather than directing tax deductions to savings. Contrary to the claims of Keynesian researchers, no causal relationship is observed between public debt and growth in this study. However, public debt directly affects total capital, consumption, government spending, and investment, which are important for sustainable economic policy.

Keywords: RGDP, REH, Public debt, Government expenditure, Northern Cyprus, Restricted VAR

JEL Classification: O1, O11, C13

Introduction

The Ricardian Equivalent Hypothesis (REH), based on the theory that public debt has a neutral effect on the real gross domestic product (RGDP; Ricardo 1951; Barro 1979, 1990; Afzal 2012), has been researched several times. However, the Keynesian economic model plays an important role in the RGDP growth rate. In the Keynesian economic model, savings are part of disposable income, and public debt has an effect on RGDP. Therefore, in this study, not only the REH but also Keynesian and modern monetary

views are considered to analyze the impact of public debt and other considered variables' causal relationships to ensure financial stability.

I develop a model based on the Keynesian expenditure output approach to estimate its effects on RGDP. While questioning the causal relationship between the parameters considered, the views of four schools of thought (classical, Keynesian, Ricardian, and Modern Monetary) that have contributed to the literature with different arguments as well as my theoretical knowledge, were used as the foundation for creating my model. While using the explanatory variables specified in the equation, I include Consumption (C), Investment (I), Government Expenditure (G), and Net Export (NX) models from the Keynesian spending approach. However, as the REH is also questioned in this study, I specifically decided to include public debt (TD) and total capital (TC). Again, when the current economic conditions and production model were questioned, when considering the dependency on imported inputs, energy, and the effects of the globalizing world, it was deemed appropriate to include both the exchange rate (REER) and employment (E) in the model.

In the model created to determine the direct effects, the second cointegration equation for the relationship between the independent variables and components of RGDP was used. Ordinary least squares (OLS) and short-term Wald tests were used to determine the long-term effects of the variables on RGDP. In addition, variance decomposition, impulse response, and Granger causality tests were conducted. However, to determine the indirect effects of the variables, the cointegration equations used in the Keynesian output expenditure model and the variables that make up the components of the RGDP were used. However, this time, each independent variable was questioned as a dependent variable, and its long- and short-term effects were estimated using OLS, Wald, and other tests.

The effects on private consumption and public deficit, government expenditure, and the growth of government debt have been examined by researchers who support both REH and Keynesian views. While some researchers have reached conclusions supporting the view of the REH, others have also supported the Keynesian view.

Several studies have questioned growth from different perspectives using the REH and Keynesian theories. However, for this inquiry, the interaction between macro variables, such as public debt, public expenditure, budget deficit, and private consumption, has been evaluated in terms of the effects of growth. It is argued that the REH model is no longer a validated model for economies under today's conditions. Therefore, this study questions the REH model while specifically examining the economy of Northern Cyprus in terms of current economic conditions. Through this research, it is predicted that the REH model can be understood more clearly.

External borrowing is the easiest way to alleviate the tax burden on states (Ogunmuyiwa 2010). Borrowing power is difficult for states not recognized by the international community, such as Northern Cyprus. The government often uses high taxes and constantly increases fees and penalties to finance spending. In addition, short- and long-term loans are mainly provided by Turkey. However, instead of constantly looking for resources to finance government expenditures in Northern Cyprus, reducing electricity and energy consumption to reduce the amount of expenditures can also be a solution. On an island like Cyprus, where sunlight is abundant, energy needs

can also be met by using solar energy panels. Kou et al. (2022) stated in their study that solar energy could not only be used to reduce government expenditures but more energy could also be produced with flexible panels that change position according to the sun's angle. Considering that energy is an important expense today, the widespread and effective use of solar energy on islands with plenty of sunshine should be considered a financially profitable and important economic investment.

Moreover, economic activities financed by borrowing are not sustainable (Ogunmuyiwa 2010). As seen in many countries in 2010, domestic or foreign borrowing caused crises and recessions (Donayre and Taivan 2017). Gómez-Puig and Sosvilla-Rivero (2018) also question the problems of public debt and growth. Several studies (Cochrane 2011; Castro et al. 2015; Soydan and Bedir 2015) have reported that public debt halts economic growth and prevents the absorption of international demand shocks.

Reviewing the literature shows that sudden tightening in financing conditions affects small and medium-sized enterprises (SMEs) the most (European Central Bank 2021a, b). Such financial problems affecting SMEs represent the engine of the Northern Cyprus economy; therefore, growth cannot be realized at the desired level. A previous study highlighted that promoting access to finance will contribute to the development of the financial system (Rashidin et al. 2020; Hasan et al. 2020a, b).

It is predicted that, while affecting economic growth, the increase in financing would lead to both an improvement in environmental factors and an improvement in carbon emissions in the country (Chienwattanasook et al. 2021). Other researchers (Borensztein et al. 1998) have stated that international financial integration supports investments, and financial instability negatively affects economic welfare.

Financial resources are needed for business continuity (Vickers 1970). Reid (1996) states that financial resources are obtained through either subprime bank borrowing or high-cost equity capital to repay capital providers. It has been stated that knowledge of financial services is vital in guiding and developing inclusive finance (Hasan et al. 2021). Unfortunately, state policies in Northern Cyprus are not prepared by competent and experienced people, and programs designed with Turkey's support are not always effective in financing the economy. Checherita-Westphal et al. (2014) also state in their study that fiscal deficits and debt are affected by unconscious policies.

In addition, the state heavily uses taxes, fees, and penalties for capital increases, which negatively affects low-income consumers. When necessary, taxes are not collected from high-income groups, entrepreneurs, and producers, and incentives are given to SMEs that report losses. This is because, as stated by Kou et al. (2021a), SMEs' annual financial information is not available in banks, and there is no internal control system; therefore, they are unreliable and insufficient to inspect SMEs. Therefore, SMEs turn this into an opportunity and declare bankruptcy, thus avoiding taxes and obtaining financial support from the state.

If tax laws are not improved in developing economies, it will not be easy to achieve long-term financial stability in the long run (Wopke et al. 2013). Tax evasion is also a problem in Northern Cyprus. A similar problem was described by González-Fernández et al. (2018), who examined the effects of the interaction between tax evasion and

innovation on the economy. Khuong et al. (2021) also question the similar relationship between the informal economy and economic growth.

Economic and social outlook of Northern Cyprus

Northern Cyprus imports are very high compared with exports, and savings, investment, and capital inefficiency increase the current account deficit (see Table 1). The state budget deficit, which the Turkish government continuously finances for the survival of the public sector, is not a sustainable model.

In Northern Cyprus, tourism, education, trade, and the public sector contribute to the gross national product (GNP), as well as to SMEs. However, the import rate, which is ten times higher than the export rate, causes high public debt, current account deficit, and resource insufficiency. The economy, which developed steadily between 1983 and 2010, had a per capita income of 1305 TL in 1983 and 43,050 TL in 2019 (see Table 1).

Literature reviews and theoretical considerations

This study was developed using the views of four schools of thought–Classical, Ricardian, Keynesian, and Modern Monetary—which have contributed to the literature through different arguments.

Classical view

According to the classical view, economic growth sustained by public debt is negatively affected over time and stagnates (Saungweme and Odhiambo 2019; Domar 1944). Increasing public and private borrowing demand has increased interest rates. According to the monetarists, this domestic borrowing demand and increasing interest rates are seen as exclusions. While this situation causes a decrease in private investments, it also creates a liquidity problem in the market (Mankiw 2000; Modigliani 1961). The classical school also argues that borrowing and inadequate resources hinder the private sector's access to finance (Modigliani 1961; Krugman 1988; Broner et al. 2014). The question of public debt included in this study's model is also supported by this approach.

Table 1 Economic and social indicators for Northern Cyprus. *Source*: http://www.devplan.org/Frame-tr.html (in main economic and social indicators)

Parameters	1983	1990	1995	2000	2007	2013	2016	2019
GNP mio $	202.9	591.0	755.7	1039.9	3598.8	3969	3839.3	3912.3
Growth rate %	1.5	5.7	2.6	− 0.6	1.5	1.3	3.8	3.0
Per capita incomeTL	1305	3447	4167	4978	14765	29217	42022	43050
Inflation rate %	33.8	69.4	72.2	53.2	9.4	10.2	20.5	19.2
Budget deficit mio$	16.1	31.9	83.7	136.7	221.2	285.0	66.1	69.1
Export mio $	40.7	65.5	67.3	50.4	83.7	120.7	105.5	109.1
Import mio $	145.3	381.5	366.1	424.9	1.539,2	1,699.4	1,554.9	1,630.1
Public debt mio $	16.1	31.9	83.7	136.7	221.2	285	66.1	98.2
Net exports mio $	− 104.6	− 316.0	− 298.8	− 374.5	− 1.455,5	− 1,578.4	− 1449.4	− 1521.0
Unemployment %	2.15	1.18	0.98	1.29	9.40	8.4	6.4	6.0
Total Investment %	18.4	16.8	13.7	17.3	23.3	15.1	15.4	14.5
Total saving %	2.3	14.1	12.1	14.1	16.4	14.0	22.9	18.4
Population	155.521	171.469	181.363	208.886	268.011	301.988	335.455	360.520

Ricardian equivalent hypothesis

The second approach, REH, is a theory that predicts that government expenditures financed by public debt and tax increases do not matter and have the same effect on aggregate demand and, consequently, the RGDP in an economy. This was also stated by Demissew and Kotosz (2020) in relation to the REH, who claimed that when the government tries to stimulate the economy by increasing debt-financed government spending, there is neither an increase in wealth in the private sector nor an increase in aggregate demand.

The Ricardian hypothesis assumes that government spending and income cause parallel changes in savings (Kourtellos et al. 2013). According to the assumptions of Ricardo (1951), Barro (1979), and Afzal (2012) for REH, the neutral effect of public debt or taxes on consumption is related to the assumption that taxpayers and households are similar. However, not everyone with household rights is a taxpayer. Thus, the prediction that a government deficit will lead to higher taxes and that households will manage to save is not a correct approach. Therefore, tax cuts and government debt-financed public expenditure do not affect the demand of all consumers.

However, REH's assumptions of the REH are not realistic. According to these assumptions, it is not plausible that individuals and households can save money whenever they want, as it is impossible for those working for minimum wages, especially in developing countries. In such countries, tax cuts can only help consumers maintain their standard of living in the face of ever-increasing inflation and declining real income. Therefore, it is obvious that tax cuts do not have a serious effect on macro indicators, savings, demand, and nominal interest rates. Lindsey (2016) made a similar prediction.

In addition, there is no perfect capital market where people can borrow money whenever they want. Likewise, in today's conditions, the assumption that individuals will save more due to tax increase expectations is incorrect. According to critics of the REH, Ricardo's theory is contrary to Keynesian economic theory.

Keynesian approach

Keynesian economics considers the mono-causal theory of growth, and in this model, savings are part of disposable income, and public debt has a positive outlook on RGDP. Keynesians assume an amount above borrowing and debt-financed government spending (Elmendorf and Mankiw 1999).

The Keynesian approach is based on government intervention, such as tax cuts or income increases, to increase government activities and stimulate demand and consumption. Furthermore, increased government spending supports economic growth and private investment (Wagner 1911; Saungweme and Odhiambo 2019). However, Keynesian economic theorists state that government spending financed by debt has a crowding effect, as well as a multiplier effect on national income, which leads to an increase in the source of funds used by the private sector (Saungweme and Odhiambo 2019). For this reason, the causal relationship between public debt and growth in my model was questioned, and it was observed that there was no causal relationship contrary to the Keynesian approach. Some researchers predict a positive relationship between growth and public debt, whereas others suggest a negative causal relationship. However, the

causal relationship between the growth rate and government debt is primarily bidirectional and has been proposed as the "feedback hypothesis' (Ferreira 2009; Erickson and Owusu-Nantwi 2016).

Contrary to the REH view, empirical results show no direct relationship between public debt and RGDP, and results close to the Keynesian view have been obtained. In studies on which both views are valid, some authors, such as Marinheiro (2001), Giorgioni and Holden (2003b), Beyene and Kotosz (2020), and Elmendorf and Mankiw (1999), reached conclusions in favor of the Keynesian model. Conversely, authors such

Table 2 Evaluation of the empirical results on the causal relationship between public debt and economic growth (REH and Keynesian approaches). *Source*: Author's interpretation

Author year	Method	Country	Findings
Beyene and Kotosz (2020)	(ARDL) Granger-causality	Ethiopia	Keynesian view valid (i.e., supports non debt neutrality)
Saungweme and Odhiambo (2019)	(ARDL) Granger-causality	Zambia	Unidirectional causality from economic growth to public debt
Gómez-Puig and Sosvilla-Rivero (2018)	Granger-causality test	EU	Higher public debt → lower GDP growth rate
Matuka and Asafo (2018)	Cointegration VECM	Ghana	External debt inflows stimulate growth in both the short-run and long-run
Donayre and Taivan (2017)	VAR/Granger-causality tests	OECD (20 countries)	Public debt ↔ low real GDP growth (socialist / capitalist economies)
Owusu-Nantwi and Erickson (2016)	Time-series	Ghana	Public debt ↔ GDP growth rate
Adom (2016)	Granger-causality test	Ghana	High public debt → low growth rate
Kobayashi (2015)	Granger-causality test	Japan	High Public debt ← low real GDP growth
Panizza and Presbitero (2014)	Endogenous growth model	OECD /20 countries	No direct relationship or causality
Afzal 2012	ARCH, GARCH, GARCH, and GJR-GARCH	Evidence from Pakistan and India	REH supported
Reinhart and Rogoff (2010)	Endogenous growth model	Emerging and 44 advanced economies	No relationship or causality
Heathcote (2005)	Time series	USA	REH not supported
Giorgioni and holden (2003b)	Time series	G7	Keynesian view valid
Giorgioni and holden (2003a)	Time series	10 countries	REH valid
Marinherio	Euler eq	Portugal	REH not supported, Keynesian view valid
Elemendorf and Mankiw (1999)	The non-linearity test developed by Hansen (1999)	West African Economic and Monetary Union (WAEMU)	Keynesian valid
Wheeler (1999)	Time series	USA	REH valid
Lucke (1998)	Time series	Germany	REH valid
Barro (1979)	Unweighted regression	USA	REH supported
Ricardo (1951)	Economic modelling	–	REH supported

as Wheeler (1999), Lucke (1998), Giorgioni and Holden (2003a), Barro (1979), Wheeler (1999), and Lucke (1998) have reported findings in favor of the REH model (see Table 2).

Modern monetary theory

Finally, this research was based on Modern Monetary Theory, a macroeconomic theory that focuses on the control of the currency because, as Mosler (2010) mentioned, government debt is money that is not taxed in economic activities. Therefore, considering that insufficient tax collection and other problems affect government debt, Wray (1998) predicted that comparing the government's budgets with that of average households would be wrong. He argued that it would not be right to expect sovereign governments to lend in their own currencies to default (Wray 2015). Another study supporting this prediction assumed that governments would support deficit financing with a near-zero interest rate by the central bank at low growth rates (Driessen and Gravelle 2019). Yet another stated that they could print money instead of taxes or borrow to finance government expenditures (Mosler 2010; Wray 1998, 2015). It has been predicted that, by printing money, the public deficit may be small enough to limit inflation, which may encourage short-term growth (Driessen and Gravelle 2019).

Theoretical and empirical results

According to classical economics schools, the saving rate plays an important role in development. However, in Keynesian economics, savings capital is the non-consumable portion of disposable income. Therefore, savings are encouraged as income increases. In neoclassical economics, Solow (1956) argues that saving stimulates growth only in the short run. Friedman hypothesizes that the expectation of future income growth would reduce the current desire to save. According to Lewis (1954a; b) weak economic growth may result from low savings accounts. Romer (1986) and Lucas (1988) state that high savings and capital accounts encourage economic growth. A report by the World Bank (2020) supports the positive relationship between savings and growth. Therefore, a country's savings capacity and bank reserves are important for its economic growth.

The savings rate in Northern Cyprus is insufficient and is significantly lower than the total investment (see Table 1). From this point of view, this study questions the Keynesian model, which assumes that savings and capital are part of disposable income, and REH, which assumes that public expenditures contribute to economic growth in parallel with the changes in savings. Previous studies have shown that sustainable public debt and capital savings increase difficulty and competitiveness. Adom (2016) stated that public debt should be increased to a sustainable level to increase economic growth. The fact that savings capital and public debt cause a skeptical attitude toward the country in the face of international shocks creates problems in terms of development (Cochrane 2011; Soydan and Bedir 2015; Castro et al. 2015). Similarly, political problems and embargoes in Northern Cyprus created problems for international trade and capital inflows, which increased public debt and reduced financial stability. Bělín and Hanousek (2020) stated that if the benefit outweighs the cost for similar embargoed countries, it may be more costly for the companies in countries imposing sanctions.

Cutting the supply chain toward international markets is sufficient to reduce economic growth. In one study, the supply chain problem was analyzed using the vector

autoregressive (VAR) method. The results of this study indicate that world trade (as a cumulative value) would be 2.7% higher, and global industrial production would be 1.4% higher in the absence of supply chain shocks (European Central Bank 2021a, b). Embargoes that have been implemented in Cyprus for years have a negative impact on both producer and consumer welfare.

As a result of the isolation of Northern Cyprus, a foreign trade deficit and negative net exports occurred between 1983 and 2018. During this period, net exports rose to − 104.6 million dollars in 1983 and to − 1521.0 million dollars in 2019 (see Table 1).

A fiscal deficit is triggered by high inflation. According to Wray (2015), governments that lend their own currency to the domestic market cannot go bankrupt. Driessen and Gravelle (2019) allude to the fact that central banks setting a near-zero nominal interest rate can contribute to the fiscal deficit when economic growth is weak. Therefore, central bank regulations are important. Central bank regulations in Northern Cyprus are predicted through the Central Bank of Turkey, and despite high inflation, nominal interest rates remain very low, resulting in negative real interest rates. This is not a fair banking arrangement, and many people, savers, manufacturers, entrepreneurs, property owners, and others choose to use and lease foreign currency.

One of the biggest problems experienced in Northern Cyprus regarding accessing finance is the inability to obtain sufficient financial data security and reliable customer information. Therefore, distrust and fraud are encountered by both the customers and the banking sector. Li Tie et al. (2022) state that insufficient data causes problems in evaluating credit, the reliability of individuals, fraud detection, rejection, and similar financial applications. Therefore, both customers and institutions in the finance sector suffer losses and must go bankrupt. The demand for loans is difficult because of these inadequacies. These negativities contribute to public debt and the burden on the government.

Research data and methodology

This study examines the effects of total government debt (TD), total capital (TC), consumption (C), government expenditure (G), employment (E), investment (I), net exports (NX), and the real effective exchange rate (REER) on RGDP. The restricted vector error correction model (VECM), a stochastic process, is used to estimate the effects of the parameters.

Model estimation and results

After performing unit root tests for the estimation integration order for the considered data series, the probability value decreases, which implies that the null hypothesis is rejected. This means that there is cointegration between the variables, and the variables are in equilibrium in the long run. The OLS method was used to determine the significance of the variables. After these estimations, the VECM, which is a restricted VAR, is employed.

The methodology consisted of three steps. In the first step, unit root tests are inverted with I (1) values less than 0.05 to estimate the order of integration for the above-mentioned data. Second, a restricted VAR comprising the principal variables is used, and the optimal delay length is determined using three information criteria: Akaike information criterion (AIC), final prediction error (FPE), and Schwarz information criterion (SIC).

The third step involved determining the significance of the variables. The OLS method consistency test was performed, and it was determined that it was not cointegrated according to the results, and restricted VAR was applied (see also "Appendix 4"). The VECM model was implemented based on Engle and Granger's representation theorem (1987). Annual time-series data for 1980–2018 were obtained from the State Planning Office in Northern Cyprus.

Some studies consider the consumption function and interest rate approach to test the REH. In this study, the model developed to estimate the effects of public debt, consumption, government expenditures, and other parameters that affect RGDP was based on the Keynesian expenditure-output model.

$$\begin{aligned} Y &= C + I + G + NX + TC + E + REER + TD \\ RGDPt &= \alpha + \beta 1Ct + \beta 2It + \beta 3Gt + \beta 4NXt + \beta 5TCt + \beta 6Et + \beta 7REERt + \beta 8TDt \end{aligned} \tag{1}$$

Unit root test results

Unit root tests, including the Augmented Dickey–Fuller (ADF) and Phillips Perron (PP) tests, were performed to estimate the investigated data series, with all variables becoming stationary at the first difference. Then, in cases where the probability values are less than 0.05, and the values of the trace and maximum eigenvalues are greater than the test critical values, the restricted VAR model, which is supported by the results of the Johansen cointegration test, is used (See Table 3). These results and interpretations are also compatible with the literature on data stationarity (Dickey and Fuller 1979, 1981; Owusu-Nantwi and Erickson 2016).

Table 3 ADF and PP Unit Root Tests results. *Source*: Author's calculations..

Variables	Tests	Intercept no trend		Intercept and trend	
		Level	First difference	Level	First difference
Invst	ADF	6.382505 (1.0000)	− 5.731215*** (0.0001)	3.532598 (1.0000)	− 8.377645*** (0.0000)
	PP	0.147201 (0.9653)	− 28.54184*** (0.0001)	2.499430 (0.3267)	− 20.44377*** (0.0000)
Emp	ADF	− 1.088471 (0.7104)	− 7.423248*** (0.0000)	− 2.161351 (0.4965)	− 5.696163*** (0.0000)
	PP	− 0.997038 (0.7446)	− 6.905606*** (0.0000)	− 2.137939 (0.5090)	− 36.39875 *** (0.0000)
NX	ADF	− 0.412630 (0.8968)	− 10.72918*** (0.0000)	− 1.739353 (0.7138)	− 10.57337*** (0.0000)
	PP	− 0.561643 (0.8673)	− 11.85035 *** (0.0000)	− 1.995081 (0.5852)	− 11.67268*** (0.0000)
Gdp	ADF	− 1.965646 (0.2995)	− 5.389923*** (0.0001)	− 2.082182 (0.5344)	− 5.072423*** (0.0015)
	PP	4.509178 (1.0000)	− 5.479591*** (0.0001)	− 0.257104 (0.9891)	− 5.481898*** (0.0004)
Cap	ADF	0.305316 (0.9745)	− 4.797510*** (0.0006)	− 0.943522 (0.9367)	− 3.971401*** 0.0051
	PP	2.737349 (1.0000)	− 16.43304 *** (0.0000)	− 0.073631 (0.9935)	− 16.24688*** (0.0000)
Debt	ADF	− 1.852606 (0.3503)	− 6.832023 0.0000	− 1.892385 0.6388	− 3.698745** 0.0386
	PP	− 1.822163 (0.3645)	− 26.40937*** (0.0001)	− 1.892385 (0.6388)	− 26.02155*** (0.0000)
Cons	ADF	− 1.486155 (0.5276)	− 3.624033*** (0.0108)	− 2.052103 (0.2644)	− 3.624033*** (0.0108)
	PP	2.697694 (1.0000)	− 12.28042*** (0.0000)	− 0.806153 (0.9561)	− 12.22615*** (0.0000)
REER	ADF	2.289314 (0.9999)	− 5.689079 *** (0.0001)	− 1.059940 (0.9224)	− 5.987472 *** (0.0000)
	PP	3.228888 (1.0000)	− 5.613070 *** (0.0000)	− 1.063754(0.9999)	− 5.975293*** (0.0001)
Gov expd	ADF	1.703302 (0.9994)	− 5.823188*** (0.0000)	1.788754 (1.0000)	− 6.437713*** (0.0000)
	PP	3.593127 (1.0000)	− 21.32017*** (0.0001)	0.921833 (0.9998)	− 20.25825*** (0.0000)

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively

Ho: variables have a unit root.
H1: variables have no unit root.

Variables are not stationary at level but are stationary at the first difference considered for the employed model.

Correlation analysis

The correlations between variables are presented in "Appendix 4". There is a negative and very weak (less than 0.20) relationship between INVEST and REER, and NX. However, between EMP, CONS, CAP, and INVEST, there was a weak positive correlation. For the second variable, NX, there is a very weak negative correlation between GEXPD and RGDP EMP. DEBT, and CAP. However, a moderate correlation was observed between REER, CONS, and NX. For the third variable, REER, there is again a weak correlation among all variables. There was a very weak negative correlation between GEXPD and EMP, but a moderate relationship existed between GEXP and RGDP, DEBT, and CONS. There was a strong correlation between CONS, CAP, and RGDP. However, a weak negative correlation was observed between the EMP DEBT and RGDP. The sixth variable, employment, has a weak correlation with the other variables. There was a weak correlation between the DEBT and CONS, but a moderate correlation was observed between the CONS, CAP, and DEBT.

Lag length selection

In this study, we continued by estimating the lag length in the restricted VAR model (Hacker and Hatemi 2008) because all series became stationary at the first difference I (1) order, as indicated at the bottom of Table 4. Three of the four lag length selection criteria, namely, SIC, AIC, and Hannan–Quinn (HQ) information criteria, have the lowest lag length values. Too many lags lead to the loss of degrees of freedom and can cause multicollinearity. Therefore, another VAR model was developed to analyze Lag 2. Table 4 presents the results of the lag-order selection test.

Cointegration results for employing restricted VAR

This study uses the Johansen test for the cointegration of non-stationary variables at the level to estimate the possible long-run relationships. If cointegration is found between the variables, it is assumed that there is a linear relationship, and the disequilibrium errors will be approximately zero. The cointegration tests of Engle and Granger, Johansen and Juselius (1990), and Pesaran et al. (2001) have been used to estimate the

Table 4 VAR Lag Order Selection test results. *Source*: Author's calculations

Lag	Log	LR	Final prediction error (FPE)	Akaike information criterion (AIC)	Schwarz information criterion (SC)	Hannan–Quinn info criterion (HQ)
0	−4111.343	NA	2.10e+88	228.9080	229.3038	229.0461
1	−3934.565	255.3463	1.17e+86	223.5869	227.5457	224.9687
2	−3613.151	303.5578*	4.71e+80*	210.2306*	217.7523*	212.8559*

*Indicates lag order selected by the criterion

long-term relationship between two variables. Additionally, existing cointegration equations between the variables handled using the Johansen technique were used. Finally, the results were evaluated using trace and maximum eigenvalue statistics.

Null Hypo: a cointegrated equation is considered for the model.
Alt Hypo: there is no cointegrated equation.

According to Table 5, the results of the cointegration test provide eight cointegration equations for the trace statistic and eight cointegration equations for the maximum eigenvalue, which are higher than the test critical values. Furthermore, the probability values for trace statistics and max eigenvalues are significantly less than 0.05, which means that our variables are not cointegrated for these equations. However, the trace statistics values for seven and eight and the maximum eigenvalues for five, six, and eight are less than the test critical values. Probability values were higher than 0.05.

The results of the restricted cointegration rank test for trace show that the null hypothesis can be accepted for at most 7 and 8 and for maximum eigenvalues 5, 6, and 8, which means that there is at least one cointegration equation. This implies cointegration between the variables, which will be in equilibrium in the long run.

The following nine equations from "Appendix 3" were estimated in the given model to determine the probability value: If the probability value is less than 0.05, it is significant and affects the endogeneity, whereas if it is greater than 0.05, it is not significant. Therefore, it is necessary to estimate the probability values for the 171 coefficients giv

en below: In "Appendix 7", nine equations are illustrated to show how each variable becomes endogenous and how it is affected by other exogenous variables, which are estimated using the OLS method.

In "Appendix 3", the probability values in bold, estimated to be less than 0.05, become significant and affect the endogenous variable. In "Appendix 3", the following results are estimated.

Table 5 Restricted cointegration rank tests for trace and maximum eigenvalues. *Source*: Author's calculations

Null hypothesis	Trace				Maximum eigenvalue		
	Trace statistic	Critical value (5%)	Probability	Null hypothesis	Max Eigen statistics	Critical value (5%)	Probability
$r \leq 0*$	645.9473	197.3709	0.0001	$r \leq 0*$	189.1808	58.43354	0.0000
$r \leq 1*$	456.7665	159.5297	0.0000	$r \leq 1*$	164.1914	52.36261	0.0000
$r \leq 2*$	292.5751	125.6154	0.0000	$r \leq 2*$	119.4457	46.23142	0.0000
$r \leq 3*$	173.1293	95.75366	0.0000	$r \leq 3*$	74.07989	40.07757	0.0000
$r \leq 4*$	99.04942	69.81889	0.0001	$r \leq 4*$	39.31506	33.87687	0.0102
$r \leq 5*$	59.73437	47.85613	0.0026	$r \leq 5$	27.41306	27.58434	0.0526
$r \leq 6*$	32.32131	29.79707	0.0251	$r \leq 6$	17.43864	21.13162	0.1523
$r \leq 7$	14.88266	15.49471	0.0617	$r \leq 7*$	14.76178	14.26460	0.0417
$r \leq 8$	0.120880	3.841466	0.7281	$r \leq 8$	0.120880	3.841466	0.7281

*Trace statistics indicate 7, and maximum eigenvalues indicate 5 cointegrating equation(s) at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level

In Eq. (2), C1 is the long-run coefficient, which is expected to become a negative value to bring the entire system back to equilibrium. However, its value here is positive (0.990352), and its probability value is higher than 0.05 and is significant. This implies no long-run causality between the exogenous variables and the RGDP growth rate. However, when the coefficients of other parameters are considered, such as employment, investment, and government expenditure, there is less than a 0.05 probability that they affect the RGDP growth rate as the endogenous variable. Additionally, the R-squared value is 0.96, indicating that the endogenous variable RGDP is sufficiently influenced by the exogenous variables under consideration.

When total capital becomes the endogenous variable in Eq. (3), government expenditure, employment, and investment affect the total capital. In Eq. (4), RGDP, public debt, employment, and investment all affect consumption.

In Eq. (5), no effect is observed on public debt. In Eq. (6), when employment becomes an endogenous variable, there is no influence from other variables. In Eq. (7), RGDP, consumption, and exchange rates influence government expenditures. In Eq. (8), only total capital influences investment. In Eq. (9), RGDP, total capital, consumption, employment, government expenditure, investment, and exchange rate affect net exports. In the last equation, RGDP, total capital, consumption, public debt, government expenditure, employment, and investment influence the exchange rate.

Vector error correction model

If one or more cointegration vectors were found among the variables, a VECM was used.

In the VECM model estimation, the parameter gives the coefficient of the error correction term to measure the adaptation rate of growth to the equilibrium level. The short- and long-term relationships were determined using the equations formed in this model. The short-term effects are captured through the individual coefficients of the differentiated terms (Dalina and Liviu 2015).

Wald test estimation

The results of the Wald test for the nine predicted equations are shown in Tables 6, 7, 8, 9, 10, 11, 12 and 13. This is done to understand whether the lags jointly affect the endogenous variables.

Table 6 Wald test results for Eq. (2). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
RGDP	Total capital	3.479104	0.1756
	Consumption	7.120228	0.0284
	Public debt	1.389247	0.4993
	Employment	12.55859	0.0019
	Investment	8.445932	0.0147
	Gov. expenditure	8.168042	0.0168
	Net exports	0.840334	0.6569
	REER	4.718188	0.0945

Table 7 Wald test results for Eq. (3). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Total capital	RGDP	32.67045	0.0000
	Consumption	48.26082	0.0000
	Public debt	13.91186	0.0010
	Employment	56.15025	0.0000
	Investment	67.57881	0.0000
	Gov. expenditure	24.84544	0.0000
	Net exports	4.433685	0.1090
	REER	9.154405	0.0103

Table 8 Wald test results for Eq. (4). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Consumption	RGDP	18.08441	0.0001
	Total capital	0.958387	0.6193
	Public debt	7.759261	0.0123
	Employment	9.395872	0.0091
	Investment	38.77481	0.0000
	Gov. expenditure	2.577205	0.2757
	Net exports	2.371653	0.3055
	REER	3.153843	0.2066

Table 9 Wald test results for Eq. (5). *Source*:Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Public debt	RGDP	2.025521	0.3632
	Total capital	5.555585	0.0622
	Consumption	1.100233	0.5769
	Employment	2.351633	0.3086
	Investment	1.897394	0.3872
	Gov. expenditure	2.804579	0.2460
	Net exports	0.013435	0.9933
	REER	1.613815	0.4462

Table 10 Wald test results for Eq. (6). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Employment	RGDP	0.022738	0.9887
	Total capital	0.071440	0.9649
	Consumption	0.003977	0.9980
	Public debt	1.523140	0.4669
	Investment	0.085578	0.9581
	Gov. expenditure	0.325629	0.8497
	Net exports	0.281735	0.8686
	REER	1.628713	0.4429

Table 11 Wald test results for Eq. (7). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Investment	RGDP	1.144774	0.5642
	Total capital	29.34934	0.0000
	Consumption	1.966686	0.3741
	Public debt	5.610173	0.0605
	Employment	3.634114	0.1625
	Gov. expenditure	2.656783	0.2649
	Net exports	0.440324	0.8024
	REER	0.473296	0.7893

Table 12 Wald test results for Eq. (8). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Gov expenditure	RGDP	44.44717	0.0000
	Total capital	2.291056	0.3181
	Consumption	30.20606	0.0000
	Public debt	32.41279	0.0000
	Employment	34.15166	0.0000
	Investment	30.41405	0.0000
	Net exports	2.199088	0.3330
	REER	13.19262	0.0014

Table 13 Wald test results for Eq. (9). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
Net exports	RGDP	14.03836	0.0009
	Total capital	9.344786	0.0093
	Consumption	11.17382	0.0037
	Public debt	6.570738	0.0374
	Employment	21.75928	0.0000
	Investment	17.91958	0.0001
	Gov. expenditure	2.552136	0.2791
	REER	6.717060	0.0348

Table 6 presents the Wald test results for Eq. (2) for the RGDP. The probability values of the estimated coefficients for total capital, public debt, and net exports are greater than 0.05, indicating that these exogenous variables do not affect the RGDP. However, the probability values for consumption, employment, investment, and government expenditure were found to be less than 0.05, indicating that they do have some effect on RGDP.

Table 7 shows the results of the Wald test for Eq. (3) for total capital. The probability values of the coefficients estimated for RGDP, consumption, employment, investment, and government expenditure are zero, whereas, for net exports, they are greater than 0.05, so the exogenous variables have no effect on total capital.

However, the probability values for public debt and REER were 0.0010 and 0.0103, respectively. Thus, the variables affect total capital.

Table 8 presents the Wald test results for Eq. (4) with consumption as the endogenous variable. The probability values for total capital, government spending, and REER is greater than 0.05, whereas, for investment, the probability value is zero, meaning that these exogenous variables have no effect on consumption. However, the probability values for employment, public debt, and RGDP are less than 0.05 and, therefore, have some influence on consumption.

Table 9 presents the results of the Wald test for Eq. (5) for public debt. The probability values for total capital, RGDP, consumption, employment, government expenditure, investment, and net exports are greater than 0.05. This implies that the exogenous variables considered in Table 9 have no effect on public debt.

Table 10 shows the results of the Wald test for Eq. (6) for employment. The probability values for the estimated coefficients of RGDP, total capital, government debt, government spending, investment, and consumption were higher than 0.05. This finding implies that the exogenous variables considered in Table 10 have no effect on employment.

Table 11 presents the results of the Wald test for Eq. (7). The probability value for total capital is zero, whereas the values for RGDP, consumption, investment, employment, public debt, net exports, and REER are greater than 0.05. This means that the exogenous variables have no effect on investment.

Table 12 shows the results of the Wald test for Eq. (8) for government expenditure. The probability values for RGDP, consumption, public debt, employment, and investment are zero, and for net exports, they are higher than 0.05. This means that these variables have no influence on government expenditures. However, the probability value for REER is less than 0.05 and therefore has some effect on government expenditure.

Table 13 shows the results of the Wald test for Eq. (9) for net exports. The probability value for employment is zero, whereas for public debt, governmental expenditure, and REER, the values are greater than 0.05 and, therefore, have no effect on net exports. However, RGDP, total capital, public debt, consumption, and investment values are less than zero and have some influence on net exports.

Table 14 presents the results of the Wald test for Eq. (10) for the REER. The probability values for RGDP, total capital, public debt, employment, investment, and government expenditure are less than 0.05. This means that these variables have some influence on REER. However, the probability values for consumption and net exports are higher than 0.05 and have no effects on REER.

Granger causality

"Appendix 5" provides the Granger causality test results. There are bidirectional causalities between consumption and capital, public debt and total capital, governmental expenditure and capital, and REER and net exports. However, there is unidirectional causality from RGDP to CAP, investment in REER, investment in consumption, consumption to governmental expenditure, and investment in total capital. The results show that public debt has no direct effect on RGDP but indirectly influences certain parameters, including total capital, investment, consumption, government expenditures, net exports, and REER.

Table 14 Wald test results for Eq. (10). *Source*: Author's calculations

Endogenous variable	Exogenous variable	Chi square	Probability
REER	RGDP	13.56643	0.0011
	Total capital	8.912412	0.0116
	Consumption	5.539855	0.0627
	Public debt	6.002376	0.0497
	Employment	7.681591	0.0215
	Investment	14.57189	0.0007
	Gov. expenditure	12.00979	0.0025
	Net exports	2.003579	0.3672

Variance decomposition

The variance decomposition results for RGDP estimate the source of the fluctuations in public debt and consumption. RGDP, consumption, and employment affect total capital more than the other variables. The variance decomposition results for government expenditure indicate that changes in RGDP consumption and public debt have a greater influence on such fluctuations. RGDP, capital consumption, public debt, employment, and investment have more effects than other variables on fluctuating consumption. RGDP, public debt, employment, total capital, and consumption influence the fluctuations in public debt. RGDP has greater value than capital, public debt, and consumption in causing employment fluctuations. RGDP, consumption, public debt, employment, and total capital contribute to investment fluctuations. RGDP, consumption, total capital, and employment cause more fluctuations in net exports than other variables. Finally, RGDP, consumption, public debt, employment, and investment cause more fluctuations in the exchange rate than the other variables (see "Appendix 1").

Impulse response results

The results show that both consumption and the real effective exchange rate have positive effects on RGDP, but all other variables react negatively to influence RGDP. Exchange rates and government spending have some value in influencing consumption, total capital, employment, and debt. The exchange rate also has a positive effect on investments and government spending. Investment has a positive effect on net export. Consumption had a positive effect on total capital and employment. Finally, GDP consumption and net exports have a positive effect on the exchange rate (see "Appendix 2").

Results and discussion

In Eq. (2), the long-term coefficient C1 is positive (0.990352), whereas a negative value is desired for the system to approach equilibrium. However, the probability value is greater than 0.05 and is significant. This means that there is no long-run causality running from exogenous variables to the RGDP growth rate. However, when the coefficients of other parameters, such as employment, investment, and public expenditure, are considered, the probability of affecting real gross national product (RGNP) as an endogenous variable is less than 0.05. In addition, the R-squared value was 0.96, which means

that the endogenous variable RGDP was sufficiently affected by the exogenous variables considered.

In Eq. (3), when total capital becomes the endogenous variable, government spending, employment, and investment affect the total capital. In Eq. (4), it can be seen that GDP, public expenditure, employment, and investment affect consumption, but again, the coefficients of both equations were determined to be 0.713628 and 1.285059, respectively, and the desired negative value was not obtained to bring it into balance.

Again, in the long run, the effect expected from the independent variables for public debt in Eq. (5) and employment in Eq. (6) was not observed, but the coefficient of public debt (− 2.79) and the coefficient of employment were determined to be negative (− 1.16) to balance the whole system. The coefficients of Eqs. (7) and (8) were positive. However, while GDP, consumption, and exchange rate affect government spending, Eq. (8) shows that only total capital affects investment. In Eqs. (9) and (10), the coefficient of net exports was determined as (− 1.06), and the coefficient of the exchange rate was determined as (− 1.59). Furthermore, the results indicated that it had a balancing effect on the entire system. In addition, net exports are affected by GNP, total capital, consumption, employment, government expenditure, investment, and exchange rate. Similarly, the exchange rate is affected by GDP, total capital, consumption, public debt, government expenditure, employment, and investment.

The short-term results are estimated as follows. According to the Wald test results for Eq. (2), in which RGDP is considered, unlike other studies, public debt does not directly affect GNP but indirectly affects total capital, consumption, investment, and public expenditure, which in turn affects GDP (See Tables 6, 7, 8, 11, 12).

Conversely, points out that unidirectional causality runs from public debt to RGDP in the long run. Saungweme and Odhiambo (2019) also support the REH and find that government debt affects economic growth. Enrique (2015) also states that there is a positive relationship between public debt and economic growth up to a certain level and that these effects become negative and harm economic growth.

Analysis of the Wald test results also shows that government spending, consumption, and investment have positive values, indicating that they jointly influence RGDP in Eq. (2) (see Table 6). As exogenous variables, public debt and investment affect consumption, REER, and government expenditures (see Tables 8, 12, 14). Additionally, as endogenous variables, REER and net exports are affected by RGDP, employment, consumption, public debt, investment, capital, and government expenditures (see Tables). Consumption and government expenditure are affected by RGDP, investment, employment, and public debt (Tables 8, 12).

The Wald test results show bidirectional causality between RGDP and consumption and governmental expenditures, as well as between REER and capital. Hilton (2021) observes a similar positive bidirectional interaction between government spending and RGDP in the long run. This study observes bidirectional causality between government expenditure and capital, capital, public debt, consumption, and REER, and between net exports and REER.

Again in my study, contrary to previous studies by Saungweme and Odhiambo (2019) and Elmendorf and Mankiw (1999), employment as an exogenous variable has a significant influence on consumption, government expenditure, REER, and net exports as

endogenous variables. GDP growth rate, investment, and public debt, as exogenous variables, also have values that affect consumption as endogenous variables (see Tables 7, 8, 9, 10, 11, 12, 13, 14).

However, the exogenous variables considered in Eqs. (5) and (6) as endogenous variables have no direct effect on public debt and employment (see Tables 9, 10). These variables do not affect the accumulated capital or income. This is because either the unregistered amount of collected income is high, or the transferred income is not used properly, meaning that the government cannot meet its debts. This means that it is not possible to overcome the negative effects of public debt and current account deficit. The relative prices of goods that cannot be traded in local markets due to public debt are lower than those of foreign goods, and production and development can be seen in these sectors. Since the increase in public debt similarly increases the risk premium, it becomes a loss, and therefore, the interest to be paid increases; as a result, the income and savings of households also decrease the resources, and the growth is also indirectly affected.

According to the findings shown in "Appendix 3", when RGDP is the endogenous variable in the second least squares equation, the coefficients of total investment, government expenditure, and employment affect RGDP. Similar findings were observed in a study by Jermsittiparsert et al. (2019), indicating that government spending affects economic growth.

In addition, this study emphasizes the importance of macroeconomic variables and fiscal policy. According to the results obtained in Eq. (3), RGDP affects total capital formation when consumption, public debt, employment, government expenditure, investment, net exports, and exchange rate become the exogenous variables. In Eq. (4), public debt, employment, investment, and RGDP have some influence on consumption. In Eq. (7), investment, public debt, consumption, employment, RGDP, and exchange rate affect government expenditure. In Eq. (8), investment is affected only by total capital. In Eq. (9), where net exports are the endogenous variable, RGDP, total capital, consumption, government expenditure, investment, exchange rate, and employment affect it. Finally, in Eq. (10), RGDP, total capital, consumption, public debt, employment, government spending, and investment affect the REER (see "Appendix 3").

Recommendations

The insufficient financing of Northern Cyprus requires a sustainable fiscal policy. Currently, due to changing conditions and preferences, financing opportunities and access to banks have become more difficult. In a study that may also contribute to the improvement of the financial system in Northern Cyprus, Kou (2021b) drew attention to technology investments to increase the financial performance of financial technologies (Fintech). It was stated that in this way, costs would be reduced, productivity would increase, and serious contributions would be made to the financial system. While emphasizing the importance of cost management in their study, they observed that payments are the strongest investment alternative based on fintech, but savings are the weakest alternative for European banking services. Additionally, the importance of non-financial factors is also highlighted in this study.

The weak regulations and practices of the Central Bank of Northern Cyprus to create a viable banking sector that encourages savings accounts and raises capital for creditors and investors should also be addressed. However, low incomes and wages reduce households' ability to contribute to savings accounts for investment transfers, in turn reducing capital formation in Northern Cyprus.

Influenced by the Central Bank of Turkey, the Turkish Central Bank of Northern Cyprus is responsible for the current financial system in Northern Cyprus. The economy in Northern Cyprus has constantly been experiencing the closure and economic contraction experienced in many countries during the pandemic. However, although liberal economic policies have been implemented, the existing political isolation and embargoes have increased trade in favor of imported products. A stable monetary policy is required to improve Northern Cyprus' terms of trade. However, the country has been experiencing serious economic and welfare reductions due to the export products produced with high-cost imported inputs and expensive imports due to the depreciating value of the Turkish lira. Banchorndhevakul et al. (2015) also pointed out that there is a long-run relationship between the increase in GDP per capita income and terms of trade.

Political and financial difficulties in trade and lack of know-how in Northern Cyprus negatively affect public debt, government expenditure, investment, and economic growth. In a study by Ayu (2017), the results showed that economic growth is affected by trade, and there is also a positive correlation between dynamic trade and expertise. Inadequate government control, incentives for inefficient production, rising government debt, and budget deficits are not sustainable. Apart from these, negative real interest rates, an increase in the exchange rate, current account deficits, financial inadequacies, resource management problems, recession, and speculation all affect Northern Cyprus.

Conclusion

This study questions the importance of public debt for stable growth. Specifically, the REH and Keynesian views were questioned, and a redesign of the REH estimates and model was proposed. The most important reason for this is that, contrary to popular belief, it is challenging to direct tax deductions to savings. Particularly in developing countries, it is predicted that when tax reductions are applied, those who work with low wages will prefer to increase their consumption instead of saving, and they will prefer to increase their welfare to some extent. Therefore, the REH model is unsuitable for today's economic conditions; thus, the assumption that public debt has a neutral effect on RGDP should be questioned.

Barro's version of the REH, which is generally interpreted as being contrary to Keynesian fiscal policy, is difficult to evaluate in today's economic conditions. According to the REH, investors and consumers agree that the effect would be the same if the government borrowed more or imposed more taxes to increase spending. It is expected that this will not change aggregate demand. The explanation for this is that debt is eventually paid with taxes. Thus, it is correct to expect an increase in demand resulting from increased public expenditure to be balanced. In this regard, it is similar to Keynes' fiscal policy. However, the REH's prediction that savings will increase because of the expectation that taxes will increase is an open question in today's economic policies. It is a correct approach to overcome this stagnation by increasing public expenditure and

lowering tax rates, thus increasing disposable income, which is present in Keynes's fiscal policies and in periods when demand decreases. However, the opposite is true. In other words, a budget surplus can be achieved by reducing public expenditures and increasing tax rates (Kurz 2017). No one objects to the necessity of state intervention for a sustainable economic structure rather than realizing economic growth in times of reduced demand. However, some differences emerge when this situation is evaluated in the context of current conditions. Today, imported inputs and energy are used in many countries, and owing to the increase in their prices, the reflection of the economic contraction on production and costs is inevitable. The fact that production is dependent on foreign exchange-indexed inputs increases the prices of goods and services, particularly in developing countries such as Northern Cyprus. This caused a decrease in demand. It is observed that wages and income decline because of continuous high inflation. Therefore, consumers are more concerned about maintaining living standards rather than saving because real wages and purchasing power decrease even though nominal wages are constantly increasing. Unfortunately, the only way to stimulate domestic demand is through consolidated budgets; raising nominal wages and salaries is one of the most frequently applied government policies. When this is done, taxes, fees, and penalties are increased again in the next stage. Thus, consumers whose welfare increases in the short run suffer more losses in the long run, which weakens both the value of money and the strength of the economy.

This study also shows no direct relationship between public debt and the RGDP. However, investments, consumption, employment, and government spending have direct effects on RGDP. However, when public debt is the endogenous variable, government expenditures and total capital are indirectly affected by net exports, exchange rates, and consumption.

Likewise, RGDP showed that consumption, public debt, employment investment, and exchange rates also affect government expenditures. Therefore, it should not be forgotten that the revival of debt-financed public expenditure affects many other variables. Beyene and Kotosz (2020) also predicted that debt-financed public expenditure would not increase either wealth or aggregate demand in the private sector.

From the 1970s to the end of the 1990s, public debt and capital savings were major problems for long-term loans and investments in Northern Cyprus, as most of the loans made by investment banks for long-term projects accumulated in these debts. Public debt negatively affects economic growth (IADB 2013). Inadequate public policies and weak international relations create economic problems. Financial problems and public debt increase as small firms have difficulty repaying their loans, most bank loans cannot be repaid, and borrowers are secured with their personal assets. These inadequacies also negatively affect financial development, ultimately increasing public debt and negatively affecting the RGDP. Dampitakse et al. (2021) obtained similar results in their research and stated that economic growth will be positively affected in parallel with financial development.

In their study, Gibson et al. (2014) stated that debt resources are secured by overdraft accounts from financial institutions, but these cannot be a permanent solution either. Financial stability refers to the prevention of financial crises, the sustainability of the

financial system, and the prevention of these negativities that affect the economy (Das et al. 2010).

The continued support of Turkey to the public sector in Northern Cyprus reduces its ability of Northern Cyprus to create a sustainable financial system. Similar problems are observed in many developing countries, and short-term loans are generally used to support and finance long-term projects that do not pay debt obligations on time (Marquez 2000). Stambuli's (1998) study supports this observation. In Northern Cyprus, the government's weak financial ability to finance long-term economic activities is not a realistic model for sustainable economic growth. As a result, taxes, fees, and penalties, which are the government's primary means of capital accumulation, have become the main instruments of fiscal policy used by the public sector for government expenditure and revenue payments.

Appendix 1: variance decomposition (VD) result for North Cyprus

Source: **Author's estimation**

Period	S.E	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	DREER
VD of DGDP/TL real gross domestic production										
1	1.06E+08	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.29E+08	68.87165	0.573492	16.21451	1.164364	1.079946	0.013381	10.03228	2.049118	0.001253
3	1.68E+08	47.33496	4.573719	15.10353	8.330281	14.54968	1.705089	6.552983	1.809491	0.040265
4	2.77E+08	18.41108	1.823171	42.79973	21.85675	6.791880	4.864271	2.456846	0.888964	0.107309
5	4.04E+08	10.06858	1.643935	43.80433	28.61573	5.336861	7.656030	1.746487	0.796455	0.331592
6	4.72E+08	7.718534	4.628383	40.25610	29.92347	4.120912	9.842792	2.405053	0.612363	0.492392
7	5.05E+08	7.409775	5.212909	37.20531	27.35684	7.234514	12.03651	2.130078	0.542523	0.871546
8	5.40E+08	6.625323	4.646132	32.49702	23.98496	17.01172	11.19163	2.189225	0.643803	1.210183
9	5.63E+08	7.334654	4.368222	30.02574	22.60080	19.65596	10.31259	3.626284	0.672595	1.403156
10	5.74E+08	7.427009	4.387233	29.01624	21.78093	19.77532	9.947872	4.866601	1.268036	1.530756
VD of DCAP (total capital)										
1	28,199,817	1.969945	98.03005	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	55,848,136	6.957497	27.36241	15.27831	2.837808	43.28727	0.495271	3.377151	0.341236	0.063040
3	79,143,540	8.907543	13.73985	8.620451	1.920329	62.75329	0.501916	2.447593	0.867422	0.241609
4	95,180,642	6.396734	11.97969	23.25284	4.503779	43.47405	2.686150	5.191883	1.525200	0.989663
5	1.21E+08	9.145021	8.835758	27.13070	15.25382	29.92547	3.160907	3.233055	2.296712	1.018551
6	1.36E+08	8.990874	7.645856	27.97860	18.10870	26.75418	4.651240	2.591239	2.306187	0.973125
7	1.41E+08	8.403055	7.743852	26.91504	19.71382	25.48835	5.855622	2.427980	2.376540	1.075731
8	1.51E+08	13.94617	9.813590	24.81234	17.33882	22.55866	5.200466	2.973284	2.366391	0.990279
9	1.66E+08	12.43690	8.758309	24.13544	15.98552	28.89580	4.296177	2.469719	2.205454	0.816687
10	1.73E+08	12.12050	8.513643	24.81938	15.99698	29.32580	3.973487	2.325863	2.126937	0.797410
VD of DCONS (consumption)										
1	97,384,080	90.73474	0.951809	8.313454	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.53E+08	67.28652	3.145412	13.32141	7.358517	2.460125	1.694390	1.679577	3.053493	0.000559
3	1.68E+08	55.83926	7.297191	12.42577	7.026157	10.92896	1.677124	1.984132	2.767518	0.053883
4	2.56E+08	26.56807	7.082952	29.80654	20.15118	5.148297	6.485608	2.114756	2.276682	0.365916
5	3.34E+08	18.48277	4.687257	32.47718	21.30474	8.549307	10.84846	1.289024	1.512158	0.849102
6	3.64E+08	15.97245	6.084649	31.59072	22.90683	7.766309	11.60922	1.608722	1.331828	1.129267

Period	S.E	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	DREER
7	3.97E+08	16.17012	6.544442	29.76945	19.73972	10.37303	12.97026	1.575077	1.116036	1.741859
8	4.21E+08	15.12179	6.059368	26.48008	17.55477	16.42470	12.23962	2.383654	1.635404	2.100615
9	4.44E+08	16.10917	5.835360	23.89126	16.56743	18.54372	11.04963	4.418453	1.475478	2.109497
10	4.59E+08	15.06564	5.467587	23.88017	16.00444	19.00843	10.39002	5.802512	2.234058	2.147132
VD of DDEBT (public debt)										
1	45.18106	50.51819	0.207424	12.55250	36.72188	0.000000	0.000000	0.000000	0.000000	0.000000
2	59.40321	29.30179	10.95578	10.86686	21.24836	24.12707	0.384051	2.741720	0.008853	0.365510
3	67.61410	36.88990	12.12662	8.833357	16.73585	18.67712	2.555827	2.607074	1.284905	0.289339
4	72.08439	33.80399	14.76042	10.95970	16.50650	16.71005	2.550531	2.538556	1.892882	0.277371
5	86.62290	29.74969	10.84099	14.27069	12.27993	27.16445	1.881368	1.765225	1.789500	0.258148
6	93.44255	26.85359	10.93763	12.41064	11.22217	32.40062	1.631384	2.579834	1.588222	0.375919
7	100.1966	25.24243	9.951478	13.21552	11.02036	33.00566	1.549221	2.393723	3.124353	0.497256
8	100.7807	25.24901	9.853802	13.08227	10.97764	32.63487	1.538450	2.800512	3.359984	0.503457
9	105.0386	23.40487	9.182202	12.11725	11.14592	36.54238	1.420721	2.628630	3.094189	0.463827
10	105.8142	23.48271	9.517554	12.11917	11.01290	36.02240	1.450027	2.882736	3.053601	0.458899
VD of DEMP (employment)										
1	1.982774	15.64428	0.001951	2.532761	0.209835	81.61117	0.000000	0.000000	0.000000	0.000000
2	2.089139	15.19801	0.137063	2.402749	2.023290	79.21758	0.291286	0.584976	0.136969	0.008074
3	2.174359	14.77085	1.282349	2.318374	2.054986	76.67627	1.261665	0.554217	0.827098	0.254190
4	2.343438	16.25330	2.299314	3.306809	3.636343	71.18064	1.690651	0.483840	0.751699	0.397399
5	2.414951	15.96755	3.841279	3.160359	3.424344	68.89435	2.448101	0.538856	1.083269	0.641893
6	2.478469	16.17393	3.767576	3.090080	3.688315	67.27977	2.427582	1.675366	1.031333	0.866044
7	2.505481	16.34672	3.760521	3.354199	3.669419	65.97110	2.389309	2.277163	1.197110	1.034455
8	2.542382	15.87594	3.680416	3.641432	3.741541	65.17693	2.323114	3.295178	1.235182	1.030272
9	2.678737	14.82386	4.822141	3.362160	3.689962	65.50343	2.237245	3.484603	1.117366	0.959235
10	2.949037	13.39254	4.864663	5.172012	5.239922	64.78422	1.873703	2.885210	0.939264	0.848462
VD of DINVST (investment)										
1	1.03E+08	23.83571	4.361505	16.10582	8.462367	33.12380	14.11080	0.000000	0.000000	0.000000
2	1.22E+08	17.25532	24.24235	13.93169	9.756481	24.07403	10.10710	0.116077	0.456847	0.060093
3	2.10E+08	6.854382	20.93054	5.887007	6.747283	47.13261	4.468525	7.612406	0.264271	0.102978
4	2.33E+08	6.239530	18.31515	11.00087	8.522084	43.23874	5.179654	6.702714	0.716147	0.085110
5	3.00E+08	4.224475	15.19530	20.85737	12.42579	37.09758	5.461632	4.137694	0.431506	0.168657
6	3.35E+08	15.06149	15.03203	17.52422	11.59310	30.97119	5.629949	3.610081	0.433190	0.144743
7	3.72E+08	22.35130	13.44565	14.83810	10.82634	29.20985	4.572045	2.967623	1.661780	0.127309
8	3.83E+08	21.06685	12.69043	16.27231	10.49802	28.76328	4.499530	2.853355	3.031268	0.324957
9	3.91E+08	20.28680	12.86450	15.65051	10.24928	29.64832	4.450704	3.574751	2.962276	0.312863
10	4.08E+08	19.11199	11.81292	14.35054	9.476315	34.55228	4.311428	3.319280	2.731159	0.334088
VD of DGEXPD (governmental expenditure)										
1	36,330,698	20.24350	19.49317	18.09718	0.133456	0.080344	8.551476	33.40087	0.000000	0.000000
2	71,384,388	23.04594	22.30204	8.754345	2.084982	25.48876	4.625296	10.89823	1.927081	0.873337
3	87,561,274	17.34508	16.37492	5.927705	1.385816	38.30666	7.366419	9.590932	3.116902	0.585562
4	1.15E+08	20.81686	11.43522	15.99197	12.60757	22.62019	5.440208	5.762161	4.858697	0.467135
5	1.50E+08	15.01858	6.757191	33.56317	16.60555	16.06115	4.892802	3.644270	3.048932	0.408356
6	1.85E+08	11.26807	8.414554	28.46056	20.53940	19.10117	6.114335	3.559929	2.178973	0.363009
7	1.99E+08	10.37540	7.611974	24.84676	17.76300	27.38181	6.046687	3.120847	2.490281	0.363230
8	2.02E+08	12.00722	7.497537	24.01140	17.52507	27.06664	5.901870	3.108919	2.433032	0.448304
9	2.12E+08	10.92326	6.855279	21.83922	16.91539	31.40338	5.370893	3.621732	2.544960	0.525886
10	2.13E+08	10.78767	6.954690	21.57940	16.73979	31.09632	5.453507	4.342937	2.523849	0.521844

Period	S.E	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	DREER
VD of DNX (net export)										
1	72.37871	27.00853	5.970357	2.490250	16.11089	5.203267	12.70961	1.015302	29.49180	0.000000
2	141.6871	53.45443	10.15629	5.143016	7.242183	9.416050	4.937527	0.541752	8.656439	0.452310
3	151.7838	46.63844	9.134725	5.026736	7.313215	18.67905	4.657778	0.476658	7.562555	0.510839
4	176.4227	37.49279	10.19005	8.150248	9.711148	18.39737	7.096480	0.675273	6.941681	1.344954
5	200.5015	30.87155	8.773468	8.521062	8.165634	27.04980	7.953200	1.321445	5.476000	1.867836
6	202.8312	31.07364	8.648308	8.342852	8.000332	26.46658	7.895411	1.878551	5.453875	2.240456
7	208.6302	31.87264	8.449638	7.886285	7.794941	25.62750	7.506951	3.144961	5.202607	2.514482
8	213.6372	30.39713	8.998211	7.585632	7.456927	24.63797	7.256683	6.066247	5.138182	2.463024
9	224.8974	28.41764	10.42314	6.866313	6.732616	26.62981	7.352999	6.681606	4.646877	2.249002
10	276.6945	20.29196	8.936442	9.208312	7.657528	39.79650	4.887746	4.603364	3.069999	1.548147
VD of DREER (real effective exchange rate)										
1	0.108522	18.15369	0.255121	11.38788	15.16301	21.14835	28.64414	0.002541	0.066925	5.178341
2	0.153618	13.81468	0.574773	37.03853	12.71172	10.85529	16.51603	1.264761	1.489909	5.734299
3	0.164530	12.13760	0.577140	37.14215	13.92987	9.464090	16.90401	2.570626	1.446180	5.828343
4	0.187787	17.90733	2.863843	28.51549	11.34009	14.60584	13.63115	5.400351	1.251222	4.484693
5	0.211332	20.15789	3.185356	22.51541	8.992464	24.15135	11.84384	4.582038	0.988080	3.583574
6	0.221812	18.37279	3.978725	21.70377	9.542410	26.60647	10.83610	4.624168	0.897137	3.438435
7	0.255591	13.94235	8.042298	18.68620	9.837266	34.01311	8.284435	3.484220	0.713991	2.996126
8	0.320684	9.606922	5.484295	20.83100	13.27548	39.03293	5.361408	3.792282	0.534699	2.080977
9	0.369763	7.261184	4.197495	23.14392	17.49538	35.82690	5.158427	4.779673	0.510016	1.627005
10	0.381696	6.835286	4.237080	22.47713	17.97838	33.62192	5.487672	6.998770	0.780054	1.583709
Cholesky Ordering: DGDPTL DCAP DCONS DDEBT DEMP DINVST DGEXPD DNX DREER										

Appendix 2: impulse response result for North Cyprus

Source: Author's estimation

Prd	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	REER
Impulse response of DGDPTL (real gros domestic production)									
1	1.06E+08	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	12,376,629	−9,769,700	51,948,091	−1,392,073	−13,406,601	1,492,293	40,861,806	−18,467,206	−456,713.5
3	−4,422,018	−34,656,090	39,783,482	−4,655,707	62,806,020	−21,934,154	13,706,118	−13,110,708	−3,347,417
4	−2,583,408	−9,915,076	1.69E+08	−1.20E+08	−32,737,343	−56,903,714	−4,695,035	−12,929,264	8,407,269
5	−4,852,159	35,907,541	1.97E+08	−1.73E+08	−59,310,589	−93,696,808	−31,177,002	−24,906,336	21,431,635
6	−2,814,900	87,458,005	1.35E+08	−1.42E+08	22,052,000	−97,334,357	−50,177,544	8,167,309	23,619,348
7	40,346,246	54,176,803	69,452,046	−5,314,822	95,987,368	−93,067,419	−7,225,610	3,705,929	33,451,780
8	21,923,947	17,165,432	12,931,921	19,646,633	1.77E+08	−45,102,781	31,130,755	−22,327,348	36,254,918
9	62,775,774	−17,392,978	21,016,577	41,497,248	1.13E+08	−7,960,460	71,551,523	−15,985,634	30,349,454
10	−3,447,986	24,278,649	17,178,950	4,944,112	52,572,242	−6,485,723	67,259,672	−45,198,928	24,282,360
Impulse response of DCAP (total capital)									
1	−3,957,978	27,920,675	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	−1,418,942	8,594,972	−21,829,630	9,408,063	36,744,199	−3,930,339	10,263,227	−3,262,390	1,402,219
3	−1,846,446	2,680,539	−7,964,072	5,636,667	50,799,029	−3,998,865	6,926,477	−6,609,806	3,628,700
4	4,643,381	−14,988,656	39,580,278	−1,696,259	2,791,265	−14,557,108	17,805,650	−9,156,450	8,632,696
5	−2,761,338	14,537,390	43,298,771	−4,278,357	−21,283,703	−14,849,404	−2,022,156	−14,101,830	7,733,819
6	17,838,059	10,733,918	34,423,987	−3,324,740	−23,426,343	−19,875,007	2,010,372	9,423,957	5,497,459
7	−3,562,673	11,393,868	13,853,819	−2,410,009	−11,575,608	−17,517,874	−2,209,857	−6,875,956	5,870,846
8	38,579,233	−26,131,204	16,311,251	−2,371,475	6,263,533	−3,615,400	13,805,939	7,954,682	3,211,466
9	16,104,336	−13,577,766	31,839,896	−2,159,442	−53,234,408	1,669,759	2,300,563	−8,377,220	383,156.7

Prd	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	REER
10	13,759,665	−11,261,479	27,458,975	−1,918,039	−28,051,747	−1,358,346	3,669,419	5,186,496	−3,588,771
Impulse response of DCONS (consumption)									
1	92,762,995	−9,500,857	28,078,811	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	−8,459,833	25,427,266	48,292,007	−4,151,783	24,005,912	−19,922,609	19,835,336	−26,744,717	−361,748.0
3	7,181,023	−36,465,299	19,959,519	−1,631,085	50,187,115	−8,834,220	12,979,076	8,274,558	−3,889,551
4	−3,994,942	50,741,958	1.27E+08	−1.06E+08	−16,688,821	−61,440,204	−28,702,754	−26,610,211	14,983,854
5	−5,672,062	24,282,932	1.29E+08	−1.03E+08	78,532,820	−88,639,371	7,265,963	−13,989,401	26,604,788
6	−2,198,155	53,016,656	74,210,852	−8,061,407	26,894,203	−56,889,377	−26,222,291	−8,522,876	23,342,928
7	66,345,057	47,785,012	72,218,509	−2,947,296	78,110,128	−71,553,313	18,943,029	−752,937.7	35,434,930
8	−3,658,165	20,824,838	7,071,921	−5,138,049	1.13E+08	−35,624,926	41,801,186	−33,808,275	31,331,401
9	69,681,543	−26,945,328	2,108,688	37,914,607	85,636,776	3,881,457	66,811,909	440,335.3	20,543,182
10	−244,418.0	−4,643,023	56,865,905	−3,276,924	−59,211,500	−10,874,660	59,288,084	−42,397,668	19,151,710
Impulse response of DDEBT(public debt)									
1	32.11296	−2.057720	−16.00742	27.37908	0.000000	0.000000	0.000000	0.000000	0.000000
2	1.656017	−19.55421	11.27944	−0.430952	29.17845	−3.681327	9.836067	0.558912	3.591363
3	−25.54406	12.95328	4.513106	−3.912471	−1.572881	10.16325	−4.736931	−7.643899	−0.574219
4	8.368124	14.58035	−12.87058	9.622708	−3.798046	−3.960527	3.566607	6.294091	−1.088594
5	−21.81209	6.817756	−22.39021	7.982748	34.20542	−2.939275	0.739404	−5.993202	2.226559
6	10.60414	−11.89805	3.582021	7.644407	28.12066	1.129391	9.633500	2.097644	3.667859
7	−13.76415	6.636495	15.59218	−11.24755	−22.01114	−3.617627	3.880171	−13.22834	4.134959
8	5.504906	−1.327622	1.407836	−2.932372	−1.043665	−0.851359	6.642805	5.253619	1.101634
9	4.219416	3.500782	2.859211	−10.71307	−26.77901	−0.702152	−2.361864	−0.346200	0.199001
10	6.855006	−7.250130	4.475494	−1.825863	1.240916	−2.367420	5.722766	0.718005	0.454763
Impulse response of DEMP (employment)									
1	−0.784244	0.008757	−0.315551	0.090826	1.791216	0.000000	0.000000	0.000000	0.000000
2	0.219727	−0.076847	0.072769	0.282944	−0.498998	0.112753	0.159785	−0.077318	−0.018772
3	−0.187148	0.233763	0.068854	−0.094074	0.409484	−0.216648	−0.025908	−0.182005	0.108006
4	−0.440727	0.256211	0.268312	−0.320220	0.532820	−0.182198	0.019198	0.046660	0.099027

Prd	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	REER
5	−0.196579	0.312652	−0.052074	0.003211	0.329975	−0.223445	0.069677	−0.147970	0.124945
6	0.249615	−0.086092	−0.074202	0.163886	0.339049	−0.079679	0.267373	−0.013290	0.125556
7	0.180615	−0.068040	0.144014	−0.061477	−0.091808	0.029423	0.200082	−0.108605	0.108341
8	0.004337	−0.042743	0.157524	−0.107223	−0.267489	0.013110	0.264657	−0.068489	0.040700
9	0.193729	−0.328828	0.076712	−0.151446	−0.698169	0.101868	0.192488	0.018426	−0.047301
10	0.317836	−0.277582	0.456666	−0.436953	−0.966375	0.049154	−0.029651	0.038834	−0.070414
Impulse response of DINVST (investment)									
1	50,272,142	−21,504,610	−4,132,423	29,954,308	59,262,974	38,680,238	0.000000	0.000000	0.000000
2	−5,209,624	55,913,515	−1,883,390	23,389,339	−7,193,857	255,546.5	−4,145,331	−8,223,765	−2,982,626
3	−2,173,182	−75,190,179	−2,317,599	39,180,185	1.31E+08	−21,839,136	57,829,394	−7,004,597	6,047,831
4	−1,875,497	−25,972,496	5,793,949	−4,043,452	−50,986,150	28,833,948	−16,365,284	−16,464,194	781,759.3
5	20,443,620	61,144,018	1.13E+08	−8,094,611	−99,630,899	−45,865,144	−9,442,388	−123,045.4	10,270,495
6	−1.15E+08	56,768,306	−3,053,830	−4,301,432	37,900,788	−37,592,392	−18,303,974	−9,930,283	3,309,459
7	1.18E+08	−41,459,764	−2,909,616	44,241,800	75,007,570	1,532,609	7,152,591	42,568,326	3,683,091
8	2,839,040	5,519,956	57,984,080	−2,086,166	−42,648,991	−16,759,119	9,147,006	−46,378,467	17,346,485
9	−6,179,247	−31,714,245	−255,625.5	15,252,907	55,029,673	13,707,907	35,600,289	8,455,572	703,542.7
10	29,381,610	6,074,483	−3,239,848	−1,172,006	−1.11E+08	19,663,458	−8,451,535	5,182,595	−8,878,294
Impulse response of DGEXPND (governmental expenditure)									
1	16,346,191	−16,040,390	15,455,363	1,327,219	−1,029,797	10,624,152	20,996,778	0.000000	0.000000
2	−3,011,911	29,650,594	−14,395,471	−1,022,172	−36,024,685	11,082,419	−10,699,513	−9,909,533	−6,671,050
3	12,469,341	−10,909,138	2,894,462	71,536.92	40,473,750	−18,140,810	13,416,045	11,864,792	−626,102.0
4	−3,778,423	−16,102,719	40,790,807	−3,954,495	−7,707,517	−12,484,070	−5,286,434	−20,115,468	4,121,140
5	24,687,411	−333,933.2	73,525,780	−4,530,656	−24,582,954	−19,397,577	−7,329,036	6,318,610	5,446,940
6	−2,184,318	36,820,396	46,742,580	−5,730,834	−53,996,689	−31,448,310	−19,936,608	−7,734,606	5,682,604
7	16,065,219	11,788,714	−10,701,342	4,008,385	65,648,743	−17,458,926	−4,409,262	15,531,975	4,446,619
8	28,470,872	−7,618,302	−701,936.1	12,138,647	15,755,968	−4,903,637	6,173,459	−3,298,775	6,309,659
9	1,048,410	−4,030,712	405,030.7	20,953,474	55,250,118	1,165,824	18,900,561	−12,222,173	7,290,245

Prd	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DINVST	DGEXPD	DNX	REER
10	−671,743.3	−9,183,431	2,456,441	4,044,409	−6,244,926	8,260,037	18,686,212	−2,208,912	1,074,243
Impulse response of DNX (net export)									
1	37.61502	−17.68524	−11.42174	−29.05163	−16.51007	−25.80340	−7.293036	39.30623	0.000000
2	96.52054	−41.54674	30.03359	24.69591	−40.22079	18.03897	7.454498	−13.88599	9.529025
3	−3.689439	−8.098679	11.20728	−15.19727	−49.12277	9.047315	−1.027633	2.117859	−5.185208
4	30.41224	−32.66745	−37.13067	36.57526	−37.72050	33.70020	10.01821	20.45264	−17.34728
5	27.22148	−18.85100	−29.81238	16.12648	−71.75011	31.44007	−17.91798	6.387728	−18.22827
6	−19.31897	−5.563095	2.598303	−2.953227	3.772273	7.138435	−15.54390	6.507875	−13.07090
7	−33.00309	−10.94884	−0.579220	−10.07426	−16.31802	4.393632	−24.41408	4.556660	−13.14277
8	−0.672783	20.71292	5.433234	−3.246121	9.498226	−6.670541	−37.41382	8.977482	−5.447743
9	−22.35641	34.13273	−3.279543	1.369302	47.16008	−20.17549	−24.71423	2.286275	3.657101
10	−34.09074	39.62100	−59.80776	49.57128	130.3806	−4.794640	−12.03532	−0.221934	6.909405
Impulse response of DREER (real effective exchange rate)									
1	0.046238	0.005481	0.036622	−0.042258	0.049906	−0.058081	−0.000547	−0.002807	0.024695
2	0.033498	−0.010276	0.086020	−0.034843	0.008429	−0.022893	0.017267	−0.018539	0.027264
3	0.005063	0.004538	0.036249	−0.027768	0.000527	−0.026047	0.019935	−0.006316	0.014985
4	0.055038	−0.029218	−0.001085	0.015103	−0.050879	0.015196	0.034763	0.007053	0.001930
5	0.051846	−0.020316	−0.000118	−0.004147	−0.075071	0.021971	0.011917	−0.000245	−0.004358
6	−0.006064	−0.023129	0.024955	−0.026053	−0.048003	0.006467	0.015124	0.000329	−0.009553
7	0.008278	−0.057413	0.039098	−0.041610	−0.095546	0.008973	−0.001001	0.005003	−0.016295
8	0.027776	−0.019652	0.095996	−0.085005	−0.133870	−0.010081	−0.040296	0.009135	−0.013519
9	−0.006945	0.009953	0.101100	−0.101332	−0.094039	−0.039233	−0.051333	0.012143	−0.009191
10	−0.005537	0.020835	0.033227	−0.047672	0.000599	−0.030696	−0.060512	0.020956	−0.009101

Appendix 3: estimation method: least squares method for Eq. (2) and others

Source: **Author's estimation**

	Coefficient	SE	t-statistic	Probability
Equation 2				
C(1)	0.990352	0.474777	2.085931	0.0524
C(2)	− 0.548050	0.530189	− 1.033687	0.3158
C(3)	− 0.416671	0.482365	− 0.863808	0.3997
C(4)	− 1.548809	0.830724	− 1.864409	0.0796
C(5)	− 0.462043	0.486587	− 0.949558	0.3556
C(6)	0.913688	0.474139	1.927047	0.0709
C(7)	− 308,684.3	468,714.0	− 0.658577	0.5190
C(8)	908,173.4	836,565.2	1.085598	0.2928
C(9)	15,947,031	19,275,861	0.827306	0.4195
C(10)	**91,831,406**	**28,883,551**	**3.179367**	**0.0055**
C(11)	**1.781968**	**0.687104**	**2.593447**	**0.0189**
C(12)	0.325079	0.958833	0.339036	0.7387
C(13)	**− 0.792938**	**0.275077**	**− 2.882599**	**0.0103**
C(14)	**− 0.552628**	**0.237091**	**− 2.330872**	**0.0323**
C(15)	− 471,149.9	543,915.5	− 0.866219	0.3984
C(16)	− 34,391.69	542,255.7	− 0.063423	0.9502
C(17)	− 18,494,041	2.70E+08	− 0.068409	0.9463
C(18)	5.44E+08	2.78E+08	1.955357	0.0672
C(19)	13,924,194	32,736,938	0.425336	0.6759
R-squared	**0.967538**			
Equation 3				
C(20)	0.713628	0.125898	5.668293	0.0000
C(21)	0.428563	0.140592	3.048276	0.0073
C(22)	0.085840	0.127910	0.671094	0.5112
C(23)	0.208738	0.220286	0.947578	0.3566
C(24)	**− 0.886109**	**0.129030**	**− 6.867468**	**0.0000**
C(25)	**− 0.457637**	**0.125729**	**− 3.639869**	**0.0020**
C(26)	**456,851.2**	**124,290.5**	**3.675674**	**0.0019**
C(27)	− 294,177.5	221,834.8	− 1.326111	0.2023
C(28)	**24,959,517**	**5,111,444**	**4.883065**	**0.0001**
C(29)	**57,384,706**	**7,659,148**	**7.492310**	**0.0000**
C(30)	**0.462859**	**0.182202**	**2.540367**	**0.0211**
C(31)	**− 0.589128**	**0.254257**	**− 2.317058**	**0.0332**
C(32)	**− 0.196145**	**0.072943**	**− 2.689009**	**0.0155**
C(33)	**− 0.460801**	**0.062870**	**− 7.329401**	**0.0000**
C(34)	− 78,943.72	144,231.9	− 0.547339	0.5913
C(35)	− 299,823.5	143,791.8	− 2.085123	0.0524
C(36)	56,781,124	71,688,571	0.792053	0.4392
C(37)	1.64E+08	73,840,821	2.220123	0.0403
C(38)	6,900,154	8,680,963	0.794860	0.4377
Equation 4				
C(39)	**1.285059**	**0.434772**	**2.955710**	**0.0089**
C(40)	− 0.744403	0.485515	− 1.533225	0.1436
C(41)	− 0.397769	0.441720	− 0.900499	0.3804

	Coefficient	SE	t-statistic	Probability
C(42)	−0.036184	0.760726	−0.047565	0.9626
C(43)	−0.801679	0.445587	−1.799154	0.0898
C(44)	**0.967750**	**0.434187**	**2.228877**	**0.0396**
C(45)	**−1,155,345**	**429,219.5**	**−2.691735**	**0.0154**
C(46)	934,122.0	766,075.1	1.219361	0.2394
C(47)	**47,175,328**	**17,651,650**	**2.672573**	**0.0161**
C(48)	**75,707,965**	**26,449,783**	**2.862328**	**0.0108**
C(49)	0.707602	0.629207	1.124593	0.2764
C(50)	−0.337961	0.878040	−0.384903	0.7051
C(51)	**−1.186012**	**0.251899**	**−4.708283**	**0.0002**
C(52)	−0.121187	0.217113	−0.558173	0.5840
C(53)	−681,465.5	498,084.4	−1.368173	0.1891
C(54)	56,746.06	496,564.5	0.114277	0.9104
C(55)	−14,648,535	2.48E+08	−0.059170	0.9535
C(56)	4.08E+08	2.55E+08	1.600078	0.1280
C(57)	22,154,646	29,978,478	0.739018	0.4700
Equation 5				
C(58)	−2.79E−07	2.02E−07	−1.384394	0.1841
C(59)	−6.35E−08	2.25E−07	−0.281903	0.7814
C(60)	−3.55E−07	2.05E−07	−1.731408	0.1015
C(61)	2.41E−07	3.53E−07	0.683101	0.5037
C(62)	2.01E−07	2.07E−07	0.973001	0.3442
C(63)	3.64E−09	2.01E−07	0.018058	0.9858
C(64)	0.161820	0.199135	0.812612	0.4277
C(65)	0.103769	0.355418	0.291964	0.7738
C(66)	12.49117	8.189431	1.525279	0.1456
C(67)	10.46196	12.27130	0.852555	0.4058
C(68)	4.81E−07	2.92E−07	1.647003	0.1179
C(69)	2.47E−07	4.07E−07	0.606326	0.5523
C(70)	7.55E−09	1.17E−07	0.064640	0.9492
C(71)	1.01E−07	1.01E−07	1.001979	0.3304
C(72)	0.024607	0.231085	0.106483	0.9164
C(73)	−9.20E−05	0.230380	−0.000400	0.9997
C(74)	145.4278	114.8577	1.266156	0.2225
C(75)	−58.62206	118.3060	−0.495512	0.6266
C(76)	3.487487	13.90843	0.250746	0.8050
Equation 6				
C(77)	−1.16E−09	8.85E−09	−0.131490	0.8969
C(78)	−1.21E−09	9.89E−09	−0.122217	0.9042
C(79)	−5.09E−10	8.99E−09	−0.056609	0.9555
C(80)	3.26E−09	1.55E−08	0.210307	0.8359
C(81)	−5.54E−10	9.07E−09	−0.061108	0.9520
C(82)	−8.36E−11	8.84E−09	−0.009457	0.9926
C(83)	0.009029	0.008739	1.033135	0.3160
C(84)	0.007247	0.015598	0.464612	0.6481
C(85)	−0.223542	0.359394	−0.621999	0.5422
C(86)	−0.077664	0.538527	−0.144216	0.8870
C(87)	6.89E−09	1.28E−08	0.537674	0.5978
C(88)	2.14E−09	1.79E−08	0.119504	0.9063
C(89)	−1.47E−09	5.13E−09	−0.285997	0.7783
C(90)	−7.21E−10	4.42E−09	−0.163085	0.8724

	Coefficient	SE	t-statistic	Probability
C(91)	−0.002021	0.010141	−0.199322	0.8444
C(92)	−0.005366	0.010110	−0.530704	0.6025
C(93)	−0.760168	5.040536	−0.150811	0.8819
C(94)	6.192676	5.191865	1.192765	0.2493
C(95)	−0.267096	0.610372	−0.437596	0.6672
Equation 7				
C(96)	**0.925956**	**0.162199**	**5.708784**	**0.0000**
C(97)	−0.131696	0.181129	−0.727081	0.4771
C(98)	0.175217	0.164791	1.063267	0.3025
C(99)	−0.143342	0.283801	−0.505080	0.6200
C(100)	**−0.747954**	**0.166233**	**−4.499423**	**0.0003**
C(101)	0.187047	0.161981	1.154751	0.2642
C(102)	−867,138.1	160,127.2	−5.415307	0.0000
C(103)	−196,265.3	285,796.6	−0.686731	0.5015
C(104)	−11,058,494	6,585,232	−1.679287	0.1114
C(105)	**31,900,809**	**9,867,517**	**3.232911**	**0.0049**
C(106)	**−0.610887**	**0.234736**	**−2.602441**	**0.0186**
C(107)	−0.114574	0.327567	−0.349773	0.7308
C(108)	−0.132377	0.093975	−1.408645	0.1770
C(109)	**−0.382000**	**0.080998**	**−4.716189**	**0.0002**
C(110)	−271,405.3	185,818.4	−1.460594	0.1624
C(111)	−149,730.1	185,251.4	−0.808253	0.4301
C(112)	**−2.70E+08**	**92,358,607**	**−2.924858**	**0.0095**
C(113)	**3.11E+08**	**95,131,417**	**3.264139**	**0.0046**
C(114)	**5,945,966**	**11,183,954**	**0.531652**	**0.6018**
Equation 8				
C(115)	0.427007	0.459713	0.928857	0.3660
C(116)	0.447690	0.513367	0.872066	0.3953
C(117)	**1.471974**	**0.467060**	**3.151572**	**0.0058**
C(118)	**−2.082301**	**0.804366**	**−2.588748**	**0.0191**
C(119)	−0.351103	0.471148	−0.745207	0.4663
C(120)	−0.635582	0.459095	−1.384425	0.1841
C(121)	699,813.8	453,842.2	1.541976	0.1415
C(122)	1,189,997	810,021.9	1.469092	0.1601
C(123)	5,261,586	18,664,257	0.281907	0.7814
C(124)	45,599,149	27,967,105	1.630457	0.1214
C(125)	−0.276241	0.665303	−0.415212	0.6832
C(126)	1.043263	0.928410	1.123709	0.2768
C(127)	−0.244202	0.266349	−0.916846	0.3720
C(128)	**−0.691074**	**0.229568**	**−3.010319**	**0.0079**
C(129)	−217,849.4	526,657.6	−0.413645	0.6843
C(130)	−335,748.3	525,050.5	−0.639459	0.5310
C(131)	−1.21E+08	2.62E+08	−0.461392	0.6504
C(132)	1.80E+08	2.70E+08	0.666059	0.5143
C(133)	−7,924,084	31,698,228	−0.249985	0.8056
Equation 9				
C(134)	**−1.06E−06**	**3.23E−07**	**−3.277891**	**0.0044**
C(135)	9.75E−08	3.61E−07	0.270225	0.7902
C(136)	**−6.38E−07**	**3.28E−07**	**−1.942072**	**0.0689**
C(137)	**−1.68E−06**	**5.65E−07**	**−2.971708**	**0.0086**
C(138)	**1.02E−06**	**3.31E−07**	**3.070699**	**0.0069**

	Coefficient	SE	t-statistic	Probability
C(139)	−6.69E−09	3.23E−07	−0.020731	0.9837
C(140)	0.512005	0.319009	1.604990	0.1269
C(141)	0.941778	0.569369	1.654071	0.1165
C(142)	**−61.18373**	**13.11922**	**−4.663670**	**0.0002**
C(143)	**−57.10722**	**19.65825**	**−2.905000**	**0.0099**
C(144)	2.52E−07	4.68E−07	0.538759	0.5970
C(145)	**1.77E−06**	**6.53E−07**	**2.708138**	**0.0149**
C(146)	**7.59E−07**	**1.87E−07**	**4.055578**	**0.0008**
C(147)	3.35E−07	1.61E−07	2.075859	0.0534
C(148)	−0.325717	0.370191	−0.879861	0.3912
C(149)	0.325511	0.369061	0.881998	0.3901
C(150)	385.8660	183.9986	2.097114	0.0512
C(151)	**−439.9923**	**189.5226**	**−2.321582**	**0.0329**
C(152)	−38.56337	22.28088	−1.730783	0.1016
Equation 10				
C(153)	**−1.59E−09**	**4.84E−10**	**−3.272774**	**0.0045**
C(154)	8.59E−11	5.41E−10	0.158851	0.8757
C(155)	4.01E−10	4.92E−10	0.814055	0.4269
C(156)	**−1.89E−09**	**8.48E−10**	**−2.228782**	**0.0396**
C(157)	**1.11E−09**	**4.97E−10**	**2.241014**	**0.0387**
C(158)	1.02E−10	4.84E−10	0.210010	0.8362
C(159)	−0.000521	0.000478	−1.089254	0.2912
C(160)	**0.002017**	**0.000854**	**2.362583**	**0.0303**
C(161)	**−0.049367**	**0.019670**	**−2.509688**	**0.0225**
C(162)	−0.020599	0.029475	−0.698875	0.4941
C(163)	7.15E−10	7.01E−10	1.019308	0.3223
C(164)	**3.28E−09**	**9.78E−10**	**3.354318**	**0.0038**
C(165)	**6.08E−10**	**2.81E−10**	**2.164458**	**0.0450**
C(166)	−1.51E−10	2.42E−10	−0.625967	0.5397
C(167)	−0.000393	0.000555	−0.707707	0.4887
C(168)	0.000471	0.000553	0.850508	0.4069
C(169)	**1.104041**	**0.275880**	**4.001887**	**0.0009**
C(170)	−0.191628	0.284163	−0.674360	0.5091
C(171)	0.009593	0.033407	0.287144	0.7775

Appendix 4: vector autoregression estimates

Source: **Author's estimation**

Sample (adjusted): 1983 2018

Included observations: 36 after adjustments

Standard errors in & t-statistics in

	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DGEXPD	DINVST	DNX
DGDPTL(−1)	1.414709	0.836309	1.603117	−3.37E−07	3.71E−09	1.189134	0.576323	−1.43E−06
	(0.44564)	(0.12968)	(0.39312)	(1.8E−07)	(7.7E−09)	(0.17951)	(0.38704)	(3.2E−07)
	[3.17453]	[6.44895]	[4.07793]	[−1.92054]	[0.48175]	[6.62442]	[1.48904]	[−4.51910]
DGDPTL(−2)	−0.401626	0.463344	−0.634562	−1.01E−07	5.39E−10	−0.009451	0.513098	−7.62E−08

Sample (adjusted): 1983 2018

Included observations: 36 after adjustments

Standard errors in & t-statistics in

	DGDPTL	DCAP	DCONS	DDEBT	DEMP	DGEXPD	DINVST	DNX
	(0.55690)	(0.16206)	(0.49127)	(2.2E−07)	(9.6E−09)	(0.22432)	(0.48367)	(4.0E−07)
	[−0.72117]	[2.85912]	[−1.29168]	[−0.45959]	[0.05607]	[−0.04213]	[1.06083]	[−0.19229]
DCAP (−1)	−0.216888	0.217153	−0.248962	−2.13E−07	1.14E−09	−0.007130	1.406980	−3.76E−07
	(0.42366)	(0.12329)	(0.37373)	(1.7E−07)	(7.3E−09)	(0.17065)	(0.36795)	(3.0E−07)
	[−0.51194]	[1.76139]	[−0.66615]	[−1.27598]	[0.15522]	[−0.04178]	[3.82380]	[−1.24673]
DCAP (−2)	−0.849929	0.483788	0.486706	3.15E−07	1.06E−08	−0.013867	−1.970669	−1.86E−06
	(0.80869)	(0.23533)	(0.71338)	(3.2E−07)	(1.4E−08)	(0.32575)	(0.70236)	(5.8E−07)
	[−1.05099]	[2.05580]	[0.68225]	[0.98887]	[0.76165]	[−0.04257]	[−2.80580]	[−3.23457]
DCONS (−1)	−0.797582	−0.976507	−1.053251	2.62E−07	−4.46E−09	−0.983552	−0.481317	1.35E−06
	(0.47632)	(0.13861)	(0.42018)	(1.9E−07)	(8.2E−09)	(0.19187)	(0.41369)	(3.4E−07)
	[−1.67446]	[−7.04506]	[−2.50665]	[1.39697]	[−0.54277]	[−5.12627]	[−1.16348]	[3.98874]
DCONS (−2)	0.865823	−0.443507	0.931521	7.45E−08	−8.80E−10	0.040920	−0.703865	2.02E−07
	(0.48616)	(0.14147)	(0.42887)	(1.9E−07)	(8.4E−09)	(0.19583)	(0.42224)	(3.5E−07)
	[1.78093]	[−3.13492]	[2.17205]	[0.38935]	[−0.10479]	[0.20896]	[−1.66699]	[0.58356]
DDEBT (−1)	−167,089.3	505,325.6	−1,049,314	0.160017	0.010588	−810,714.2	735,768.5	0.432346
	(496,201.)	(144,394.)	(437,720.)	(0.19517)	(0.00857)	(199,873.)	(430,953.)	(0.35292)
	[−0.33674]	[3.49964]	[−2.39723]	[0.81990]	[1.23566]	[−4.05615]	[1.70730]	[1.22507]
DDEBT (−2)	267,274.2	−587,804.7	455,137.5	−0.058814	0.000845	−142,649.6	1,163,765	0.860804
	(778,700.)	(226,600.)	(686,924.)	(0.30628)	(0.01345)	(313,665.)	(676,305.)	(0.55384)
	[0.34323]	[−2.59401]	[0.66257]	[−0.19203]	[0.06287]	[−0.45478]	[1.72077]	[1.55425]
DEMP (−1)	23,601,189	29,036,333	52,888,542	15.74435	−0.152119	−14,072,295	4,526,347	−56.82526
	(1.9E+07)	(5,607,141)	(1.7E+07)	(7.57874)	(0.33273)	(7,761,522)	(1.7E+07)	(13.7045)
	[1.22485]	[5.17846]	[3.11152]	[2.07744]	[−0.45719]	[−1.81308]	[0.27047]	[−4.14646]
DEMP (−2)	1.00E+08	61,322,205	81,990,168	12.79191	0.005553	30,840,607	45,785,605	−55.53509
	(3.0E+07)	(8,812,003)	(2.7E+07)	(11.9105)	(0.52290)	(1.2E+07)	(2.6E+07)	(21.5376)
	[3.31018]	[6.95894]	[3.06930]	[1.07400]	[0.01062]	[2.52838]	[1.74089]	[−2.57852]
DGEXPD (−1)	1.520693	0.383298	0.511827	5.07E−07	3.92E−09	−0.756157	−0.360767	4.58E−07
	(0.72093)	(0.20979)	(0.63596)	(2.8E−07)	(1.2E−08)	(0.29039)	(0.62613)	(5.1E−07)
	[2.10936]	[1.82707]	[0.80481]	[1.78751]	[0.31525]	[−2.60390]	[−0.57619]	[0.89273]
DGEXPD (−2)	−0.634859	−0.941485	−1.056491	2.05E−07	−8.22E−09	−0.398308	0.843151	2.17E−06
	(0.90774)	(0.26415)	(0.80075)	(3.6E−07)	(1.6E−08)	(0.36564)	(0.78838)	(6.5E−07)
	[−0.69939]	[−3.56420]	[−1.31937]	[0.57314]	[−0.52458]	[−1.08934]	[1.06948]	[3.35522]
DINVST (−1)	−1.017709	−0.271065	−1.354353	1.51E−08	−3.96E−09	−0.230393	−0.305009	8.98E−07
	(0.27173)	(0.07907)	(0.23970)	(1.1E−07)	(4.7E−09)	(0.10945)	(0.23599)	(1.9E−07)
	[−3.74536]	[−3.42810]	[−5.65020]	[0.14113]	[−0.84382]	[−2.10496]	[−1.29244]	[4.64556]
DINVST (−2)	−0.623639	−0.499137	−0.174184	6.96E−08	−1.38E−09	−0.351899	−0.683307	2.91E−07
	(0.24367)	(0.07091)	(0.21495)	(9.6E−08)	(4.2E−09)	(0.09815)	(0.21163)	(1.7E−07)
	[−2.55933]	[−7.03917]	[−0.81033]	[0.72583]	[−0.32774]	[−3.58521]	[−3.22876]	[1.68183]

Sample (adjusted): 1983 2018								
Included observations: 36 after adjustments								
Standard errors in & t-statistics in								
	DGDPTL	**DCAP**	**DCONS**	**DDEBT**	**DEMP**	**DGEXPD**	**DINVST**	**DNX**
DNX (− 1)	− 422,528.0	27,583.79	− 646,194.8	0.230764	− 0.002279	− 626,250.4	− 370,821.4	0.181645
	(413,979.)	(120,467.)	(365,189.)	(0.16283)	(0.00715)	(166,753.)	(359,543.)	(0.29444)
	[− 1.02065]	[0.22897]	[− 1.76948]	[1.41724]	[− 0.31876]	[− 3.75555]	[− 1.03137]	[0.61693]
DNX (− 2)	344,619.5	− 148,637.5	340,289.6	0.044391	− 0.001382	− 87,936.38	− 278,929.7	0.239796
	(543,211.)	(158,074.)	(479,190.)	(0.21366)	(0.00938)	(218,809.)	(471,782.)	(0.38635)
	[0.63441]	[− 0.94031]	[0.71014]	[0.20777]	[− 0.14732]	[− 0.40189]	[− 0.59123]	[0.62067]
C	34,824,267	17,459,026	37,762,129	11.05206	− 0.067016	102,635.9	− 8,877,631	− 30.07167
	(3.0E+07)	(8,774,661)	(2.7E+07)	(11.8600)	(0.52069)	(1.2E+07)	(2.6E+07)	(21.4463)
	[1.15489]	[1.98971]	[1.41964]	[0.93188]	[− 0.12871]	[0.00845]	[− 0.33899]	[− 1.40218]
R-squared	0.958528	0.954753	0.944923	0.780313	0.251855	0.949392	0.929330	0.809528
Adj. R-squared	0.923604	0.916650	0.898542	0.595313	− 0.378161	0.906775	0.869818	0.649131
Sum sq. resids	2.46E+17	2.08E+16	1.91E+17	37,996.90	73.23676	3.99E+16	1.85E+17	124,246.0
S.E. equation	1.14E+08	33,085,821	1.00E+08	44.71954	1.963305	45,798,086	98,747,019	80.86572
F-statistic	27.44621	25.05732	20.37325	4.217914	0.399760	22.27735	15.61585	5.047016
Log likelihood	− 707.3443	− 662.9045	− 702.8298	− 176.3931	− 63.86500	− 674.6095	− 702.2689	− 197.7188
Akaike AIC	40.24135	37.77247	39.99054	10.74406	4.492500	38.42275	39.95939	11.92882
Schwarz SIC	40.98912	38.52025	40.73832	11.49184	5.240273	39.17052	40.70716	12.67659
Mean dependent	3.25E+08	61,503,414	2.49E+08	1.433333	0.171111	69,458,130	50,036,956	− 39.07889
S.D. dependent	4.11E+08	1.15E+08	3.15E+08	70.29715	1.672391	1.50E+08	2.74E+08	136.5186
Determinant resid covariance (dof adj.)		9.67E+82						
Determinant resid covariance		5.82E+80						
Log likelihood		− 3756.080						
Akaike information criterion		216.2267						
Schwarz criterion		222.2089						
Number of coefficients		136						

Appendix 5: Granger causality results

Source: **Author's estimation**

Null hypothesis	**Obs**	**F-statistic**	**Probability**	**Direction**
DCAP does not Granger Cause DGDPTL	36	14.6429	3.E-05	
DGDPTL does not Granger Cause DCAP		5.95176	0.0065	GDP → CAP
DCONS does not Granger Cause DGDPTL	36	2.78430	0.0773	
DGDPTL does not Granger Cause DCONS		1.75862	0.1890	
DDEBT does not Granger Cause DGDPTL	36	0.05527	0.9463	

Null hypothesis	Obs	F-statistic	Probability	Direction
DGDPTL does not Granger Cause DDEBT		3.09461	0.0595	
DEMP does not Granger Cause DGDPTL	36	2.21638	0.1260	
DGDPTL does not Granger Cause DEMP		0.31780	0.7301	
DINVST does not Granger Cause DGDPTL	36	1.47385	0.2447	
DGDPTL does not Granger Cause DINVST		6.15127	0.0056	GDP → INVST
DGEXPD does not Granger Cause DGDPTL	36	1.68656	0.2017	
DGDPTL does not Granger Cause DGEXPD		20.3646	2.E-06	
DNX does not Granger Cause DGDPTL	36	0.46667	0.6314	
DGDPTL does not Granger Cause DNX		0.09480	0.9098	
DREER does not Granger Cause DGDPTL	36	0.29908	0.7436	
DGDPTL does not Granger Cause DREER		3.57012	0.0402	GDP → REER
DCONS does not Granger Cause DCAP	36	5.13101	0.0119	CONS ↔ CAP
DCAP does not Granger Cause DCONS		5.90460	0.0067	
DDEBT does not Granger Cause DCAP	36	3.81159	0.0331	DEBT ↔ CAP
DCAP does not Granger Cause DDEBT		9.08042	0.0008	
DEMP does not Granger Cause DCAP	36	2.87485	0.0716	
DCAP does not Granger Cause DEMP		1.03194	0.3682	
DINVST does not Granger Cause DCAP	36	6.19535	0.0055	INVST → CAP
DCAP does not Granger Cause DINVST		25.2236	3.E-07	
DGEXPD does not Granger Cause DCAP	36	4.09692	0.0264	GEXPND → CAP
DCAP does not Granger Cause DGEXPD		4.63291	0.0174	
DNX does not Granger Cause DCAP	36	1.44594	0.2510	
DCAP does not Granger Cause DNX		0.70915	0.4999	
DREER does not Granger Cause DCAP	36	2.48975	0.0994	
DCAP does not Granger Cause DREER		1.76968	0.1872	
DDEBT does not Granger Cause DCONS	36	0.15150	0.8601	
DCONS does not Granger Cause DDEBT		0.21933	0.8043	
DDEBT does not Granger Cause DCONS	36	0.15150	0.8601	
DCONS does not Granger Cause DDEBT		0.21933	0.8043	
DEMP does not Granger Cause DCONS	36	1.19393	0.3166	
DCONS does not Granger Cause DEMP		0.19161	0.8266	
DINVST does not Granger Cause DCONS	36	3.76975	0.0342	INVST → CONS
DCONS does not Granger Cause DINVST		2.21365	0.1263	
DGEXPD does not Granger Cause DCONS	36	0.04503	0.9560	
DCONS does not Granger Cause DGEXPD		4.80290	0.0152	CONS → GEXPD
DNX does not Granger Cause DCONS	36	0.08033	0.9230	
DCONS does not Granger Cause DNX		1.12284	0.3382	
DREER does not Granger Cause DCONS	36	2.09535	0.1401	
DCONS does not Granger Cause DREER		1.28420	0.2912	
DEMP does not Granger Cause DDEBT	36	1.67636	0.2036	
DDEBT does not Granger Cause DEMP		0.41099	0.6666	
DINVST does not Granger Cause DDEBT	36	0.11665	0.8903	
DDEBT does not Granger Cause DINVST		3.00332	0.0642	
DGEXPD does not Granger Cause DDEBT	36	0.49421	0.6148	
DDEBT does not Granger Cause DGEXPD		0.95678	0.3952	
DNX does not Granger Cause DDEBT	36	1.77162	0.1868	
DDEBT does not Granger Cause DNX		0.39063	0.6799	
DREER does not Granger Cause DDEBT	36	1.00415	0.3780	
DDEBT does not Granger Cause DREER		0.74346	0.4838	
DINVST does not Granger Cause DEMP	36	0.09421	0.9104	
DEMP does not Granger Cause DINVST		2.46121	0.1018	

Null hypothesis	Obs	F-statistic	Probability	Direction
DGEXPD does not Granger Cause DEMP	36	0.13030	0.8783	
DEMP does not Granger Cause DGEXPD		0.65251	0.5277	
DNX does not Granger CauseDEMP	36	1.07835	0.3526	
DEMP does not Granger Cause DNX		3.99674	0.0286	
DREER does not Granger Cause DEMP	36	0.79185	0.4620	
DEMP does not Granger Cause DREER		0.25906	0.7734	
DGEXPD does not Granger Cause DINVST	36	2.48868	0.0995	
DINVST does not Granger Cause DGEXPD		3.12658	0.0580	
DNX does not Granger Cause DINVST	36	0.13422	0.8749	
DINVST does not Granger Cause DNX		2.06739	0.1436	
DREER does not Granger Cause DINVST	36	0.45146	0.6408	
DINVST does not Granger Cause DREER		0.79901	0.4588	
DNX does not Granger Cause DGEXPD	36	0.46468	0.6326	
DGEXPD does not Granger Cause DNX		0.73339	0.4884	
DREER does not Granger Cause DGEXPD	36	0.34609	0.7101	
DGEXPD does not Granger Cause DREER		1.09058	0.3486	
DREER does not Granger Cause DNX	36	6.23033	0.0053	REER ↔ NX
DNX does not Granger Cause DREER		6.82859	0.0035	

Appendix 6: correlation analysis between variables

Source: **Author's estimation**

Covariance analysis: ordinary									
Correlation t-statistic probability	**DINVST**	**DNX**	**DREER**	**DGEXPD**	**DGDPTL**	**DEMP**	**DDEBT**	**DCONS**	**DCAP**
DINVST	1.000000								
	–								
	–								
DNX	— 0.152885	1.000000							
	— 0.928221	–							
	0.3595	–							
DREER	— 0.018431	— 0.471958	1.000000						
	— 0.110605	— 3.211979	–						
	0.9125	0.0028	–						
DGEXPD	0.562604	— 0.296125	0.167447	1.000000					
	4.083116	— 1.860182	1.019068	–					
	0.0002	0.0710	0.3150	–					
DGDPTL	0.421406	— 0.072537	— 0.021114	0.687313	1.000000				
	2.788085	— 0.436373	— 0.126715	5.677439	–				
	0.0084	0.6652	0.8999	0.0000	–				
DEMP	0.019779	— 0.160435	— 0.008456	— 0.137229	— 0.041764	1.000000			
	0.118696	— 0.975244	— 0.050738	— 0.831241	— 0.250805	–			
	0.9062	0.3359	0.9598	0.4113	0.8034	–			
DDEBT	— 0.436235	0.134678	0.001862	— 0.623099	— 0.178600	0.054578	1.000000		
	— 2.908774	0.815497	0.011171	— 4.779933	— 1.089108	0.327959	–		
	0.0062	0.4202	0.9911	0.0000	0.2833	0.7448	–		

Covariance analysis: ordinary									
Correlation t-statistic probability	**DINVST**	**DNX**	**DREER**	**DGEXPD**	**DGDPTL**	**DEMP**	**DDEBT**	**DCONS**	**DCAP**
DCONS	0.378254	− 0.423392	0.074390	0.637721	0.856186	− 0.053166	− 0.137910	1.000000	
	2.451676	− 2.804084	0.447582	4.967526	9.942780	− 0.319446	− 0.835444	–	
	0.0192	0.0081	0.6571	0.0000	0.0000	0.7512	0.4090	–	
DCAP	0.266866	− 0.187453	0.063151	0.478367	0.635826	0.024643	− 0.090457	0.416800	1.000000
	1.661449	− 1.145014	0.379664	3.268431	4.942730	0.147904	− 0.544976	2.751162	–
	0.1053	0.2598	0.7064	0.0024	0.0000	0.8832	0.5891	0.0092	–

Appendix 7

$$\begin{aligned} DGDPTL = {} & C(1) * DGDPTL(-1) + C(2) * DGDPTL(-2) + C(3) * DCAP(-1) + C(4) * DCAP(-2) \\ & + C(5) * DCONS(-1) + C(6) * DCONS(-2) + C(7) * DDEBT(-1) + C(8) * DDEBT(-2) \\ & + C(9) * DEMP(-1) + C(10) * DEMP(-2) + C(11) * DGEXPD(-1) + C(12) * DGEXPD(-2) \\ & + C(13) * DINVST(-1) + C(14) * DINVST(-2) + C(15) * DNX(-1) + C(16) * DNX(-2) \\ & + C(17) * DREER(-1) + C(18) * DREER(-2) + C(19) \end{aligned} \tag{2}$$

$$\begin{aligned} DCAP = {} & C(20) * DGDPTL(-1) + C(21) * DGDPTL(-2) + C(22) * DCAP(-1) + C(23) * DCAP(-2) \\ & + C(24) * DCONS(-1) + C(25) * DCONS(-2) + C(26) * DDEBT(-1) + C(27) * DDEBT(-2) \\ & + C(28) * DEMP(-1) + C(29) * DEMP(-2) + C(30) * DGEXPD(-1) + C(31) * DGEXPD(-2) \\ & + C(32) * DINVST(-1) + C(33) * DINVST(-2) + C(34) * DNX(-1) \\ & + C(35) * DNX(-2) + C(36) * DREER(-1) + C(37) * DREER(-2) + C(38) \end{aligned} \tag{3}$$

$$\begin{aligned} DCONS = {} & C(39) * DGDPTL(-1) + C(40) * DGDPTL(-2) + C(41) * DCAP(-1) + C(42) * DCAP(-2) \\ & + C(43) * DCONS(-1) + C(44) * DCONS(-2) + C(45) * DDEBT(-1) + C(46) * DDEBT(-2) \\ & + C(47) * DEMP(-1) + C(48) * DEMP(-2) + C(49) * DGEXPD(-1) + C(50) * DGEXPD(-2) \\ & + C(51) * DINVST(-1) + C(52) * DINVST(-2) + C(53) * DNX(-1) + C(54) * DNX(-2) \\ & + C(55) * DREER(-1) + C(56) * DREER(-2) + C(57) \end{aligned} \tag{4}$$

$$\begin{aligned} DDEBT = {} & C(58) * DGDPTL(-1) + C(59) * DGDPTL(-2) + C(60) * DCAP(-1) + C(61) * DCAP(-2) \\ & + C(62) * DCONS(-1) + C(63) * DCONS(-2) + C(64) * DDEBT(-1) + C(65) * DDEBT(-2) \\ & + C(66) * DEMP(-1) + C(67) * DEMP(-2) + C(68) * DGEXPD(-1) + C(69) * DGEXPD(-2) \\ & + C(70) * DINVST(-1) + C(71) * DINVST(-2) + C(72) * DNX(-1) \\ & + C(73) * DNX(-2) + C(74) * DREER(-1) + C(75) * DREER(-2) + C(76) \end{aligned} \tag{5}$$

$$\begin{aligned} DEMP = {} & C(77) * DGDPTL(-1) + C(78) * DGDPTL(-2) + C(79) * DCAP(-1) + C(80) * DCAP(-2) \\ & + C(81) * DCONS(-1) + C(82) * DCONS(-2) + C(83) * DDEBT(-1) + C(84) * DDEBT(-2) \\ & + C(85) * DEMP(-1) + C(86) * DEMP(-2) + C(87) * DGEXPD(-1) + C(88) * DGEXPD(-2) \\ & + C(89) * DINVST(-1) + C(90) * DINVST(-2) + C(91) * DNX(-1) + C(92) * DNX(-2) \\ & + C(93) * DREER(-1) + C(94) * DREER(-2) + C(95) \end{aligned} \tag{6}$$

$$\begin{aligned} DGEXPD = {} & C(96) * DGDPTL(-1) + C(97) * DGDPTL(-2) + C(98) * DCAP(-1) \\ & + C(99) * DCAP(-2) + C(100) * DCONS(-1) + C(101) * DCONS(-2) \\ & + C(102) * DDEBT(-1) + C(103) * DDEBT(-2) + C(104) * DEMP(-1) \\ & + C(105) * DEMP(-2) + C(106) * DGEXPD(-1) + C(107) * DGEXPD(-2) \\ & + C(108) * DINVST(-1) + C(109) * DINVST(-2) + C(110) * DNX(-1) \\ & + C(111) * DNX(-2) + C(112) * DREER(-1) + C(113) * DREER(-2) + C(114) \end{aligned} \tag{7}$$

$$\begin{aligned} DINVST = {} & C(115) * DGDPTL(-1) + C(116) * DGDPTL(-2) + C(117) * DCAP(-1) + C(118) * DCAP(-2) \\ & + C(119) * DCONS(-1) + C(120) * DCONS(-2) + C(121) * DDEBT(-1) + C(122) * DDEBT(-2) \\ & + C(123) * DEMP(-1) + C(124) * DEMP(-2) + C(125) * DGEXPD(-1) + C(126) * DGEXPD(-2) \\ & + C(127) * DINVST(-1) + C(128) * DINVST(-2) + C(129) * DNX(-1) + C(130) * DNX(-2) \\ & + C(131) * DREER(-1) + C(132) * DREER(-2) + C(133) \end{aligned} \tag{8}$$

$$\begin{aligned} DNX = {} & C(134) * DGDPTL(-1) + C(135) * DGDPTL(-2) + C(136) * DCAP(-1) + C(137) * DCAP(-2) \\ & + C(138) * DCONS(-1) + C(139) * DCONS(-2) + C(140) * DDEBT(-1) + C(141) * DDEBT(-2) \\ & + C(142) * DEMP(-1) + C(143) * DEMP(-2) + C(144) * DGEXPD(-1) + C(145) * DGEXPD(-2) \\ & + C(146) * DINVST(-1) + C(147) * DINVST(-2) + C(148) * DNX(-1) + C(149) * DNX(-2) \\ & + C(150) * DREER(-1) + C(151) * DREER(-2) + C(152) \end{aligned} \tag{9}$$

$$\begin{aligned} DREER = {} & C(153) * DGDPTL(-1) + C(154) * DGDPTL(-2) + C(155) * DCAP(-1) \\ & + C(156) * DCAP(-2) + C(157) * DCONS(-1) + C(158) * DCONS(-2) \\ & + C(159) * DDEBT(-1) + C(160) * DDEBT(-2) + C(161) * DEMP(-1) \\ & + C(162) * DEMP(-2) + C(163) * DGEXPD(-1) + C(164) * DGEXPD(-2) \\ & + C(165) * DINVST(-1) + C(166) * DINVST(-2) + C(167) * DNX(-1) \\ & + C(168) * DNX(-2) + C(169) * DREER(-1) + C(170) * DREER(-2) + C(171) \end{aligned} \tag{10}$$

Abbreviations

ADF	Augmented Dickey Fuller
AIC	Akaike information criterion
ARCH	Autoregressive Conditional Heteroscedastic
ARDL	Autoregressive distributed lag
C or CONS	Consumption
EGARCH	Exponential Generalized Autoregressive Conditional Heteroscedastic
E or EMP	Employment
Fintech	Financial Technology
FPE	Final prediction error
GARCH	Generalized Autoregressive Conditional Heteroscedastic
GJR-GARCH	Glosten,Jaganathan & Runkle-Generalized Autoregression. Conditional Heteroscedastic
GNP	Gross National Product
G or GEXPD	Government expenditure
HQ	Hannan–Quinn information criterion
I or INVST	Investment
MMT	Modern Monetary Theory
NX	Net exports
OBS	Observations
OLS	Ordinary least squares method
OECD	Organisation for Economic Co-operation and Development
PP	Phillips Perron
PRD	Period
REER	Real effective exchange rate
RGDP	Real Gross Domestic Product
REH	Ricardian Equivalence Hypothesis
SC	Schwarz information Criterion
SE	Standard Error, forecast error of the variable for each forecast horizon
SMEs	Small and Medium Sized Enterprises

TD	Total government debt
TC or CAP	Total capital
VAR	Vector autoregression model
VD	Variance Decomposition
VECM	Vector Error Correction Model
Y	Output

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