NATIONAL DEBT AND INCOME INEQUALITY

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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Abstract

This study examines the relationship between national debt levels and income inequality in an economy. With no a priori specification on the direction of causality, the role of either variable in influencing the other is analysed. The study makes use of panel data from 34 countries of different geographical regions and development status, over the period running from 1980 to 2010. Analysis of data is done by means of country fixed effects panel regressions. Including control variables such as government expenditure, real GDP growth and inflation, the findings indicate a significant positive influence of income inequality on debt levels, with the exception of European and Developed countries. Similarly, the levels of national debt are found to positively and significantly impact the degree of heterogeneity in the distribution of incomes. These results, therefore, bring to question the appropriateness of using excessive government expenditure to remedy for income inequality.

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Abbreviations

EU	European Union
GDP	Gross Domestic Product
GNI	Gross National Income
IMF	International Monetary Fund
OECD	Organisation for Economic Co-operation and Development
VAT	Value Added Tax
ANOVA	Analysis of Variance
CPI	Consumer Price Index

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Chapter 1

Introduction

1.1 Background

National debt has been one of the core subjects of economic discourse and literature. Over the last century, a rich political economy literature has developed examining the determinants and effects of national debt. The International Monetary Fund (IMF), in its Public Sector Statistics Guide sets out the definition of gross debt of the general government as "all liabilities that are debt instruments. A debt instrument is defined as a financial claim that requires payments of interest and/or principal by the debtor to the creditor at a date(s) in the future" (International Monetary Fund, 2011, p. 3).

Amongst the five types/levels of debt instruments, debt securities and loans are the most relevant in reporting debt statistics of a country. Moreover, only the debt and spending attributable to three levels of government: the budgetary central government, composed of judiciary, legislature and executive, social security funds, extra-budgetary units, such as state agencies, and local/state governments, is relevant in the computation of government debt and government spending (Dipplesman, Dziobek, & Mangas, 2012).

A further distinction can be made between domestic debt and external debt. Amongst the three common definitions to distinguish between the two, the officially adopted one is, domestic debt is that for which the residents of the economy issuing the debt are the creditors, whereas external debt is held by non-resident creditors (Panizza, 2008).

While national debt has been one of the central themes in economic literature, in recent years, it has attracted even more attention to itself due to the notoriousness with which fiscal deficits have persisted in many countries leading to accumulation of huge amounts of debt (Larch, 2012). Greiner writes, 'Public debt has been a major problem for industrialized countries in the world since the second world war' (Greiner, 2010, p. 205). Developing countries, especially in Africa, have also had their own fair share of run-ins with the menace of high national debt. The rise of debt levels in many developed economies was further amplified by the 2007/2008 global financial crisis.

With joint public debt at levels not seen since the end of World War II, many countries are moving to tame their persistent fiscal deficits (Batini, Callegari, & Melina, 2012). The Euro-zone

and other countries like Japan have opted for the now infamous austerity measures. Other countries, like the U.S., that are not yet facing market pressures and waning investor and public confidence seem to be postponing fiscal consolidation and instead going for monetary policy/tools to stimulate economic growth. While these measures may play a significant role in curbing rising debt levels, one may argue that they are rather short-term and do not address the root causes of the problem. Redistributive and welfare spending, which have become a significant portion of government budgets, may hint at a possible root cause for the increase in public debt, income inequality.

While national debt has received its fair share of attention, the other subject of this study, income distribution, has been 'out in the cold' as relates to the study of main stream or modern neoclassical economics (Larch, 2012). Larch notes that 'Only recently after decades of increasing inequality of income in developed countries ... the public eye and the economic profession are gradually rediscovering the personal distribution of income as a relevant economic issue' (p. 54). And indeed income inequality has been increasing over the last three decades (International Monetary Fund, 2014). The gap between the rich and the poor is at its highest level in most OECD countries in the last thirty years (OECD, 2014).

Income inequality refers to the extent of disproportionate distribution of aggregate income across consumption units in the economy (Schutz, 1951). It is an indicator of how material resources are distributed across society (OECD, 2011). However, it differs from other forms of economic inequality; inequality of wealth, inequality of lifetime and inequality of opportunity, in that it is concerned with household or individual incomes whereas the other three capture distribution of wealth, lifetime incomes and social mobility respectively (International Monetary Fund, 2014). The consumption unit is usually taken as a household and income is taken as monetary benefits/compensation received from employment, investment, trade or in kind benefits (The Equality Trust, 2012).

Income inequality is measured in a number of ways, most commonly using the Gini coefficient, based on the Lorenz curve mechanism. The Gini coefficient is essentially a ratio that yields a zero value in perfect income equality and '1' in perfect income inequality. The higher the value of the ratio, the more unequal income distribution is. The Gini coefficient can also be measured using different criteria for the recognition of income. These are such as total income, market income, disposable income and consumption. Other measures of income inequality are ratio measures,

such as 90/10 and 20:20, and the Palma ratio (The Equality Trust, 2012) as well as the Robin Hood Index (The Equality Trust, 2011).

A number of theories and models have come up to explain why fiscal deficits would arise. These are such as tax smoothing, geographically distributed interests, distribution conflicts with social groups and/or political parties and models of intergenerational conflict (Alesina & Perotti, 1995). However, not many of these theories or models focus explicitly on income distribution as a possible propagator of fiscal deficits.

Furthermore, 'autonomous' events such as wars and conflict, business/economic cycles and large infrastructural projects have traditionally been known to lead to deficit spending (Alesina & Perotti, 1995). However, in light of recent developments, another item that may be added to this least is welfare spending. This has grown to be a substantial proportion of government spending in many countries. The average public welfare expenditure as a percentage of GDP for countries in the OECD is 22.5 percent and in the European Union (EU) the figure is 25.4 percent (OECD, 2009). Where no explicit welfare programs are in place, welfare and redistributive spending take place through the provision of free public services, subsidization of essential goods and the adoption of tax systems in favour of the lower income earners.

One may of course object that a government can achieve its redistributive expenditure goals and attain a balanced budget. However, the propositions made in this paper are that: first, the more unequally distributed incomes are, the higher the demand for redistributive spending and the more difficult it is to balance the budget. Secondly, the more unequal society is, the greater the delays in making the fiscal adjustments necessary in correcting the dismal and unsustainable fiscal situation. And thirdly, the more unequal society is, the higher the proportion of the cost of fiscal consolidation to be borne by the less well off, hence the greater the resistance to what would amount to austerity measures by the government. These three propositions strongly suggest that there is some link between income distribution and national debt.

A reversed direction of causality between income inequality and national debt has also been suggested by some authors (You & Dutt (1996); Salti (2011)). The idea behind such a relationship is that the more the national debt, specifically, domestic share of national debt, the higher the interest payments paid out to the exclusive group of wealthy individuals owning the debt instruments. This debt servicing is facilitated by taxes collected from the working class.

This paper seeks to investigate the relationship between national debt and income inequality. Using a sample of thirty countries over the period 1980 - 2010, the study empirically analyses the

significance of the impact of income inequality on national debt and that of national debt on income inequality using panel regression and granger causality tests.

1.2 Problem statement

For many economists it was a wonder that debt levels continued to rise even in times of peace (Alesina & Perotti, 1995). While a number of theories have been advanced to explain the perpetual fiscal deficits countries have been running (Alesina & Perotti, 1995), very few have looked into distributional conflicts, due to the heterogeneity of distribution of income, as a possible culprit. With regards to empirical investigations into the same, Larch (2012) comes short of admitting that none had been undertaken at the time.

With the apparent correlation in the trends of national debt and income inequality, there also exists the possibility of reversed direction of causality, that is, higher national debt leading to higher income inequality. However, such a relationship too has hardly been investigated, theoretically nor empirically. Salti (2010) refers to the literature on the distributional effects of public debt as scant while You and Dutt (1996) state that many analysts saw the rise in national debt levels and income inequality as unrelated.

There is therefore a need to further explore the relationship between national debt and income inequality, within an economy, and to establish if either has any impact on the other and hence also establish the direction of causality between the two economic variables.

1.3 Research Objectives

i. To analyse the role of income inequality in determining the level of national debt.
ii. To analyse the role of the domestic share of national debt in determining the level of income inequality.

1.4 Research Questions

i. What role does income inequality play in determining the level of national debt in an economy?
ii. What role does domestic debt play in determining the degree of income inequality in a country?

1.5 Significance of the Research

This study is of benefit to fiscal policy makers and planners, world economic agencies and advisers as well as economic analysts and researchers in the areas of fiscal planning and income distribution. The findings of the study will enable fiscal planners and policy makers as well as other participants involved in seeking a solution to the persistent fiscal deficits and rising levels of debt to consider possible root causes of this problem and hence better evaluate possible long-term solutions. The findings will also enable fiscal planners to weigh wisely different alternatives of deficit financing as regards to their impact on income inequality.

This study will further benefit the society(s) at large due to the direct effects both public debt and income inequality have on individuals' lives. National debt has been shown to have an effect on economic growth, wage levels and disposable incomes for both the current and future generations. Effective management of national debt will therefore go a long way in improving the economic welfare of a society and avert debt crises like that currently being experienced in Greece.

Chapter 2

Literature Review

This section of the paper reviews existing literature on the subject matter of the study. Looking first at the validity of the premise that national debt needs to be properly managed, the section moves on to look at theoretical literature on the relationship between national debt and income inequality, after which a review of empirical analyses previously carried out is done.

2.1 Theoretical Literature Review

2.1.1 A need for proper debt management

In the 1940s and '50s, the controversy that surrounded national debt mainly pertained to whether or not the real cost of national debt could be shifted to future generations. The predominant view then was "National debt is no burden to the economy and the real cost of government expenditure, no matter how financed, cannot be shifted to future generations." (Modigliani, 1961, p. 730).

However, this view has long been abandoned. Bowen, Davis & Kopf, (1960) show that both the debt asset and the liability can be passed on to the next generation, by sale, bequests or death, depending on whether it is debt or asset, if the government does not choose to retire the debt within the time of the current generation. Furthermore, it is the generation existing at the time the government chooses to retire the debt that will bear the cost of this mode of financing. (Bowen, Davis, & Kopf, 1960).

The proponents of the idea that national debt is no burden to the economy also recognized a potential objection to that idea. If debt has no burden to the economy and its real cost cannot be shifted to future generations, "why not forego altogether the painful activity of levying taxes?" (Modigliani, 1961, p. 732). To counter this objection it is argued that the purpose of taxes is not to make current members of the community pay for the government use of goods and services, hence a balanced budget, but instead to prevent the great social evil of inflation.

In response to this argument, Modigliani (1961) shows that with the use of monetary policy there will not be one, "but a whole schedule of values of T (tax), which are consistent with the maintenance of full employment and price stability, each value of T accompanied by an appropriate monetary policy." (p. 736). He further shows that if one starts with a correct combination of T, r (interest rate) and M (money supply), then if taxes are lowered, thereby

increasing consumption, monetary policy will have to be tightened in order to maintain price stability. In fact, increased government expenditure without increased taxes, will lead to a corresponding decrease in capital formation (I). From the Keynesian framework, to maintain full employment without inflation, we must have $dG + dC + dI = 0$. Therefore, if government expenditure is raised without an increase in taxes,

$$dG = dD = -dI$$

where D is debt. Consumption which responds only to taxes will remain unchanged leading to only one variable being affected, capital formation. Hence the increase in government expenditure puts no burden on the current members of the community but affects future generations through the stock of capital inherited by them. Moreover, the deficit-financed expenditure leaves an overall burden on the economy in form of a reduced flow of income from the reduced stock of private capital. Taking the interest rate the government borrows at to be an approximate measure of the marginal productivity of capital, then the reduction in future stream of capital will be adequately approximated by $r^*(dD)$.

Diamond (1965) analyses the effect of government debt not only on the capital stock of an economy, but also on the utility of individuals in the context of a neoclassical growth model in long-run equilibrium. He distinguishes between internal and external debt and makes the conclusion that "in the long-run, government debt has two effects both arising from the taxes needed to finance interest payments. The taxes directly reduce available lifetime consumption of the individual taxpayers. Furthermore, by reducing his disposable income, taxes reduce his saving and thus the capital stock. Internal debt has an even greater negative effect on capital stock arising from the substitution of government debt for physical capital in individual portfolios" (Diamond, 1965, p. 1126).

Barro (1974), however, contends with the conclusions that individual savings decrease, relative to consumption, as government debt increases. He contradicts the popular theory that an expansionary fiscal policy, that is, a reduction in taxes backed by simultaneous increase in public debt, leads to increased aggregate demand. He asserts that, the idea that the private sector perceives government bonds as net wealth due to increased disposable income is a fallacy. He instead argues that individuals recognize the future tax obligations due to them and the future generations necessary for financing the servicing of the debt. Given that the individuals' utility is dependent not only on their own consumption but also that of their heirs, the current generation will not increase their consumption but will instead increase their savings to meet the future

obligations, that is, they will capitalise their future obligations. This therefore means that government debt is equivalent to taxation and has no effect on private capital accumulations (Barro, 1974).

However, Buchanan (1976) questions the plausibility that tax payers fully capitalize their future tax liabilities arguing that 'perceived net wealth, as relevant for spending behaviour, increases with increase in either private or public debt' (p. 340). Both Buchanan (1976) and Feldstein (1976) cast doubts on Barro's conclusions given what they consider to be his 'restrictive and empirically unwarranted assumptions' (Feldstein, 1976, p. 331). These assumptions are such as, that the economy has a constant population and no economic growth. By considering the growth of the economy and the rate of interest on government debt, Feldstein (1976), dispels the argument that government debt brings about equal aggregate future liabilities. He also shows that the creation of public debt or social security 'wealth' depresses savings in a growing economy, thereby reducing the accumulation of private capital leading to a lower capital labour ratio and hence lower wages for future generations.

To get a more comprehensive picture on the effects of government debt one also needs to look at the potential yield of the capital expenditure the government finances using the debt. Modigliani (1961) concludes that 'if the government spends on projects which produce a yield in the future, then the gross burden will be offset by the gross yield and the net outcome may even be positive.' (p. 755). Secondly, Modigliani also argues that due to the multiplier effect from the increased consumption, the gain in income to those present is likely to be appreciably larger than the lost stock of capital which approximates the present value of the sacrificed income streams. This translates into a stimulated increase in economic growth in the short run and to a certain extent in the long run as well.

2.1.2 Effect of public debt on income distribution

You and Dutt (1960) analyse the proposition by some economists that the existence of domestic debt results in interest payments, being paid to an exclusive small minority of wealthy individuals, facilitated by tax revenues from the working class thereby skewing income away from workers. To make this analysis they build a post Keynesian model in which the growth rate of an economy is constrained by resource aggregate demand instead of resource supplies.

To factor in income distribution into the model, You and Dutt (1996) consider two income classes within their model, workers and capitalists. They share the total output of the economy, X, where by the capitalists get profits, πX, and workers get wages, $(1-\pi)X$. The two income classes,

capitalists and workers, also have different tax rates, T_c and T_w respectively. You and Dutt (1996) further assume that only the capitalists have a marginal propensity to save, *s,* to facilitate the investments and debt purchases. To actually test the earlier mentioned hypothesis, the regressive redistributive effect of domestic debt on income, it is assumed that only the capitalists hold debt assets and hence their income consists of their share of total output plus the real interest payments they receive, πX + iD/P, where *i* is the interest rate of domestic debt, *D* and P is the price level.

Therefore, the inequality ratio, the ratio of disposable income received by the capitalists to that received by the workers is given by

$$v = \frac{(1 - T_c)(\pi X + \frac{iD}{P})}{(1 - T_w)(1 - \pi)X}$$

If we divide both the numerator and denominator by capital stock K, we get

$$v(\delta,\pi) = \frac{(1-T_c)(\pi u+i\delta)}{(1-T_w)(1-\pi)u}$$

where, u is the productivity of capital, X/K, referred to in the paper as capacity utilization and δ is the ratio of real public debt to capital stock, $\frac{D}{PK}$.

The ratio can further be written as:

$$v(\delta,\pi) = q\frac{(\pi+i\delta/u)}{(1-\pi)}, \text{ where q} \equiv \frac{(1-T_c)}{(1-T_w)}.$$

Therefore, the inequality ratio has three determinants: the relative tax rates, q, the profit share of output, π, and the ratio of interest income to income from total real output given by $\frac{i\delta}{u}$. Remember that, $\frac{i\delta}{u} = \frac{i^D/_{PK}}{X/_K} = \frac{i^D/_P}{X}$ = ratio of interest income to income from total real output. The focus is kept on the latter determinant, given that it is the one that brings out explicitly the effect of domestic debt on income inequality. From the equation showing the inequality ratio, it can be seen that the higher the interest income to total output ratio, the higher the inequality. The main determinant of the interest income to total output ratio that is considered is the real debt to capital ratio, δ. This ratio captures a rise in national debt, at least in the relative sense.

From an in depth analysis of the relationship between δ and the inequality ratio $v(\delta,\pi)$ the rate of capital accumulation $g(\delta,\pi)$ and the productivity of capital, referred to in the paper as capacity utilization, $u(\delta, \pi)$, You and Dutt (1996) come to the conclusion that the precise effect of national

debt on income distribution depends on the reason for the rise in government debt. Other things held constant, a rise in debt to capital ratio implies an increase in income inequality. However, although in many cases they do find that a rise in the debt capital ratio accompanied a worsening in the distribution of income, this relationship does not always hold. This is because the proponents of the theory that increased national debt worsens income inequality fail to consider the expansionary effects of a rise in national debt, even through the multiplier effect.

2.1.3 Effect of income inequality on fiscal performance

Larch (2012) looks into the role of income distribution in determining fiscal performance of a country. The idea behind the study is that political 'struggles' between different social groups, including the 'poor' and the 'rich' can delay fiscal adjustments towards balanced budgets and lead to accumulation of debt. The hypothesis is that income inequality can lead to some kind of 'soothing' increases in spending unmatched by revenue increases.

Larch (2012) distinguishes two groups of models dealing with income distribution. The first focuses on the redistribution of pre-tax income via the political process. Studies in this area (Dixit & Londregan (1996); Meltzer & Richard (1981)) conclude that the more unequal the distribution of income, the higher the level of redistributive spending. Furthermore, due to the negative effect of redistributive spending on economic growth, then 'in a more unequal society with higher demand for redistributive spending, lower economic growth may complicate the government process aimed at accommodating competing claims on the budget as compared to a more equal society with lower redistributive spending and high growth.' (p. 56).

The second group of models investigates the link between income distribution and macroeconomic outcomes, including fiscal performance. The prominent hypothesis in these models is that poor and liquidity-constrained households want to run government deficits thereby hampering and causing the deferment of the implementation of fiscal reform programs, such as fiscal consolidation, even when the economic case is clear and compelling. Larch (2012) points out that, procrastination is a function of how the cost of reforms is distributed: the more unequal the distribution of costs of reform the stronger the resistance to change.

2.2 Empirical literature review

2.2.1 Domestic share of public debt as the explanatory variable

Salti (2011) performs an empirical examination on the effect of public debt composition on the Gini coefficient with a similar hypothesis to that of You & Dutt (1996), that domestic debt

primarily held by higher income earners, yet serviced by the entire tax base, skews income distribution regressively. A panel of cross-country data from 109 countries between 1990 and 2007 is used. The study found consistent evidence that 'the domestic share of public debt is associated with higher levels of the Gini coefficient' (Salti, 2011).

The hypothesis is further refined to examine whether the effect of domestic debt on income depends on the purpose for which the debt is being raised. The impact of GDP per capita on the relationship between domestic debt and income inequality is also looked into. The impact of GDP per capita on the relationship between the two variables may arise because countries where GDP per capita is higher will issue domestic debt at lower interest rates while those whose GDP per capita is lower will issue debt at higher interest rates due to the perceived riskiness in lending to such countries.

The Gini coefficient is therefore initially regressed against domestic share of public debt and GDP per capita. In this regression the coefficient of domestic share of public debt has a value of 6.69 i.e. an increase of 10 percentage points in the share of domestic debt in public debt leads to an increase of 0.669 percentage points in the Gini coefficient and is significant at 1% level. The coefficient of GDP per capita though being significant at only 10% level shows that GDP per capita does play a protective role but does not undermine the relationship between the two variables. Adding government expenditure to the regression hardly alters the magnitude or significance of coefficient of domestic share of public debt. However, replacing government expenditure with the ratio of government expenditure to GNI lowers the magnitude and significance of the coefficient of domestic share of public debt to 4.54, significant only at 10%. However, when the ratio of debt service to GNI is added to this list of regressors and replacing the ratio of government expenditure to GNI with the absolute value of government expenditure, the coefficient of domestic share of public debt shoots up to 8.18 and is significant at 1% level.

Salti (2011) therefore concludes that the domestic share of public debt is consistently regressive across the different specifications made and hence the evidence is consistent with the hypothesis. Furthermore, external debt is vouched for as a better alternative to deficit financing due to its considerably smaller effect on income inequality.

However, one may argue that there is the possibility of unobserved heterogeneity in the Salti (2011) model due to the exclusion of wealth inequality as an explanatory factor. It is possible that wealth inequality could be a confounding factor between income inequality and domestic share of public debt. Wealth inequality is likely to lead to higher levels of income inequality as the wealth

owners seek to earn returns on the stocks of wealth the hold. This may be through leasing or lending and/or engaging in enterprise even through the purchase of equity securities. Government debt securities form a means for wealth owners to earn returns on their wealth. Hence it is very plausible that the higher the wealth inequality, the higher the domestic share of public debt.

2.2.2 The Gini coefficient as the explanatory variable

Larch (2012) empirically tests the possibility of income inequality as a factor causing persistent fiscal deficits using data on income inequality, national accounts, including fiscal variables, and data on political and societal institutions. The study is conducted using a data set covering 30 middle income and industrialized countries over the period of 1960 to 2007.

For data on income inequality, the Gini coefficient is used as it offers the broadest coverage across time and countries. Comparing the Gini coefficient to its closest alternative, the 9^{th} to 1^{st} decile ratio, Larch (2012) notes that the latter captures only a part of the distributional spectrum while the former represents a synthetic measure of the entire distribution. Also, due to the issue of quality of data on income inequality, Larch (2012) performs his panel regression on five different sets of data from five data bases. These are UNU-WIDER data-base, the data set constructed by Deininger and Squire (1996), figures from the Luxembourg Income Study (LIS), the OECD and EUROSTAT.

In the preliminary study, an ANOVA test comparing means between two subsets of the data, that is, countries with above average Gini coefficient and those that have lower than average Gini coefficient, is performed. It is found that countries with above average Gini coefficient have statistically significant higher budget deficits as a percentage of GDP, have more right winged governments and a significantly higher number of political crises and anti-government demonstrations. However, the same countries have statistically significant lower social spending as a percentage of GDP as well as lower government debt as a percentage of GDP. This seems to be a bit of a contradiction. One would expect the higher budget deficits are driven by higher social spending and would result in higher debt to GDP ratios.

For the panel regression, the budget balance to GDP ratio is first regressed against itself, against Gini coefficient and against GDP growth, all lagged by one year. Other variables include number of anti-government protests and dummy variables for representing the quality of fiscal rules, legislative election and political orientation of governments amongst others. The lagged value of budget deficit is meant to capture the degree of inertia in budget balancing. The real GDP growth is set as an indicator of business and economic cycles since these cycles may be confounding

factors affecting both deficits and income inequality. The findings are that the coefficient for GDP growth is statistically significant and positive across all the data sets used, however, the coefficient for Gini coefficient is statistically insignificant, though negative,in all but one data set. This implies a weak negative relationship between fiscal performance and income inequality.

In the second regression, interacting terms are introduced to the equation. These interacting terms are, Gini coefficient * Real GDP growth, Gini coefficient * political orientation of the government and Gini coefficient * number of anti-government protests. The coefficient for the interaction term between right wing government and Gini coefficient has a negative algebraic work and turns out to be statistically significant across many data sets. This shows, first, that the preference for fiscal discipline among right wing governments weakens as inequality of income rises. Secondly, it coincides with the hypothesis that income inequality would give rise to political pressure favouring deficits. The coefficient for the interaction term between number of anti-government protests and Gini coefficientseems to lead to higher deficits or lower surpluses most likely on the back of governments' attempts to calm the situation by handing out money to the less well-off.

The coefficient of the third interaction term, real GDP growth and Gini coefficient, is negative and in most cases statistically significant. Therefore, inequality tends to dampen the impact of economic growth on the balance sheet. Essentially, this means that the high the Gini coefficient, the lower the benefit on fiscal performance from economic growth. In fact Larch (2012) says, 'for very high Gini coefficient, the budgetary impact of economic growth could actually be negative.' The estimated value of these very high Gini coefficients is about 45 to 50.

Larch (2012) concludes that the link between income distribution and fiscal balance is not a direct one. Rather, income distribution is likely to make its impact on fiscal performance through 'more circuitous ways', that is, in combination with other variables. And, in this case, these are real GDP growth, government political orientation and political instability. However, this empirical analysis is done using a sample of countries all in the same economic block, the OECD, and roughly within the same economic/development status. Additionally, the study does not test the extent to which income inequality causes national debt. Instead the focus is only kept on fiscal deficits.

2.3 Summary

This section has examined the soundness of the idea that high levels of debt could be potentially detrimental to an economy. Though no conclusion or consensus on the matter has been highlighted explicitly, cause for the prudent management of debt is shown. Literature on the relationship between national debt and income inequality has also been reviewed. Investigating the hypothesis that domestic debt leads to higher levels of income inequality, You and Dutt (1996) find that the impact of public debt on income distribution depends on the purpose why raised. Larch (2012) hypothesises distributional conflicts due to income inequality are likely to lead to sustained fiscal deficits. He finds that income inequality is likely to affect fiscal performance through government political orientation, political stability and by hampering fiscal performance during economic booms. Finally, Salti (2011) finds evidence that domestic debt regressively skews income distribution.

However, none of the studies reviewed studies or tests the impact of income inequality on national debt. Salti (2011) also fails to incorporate wealth inequality in her model investigating the impact of domestic debt on income distribution. This study therefore pushes forward the analysis of the link between income distribution and fiscal performance by testing the impact of both income inequality and national debt on each other. In testing the effect of domestic debt on income inequality, wealth inequality is also factored in.

Chapter 3

Methodology

3.1 Research design

The nature of this study is explanatory as it seeks to analyse the reasons for the rising levels of national debt and income inequality, across various economies, proposing either variable as the cause of the other. Given the numerical nature of the indicators and measures of the two variables investigated, the study employs the use of quantitative methods to test for causation between the two variables. Moreover, since the findings of the study should be applicable to any economy on the globe, and given that the analysis considers the evolution of the variables of interest, both cross-sectional and longitudinal designs are taken up for the study.

3.2 Data collection

Three types of data will be collected for each sample country over the period of concern. They include data on income inequality, data on national accounts including fiscal variables and data on major economic variables such as economic growth and inflation rates. These shall all be collected from secondary sources which include: UNU-WIDER database on income inequality measures, the OECD database on a wide variety of data, the World Bank's World Economic Indicators' database and the database for composition of public debt for 130 countries compiled by Pazinna (2008). These data sources will also be supplemented by the Development Finance dataset of the World Bank and the Quarterly External Debt Database of the IMF and the World Bank. These databases are readily available on the internet for those with browsing machines and access to data storage devices.

3.3 Population and sample

The population of this sample is all the countries of the world. However, the sample frame consists of countries for which the relevant data is available. The target sample size is thirty to forty countries as this number yields a tolerable margin of error and a good level of confidence. The sampling technique used is similar to the stratified random sampling technique. This is because the sample should be a good representative of the different regions and income status, high/middle/low-income status, that countries fall in. Additionally, the study uses a period of thirty years, from 1980 to 2010. The period is chosen as it is adequate to yield a high level of

confidence for the estimation of parameters and maximizes the degrees of freedom for the panel regression subject to data availability.

3.4 Data analysis

Data is analysed by use of panel regression techniques. Two regression equations are run as follows:

$$total\_debt_{it} = \beta_0 + \beta_1 total\_debt_{it-1} + \beta_2 Gini_{it-1} + \sum_j \alpha_j X_{ij,t-1} + \sum_k \gamma_k Gini_{it-1} X_{ik,t-1} + \varphi_i D_i Gini_{it-1} + u_{it} \quad (1)$$

$$Gini_{it} = \beta_0 + \beta_1 total\_debt_{it-1} + \beta_2 Gini_{it-1} + \sum_j \alpha_j X_{ij,t-1} + \sum_k \gamma_k total\_debt_{it-1} X_{ik,t-1} + u_{it} \quad (2)$$

Where,

total_debt is the ratio of total national debt to GDP.

Gini is the income inequality as measured by the Gini coefficient of market incomes.

X_j represents other variables of interest such as real GDP growth rate, ratio of government expenditure to GDP, ratio of gross savings to GDP, amongst others.

i represents the country, *i = 1, 2, ..., n;* and ***t*** is for time.

Ideally, three regression equations should be run. This would allow for the decomposition of debt into domestic debt and external debt. The two variables relative to GDP, would then be treated as separate variables and the effect of income inequality on both would be tested. Equally, the separate effect of domestic debt and external debt on income inequality would be analysed. However, it is quite challenging to get the decomposition of debt into domestic and external debt, especially for developed nations. As such, total national debt to GDP ratio is used, with the analysis involving the two equations above.

The lagged value of total national debt is added to the regression equation (1) so as to capture the sensitivity of current debt levels to previous debt levels. Real GDP growth rate is put in so as to capture business cycles, recessions and in particular the effect of the global financial crisis (Larch, 2012). Business cycles and economic recessions would probably be correlated to both national debt and income inequality. Government expenditure (Salti, 2011) relative to GDP size is also a potential confounding factors that could lead to unobserved endogeneity in the model. Higher government expenditure is associated with higher employment rates, and in the long-run, increased expenditure on sectors such as health and education is likely to improve social mobility

hence lower inequality. Other variables that are included as control variables are political stability and military expenditure.

In equation (2), the control variables included are government expenditure, Consumer Price Index (CPI) and gross savings as a percentage of GDP. Government expenditure is correlated to both our variables of interest. Inflation is theorised to affect income distribution since the adjustment of wages due to inflation is not even for all persons. Additionally, CPI may be correlated also to total national debt levels. Governments may use high inflation to depress real interest rates thus making it cheaper to borrow and lead to higher levels of debt.

It is very possible that wealth inequality may be strongly correlated with both income inequality and total national debt. The stock of wealth one has is used to generate income. Treasury securities forms a part of this individuals' wealth. Therefore high wealth in an economy could mean higher income inequality but potentially also higher levels of domestic debt, due to a higher demand for treasury securities by the wealthy. Given that there is hardly any data on wealth inequality, gross savings is introduced to serve as a proxy for wealth inequality. This is because savings may be viewed as the annual increment in one's stock of wealth. However, gross savings has some short comings. First, this variable includes public sector savings. Assets and any savings of the public sector ideally are national/public assets and do not belong to any individual. Secondly, gross savings does not show the heterogeneity in the level of savings amongst the different households, firms and other entities. As such, the unequal distribution of these savings is not brought out.

Both equations include interaction variables in their list of regressors. They allow for the investigation of other ways in which either of the two main variables may affect the other. In equation one an interaction variable between a dummy variable and Gini is also included. The dummy variables allow for the analysis of the role of the geographical location and development status in determining the relationship between the two variables. All the explanatory variables are lagged so as to better factor the time responsiveness of the explained variable.

Diagnostic tests such as unit root tests and cointegration tests are carried out after which panel regression analysis is done. The Hausman test is used determine which between the fixed effects model and the random effects model is more appropriate for each regression run Furthermore, to analyse the direction of causality, the Granger-Sims causality tests is carried out as specified by Mehta (n.d.).

Chapter 4

Results and discussions

The results highlighted in this section are categorized into two. Table 1 shows the results of the equations with total national debt as the dependent variable. Table 2 shows the results of the equations with Gini as the independent variable

4.1 Effect of income inequality on the accumulation of national debt

Regressing total debt against itself and Gini, both lagged by one period, yields a positive slope coefficient for Gini, but which is not statistically significant. With the addition of government expenditure as a proportion of GDP and the real GDP growth, the slope coefficient becomes larger in magnitude and significant at 10% significance level. In this case, the results indicate an increase in Gini by 1, leads to a subsequent increase in the ratio of national debt to GDP by 0.31%. The slope coefficient of real GDP growth is negative and very significant, remaining as such in all subsequent equations with adjusted specifications. This is in line with the findings of Larch (2012) where the lower the growth in real GDP, the higher the budget deficit. The coefficient of government expenditure is positive and significant, showing that an increase in government expenditure relative to the economy is likely to put greater pressure for deficit spending. This result is expected, assuming government revenues remain unchanged.

Replacing government expenditure with health expenditure as a proxy for social/welfare expenditure yields a Gini slope coefficient that's significant at 1% level. The slope coefficient of health expenditure is positive and significant at 10% significance level. However, upon the introduction of military expenditure, the coefficient of health expenditure becomes negative and statistically insignificant. The coefficient of military expenditure is also negative and insignificantly different from zero. The coefficient of Gini remains statistically significant at 1% significance level.

Political stability as measured by the World Bank index for political stability and absence of violence/terrorism is also introduced. The index's spectrum of values runs from -2.5 (highly politically unstable countries with high internal conflict) to 2.5 (highly politically stable countries with no levels of violence). The slope coefficient of Gini becomes significant at 5% level. The coefficient of political stability index is negative and significant at 10% significance level. This

Table 1

Panel regression – Dependent variable: Total national debt

Unbalanced panel. OLS estimation with country fixed affects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
c	3.507	24.487	17.592	17.352	-49.654	-7.393	-41.289	16.409	13.620	6.393	7.136
	(0.558)	*(0.003)*	*(0.035)*	*(0.142)*	*(0.000)*	*(0.513)*	*(0.017)*	*(0.057)*	*(0.393)*	*(0.297)*	*(0.245)*
total_debt (-1)	0.857	0.833	0.814	0.777	0.783	0.781	0.784	0.813	0.778	0.858	0.854
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
gini(-1)	0.155	0.279	0.309	0.663	0.760	0.704	0.809	0.281	0.559	0.413	0.403
	(0.339)	*(0.095)*	*(0.064)*	*(0.009)*	*(0.002)*	*(0.023)*	*(0.009)*	*(0.108)*	*(0.153)*	*(0.044)*	*(0.035)*
govt_expenditure (-1)		1.438	1.167		2.692		2.651	1.166			
		(0.000)	*(0.000)*		*(0.000)*		*(0.000)*	*(0.092)*			
real_gdp_growth(-1)			-0.698	-0.846	-0.718	-0.935	-0.782	-1.002	-0.835		
			(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.000)*	*(0.000)*		
health_expend (-1)				1.808	-1.010		-2.490		0.804		
				(0.097)	(0.411)		*(0.102)*		*(0.794)*		
military_expend(-1)					-2.328		-2.265				
					(0.230)		*(0.334)*				

political_stability						-8.404 *(0.001)*	-7.609 *(0.004)*				
r.gdp.growth-gini(-1)								0.007 *(0.595)*			
gini.health(-1)									0.029 *(0.728)*		
gini.dumdev(-1)										-0.671 *(0.042)*	
gini.dumeur(-1)											-0.871 *(0.015)*
R_squared	0.8725	0.8782	0.8818	0.9264	0.9310	0.9230	0.9270	0.8819	0.9264	0.8734	0.8738
Observ.	625	613	612	357	500	284	284	612	357	625	625

Note: Figures in brackets are p-values. The appendage of (-1) on the dependent variable names shows the variable enters the equation, lagged by one period.

Dependent variables: TOTAL_DEBT – Total national debt as a percentage of GDP; GINI - Gini coefficients; GOVT_EXPENDITURE – government expenditure as a percentage of GDP; REAL_GDP_GROWTH – real GDP growth; HEALTH_EXPEND – health expenditure as a percentage of GDP; MILITARY_EXPEND – military expenditure as a percentage of GDP; POLITICAL_STABILITY – political stability and absence of violence/terrorism index; R.GDP.GROWTH_GINI – Interaction variable between the *real_gdg_growth* and *gini*; GINI.HEALTH – Interaction variable between *gini* and *health_expend*; GINI.DUMDEV – Interaction variable between *gini* and the dummy variable for development status of a country; GINI.DUMEUR – interaction variable between *gini* and the dummy variable for the geographical location of a country in reference to the European continent.

resonates with the findings of Larch (2012) who used the number of anti-government protests as the measure for political stability. His results show that the lower the political stability, the lower the budget balance. Putting all the variables together doesn't lead to much changes in the values and significance of the coefficients. The coefficient for Gini remains significant at 1% significance level.

When the interaction variables between Gini and the real GDP growth, and between Gini and government expenditure are introduced separately, the significance of the Gini falls below the 10% significance level. The coefficients of the interactive variables are themselves also not significant. This to a large extent goes contrary to the findings of Larch (2012), who finds that even though the direct impact of distribution of income on the budget balance may be weak and statistically insignificant, there is evidence that income distribution can have an impact through more circuitous ways, in combination with other variables such as the real GDP growth and the political orientation of the current government, which greatly influences the level of government expenditure and fiscal discipline.

Another set of interaction variables are added separately. These are the interaction between Gini and the dummy for development status of a country, and between Gini and the dummy for whether a country is in Europe or not. The dummy variable for the development status of a country is constructed on the basis of the country classification into developed and developing nations, by the UN (United Nations, 2014). If the country is listed as developed, the dummy takes on a value of 1, and 0 if not. For the other dummy variable, it takes on the value of 1 if the country is in Europe and 0 if not. In a surprising twist of events, the, the regressions yield negative and significant slope coefficients for each variable. In fact, the magnitude of these coefficients is larger than those of the Gini variable. This means that the overall effect of income inequality on total national debt relative to GDP is inverse for developed countries and countries in Europe.

Larch (2012) who uses a sample of 30 OECD countries, many of which are developed and in Europe finds, though statistically insignificant, negative coefficients for the Gini. Meaning that the lower the income inequality, the higher the budget balance (the higher the budget surplus/the small the budget deficit). What then can be the explanation for these results? Given that the Gini coefficient used is based on disposable income, it is possible that in the long-run, the deficit spending by government in order to remedy for income inequality does lead to lower levels of income inequality. Therefore, in the long-run, higher levels of social/welfare spending, and other

forms of government expenditure lead to increased social mobility, introduction/increase in unemployment benefits, increased employment and an increase in the overall level of economic activity, thereby increasing disposable incomes, especially for people in the lower income bracket. Hence, ignoring the correlation of Gini and national debt across time, cross-sectional comparison of countries' debt and Gini, for those countries in Europe and in the developed world, may lead to the conclusion that the lower a country's Gini coefficients, the higher its debt, as a result of proactively aiding in redistribution of income through increased government expenditure.

4.2 Effect of national debt on income inequality

In the regression of Gini against itself and total debt, both lagged by one period, the coefficient of total national debt is positive, though small in magnitude, and significant. For an increase in the ratio of national debt to GDP of 1%, Gini is likely to increase by 0.009. Salti (2010) found that the coefficient of total national debt as a percentage of GDP when regressed against inequality, and the share of domestic debt in the total debt is included, is statistically insignificant.

The introduction of government expenditure in the regression equation does not alter the significance of the coefficient of total debt. Its own coefficient is negative and statistically insignificant. Salti (2010) found that government expenditure has a negative significant impact on income inequality. Introducing an interaction variable between total debt and government expenditure changes things quite a bit. The coefficient of national debt now becomes negative and statistically insignificant. The coefficient of government expenditure is still negative and insignificant while that of the interacting variable is positive and significant at 10% significance level. The coefficient shows that the effect of total debt on Gini increases as Government expenditure increases. This doesn't make sense, given that if the government takes up more debt to increase its expenditure further, rather than, say, to make interest payments, the effect of national debt on income inequality should be smaller. However, Salti (2010) in a similar way interacts the share of domestic debt in national debt and government expenditure and finds a positive but insignificant coefficient of this variable.

The addition of gross savings as a percentage and GDP and the Consumer Price Index (CPI) have no impact on the significance of the coefficient of total debt. The coefficient is positive and significant at 1% significance level. The coefficients of both gross savings and CPI are both statistically insignificant. The levels of saving in an economy, which is meant here to proxy for

wealth inequality, have no significant impact on the distribution of incomes. Similarly, the level of inflation seems not to have a redistributive effect on incomes.

Table 2

Panel regression – Dependent variable: Gini

Unbalanced panel. OLS estimation with country fixed affects.

	(1)	(2)	(3)	(4)	(5)	(6)
c	7.513	8.149	14.989	7.235	9.130	8.825
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
gini(-1)	0.778	0.766	0.562	0.791	0.730	0.742
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
total_debt(-1)	0.009	0.009	0.006	0.008	0.010	0.009
	(0.003)	*(0.003)*	*(0.274)*	*(0.006)*	*(0.002)*	*(0.003)*
govt_expenditure(-1)		-0.013				
		(0.747)				
health_expend(-1)			0.096			
			(0.534)			
gross_savings(-1)				-0.007		0.001
				(0.724)		*(0.792)*
cpi					0.002	-0.004
					(0.692)	*(0.852)*
R_squared	0.9775	0.9777	0.9792	0.9792	0.9786	0.9804
No. observation	491	482	286	480	470	460

Note: Figures in brackets are p-values. The appendage of (-1) on the dependent variable names shows the variable enters the equation, lagged by one period.

Variables: TOTAL_DEBT – Total national debt as a percentage of GDP; GINI - Gini coefficients; GOVT_EXPENDITURE – government expenditure as a percentage of GDP; HEALTH_EXPEND – health expenditure as a percentage of GDP; GROSS_SAVINGS – Gross Savings as a percentage of GDP; CPI – Consumer Price Index.

Testing for Granger causality between the two main variables, total national debt and Gini, none is found to Granger cause the other. There is no significant increase in the explanatory power in the respective unrestricted models over the restricted models, as illustrated in Appendix B.

Chapter 5

Conclusion and recommendations

5.1 Conclusion

The findings of this study show evidence of a direct link between income inequality and the levels of debt in an economy. The results consistently show that the degree of income inequality has a positive effect on debt. Though the significance of this effect does not meet the threshold in all the regression specifications, it may still be concluded that the more uneven the distribution of incomes in an economy, the greater the likelihood of an increase in the debt accumulated in that economy. Furthermore, the impact of income inequality on debt is independent of the impact of economic/business cycles, previous levels of government expenditure and political stability.

With the exception of the results found for developed and European countries, the findings support the three propositions made at the beginning of this paper. The more unequally distributed incomes are, the higher the demand for redistributive spending and the more difficult it is to balance the budget. Secondly, the more unequal society is, the greater the delays in making the fiscal adjustments necessary in correcting the dismal and unsustainable fiscal situation. And thirdly, the more unequal society is, the higher the proportion of the cost of fiscal consolidation to be borne by the less well off, hence the greater the resistance to what would amount to austerity measures by the government. In other words, income inequality gives rise to political and social pressure for excessive government spending or excessive government subsidies.

In the case of European and developed nations, the results are to be contrary to the seemingly observed correlation between income inequality and levels of debt, given, further, that both variables are at their highest levels in the last thirty years. The most plausible source of this inverse relationship would be in the cross-sectional trend. Countries with lower Gini have higher levels of debt, while those with higher Gini, have lower levels of debt. This may suggest that excessive government spending financed by debt does remedy for income inequality. However, the second set of results in the study bring to question such a suggestion. The results show that total national debt, relative to GDP, has a positive impact on income inequality. This, therefore, confirms the proposition that the interest payments from government securities to the holders of those securities, significantly regresses the distribution of income in an economy.

5.2 Limitations

Due to the unavailability of data on debt decomposition into domestic and external debt, this paper is unable to analyse the separate effects of domestic debt and external debt on income inequality. The suggestions of You and Dutt (1997) and the findings of Salti (2010) are therefore not tested effectively.

The consistency of the methodology applied in calculating the Gini coefficient for the sampled countries is also another major limitation. In fact Larch (2012) notes that there is no commonly agreed methodological basis for the construction of (income) distribution data. This makes the comparison of income inequality across time and countries difficult due to methodological breaks, difference in coverage, units of reference and/or income concept. More than this, a more preferable measure for income inequality for this study would have been the Gini coefficient based on market incomes. In this study, Gini based on disposable income, was used. This measure of Gini bears some effect of the redistributive effect of fiscal policy on incomes. This is because disposable income is net of tax and would include benefits received by citizens from the government. This is therefore a major short coming of this study.

5.3 Policy recommendations

Based on the findings and conclusions of this study, it is clear that one of the means to effectively tackle the problem of rising debt levels in many economies around the world is to tackle the question of rising income inequality. Policies to combat income inequality that do not involve excessive government spending and excessive government subsidies should be sought. This is not to say that fiscal policy should abandon its 'redistribution of incomes' role, but instead should effect this role prudently, bearing in mind the cost of excessive national debt on the economy as well as its counter-productive effect on income inequality. Furthermore, governments should channel redistributive spending towards sectors that would increase social mobility and give all access to equal opportunities. This in the long-run could be effective in taming income inequality.

5.4 Areas of further research

Though the findings of this study lead to the conclusion that higher levels of income inequality lead to higher levels of debt in a country, not all the results point in this direction. The case of European nations and developed nations being one of such results. Additionally the results of the

Granger causality tests seem to weaken the strength of the conclusion of this study. Therefore further research is needed in this area so that more conclusive results/findings can be achieved.

This study also fails to concretely and conclusively identify the channels through which income inequality impacts national debt. The main channel proposed here is that of excessive government expenditure. Other channels should be investigated, such as that of excessive government subsidies to cushion those in the lower end of the distribution tail. Yet another channel that could be researched on, is whether income inequality has an effect on the cost of borrowing to the government. Is it possible that higher income inequality, increase aggregate savings thus making the cost of debt cheaper? Overall, this area is rich for further study.

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Appendix

Appendix A: Sampled Countries

The sampled countries, their development status and the geographical location are given below.

	Country	Development status	Geograhical region		Country	Development status	Geograhical region
1	Argentina	Developing	South America	18	Kenya	Developing	Eastern Africa
2	Australia	Developed	Australia	19	Malawi	Developing	Southern Africa
3	Brazil	Developing	South America	20	Mexico	Developing	North America
4	Bulgaria	Developed	Eastern Europe	21	Netherlands	Developed	Western Europe
5	Canada	Developed	North America	22	Nigeria	Developing	West Africa
6	Chile	Developing	South America	23	Norway	Developed	Northern Europe
7	China	Developing	East Asia	24	Paraguay	Developing	South America
8	Egypt	Developing	North Africa	25	Poland	Developed	Central Europe
9	Finland	Developed	Northern Europe	26	Russia	Economy in transition	Eastern Europe
10	France	Developed	Western Europe	27	Singapore	Developing	South East Asia
11	Germany	Developed	Western Europe	28	South Africa	Developing	Southern Africa
12	Ghana	Developing	West Africa	29	Spain	Developed	Western Europe
13	Greece	Developed	Eastern Europe	30	Sweden	Developed	Northern Europe
14	India	Developing	Asia	31	Thailand	Developing	South East Asia
15	Israel	Developing	Middle East	32	Turkey	Developing	Eastern Europe
16	Italy	Developed	Western Europe	33	UK	Developed	Western Europe
17	Japan	Developed	East Asia	34	US	Developed	North America

Appendix B: Granger-Sims test applied

The Granger-Sims technique applied involves running four equations, two unrestricted and two restricted, with the purpose of testing whether either of the variables Granger Cause each other.

Testing that Gini Granger Causes Total Debt

$$total\_debt = \sum_{j=1}^{5} \beta_j total\_debt_{i,t-j} + \sum_{j=1}^{5} \beta_j gini_{i,t-j} + \varepsilon_{i,t} \quad (1)$$

$$total\_debt = \sum_{j=1}^{5} \beta_j total\_debt_{i,t-j} + \varepsilon_{i,t} \quad (2)$$

Testing that Total Debt Granger causes Gini

$$gini = \sum_{j=1}^{5} \beta_j gini_{i,t-j} + \sum_{j=1}^{5} \beta_j total\_debt_{i,t-j} + \varepsilon_{i,t} \quad (3)$$

$$gini = \sum_{j=1}^{5} \beta_j gini_{i,t-j} + \varepsilon_{i,t} \quad (4)$$

The R^2's for each regression are given below together with the F-statistics and critical values for each test.

	Testing that Gini Granger causes total debt		**Testing that total debt Granger causes Gini**	
	Unrestricted	Restricted	Unrestricted	Restricted
r-squared	0.8910	0.8993	0.9770	0.9813
No. of observations	820	388	354	315
F-statistic	-		0.2673	
10% level	1.88		1.88	
5% level	2.26		2.26	
1% level	3.11		3.11	

In testing whether Gini Granger causes total debt, it is not possible to compute the F-statistic because the R^2 of the unrestricted model is smaller than the R^2 of the restricted model. This is due to the differences in number of observations in each equation, arising from more data gaps present in the Gini data.