Does the Ricardian Equivalence Theorem capture the consumption behaviour of Maltese households?[*]

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Abstract

This paper explores the relationship between government debt and private consumption for Malta. In particular, it attempts to find evidence in favour or against the proposition that the consumption behaviour of Maltese households follows the Ricardian Equivalence Theorem. The empirical findings from this analysis suggest that household consumption behaviour in Malta is not Ricardian. The resulting lack of evidence supporting the presence of a cointegrating relationship between private consumption and public debt indicates that there is no long run relationship amongst these two variables. However, the results obtained from a subsequent application of a vector auto regressive generalized impulse response function suggests that in the short-term a rise in public debt does positively influence private household consumption. This implies that Keynesian theory may be better suited at explaining the underlying behaviour of Maltese households in response to changes in the level of public debt, supporting the view that Maltese households, on aggregate, exhibit a myopic behaviour with regards to household consumption patterns. This suggests that to an extent, the Government may thus be able to take advantage of the implicit effectiveness of an expansionary fiscal stance to stimulate the economy through higher aggregate consumption, at least in the short run. However, it should be noted that in the case of Malta the non-presence of the Ricardian Equivalence Theorem may not necessarily imply a high level of effectiveness of Keynesian fiscal policy, given that Malta is a small and open economy characterised by a high level of import content in its aggregate demand components. The longer-term implications pertaining to the public debt burden on future generations should be taken into account by policy makers as higher levels of debt could result in an eventual contractionary fiscal stance which would negatively impact the consumption pattern of future generations.

1. Introduction

The way in which fiscal policy is conducted, particularly the decision on how to finance government expenditure, and its influence on aggregate demand has been comprehensively analysed in various macroeconomic studies. In particular, Barro's (1974) seminal paper re-introduced the idea of the Ricardian Equivalence, originally proposed by David Ricardo (1771-1823) in his *Essay on the Funding System*, which contrasted with Keynesian theories that were prevalent at the time[5]. The Keynesians argued that by issuing debt to finance spending, whilst keeping taxation at a given level, governments could take advantage of the public's positive marginal propensity to consume and thus stimulate the economy through higher aggregate demand. In addition, they argued that if the government increased taxation to finance more expenditure, this would instil a negative effect on real private consumption.

The Ricardian Equivalence Theorem (RET) as put forward by Barro (1974) suggests that it does not matter how governments finance additional expenditure, either through higher taxation or by issuing bonds, as this in the long run, does not alter household's consumption patterns, since by issuing bonds the government is simply postponing taxes to be paid later. Taking a reduction in taxation together with the issue of bonds would, according to the RET, induce economic agents not to spend the resultant tax cut but rather invest it by purchasing bonds. This is because they would anticipate an increase in taxation in the future in order for the borrowings to be repaid and the debt to be serviced.[6] Therefore, private savings would increase by the amount of the tax cut, implying that overall consumption remains constant. This suggests that the issuance of government bonds does not have an effect on the net wealth of its households, since although government bonds are a form of an asset for those holding them, they also represent a future liability to tax payers which have to redeem them in a future date (Poterba & Summers, 1987; Seater, 1993). It should further be noted that as put forward by Seater (1993) the RET is underpinned by the following set of assumptions; infinite time horizons, an equal number of children to every parent (no childless families), no liquidity constraints, a single interest rate for consumers and the government, no uncertainty, no income redistribution, no distortionary taxation, no interest rate or growth rate differential, and perfectly rational consumers. These assumptions should implicitly be taken into consideration when evaluating the analysis undertaken in this study.

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[5] As the theory's name suggests, David Ricardo is believed to have been the first to have conveyed this equivalence proposition.
[6] The RET should also hold when in order to finance a given path of expenditure, the government increases taxation and reduces borrowing.

The German view of expansionary fiscal contraction, as put forward by Fels and Froehlich (1986) and Hellwig and Neumann (1987) suggests that a fiscal contraction resulting from a reduction in government expenditure would lead to an increase in private consumption through lower expected future taxation. However, they note that if this fiscal contraction was to be implemented by increasing taxation, consumers may not expect taxation to be lower in future and thus aggregate private consumption would remain unchanged.

Various studies have been undertaken over the years attempting to provide evidence for the RET. Seater (1993) notes a number of failed attempts to verify whether the RET does indeed hold for a number of countries. Giorgioni and Holden (2001) provide empirical evidence of the RET through a Vector Error-Correction modelling (VECM) framework for six countries over the period 1950-1997. They also find some tentative evidence of the RET for less-developed countries in another study (Giorgiani and Holden, 2003). However, the majority of studies fail to find support for the RET. In testing the long-run relationship between private debt and consumption using data for 15 OECD countries, Gogas et al. (2014) also fail to find empirical evidence supporting the RET. Feldstein (1982) also suggests that the RET does not hold for the U.S when analysing the relationship between public debt and private consumption over the period 1930-1971. Drakos (2001) concludes that in Greece, households perceive government bonds as net wealth and accordingly, consumption rises, possibly because of liquidity constraint or myopic behaviour. Ismaili et al. (2008) also reject the RET when applied in Malaysia, using 45 years of data up to the year 2006. These studies tend to suggest that the Keynesian or the German view of expansionary fiscal contraction are more appropriate when attempting to describe the effect that fiscal policy has on household behaviour. Studies which test the RET for the case of Malta have suggested that there is an absence of complete Ricardian equivalence (Grech, 2000; Gatt, 2014).

Whether the debt neutrality theorem holds or not has important implications for policy makers. The recent financial crisis brought about several fiscal policy response measures in the euro area. In this respect, increases in government consumption patterns led to significant responses in private consumption, and discretionary fiscal policies led to an increase in annualized quarterly real GDP growth by up to 1.6 percentage points (Coenen et al., 2012). Applied economic models show the relevant role of government in boosting aggregate demand (Christiano et al., 2011), although it still depends on certain country-specific characteristics (Hebous, 2010).

The purpose of this paper is to attempt to provide an additional empirical contribution on the validity of the RET, or otherwise, in the case of Malta by analysing the long run relationship between public

debt and private consumption. The paper is organised as follows. Section 2 describes the data utilised and the econometric methodological framework employed. Section 3 provides a description of the main the empirical findings of the study and finally, Section 4 concludes with a discussion on the associated economic implications of the results.

2. Methodology

2.1 The Data

The dataset employed in this study consists of the natural logarithms of government debt and private consumption expenditure for Malta in annual observations, at 2010 constant prices, from 1980 to 2016, compiled from the historical dataset sourced from the Central Bank of Malta. Level data were used for both government debt and private consumption and the nominal series have been expressed in 2010 constant prices by utilizing the Retail Price Index (RPI) as deflator. The RPI was used rather than the Harmonised Index of Consumer Prices (HICP) inflation measure given that data is not available for this index from 1980 to 1995.

Although the RET is more commonly explained in terms of the effect of higher or lower debt on private savings, given the unavailability of data on real private savings in Malta we use real household consumption as a close proxy following Drakos (2001) and Gogas et al. (2014). This is justified since lower private savings should be reflected into higher private consumption and vice versa, by assuming that household income and wealth remains constant. This study aims to examine the potential short-run and long-run linkages between government debt and private consumption expenditure on the basis of a univariate cointegrating framework.

Over the period under review, the level of real private consumption has increased by more than three times that of the first observation. The macroeconomic background has over the years experienced a number of changes, in composition, contribution to growth and the need of several structural reforms. The stance of fiscal policy was, to a certain extent, swerved around such reforms, investment and infrastructural needs. In return, this had implications on the level of public debt. As the level of public expenditure remains higher than revenue, public debt accumulates, and vice-versa. The first observation in the study, recorded real government debt at around €288 million, whilst the most recent observation stood at around €5029 million; a notable increase.

The 1980s were characterised by a period of restrictive and rather prudent fiscal policy, especially in the earlier period of the decade, when fiscal surpluses were still being registered. This shifted to an expansionary policy in the late 1980s and throughout the 1990s. The deficits experienced during this period were partially a result of lower government revenue following the recession of the early 1980s. This period saw the government aiming towards more liberalisation of the market, and the promotion of Foreign Direct Investment (FDI). The running of year-on-year deficits led to a gradual escalation in the level of public debt, with the rate of annual growth of real public debt between 1987 and 1999 averaging around 20 percent.

Real private consumption was rather stagnant and only increased marginally in the beginning of the 1980s, mainly due to the adverse impact the international recession had on labour market participation, tourism and other externally exposed local markets. Afterwards, substantial increases were registered over the late 1980s and during the following decade. Expansionary fiscal policy may have had an impact on consumption during this period. This was followed by the impact on consumption of the dot com bubble in the first few years of the 2000s. A major milestone was reached in 2004 where Malta became a European Union Member State and then entered the euro area in 2008. The latter occurred at the time of global crisis of credit, and the sovereign effects this had on some euro area Members. All these factors over time resulted in a rather volatile pattern of changes in both the level of real debt and real private consumption as shown in Figure 1 which demonstrates the variables in first differences. The Maltese economy and the stance of fiscal policy has performed better off than most other EU countries following the period of the crisis. The stance of Malta's fiscal policy was also influenced by the imposition of the fiscal rules enshrined within the EU Stability and Growth Pact (SGP).

The presence of a very high correlation across the absolute values of real public debt and real private consumption amounting to 0.98 was noted. This is to be expected given the persistent upward trend of the two variables and the association of the fiscal stance with macroeconomic developments. Nevertheless, the slope of real public debt in Figure 1, is steeper than that of real private consumption, with real public debt exceeding the level of real private consumption in the late 2000s. The correlation in first difference points to a coefficient of 0.22, suggesting that changes in each of the variables provides a positive but not a strong link across each other. Such statistics may give an indication of the properties of the two variables, however, a cointegration analysis needs to be performed for a more meaningful analysis of the occurring linkage, impact or otherwise.

One must note that some factors need to be taken into consideration specifically in the case of Malta. The fact that constraint on liquidity has declined drastically over the timeframe of this study, needs

to be taken into account. Moreover, there seems to be an apparent brevity of the intergenerational horizon amongst individuals. This is more apparent given the difficulty, even among experts to make predictions, even more so for longer periods of time. This leaves room for further difficulty amongst the general public to predict, and even more to direct a link between the extent of public policy behaviour on the extent of savings and consumption. A major contributor to this understanding is the smallness and openness of the Maltese economy, leaving room for more volatility and certain factors exerting a larger impact than would have otherwise occurred in larger countries. Also, a large proportion of Maltese households maintain government debt as a significant proportion of their savings, thus it may be the case that if government issues more debt the effect on savings may be driven by this fact.[7] Certain key outcomes affecting our economy and the state of public finances were unpredictable in the past. Gatt (2014) argues that the persistent government budget deficits appear not to have been a major concern for households, possibly, as described in Grech (2000): "in view of the widespread tax evasion and a common perception that government can run deficits for a long time". A substantial proportion of Maltese households are property owners. This may be one significant factor amongst other alternatives to holding public debt which may influence the extent of the applicability of the study.

Fig. 1. Real public debt and private consumption (in levels and first difference)
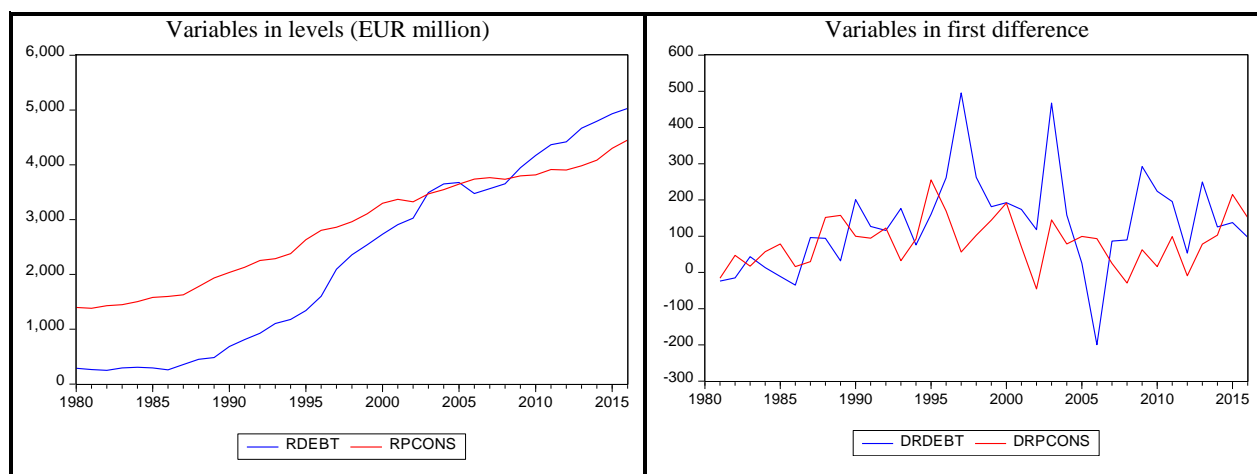
2.2   Econometric Methodology

The RET suggests that increases in government borrowing, brought about by high debt levels should generate an increase in private savings. In other words, the extra wealth in the form of bonds, held

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[7] The most recent NSO News Releases on the structure of general government debt show that around 60% of government debt is held by financial corporations while around 25% of government debt is held by Households and Non-Profit Institutions Serving Households (NPISH).

by households, should be transformed into increased savings, which would imply lower private consumption. Therefore, the hypothesis being tested is that for the RET to hold, we should find evidence of a long run negative relationship between public debt and private consumption. In contrast, finding evidence of a positive relationship, or indeed no long run relationship at all, would imply that the RET does not hold in the case of Malta.

The time-series of the macroeconomic variables included in this analysis are typically non-stationary. As a result, the analysis has to take into account the possibility that public debt and private consumption are cointegrated. A vector time series $\mathbf{Y_t}$, which includes two variables $\mathbf{y_t}$ and $\mathbf{x_t}$ is said to be cointegrated if there exists a parameter $\boldsymbol{\alpha}$ such that $\boldsymbol{e_t = x_t - \alpha y_t}$ is a stationary process, whereas $\mathbf{y_t}$ and $\mathbf{x_t}$ are non-stationary in a univariate series (Granger, 1981; Granger & Weiss, 1983; Granger, 1986; Engle & Granger, 1987).

There are two main methodologies which are utilised in examining cointegration analysis, which are the Engle-Granger and the Johansen procedure. The Engle-Granger methodology involves examining the residuals from a long-run equilibrium relationship by the Ordinary Least Squares (OLS) method. On the other hand, the Johansen procedure utilises a Vector Auto-Regressive (VAR) model in first differences which includes lagged variables. As highlighted in both Bilgili (1998) and Shrestha and Bhatta (2018) there are several shortcomings with the Engle-Granger methodology which the Johansen procedure overcomes. Thus, in order to test for a cointegrating relationship between public debt and private consumption, the Johansen procedure is used (Johansen, 1988; 1991; 1995) which also follows the methodology used by Drakos (2001) and Gogas et al. (2014) in their analysis on the RET.

The first step in the Johansen procedure is to estimate a VAR model using level data to identify the appropriate lag length. A VAR is a stochastic process model which factors in the linear interdependencies between various time series. The output of the VAR can be interpreted as several OLS equations.

$$y_t = A_0 + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_k y_{t-k} + e_t$$

where in our case, y_t is a vector of private consumption and public debt, A_0 is a matrix of intercept terms, A_i are matrices of coefficients and e_t is a vector of error terms. A similar specification was utilised in Gogas et al. (2014). The optimum lag structure of the VAR is then determined by looking at lag length criteria.

This model can be reformulated into a Vector Error Correction Model (VECM) as follows;

$$\Delta y_t = \tilde{A}_0 + \tilde{A}_1 y_{t-1} + \tilde{A}_2 y_{t-2} + \cdots + \tilde{A}_{k-1}\Delta y_{t-k-1} - \pi y_{t-k} + u_t$$

$$where, \ \pi = -(I - A_1 - \cdots - A_k)$$

Let π be a matrix of coefficients on the lagged values of the endogenous variables in the reparametrised version of the VAR model. VAR models are used for multivariate time series and their structure is such that each variable is a linear function of past lags of itself and past lags of the other variables. One of the most important advantages of a VAR model, when compared with other structural approaches to time series modelling, is its ability to provide a dynamic specification among all the relationships between variables. The number of cointegrating vectors in the model is equal to the number of statistically significant eigenvalues in the π matrix. Following the Johansen Procedure, the following two test statistics are used: the trace statistic ($ë_{trace}$) and the maximum eigenvalue test statistic ($ë_{max}$). The former tests the null hypothesis that the number of linearly independent rows (i.e. cointegrating vectors) in the π matrix is at least as great as r against a general alternative, while the $ë_{max}$ evaluates the null hypothesis that the number of cointegrating vectors is precisely 'r' as opposed to the (specific) alternative of (r+1). Therefore, the $ë_{max}$ tests the null hypothesis against a specific alternative, whereas the trace statistic tests against a general alternative. It was decided to utilize the $ë_{max}$ for this analysis given that it has a more accurate alternative hypothesis. In the event that the variables do not appear to cointegrate (r=0), the procedure which will be undertaken is that of fitting to the data a VAR in first differences rather than a VECM.

The rejection of a cointegrating relationship is a necessary but not a sufficient condition for the failure of the RET (Gogas et al. 2014). Thus, a VAR model is then typically used to compute a generalized impulse response function in order to investigate the short run dynamics between public debt and private consumption, thereby implicitly testing for the RET. Given that of course, statistical correlation does not necessarily imply causation, Granger causality tests will be conducted following the methodology put forward in Drakos (2001) and Gogas et al. (2014) in order to provide evidence supporting some degree of causation between public debt and private consumption. The Granger (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation.

3. Empirical Findings

In order to identify the dynamic link between public debt and private consumption, the order of integration of the series was first established utilising the Augmented Dickey Fuller (ADF) test (Dickey and Fuller, 1979; 1981). The results, which are shown in Table 1, indicate that both real consumption and real debt are integrated of order 1, which implies that when differenced once both series are stationary. The necessary condition to test for cointegration requires that both variables share the same order of integration, meaning that both should be differenced the same amount of times to achieve stationarity. The results obtained satisfy this necessary condition, and thus the Johansen procedure can be employed.

Table 1. Augmented Dickey Fuller Unit Root tests

Variable	T-Statistic	Critical Value (5%)	p-value
LNRDEBT (level)	-0.2723	-3.5403	0.9885
LNRPCONS (level)	-0.4056	-3.5403	0.9835
LNRDEBT (difference)	-3.0450	-1.9507	0.0034
LNRPCONS (difference)	-2.1681	-1.9507	0.0308

The VAR lag order selection criteria all indicate that the model should include one lag.[8] The lag length criteria referred to here are the sequential modified likelihood ratio (LR) test statistic, the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC) and the Hannan-Quinn Information Criterion (HQ).[9]

Table 2 reports the Johansen cointegration test results, which show that when utilising a lag length of one, the $ë_{max}$, maximum eigenvalue test statistic rejects the existence of a cointegrating relationship between the two variables at the 5% significance level.[10] This provides evidence that public debt and private consumption are not linked together via a long-run relationship, more specifically, they do not share a common stochastic trend.

Table 2. Cointegration Results

Rank under the Null	Alternate Hypothesis	$ë_{max}$	5% (significance)	p-value
R = 0	R = 1	12.099	14.265	0.1070
R = 1	R = 2	4.807	3.841	0.0283

The lack of evidence in support of a cointegrating relationship between private consumption and public debt provides an indication that the RET may fail to hold in the case of Malta. Since no cointegrating

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[8] See Statistical Annex Table A.

[9] Test results may be found in appendix.

[10] 'R' represents the cointegrating rank. The null hypothesis of no cointegrating relationship (R = 0) is tested against an alternative hypothesis were there exists at most one cointegrating relationship (R = 1). If the null hypothesis is accepted, we can thus conclude that there is no cointegrating relationship.

relationship is identified, the VECM methodology should not be used, and thus an estimation of a VAR model in first differences is estimated to capture short-run dynamics between private consumption and public debt. It should be noted that the VAR model is a-theoretical which will be employed in the context of this study in order to develop granger causality tests and a generalized impulse response function in order to shed light on the underlying short-run dynamics between private consumption and public debt.

The lag length criteria for the first differenced VAR model all indicate the inclusion of 2 lags.[11,12] Despite some of the variables being statistically insignificant, which is to be expected in VAR models (Gujarati 2009; Enders 2008), collectively the regression seem to be significant on the basis of the F-statistic.[13]

Next, VAR Granger Causality tests are employed to assess whether causation exists between public debt and private consumption. This test is used to determine how much of the current consumption can be explained by its own past values and to test whether adding lagged values of debt leads to a better explanation. Consumption is said to be Granger-caused by debt, if the latter improves the prediction of consumption. The null hypothesis is that private consumption does not Granger-cause public debt in the first regression and that public debt does not Granger-cause consumption in the second regression. The results are summarised in Table 3. Given that the p-values are lower than 0.05, we fail to accept the null hypothesis in both regressions. Thus, Granger-causality runs both ways, meaning that private consumption Granger-causes debt, and debt Granger-causes private consumption.

Table 3. VAR Granger Causality test

Null Hypothesis	F-Statistics	p-value
Consumption does not granger cause debt	7.270538	0.0264
Debt does not granger cause consumption	10.76451	0.0046

In order to assess the implicit short-run dynamics between fluctuations in public debt and the associated impact on private consumption, a VAR generalized impulse response function is carried out in figure 1 in which a positive shock to private debt by one standard deviation is applied.[14]

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[11] The lag length criteria referred to here are the sequential modified likelihood ratio (LR) test statistic, the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC) and the Hannan-Quinn Information Criterion (HQ).
[12] See Statistical Annex Table B.
[13] See Statistical Annex Table C.
[14] For the purpose of the impulse response function and variance decomposition, Cholesky Decomposition orthogonal factorisation is used.

Fig. 2. Impulse response and variance decomposition of private consumption to a public debt shock
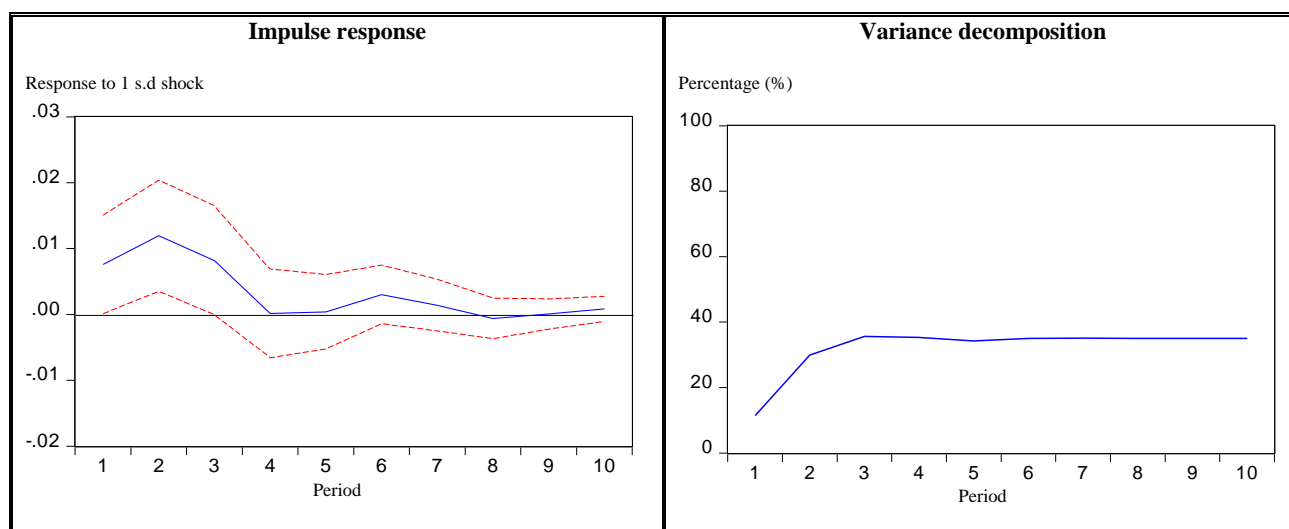
The impulse response function suggests that with a positive shock to public debt, private consumption rises in the initial period, but then the response of consumption to the public debt shock dies out and is insignificant following the first three periods. With respect to the implications of this result within the contest of testing for the RET, and also given that economic agents are assumed to be far sighted and rational, in the short-run we would expect that a rise in public debt would lead to lower consumption. This is due to the expectation of higher taxes or lower public sector expenditure in the near future, which would be required to finance the increase in debt. Our result therefore goes against the RET, given that with a positive public debt shock, private consumption seems to respond positively.

The attribution of public debt towards the variance in private consumption is also shown in Figure 1. Based on the results, public debt seems to explain a large proportion of the variance in private consumption expenditure.[15] Nearly 40% of the deviation on private consumption is due to a public debt shock, which remains constant following the third period. This result has to be placed in a context as explained from figure 2 where the shock of debt to consumption declines substantially following the third period and remains relatively low, close to the zero mark for the remaining periods. This enforces the results of the generalized impulse response function in light of the RET, given that there only appears to be a short-term effect on consumption due to a public debt shock. The overall results suggest that the Keynesian theory may be more suitable in explaining the relationship between public debt and private consumption in the case of Malta. Ceteris paribus, a rise in public debt is generally associated with the occurrence of year-on-

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[15] The variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR.

year budget deficits, implying an expansionary fiscal stance, which according to Keynesian theory should lead to a rise in national income and a consequent rise in private consumption.

4. Conclusion

This study examines the validity of the RET for the Maltese economy by analysing the relationship between public debt and private consumption over a period of 37 years, via the application of a univariate cointegrating framework and the resulting application of a VAR generalized impulse response function. The econometric results suggest that the RET may not hold in the case of Malta, which follows the results obtained from similar studies applied to the Maltese economy such as Grech (2000) and Gatt (2014). The results suggest that in response to a rise in public debt, households may not on aggregate perceive that they will have to pay more in taxes at some point in the future. In fact, one of the most important implications which stems from the failure of the RET relates to the possible rejection of the theory's assumption of intertemporal linkages across generations. This supports the view that Maltese households, on aggregate, exhibit a myopic behaviour with regards to household consumption patterns, as increases in public debt translate into a positive stimulus for consumption expenditure, at least in the short-run. This implies that policy makers can take advantage of the underlying effectiveness of an expansionary fiscal stance in order to stimulate the economy through higher aggregate consumption. Caution is however warranted as in the longer-term this may cause a rise in the public debt burden of future generations, resulting in an eventual reversal of the fiscal stance which would negatively impact the consumption pattern of future generations. One should note, however, that the non–presence of the RET may not necessarily imply a high level of effectiveness of Keynesian policy, this in view of Malta being a small and open economy which is open for trade and in view of the high import content in aggregate demand components. Another factor which needs to be taken into consideration is whether the effect of EU fiscal rules which imply targets on both government deficit and debt limits the extent of policy.

The limitations of the study have to be kept into consideration. In particular, the various assumptions employed as discussed in Seater (1993) and data limitations in terms of the number of observations used are also to be noted. In addition, one has to consider the apparent brevity of the intergenerational horizon which becomes more understandable taking into account the poor ability, even among experts, to predict even over several quarters or years, let alone decades. This consideration is more acute in small and therefore more volatile economies, such as Malta. For instance, sources of Government revenue, such as the streams of revenue from EU funds received after the EU accession and the proceeds

generated from the Individual Investor Programme (IIP) could not have been predicted several years prior to their commencement.

Within the context of scope for future research, this analysis could make use of a quarterly frequency and may include other variables that are also relevant when testing for the relevance of the RET. In addition, a behavioral perspective could also be undertaken via an experimental or laboratory analysis whereby simulations of the household's savings decisions in response to changes in the state of public finances could be observed.

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Statistical Annex

Table A. VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	24.75796	NA	0.000714	-1.569515	-1.475218	-1.539982
1	114.3025	160.5626*	1.96e-06*	-7.469138*	-7.186249*	-7.380540*
2	115.2756	1.610599	2.43e-06	-7.260384	-6.788903	-7.112722
3	121.0968	8.832287	2.17e-06	-7.385990	-6.725916	-7.179263
4	123.3601	3.121741	2.50e-06	-7.266214	-6.417548	-7.000423
5	127.9079	5.645520	2.50e-06	-7.303992	-6.266734	-6.979136
6	128.5032	0.656858	3.35e-06	-7.069184	-5.843333	-6.685263
7	129.0552	0.532969	4.62e-06	-6.831391	-5.416947	-6.388405
8	134.6099	4.597016	4.68e-06	-6.938614	-5.335577	-6.436563

* indicates lag order selected by the criterion

Table B. Differenced VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	94.04050	NA	4.79e-06	-6.574322	-6.479164	-6.545231
1	101.7801	13.82067	3.67e-06	-6.841434	-6.555962	-6.754162
2	112.1233	16.99239*	2.35e-06*	-7.294520*	-6.818732*	-7.149067*
3	112.9335	1.215318	2.99e-06	-7.066678	-6.400575	-6.863043
4	119.3160	8.661958	2.59e-06	-7.236856	-6.380439	-6.975040
5	119.3740	0.070410	3.57e-06	-6.955283	-5.908551	-6.635287
6	119.7771	0.431935	4.93e-06	-6.698365	-5.461318	-6.320187
7	121.6605	1.748882	6.31e-06	-6.547180	-5.119818	-6.110821
8	127.2049	4.356310	6.50e-06	-6.657494	-5.039817	-6.162954

* indicates lag order selected by the criterion

Table C. Vector Auto Regression Estimates

	DLN_RDEBT	DLN_RPCONS
DLN_RDEBT(-1)	0.138186	0.110138
	(0.81307)	(2.68154)
DLN_RDEBT(-2)	-0.165380	0.061423
	(-0.93529)	(1.43739)
DLN_RPCONS(-1)	0.508779	0.227782
	(0.72007)	(1.33398)
DLN_RPCONS(-2)	1.581121	-0.276748
	(2.40722)	(-1.74347)
C	0.023265	0.019993
	(0.80111)	(2.84865)
R-squared	0.254596	0.376219
Adj. R-squared	0.151781	0.290181
F-Statistic	2.476265	4.372674

The number in ( ) indicates the t-statistic