

Income inequality and the composition of public debt

Composition
of public debt

Nisreen Salti

Department of Economics, American University of Beirut, Beirut, Lebanon

821

Abstract

Purpose – The purpose of this paper is to examine the redistributive effect of domestic public debt: lenders to the government lie on the higher end of the income distribution, but the burden of debt financing falls on the entire tax base, to the extent that taxes are used to service debt. Because domestic debt is typically held by domestic lenders, this involves a redistribution of resources.

Design/methodology/approach – The author uses cross-country panel data on debt composition, and run regressions of income inequality, as measured by the Gini coefficient, using various specifications, controlling for a variety of macroeconomic, fiscal and political variables.

Findings – The author finds that the composition of public debt is consistently a significant determinant of income inequality: the domestic share of public debt is regressive and significant across all specifications, even controlling for total and external debt servicing, political conflict, corruption and a variety of government spending variables.

Research limitations/implications – The data span 18 years (1990-2007) which means that long-run effects are hard to track. While the author has a good mix in the sample of observations from low-, middle- and high-income countries, the author is constrained in the choice of countries by the availability of data on inequality and on the composition of public debt.

Originality/value – This is the first paper to examine the composition of public debt in terms of domestic and external debt, and any bearing it may have on income inequality. The finding is also new for both the public debt and income inequality literatures: cross-country panel data are consistent with the belief that domestic debt redistributes resources from the entire tax base to wealthy holders of government debt in a way that external debt does not.

Keywords Inequality, Debt composition, Public debt

Paper type Research paper

Received 23 January 2014

Revised 16 July 2014

16 October 2014

Accepted 5 November 2014

1. Introduction

The literature on public debt has traditionally concentrated on external debt and, until recently, largely ignored domestic debt. The interest that external debt has garnered is partly due to the transfer of resources involved in external public debt and not in domestic debt, and the larger risk of debt crisis with external borrowing (Panizza, 2008). More recently, there has been growing interest in looking at domestic public debt (Reinhart and Rogoff, 2011; Arnone and Presbitero, 2007), partly because of the trend over the last few years of “on-shoring” and “dedollarization” of public debt from foreign currency external to local currency domestic debt (Cowan *et al.*, 2006).

This paper aims to examine the redistributive effect of domestically held public debt: the claim we hope to investigate is that while access to public debt products as savings instruments for lenders are primarily reserved for the higher end of the income

JEL Classification — H63, D31, D63

The author would like to thank Khaled Saghie for piercing insight and inspiration. The author would also like to thank two anonymous referees, participants at the Economic Research Forum annual conference in Antalya, Turkey, participants at the Eurasia Business and Economic Association conference in Rome, Italy for their feedback and comments. Finally, the author owe special thanks to Sara Daniel, Ali Abboud and Pierre Mouganie for excellent research assistance.



Journal of Economic Studies

Vol. 42 No. 5, 2015

pp. 821-837

© Emerald Group Publishing Limited

0144-3585

DOI 10.1108/JES-01-2014-0015

distribution, the burden of debt financing falls on the entire tax base, to the extent that any tax revenues are used to service debt. Domestic debt, under this logic, ends up redistributing resources from the entire tax base to wealthy holders of government debt in a way that external debt does not.

The textbook view that national debt held domestically has no effect on the distribution of income has been examined and refuted in a series of empirical and theoretical papers in the post-Keynesian literature. This literature is distinct from the literature on the intergenerational incidence of the burden of public debt, as it is concerned with the redistribution involved primarily with domestic debt, where the fact that debt securities are held by some domestic agents and not others means that servicing the debt will involve a transfer of resources within a society and will therefore have a distributional effect.

Upon closer scrutiny, interest on the national debt is shown to redistribute income regressively in the USA: Michl (1991) finds that the top 10 percent of households by income receive over 75 percent of interest payments on the national debt (the top one percent receive over 40 percent) while the poorest 30 percent of households receive a little over one cent of every dollar of interest paid on the national debt. However, a complete understanding of the distributional impact of domestic debt would have to look not only at the distribution of interest payments on the debt, but also at the distribution of the debt burden across income groups.

Furthermore, because there tend to be differences in the interest rates between domestic and external debt, with some evidence that interest on domestic debt is on average higher than interest on external debt (Arnone and Presbitero, 2007), the redistributive effect of domestic debt, if it exists, is likely to be exacerbated by the heavier debt servicing burden of the higher interest bearing domestic debt.

In this paper, we examine the logic of the redistributive effect of domestic public debt by looking at the empirical effect of public debt composition on the distribution of income. Domestic debt tends to be more likely held by domestic agents than is external debt; it bears higher interest rates especially for low income and emerging economies (Panizza, 2008). We contend that both these factors lead domestic debt to have more of a regressive effect on the income distribution than external debt. Using a cross-country data set, we investigate the impact of debt composition on measures of income inequality and test the hypothesis that domestic debt is more regressive than external debt.

The paper contributes to the scant literature on the distributional effects of public debt, which has so far looked only at country case studies, by adopting a cross-country approach. It also contributes to the literature on the composition of public debt, which has primarily looked at the effect of debt composition on outcomes other than the distribution of income, like debt crises.

We make use of the recently compiled data sets on domestic debt and debt composition in Panizza (2008), which include many of the measures put together by Cowan *et al.* (2006). We match the data on debt composition with data on inequality taken from the World Income Inequality Database (2008). The paper tests the central hypothesis empirically by running cross-country regressions of measures of income inequality on the share of public debt issued domestically.

We find that the domestic share of public debt is consistently regressive across a variety of specifications and using a variety of macroeconomic, political and financial control variables. We include measures of the size of total and external debt servicing and find that the evidence is consistent with our hypothesis that the effect of domestically issued debt on inequality works through the incidence of the burden of servicing

domestic debt. We refine the hypothesis to test whether the effect of domestic debt is specific to conflict economies, and whether it depends on GDP per capita and find that the effect is universal, but GDP per capita plays a protective role against the regressive effect of domestic debt. We control for corruption to rule out the possibility that the choice of issuing domestic rather than external debt is only capturing the extent of corruption, which itself leads to inequality and find that the inclusion of corruption does not alter the results on debt composition. We also control for the nature of government spending as one might expect that debt that goes toward financing government spending on certain sectors (namely, health and education) may be less regressive. We find that the effect of debt composition on income inequality is robust to the inclusion of a variety of government spending variables.

Evidence of a regressive effect of domestic debt would have serious equity implications for government strategy in financing its spending. The choice of sources of financing available to a government may be constrained by a myriad other factors, including a limited ability to attract lenders on the international market, the flexibility and fiscal control afforded by domestic debt, and the possibility of inflating domestic debt away. A government may therefore opt to disregard the redistributive effect of domestic debt in choosing its source of financing, but it should keep in mind that its choice will have implications on the distribution of incomes, and that domestic debt may entail a more regressive debt burden.

The paper is organized as follows: Section 2 reviews the literatures on debt composition and on the distributional impact of public debt. Section 3 describes the data, presents our empirical results and checks their robustness, and Section 4 concludes.

2. Debt composition and the distributional impact of public debt

2.1 Debt composition

The literature on debt composition has taken two broad strands. One part of the literature has taken debt composition as an outcome that it has sought to explain by identifying the determinants of public debt composition. Another strand of the debt composition literature has focussed on debt composition as a determinant of other outcomes. However, to date, no paper to our knowledge has looked at the effect of debt composition on inequality.

The first strand of the literature, treating debt composition as an outcome to be explained, is primarily empirical, but one theoretical paper develops a political economy model of the composition of public debt in which the government acts like a discriminating monopsonist in placing its debt (Drazen, 1997). Lima *et al.* (2008) look closely at the determinants of the composition of public debt in emerging economies. Claessens *et al.* (2007) use panel data to study the determinants of the development of the market for local currency government bonds.

The literature has also looked at some of the features associated with debt composition, namely, the interest rate on domestic vs external debt as well as the identity of the holders of domestic debt instruments.

There is ample evidence that domestically issued debt tends to have higher interest rates. In a study of 65 developing countries, the IMF (2006) shows that domestic debt constitutes around 42 percent of total interest payments on public debt, but only 21 percent of total debt. Panizza (2008) suggests that external debt tends to be issued at concessional rates in the case of lower income countries. However, even in emerging markets, Borensztein *et al.* (2006) find that bonds issued on the international market tend to bear smaller interest rates than bonds issued domestically.

Domestic debt is largely held by domestic banks: Gopinath (2007) finds that 50 percent of government bonds in India are held by domestic banks, while Arnone and Presbitero (2007) calculate the average domestic bank holdings of public debt at 61 percent of total domestic debt. Out of 73 middle income countries, Hauner (2009) finds that in half of them, public sector credit constitutes more than 20 percent of total domestic banking credit, in 13 of them, public sector credit constitutes more than 50 percent of total domestic banking credit[1].

The second main strand of the literature treats debt composition as a determinant of other outcomes. Panizza (2008) straddles both strands of the literature as it first describes patterns in the recent rise in the popularity of domestic debt, then anticipates some challenges in debt management that are due to the increasing share of domestic debt in total public debt. Reinhart and Rogoff (2011) look at domestic debt as a determinant of sovereign default and, relatedly, of high-inflation episodes. Similarly, Bolle *et al.* (2006) look at the role played by the composition of public debt in emerging market crises.

Our paper contributes to this second strand of the literature as it treats debt composition not as an outcome to be explained, but rather as the determinant of income inequality, an outcome that the debt composition literature has ignored, so far.

2.2 Distributional impact of the public debt

Another relevant literature to this work is the literature on the incidence of the burden of debt and the distributional impact of public debt. Carlberg (1985) develops a model that allows him to compare the long-run burden of external and internal debt, without, however, modeling the difference in the distribution of the burden across the two classes of debt. The distributional impact of the public debt has also been examined in a series of post-Keynesian papers. You and Dutt (1996) develop a formal post-Keynesian model of growth to analyze the effects of public debt on income distribution. They find that expansionary government policy may lead to a reduction in income inequality, but the precise effect of a rise in government debt on income inequality depends on the circumstances behind the rising debt.

The empirical literature consists mostly of country case studies: Ramos and Roca-Sagales (2007) find that public spending and direct taxes in the UK are pro-poor and reduce income inequality, while indirect taxes raise income inequality. The literature on debt consolidation in European countries, which emerged around the signing of the Maastricht Treaty and the Stability and Growth Pact, focusses primarily on intergenerational distribution issues of the reduction in debt (Raffelhuschen, 1999; Jensen and Rutherford, 2002). The regressive effect of interest payments on the public debt in the USA has been widely documented (National Economic Commission, 1989; Heilbroner and Bernstein, 1989; Michl, 1991).

For the purpose of this paper, it is the redistributive effect of domestic debt that is of primary interest. The cross-country approach uses a panel of cross-country data on income inequality (pioneered by Deininger and Squire (1996), and expanded by World Institute for Development Economics Research) and on debt composition (assembled by Panizza, 2008). The redistributive effect depends on the identity of the debt holders, and financial penetration may introduce some progressivity in the redistributive effect of the domestic debt. But the relationship we are interested in testing is a reduced form relationship, that will address the overall impact of debt composition on income inequality, without identifying the magnitudes of the various channels and conduits for redistribution or progressivity. We attempt to control for the main possible

confounding effects by including in our regressions measures of government policies that might affect income distribution and that are also possibly correlated to debt composition.

To the extent that we find a significant determinant of cross-country differences in the level of income inequality, this paper also contributes to the large literature focussing on income inequality as a cross-country outcome to be explained. This literature includes a strand that seeks to identify the determinants of inequality (Deininger and Squire, 1998; Vanhoudt, 2000; Barro, 2000; Odedokun and Round, 2001). It also includes work that tests the effect of a particular variable on inequality: Mushinski (2001) and Thornton (2001) examine the relationship between inequality and the level of development, Li *et al.* (2000) look at the effect of corruption, Tanninen (1999) examines the effect of government spending, Bourguignon and Morrisson (1998) investigate the effects of dualism, especially as it relates to agriculture.

3. Empirical analysis

3.1 Data

The data come from a variety of sources. We use measures of GDP, total government debt, government expenditures, military expenditures, public spending on education, income inequality (as measured by the Gini coefficient) and population from the World Bank's World Development Indicators. Panizza (2008) has compiled measures of the composition of public debt as well as total debt. We supplement these with data on the same variables from the Global Development Finance data set of the World Bank, the Quarterly External Debt Database of the IMF and World Bank, the Joint External Debt Hub, BIS, the World Economic Outlook data set of the IMF. Our expenditures on health measures come from the World Bank Development Indicators and the World Health Organization. We also use the UCDP/PRIO data set on armed conflict which is described in more detail in Gleditsch *et al.* (2002) and updated in Harbom *et al.* (2008). Corruption data are collected from Transparency International, Kaufman *et al.* (2005) Government Matters V database and Easterly's (1999) "Life during Growth Study."

Table I provides a definition of the variables, their sources and the labels used in the regression tables. Our sample contains data on 120 countries for the period 1990-2007. We end up with an unbalanced panel data set of 883 observations. The summary statistics in Table II divide the country-year pairs in our sample by low-, middle- and high-income group, according to the World Bank classification[2] for the relevant year. The time frame of the data are limited by the unavailability of institutional quality and corruption measures earlier than 1990 and by the limited time scope of data on debt composition. The results are therefore specific to the 18-year period from 1990 to 2007 and we cannot, with the data set at hand, look at longer-term effects or trends. The Gini coefficient averages 42 for low-income countries, 43 for middle-income countries and 32.3 for high-income countries in our sample.

The debt composition variable that we use is the domestic share of public debt, with a mean ranging from 24 percent for low-income countries to 73 percent for high-income countries. We measure the absolute value of public debt as well as public debt as a share of GDP. Debt averages 31.6 percent of GDP for low-income countries and 35.2 percent of GDP for high-income countries. Middle-income countries have a lower debt to GDP ratio on average, at 12.6 percent. We also have data on debt servicing variables from the World Development Indicators, however these variables are only available for low- and middle-income countries total debt servicing as a fraction of GNI is 5.8 percent for low-income countries and 6.8 percent for middle-income countries.

Variable	Label	Description	Source
Gini	Gini	Based on household survey data, with person as the unit of analysis. Index averaged for country-year pairs with more than one measure	WIID v2, WDI
<i>Debt variables</i>			
Domestic share of public debt (%)	Sharedom	Share of public debt held by residents	Panizza, WDI
Public debt (% of GDP)	Debt/GDP	Total public debt as a share of GDP	Panizza, WDI
Public debt	Total debt	Total public debt (billions of current USD)	Panizza
Service on external debt	Ext. debt serv.	The sum of principal repayments and interest payments (billions of current USD)	WDI
Service on total debt (% of GNI)	Debt serv./GNI	Principal repayments and interest paid on debt as a share of GNI	WDI
<i>Macroeconomic variables</i>			
GDP per capita	GDP per cap	GDP per capita (2000 international USD)	WDI
Consumer price index	CPI	Consumer price index (base year 2005)	WDI
Government expenditures	Gov. exp.	Total government spending (billions of 2000 international USD)	WDI
Government expenditures (% of GDP)	Gov. exp./GDP	Government expenditures (share of GDP)	WDI
Public expenditures on education (% of GDP)	Educ. exp./GDP	Public expenditures on education (share of GDP)	WDI
Military expenditures (% of GDP)	Milit. exp./GDP	Military expenditures (share of GDP)	WDI
Public expenditures on health (% of gov. exp.)	Health exp./Gov. exp.	Health expenditures (share of government spending)	WDI, WHO
<i>Political stability variables</i>			
Conflict	Conflict	Dummy variable for conflict with at least 25 battle deaths	PRIO
Conflict intensity = 0 (no conflict)		No conflict with more than 25 battle deaths	PRIO
Conflict intensity = 1		Minor conflict: 25-999 battle deaths	PRIO
Conflict intensity = 2		Major conflict: 1000 or more battle deaths	PRIO
Institutional quality	Institutional quality	Average of standardized transformations of Transparency International counter corruption measure, Government Matters V corruption measure and "Life during Growth" study corruption measure	TI, KKM, Easterly

Table I.
Variable definitions

Our macroeconomic variables include measures of GDP per capita, with a mean of 441, 3,087 and 23,126 constant 2000 USD, respectively, for low-, middle- and high-income countries. Our consumer price index (CPI) is calculated using 2005 as a base year, and has an average of 60, 69 and 85 going from low to high income. We also measure government expenditures, in billions of dollars as well as a share of GDP. We include more detailed data on the nature of government spending: public expenditures on education average 4.3 percent of GDP while spending on the military is

Variable	Mean (SD)		
	Lower income	Middle income	High income
Gini	42.0 (9.2)	43.3 (10.3)	32.3 (5.7)
<i>Debt variables</i>			
Domestic share of public debt (%)	24 (23)	39 (24)	73 (15)
Public debt (% of GDP)	31.6 (37.4)	12.6 (24.7)	35.2 (39.6)
Log (Public debt (total in billions of current USD))	24.4 (65.3)	44.5 (89.0)	503.6 (878.9)
Service on external debt (in current USD)	1.5 (3.8)	6.6 (12.4)	No data
Service on total debt (% of GNI)	5.8 (4.3)	6.8 (4.8)	No data
<i>Macroeconomic variables</i>			
GDP per capita (constant 2000 USD)	441 (237)	3,087 (1,869)	23,136 (72,126)
CPI (base year 2005)	60.1 (28.3)	69.6 (29.8)	85.5 (9.2)
Government expenditures (in billions of 2000 USD)	6.2 (14.5)	17.0 (43.7)	230 (371)
Government expenditures (% of GDP)	19.8 (6.3)	25.5 (8.7)	34.5 (10.4)
Public expenditures on education (% of GDP)	4.2 (2.2)	4.3 (1.4)	5.7 (1.3)
Military expenditures (% of GDP)	2.5 (2.2)	2.0 (1.2)	2.3 (1.5)
Public expenditures on health (% of gov. exp.)	8.5 (5.2)	11.1 (5.3)	11.9 (5.7)
<i>Political stability variables</i>			
	<i>Proportions (%) (SD %)</i>		
Conflict	31.4 (46.6)	13.2 (33.9)	4.7 (21.2)
Conflict intensity = 0 (no conflict)	68.6 (46.6)	86.8 (33.9)	95.3 (21.2)
Conflict intensity = 1	28.9 (44.5)	10.3 (30.5)	4.3 (20.3)
Conflict intensity = 2	4.5 (20.8)	2.8 (16.7)	0.4 (6.5)
Institutional quality	3.5 (1.2)	4.3 (1.4)	8.4 (1.4)

Table II.
Summary statistics

close to 2 percent of GDP on average. Public expenditures on health are measured as a share of total government expenditures and are close to 11 percent, on average.

Military spending is included as a possible confounding factor in the relation between public borrowing and income inequality. Military spending can lead to income inequality because of pay differentials between military and civilian work, as well as the because of the limited opportunities it creates for some segments of the populations (women, minorities, etc.). Abell (1994) finds a positive relationship between military spending and income inequality in the USA, and Ali (2007) reports similar results using global data.

All three of our government policy variables are attempts to capture the effect of policies that could play a confounding role in the relationship we are investigating between the composition of public debt and income inequality. Perhaps a more direct measure of government policy that affects the income distribution and may be linked to public debt is social welfare spending, but because such a measure is not available for the panel of countries we are using, and because it is not measured in a standard comparable way across countries, we use government spending on health, education and the military as proxies for these government policies that could be the drivers behind any relationship between debt composition and income inequality.

We construct an indicator of institutional quality. Institutional quality is measured using an average of corruption indicators from Transparency International's Corruption Perception Index (TIC index), Kaufman *et al.* (2005) Governance Matters V (KKM index) measure of the control of corruption and Easterly's (1999) Life During Growth study[3].

The TIC index ranks countries in terms of perceived levels of corruption. The corruption measure in the Governance Matters V study measures the level of corruption defined as the abuse of public power for private gain. Easterly measures corruption using data from Political Risk Services. Taking a simple mean of three standardized measures of corruption allows us to maximize the number of observations across countries and over time, while reducing measurement error in these variables, to the extent that measurement error is uncorrelated across these data sets. Institutional quality varies substantially from an average of 3.5 in low-income countries to an average of 8.4 for high-income countries.

We also include variables that measure the presence of violent political conflict. Over 31 percent low-income country-year pairs have witnessed conflict, while only 13.2 percent of middle-income country-year pairs and 4.7 percent of high-income country year pairs suffer from conflict. Our conflict intensity dummies scale conflict by the number of deaths: a minor conflict (or an intensity of one) corresponds to conflicts with 25-999 deaths in that year; a major conflict (or a conflict intensity of two) corresponds to conflicts with more than a thousand deaths in that year. While the UCDP/PRIO data set does not scale conflict intensity to population size, their dummy variable for the presence of any conflict, when compared with other conflict data sets such as the Correlates of War and the Militarized Interstate Disputes data set shows that UCDP/PRIO contains no false positives and that any discrepancies across data sets is the result of the specific definition that UCDP/PRIO which involves 25 or more deaths in a year. We rely mostly on the binary conflict variable in our analysis and use the intensity variable only to check the robustness of our results.

3.2 Main findings

We run reduced form regressions of inequality on debt composition and other controls, of the general form:

$$Inequal_{it} = \beta_0 + \beta_1 Debt\ Comp_{it} + gX_{it} + v_t + \mu_i + u_{it} \quad (1)$$

for country i and year t . $Inequal_{it}$ is a measure of income inequality for country i and year t . $Debt\ Comp_{it}$ is a vector of debt composition measures, including $sharedom_{it}$, the share of domestic debt in total public debt, $Debt_{it}$, the dollar value of public debt held by foreigners, and $Dom\ Debt_{it}$, the dollar value of public debt held internally. X_{it} is a vector of controls including government consumption spending, military

spending, public spending on education and on health, and per capita GDP. We also include year fixed effects (v_t) and time-invariant country effects (μ_i). All regressions in the main findings section are estimated using a fixed effects model. In the robustness check section below, we show results of similar specifications using different functional forms and estimation techniques.

Table III reports results of regressions of Equation (1) with the Gini coefficient as $Inequal_{it}$, $sharedom_{it}$, the share of domestic debt in total public debt, as the measure of debt composition, and a different set of control variables X_{it} in each column. Column (1) of Table III runs a fixed-effects regression of (1) with log GDP per capita. Both variables have significant effects on the Gini coefficient. The share of domestic debt in total debt has a large coefficient of 4.7, significant at the 1 percent level: an increase in the share of domestic debt by 10 percent is associated with a rise in the Gini coefficient by 0.47 percentage points. GDP per capita is also significantly positively correlated to the Gini coefficient.

The simple share of domestic debt in total debt variable may actually be capturing the overall size of debt, if we believe that countries that issue domestic debt are typically heavily indebted. So in column (2), we add total debt as one of the control variables in order to single out the effect of debt composition in the $sharedom_{it}$ variable and not of the scale of debt. We find that the coefficient on the share of domestic debt in total debt is hardly changed from column (1), and remains highly significant. The total debt variable is also significant. In column (3), we modify the specification slightly by including the total debt figure as a share of GDP. The results are virtually unchanged from column (2), and the debt to GDP ratio is not significant.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharedom	4.70** (1.20)	4.95** (1.20)	4.67** (1.20)	4.79** (1.19)	6.29** (1.79)	5.25** (1.73)	5.21** (1.73)	4.44** (1.20)
Log(GDP/cap)	6.64** (1.28)	6.50** (1.28)	6.61** (1.28)	5.65** (1.28)	4.08* (1.81)	5.24** (1.55)	5.48** (1.57)	5.92** (1.27)
Total debt		3e ⁻³ * (1e ⁻³)						
Debt/GDP			-6e ⁻³ (5e ⁻³)	-0.01*** (5e ⁻³)	-0.01 (0.01)	-2e ⁻³ (0.01)	-1e ⁻³ (1e ⁻³)	-6 ⁻³ (5e ⁻³)
Gov. exp				2e ⁻³ (2e ⁻³)		6e ⁻³ (6e ⁻³)	8e ⁻³ (6e ⁻³)	3e ⁻³ (2 ⁻³)
Gov. exp./GDP					4e ⁻³ (0.05)			
Debt serv./GNI						0.08 (0.05)	0.09*** (0.05)	
Ext. debt serv.							4e ⁻¹¹ (3e ⁻¹¹)	
CPI								0.03** (0.01)
R ² within between	0.08 0.15	0.09 0.15	0.08 0.15	0.09 0.13	0.13 0.12	0.12 0.02	0.12 0.02	0.10 0.15
<i>n</i>	883	883	883	848	472	545	545	834
Countries	120	120	120	116	94	83	83	110

Notes: Dependent variable: Gini coefficient. All regressions include country and year fixed effects. Standard errors in parentheses. *, **, *** significant at 5, 1 and 10 percent level, respectively

Table III.
The effect of debt composition on inequality

One might think that the effect of debt on inequality may be dampened by government spending. And if we are concerned that the composition of debt may be correlated to government spending, then failing to control for government expenditures would bias our results[4].

Column (4) reruns the regression in column (3) adding total government consumption expenditures as a control variable. The coefficient of the share of domestic debt is slightly larger in magnitude but remains highly significant. So holding the debt to GDP ratio as well as government expenditures constant, it still protective against inequality to borrow externally. Government spending has a negative effect on the Gini, but it is not significant. We will take this regression to be the main regression going forward. The remainder of the table tries to examine whether the class of government expenditures has an impact on the effect of the share of domestic debt on inequality.

Column (5) uses government expenditures as a share of GDP instead, and the results are qualitatively unchanged. The magnitude of the coefficient on the share of debt that is domestic is now larger: an increase in the share of domestic debt by 10 percentage points leads to just a 0.63 increase in the Gini coefficient. Of all the control variables, only log GDP/cap is significant[5].

The next two columns check the robustness of our main hypothesis of domestic debt having a regressive redistributive effect that external debt does not by including in the main regression measures of debt servicing: column (6) adds a variable measuring total debt servicing as a fraction of gross national income. The addition of this variable does not affect the significance of our debt composition measure: a 10 percent increase in the share of domestic debt is associated with a 0.52 increase in the Gini coefficient, and this result is significant at the 1 percent level. Total debt servicing as a fraction of GNI is insignificant. Column (7) also includes service on external debt. The results from the regression in column (6) show that the coefficient on debt composition is still significant and has the same magnitude, total debt servicing as a fraction of GNI is also regressive and significant at the 10 percent level (a 10 percent increase in the debt servicing share of GNI is associated with a basis point increase in the Gini). Service on external debt on the other hand is not a significant determinant of inequality: holding total debt as a fraction of GDP and total debt servicing as a fraction of GNI constant, changing the composition of debt servicing in favor of external debt has no significant effect on inequality as measured by the Gini.

In column (8), we investigate the hypothesis that it is the inflationary incentive associated with debt denominated in local currency (so, typically, domestic debt[6]) that is driving the observed effect of debt composition on inequality, and not the redistribution resulting from servicing the debt through taxation. This hypothesis, while consistent with our general claim of a redistributive effect of domestic debt that is absent in external debt, suggests that the mechanism of redistribution works through the inflationary incentive. The implication of such a hypothesis would be that domestically issued debt in foreign currency should have no redistributive impact, or at least, none that is distinct from the redistributive impact of external debt. We add the CPI to the basic regression in column (4) and find that the effect of debt composition is unaffected by controlling for the CPI and that the CPI has a significant regressive effect.

The evidence in columns (6) and (7) is consistent with the hypothesis that domestically issued public debt is regressive because debt servicing on domestic debt ends up redistributing resources from the entire tax base (if at least part of debt is serviced through taxes) to the holders of domestic public debt, which are typically

in the higher end of the income distribution. Debt servicing *per se* does not have a regressive effect when the debt is external, as servicing external debt does not involve a similar redistribution within a country's tax base.

3.3 From debt composition to inequality

In Table IV, we examine the validity of a few hypotheses about the possible mechanism through which the composition of public debt may affect inequality. We can test the hypothesis that government spending mitigates some of the regressive effects of debt composition by including an interaction term between our debt composition variable and government spending. The intuition behind such a hypothesis is that governments who are getting indebted in order to spend more domestically on consumption will reduce inequality, whereas governments using debt for other government expenses (say interest payments on outstanding debt) will induce debt to have a larger effect on inequality. Column (1) of Table IV adds this interaction term to the main regression from Table III (column 4) and finds that the coefficient on debt composition is practically unchanged, while the coefficient on the interaction term is negative and significant, as the hypothesis would have predicted.

In column (2), we test the hypothesis that the effect of debt composition on inequality depends on a country's income level: poorer countries, that are only able to issue domestic

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sharedom	5.85** (1.25)	20.54** (7.53)	4.75** (1.19)	5.05** (1.74)	4.59* (1.93)	4.90** (1.20)	5.40** (1.73)	4.73** (1.26)
GDP per cap	5.79** (1.27)	6.33** (1.32)	5.67** (1.28)	5.50** (1.57)	5.51** (1.57)	5.78** (1.28)	5.68** (1.58)	5.81** (1.30)
Debt/GDP	-0.01*** (5e ⁻³)	-0.01*** (5e ⁻³)	-0.01 (5e ⁻³)	-7e ⁻⁴ (0.01)	-3e ⁻⁴ (0.01)	-0.01 (5e ⁻³)	7e ⁻⁴ (0.01)	-0.01*** (5e ⁻³)
Gov. exp.	0.02*** (6e ⁻³)	2e ⁻³ (2e ⁻³)	2e ⁻³ (2e ⁻³)	9e ⁻³ (6e ⁻⁴)	8e ⁻³ (6e ⁻³)	2e ⁻³ (2e ⁻³)	-0.08 (0.67)	3e ⁻³ (2e ⁻³)
Sharedom × Gov. exp.	-0.02** (6e ⁻³)							
Sharedom × GDP		-3.37* (1.56)						
Sharedom × conf.					4.88 (3.04)			
Conflict			-0.38 0.89	-0.16 (0.92)	-1.67 (1.31)			
Conflict _{t-3}						-0.43 (0.79)	-0.27 (0.81)	
Institutional quality								0.17 (0.23)
Ext. debt serv.				-0.04 (0.03)	-0.04 (0.03)		-0.04 (0.03)	
Debt serv./GNI				0.10*** (0.05)	0.10*** (0.05)		0.10*** (0.05)	
R ² within between	0.10 0.13	0.10 0.12	0.09 0.13	0.13 0.02	0.13 0.02	0.09 0.13	0.13 0.02	0.09 0.13
n	848	848	848	545	545	848	545	826
Countries	116	116	116	83	83	116	83	114

Notes: Dependent variable: Gini coefficient. All regressions include country and year fixed effects. Standard errors in parentheses. *, **, ***Significant at 5, 1 and 10 percent level, respectively

Table IV. From debt composition to inequality

debt at high interest, will suffer more inequality than industrialized countries who are able to issue domestic debt with lower interest. We add an interaction between the composition of public debt and GDP per capita. We find that the effect of debt composition is still large and regressive, as is the effect of log GDP per capita, but the interaction term has a negative and significant coefficient, indicating that the larger the country's GDP per capita, the smaller the effect of the domestic share of its public debt on inequality. There seems to be some support for the hypothesis that income is protective against the regressive effects of the domestic share of public debt, so that debt composition has a more egregious effect on the income distribution of poorer countries.

Although we do not report the results here, in regressions that include an interaction term between the share of domestic debt in public debt and a given class of government spending (education or health), the coefficient on the interaction terms is consistently insignificant.

One hypothesis explaining the effect observed in Table III is that a determinant of both inequality and the share of public debt issued domestically is violent conflict. On the one hand, countries that suffer from the political instability associated with war are likely to need to borrow, they are also likely to borrow more domestically (Barro, 1979; Cappella, 2012). On the other hand, these same countries are likelier to suffer higher rates of inequality (Bircan *et al.*, 2010). If this hypothesis is true, then failing to control for conflict in the regressions in Table III results in omitted variable bias. Columns (3), (4) and (5) provide tests for this hypothesis. The UCDP/PRIO data set records the presence of violent political conflict as well as the intensity of conflict (based on the number of casualties). We use data from UCDP/PRIO to create a dummy for the presence of any conflict, and a set of dummy for the various intensity levels (nil, low and high). In column (3), we add the conflict dummy to the basic regression from Table III and find that the coefficient on the domestic share of public debt is still positive and highly significant, while the conflict dummy is not a significant determinant of inequality. We do not report the results from a similar regression where conflict intensity is also included (with a dummy variable specification), but they are qualitatively similar to those of column (3). In column (4), we add to the regression with controls for conflict variables measuring the size of debt servicing and still find no significant change in the results.

To rule out the possibility that the domestic share of public debt has a different impact on inequality in conflict stricken contexts, we add an interaction term between the debt composition variable and our conflict dummy in column (5). The main effect of debt composition is still large, positive and significant. The interaction term however, is not significant. There seems to be no evidence that conflict is the driver behind the regressive effect of debt composition, as neither the main nor the interaction effect of conflict is significant while the main effect of debt composition remains positive, large and significant.

In columns (6) and (7), we refine the hypothesis somewhat to test whether the effect of debt composition on inequality is the long-term result of conflict. We use a three-year lag of conflict to measure past conflict, based on the estimated lag between conflict and inequality in the literature on the effect of conflict on income distributions (Bircan *et al.*, 2010). We find, in column (6), that the effect of debt composition is unchanged and past conflict is not a significant determinant of inequality. Column (7) adds the lagged conflict dummy to the more complete regression including the sectors of government spending and also finds that the coefficient on debt composition remains significant while the coefficient on lagged conflict is not[7].

Column (8) presents the results from a regression which includes another possibly confounding factor: the quality of institutions. To the extent that the quality of

institutions index captures the degree to which institutions are plagued with corruption, including it in our main regression rules out the possibility that the observed regressive effect of the composition of public debt is actually capturing the effect of corruption on inequality, if we believe countries with more corrupt institutions to hold more domestic debt. The results show that the coefficient on our institutional quality variable is not significant, and it does not change the significance of the composition of domestic debt variable, which still has a positive and highly significant effect on the Gini coefficient. In the same vein as columns (1) and (2), we also investigate the possibility that the effect of the domestic share of public debt depends on the quality of institutions by adding to column (8) an interaction term between these two variables. Although we do not report the results here, we find that the domestic share of public debt is still regressive, highly significant, but that institutions can significantly reduce the regressivity of domestic debt.

3.4 Robustness checks

Table V reports the results from some of the robustness check regressions that were conducted following the findings in Tables III and IV. We vary some of the estimation techniques, the regression specifications and the control variables we include to investigate the persistence of the results of the previous tables.

Column (1) reports results from the main regression (column 4 in Table III) but using random effects instead of fixed effects. The results are qualitatively unchanged and while a Hausman test[8] shows a significant systematic difference between the consistent estimator (fixed effects) and the more efficient one (random effects), so in all other columns we report fixed effects regressions.

In column (2), we use the log of the domestic share of public debt instead of a linear fit. The results are also qualitatively unchanged when a log specification is used. The coefficient on the log share of domestic debt in total public debt is slightly less significant than in the linear specification, but it is still significant at the 5 percent level.

The effect of debt on inequality may be mitigated by certain kinds of government spending: education, and health spending may impact the distribution of incomes progressively. The next set of columns add to the set of control variables measures of government expenditures on specific sectors, in order to investigate the presence of an effect of debt composition on inequality holding fixed certain classes of government spending, in addition to total government spending. Column (3) reports the results from adding to the main regression in Table III a measure of government spending on education as a share of GDP. The coefficient on the share of domestic debt is still significant at the 5 percent level, but its magnitude is similar to the level it was in Table III: an increase in the share of domestic debt by 10 percentage points leads to an increase in the Gini coefficient by about 0.46. Both government spending variables are significant: government consumption spending is regressive while education spending reduces inequality.

When we add a variable measuring government military expenditures as fraction of GDP to the regression in column (3), we find, in column (4), that the coefficient on the share of domestic debt is now larger in magnitude and significant at the 5 percent level. The effects of all other variables remain qualitatively similar, while military spending is not significant.

In column (5), we add to the regression in column (4) a measure of public expenditures on health (as a fraction of total government expenditures) and find that the coefficient on the domestic share of public debt is still positive and significant (at the 10 percent level).

When we also add in column (6) conflict to the regression in column (5), the coefficient on debt composition remains significant, while the coefficient on the conflict

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(RE)	(FE)	(FE)	(FE)	(FE)	(FE)	(FE)	(FE)
Sharedom	3.37** (1.17)		4.59* (2.33)	4.76** (2.35)	4.56*** (2.53)	4.76*** (2.54)		
Log (sharedom)		0.64* (0.30)						
Sharedom _{t-1}							3.54** (1.21)	
Sharedom _{t-3}								4.01** (1.24)
GDP per cap.	-1.51** (0.50)	7.17** (1.26)	4.38*** (2.63)	3.32 (2.73)	2.56 (3.23)	2.05 (3.27)	6.14** (1.36)	7.37** (1.57)
Debt/GDP	-0.01** (5e ⁻³)	-3e ⁻³ (5e ⁻³)	-0.03** (0.01)	-0.02* (0.01)	-0.03* (0.01)	-0.03* (0.01)	-0.01 (5e ⁻³)	-0.01 (0.01)
Gov. exp.	2 ⁻³ (2e ⁻³)	3e ⁻³ (3e ⁻³)					3e ⁻³ (2e ⁻³)	3e ⁻³ (2e ⁻³)
Gov. exp./GDP			0.16* (0.07)	0.15* (0.07)	0.17* (0.08)	0.18* (0.08)		
Educ exp./GDP			-0.87*** (0.45)	-0.83*** (0.46)	-0.91*** (0.54)	-0.92*** (0.54)		
Milit. exp./GDP				1.02 (0.63)	0.47 (0.78)	0.47 (0.77)		
Health exp./Gov. exp.					0.04 (0.11)	0.03 (0.11)		
Conflict						1.31 (1.25)		
R ² within	0.04	0.08	0.26	0.23	0.18	0.18	0.08	0.08
between	0.09	0.13	0.16	0.16	0.13	0.12	0.12	0.13
n	848	815	284	276	262	262	813	718
Countries	116	114	79	76	72	72	115	113

Table V.
Robustness checks

Notes: Dependent variable: Gini coefficient. All regressions include country and year fixed effects. Standard errors in parentheses. *, **, ***Significant at 5, 1 and 10 percent level, respectively

dummy is not. When conflict is modeled using a set of dummy variables to reflect conflict intensity, the results (not reported here) are virtually unchanged, with the main effect of debt composition still positive and significant, while the conflict intensity dummies have no significant effect on inequality.

In the last two columns of Table V, we address the possibility of the endogeneity of the composition of public debt by using lagged values of the debt composition variable. In column (7), we attempt the main regression using the domestic share of public debt lagged one year. The coefficient on the debt composition variable remains significant and positive. In column (8), we lag the domestic share of public debt three periods instead and still find a positive and significant association to the Gini coefficient.

4. Conclusion

We have examined the effect of the domestic share of public debt on the Gini coefficient using a panel of cross-country data, and controlling for GDP per capita and government expenditures. We have found consistent evidence using both fixed and random effects that the domestic share of public debt is associated with higher levels of the Gini coefficient. The results persist when we add other control variables that are correlated to

both debt composition and inequality as well as when we add variables that might affect the relation between debt composition and inequality, including government spending on a variety of sectors. Our findings are also robust to using alternative measures of the variables and to using lagged values of the explanatory variables of interest.

The magnitude of the effects that we have estimated also suggests to us that the share of public debt held domestically is an important contributor to inequality and would be a factor to consider in the large literature on the cross-country determinants of inequality.

While we acknowledge that there is a wide variety of factors affecting a government's recourse to domestic debt, we hope that this paper contributes to the considerations that should enter a government's deliberations when deciding whether to issue debt domestically. The persistent regressive effect of domestic public debt has serious welfare implications beyond the classic debate on the intergenerational incidence of the burden of the debt: it is the distinct factor that domestic debt tends to be held domestically that makes it regressive according to our argument. We therefore think that the welfare implications of issuing domestically held debt should be taken into consideration when domestic debt is issued, particularly when the option of external debt at lower interest rates is available.

Notes

1. These are Albania, Algeria, Argentina, Brazil, Ghana, Indonesia, Jamaica, Lebanon, Libya, Mexico, Qatar, Syria and Turkey.
2. Historical classifications by the World Bank are available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries>
3. The institutional quality indicator averages the three corruption measures where the data are available, treating missing values as missing (no attempt is made to impute missing values).
4. This would be especially true if we believe some of the predictions of the post-Keynesian theoretical models mentioned above that government spending may reduce inequality under certain circumstances.
5. When the regressions in columns (4) and (5) are re-run using the total debt rather than the debt to GDP ratio to control for the size of the debt instead of total debt, the results (not reported) are virtually unchanged.
6. See, e.g. Vasishta, 2010: "for many emerging markets, domestic-currency debt comprises a greater share of domestic debt than of foreign debt. For most small countries, debt held by foreigners is solely denominated in foreign currency" (p. 1072).
7. The results in columns (6) and (7) are unchanged with a five-year lag is used to measure past conflict instead of a three-year lag (not reported, but available from author).
8. The Hausman test is not reported here, but is available on request from the author.

References

- Abell, J. (1994), "Military spending and income inequality", *Journal of Peace Research*, Vol. 31 No. 1, pp. 35-43.
- Ali, H. (2007), "Military expenditures and inequality: empirical evidence from global data", *Defense and Peace Economics*, Vol. 18 No. 6, pp. 519-535.
- Arnone, M. and Presbitero, A. (2007), "External debt sustainability and domestic debt in heavily indebted poor countries", *Rivista Internazionale de Scienze Sociali*, Vol. 115 No. 2, pp. 187-213.
- Barro, R.J. (1979), "On the determination of the public debt", *Journal of Political Economy*, Vol. 87 No. 5, pp. 940-971.

- Barro, R.J. (2000), "Inequality and growth in a panel of countries", *Journal of Economic Growth*, Vol. 5 No. 1, pp. 5-32.
- Bircan, C., Bruck, T. and Vothknecht, M. (2010), "Violent conflict and inequality", Working Paper No. 129, Brooks World Poverty Institute, University of Manchester, Manchester.
- Bolle, M., Rother, B. and Hakobyan, I. (2006), "The level and composition of public debt in emerging market crises", Working Paper No. 06/186, IMF, Washington, DC.
- Borensztein, E., Levy-Yeyati, E. and Panizza, U. (2006), "Living with debt. Inter-American development bank report on economic and social progress in Latin America", Harvard University Press and Inter-American Development Bank, Washington, DC.
- Bourguignon, F. and Morrisson, C. (1998), "Inequality and development: the role of dualism", *Journal of Development Economics*, Vol. 57 No. 2, pp. 233-257.
- Carlberg, M. (1985), "External versus internal public debt – a theoretical analysis of the long-run burden", *Journal of Economics*, Vol. 45 No. 2, pp. 141-154.
- Cappella, R. (2012), "The political economy of war finance", Doctoral Dissertation, Paper AAI3542786, University of Pennsylvania, Department of Political Science, PA.
- Claessens, S., Klingebiel, D. and Schmukler, S. (2007), "Government bonds in domestic and foreign currency: the role of institutional and macroeconomic factors", *Review of International Economics*, Vol. 15 No. 2, pp. 370-413.
- Cowan, K., Levy Yeyati, E., Panizza, U. and Sturzenegger, F. (2006), "Sovereign debt in the Americas: new data and stylized facts", Working Paper No. 577, Research Department, IDB, Washington, DC.
- Deininger, K. and Squire, L. (1996), "Measuring income inequality: a new data base", *World Bank Economic Review*, Vol. 10 No. 3, pp. 565-591.
- Deininger, K. and Squire, L. (1998), "New ways of looking at old issues: inequality and growth", *Journal of Development Economics*, Vol. 57 No. 2, pp. 259-287.
- Drazen, A. (1997), *Towards a Political Economic Theory of Domestic Debt*, NBER, Cambridge.
- Easterly, W. (1999), "Life during growth", *Journal of Economic Growth*, Vol. 4 No. 3, pp. 239-275.
- Gleditsch, N.P., Wallensteen, P., Erikson, M., Sollenberg, M. and Strand, H. (2002), "Armed conflict, 1945-99: a new dataset", *Journal of Peace Research*, Vol. 39 No. 5, pp. 615-637.
- Gopinath, S. (2007), "Development of local currency bond markets: the Indian experience", Federal Reserve Bank of India, paper presented at the Workshop on 'Debt, Finance and Emerging Issues in Financial Integration', organized by Commonwealth Secretariat London, March 6-7.
- Harbom, L., Melander, E. and Wallensteen, P. (2008), "Dyadic dimensions of armed conflict, 1946-2007", *Journal of Peace Research*, Vol. 45 No. 5, pp. 697-710.
- Hauner, D. (2009), "Public debt and financial development", *Journal of Development Economics*, Vol. 88 No. 1, pp. 171-183.
- Heilbroner, R. and Bernstein, P. (1989), *The Debt and the Deficit*, WW Norton, New York, NY.
- IMF (2006), "Applying the debt sustainability framework for low-income countries: post debt relief", International Monetary Fund and Mimeo, Washington, DC.
- Jensen, S. and Rutherford, T. (2002), "Distributional effects of fiscal consolidation", *Scandinavian Journal of Economics*, Vol. 104 No. 3, pp. 471-493.
- Kaufman, D., Kraay, A. and Mastuzzi, M. (2005), *Governance Matters IV: Governance Indicators for 1996-2004*, The World Bank, Washington, DC, available at: www.worldbank.org/wbi/governance/pdf/GovMatters%20IV%20main.pdf (accessed October 15, 2014).
- Li, H., Xu, L.C. and Zou, H. (2000), "Corruption, income distribution, and growth", *Economics & Politics*, Vol. 12 No. 2, pp. 155-182.

-
- Lima, L., Panizza, U. and Forslund, K. (2008), "The composition of public debt in developing and emerging countries", UNCTAD and Mimeo, Geneva.
- Michl, T.R. (1991), "Debt, deficits and the distribution of income", *Journal of Post Keynesian Economics*, Vol. 13 No. 3, pp. 351-365.
- Mushinski, D.W. (2001), "Using non-parametrics to inform parametric tests of Kuznets' hypothesis", *Applied Economics Letters*, Vol. 8 No. 2, pp. 77-79.
- National Economic Commission (1989), "Report of the National Economic Commission", GPO, Washington, DC.
- Odedokun, M. and Round, J. (2001), "Determinants of income inequality and its effect on economic growth: evidence from African countries", Discussion Paper No. 2001/103, World Institute for Development Economics Research, United Nations University, Helsinki.
- Panizza, U. (2008), "Domestic and external public debt in developing countries", Discussion Paper No. 188, UNCTAD/OSG, Geneva.
- Raffelhuschen, B. (1999), "Generational accounting in Europe", *American Economic Review, Papers and Proceedings*, Vol. 89 No. 2, pp. 167-170.
- Ramos, X. and Roca Sagales, O. (2007), "Long term effects of fiscal policy on the size and the distribution of the pie in the UK", Working Paper No. 2007/39, RSCAS, EUI, Florence.
- Reinhart, C.M. and Rogoff, K.S. (2011), "The forgotten history of domestic debt", *Economic Journal, Royal Economic Society*, Vol. 121 No. 552, pp. 319-350, 05.
- Tanninen, H. (1999), "Income inequality, government expenditures and growth", *Applied Economics*, Vol. 31 No. 9, pp. 1109-1117.
- Thornton, J. (2001), "The Kuznets inverted-u hypothesis: panel data evidence from 96 countries", *Applied Economic Letters*, Vol. 8 No. 1, pp. 15-16.
- UNU-WIDER World Income Inequality Database (2008), "Version 2.0", available at: www.wider.unu.edu/research/Database/en_GB/database/ (accessed October 15, 2014).
- Vanhoudt, P. (2000), "An assessment of the macroeconomic determinants of inequality", *Applied Economics*, Vol. 32 No. 7, pp. 877-883.
- Vasishtha, G. (2010), "Domestic vs external borrowing and fiscal policy in emerging markets", *Review of International Economics*, Vol. 18 No. 5, pp. 1058-1074.
- You, J. and Dutt, A. (1996), "Government debt, income distribution and growth", *Cambridge Journal of Economics*, Vol. 20 No. 3, pp. 335-351.

Further reading

- Abbas, A. (2007), "Public domestic debt and economic growth in low income countries", Department of Economics, Oxford University and Mimeo, Oxford.
- Christensen, J. (2005), "Domestic debt markets in Sub-Saharan Africa", *IMF Staff Papers*, Vol. 52 No. 3, pp. 518-538.
- Jeanne, O. and Guscina, A. (2006), "Government debt in emerging market countries: a new data set", Working Paper No. 06/98, International Monetary Fund (IMF), Washington, DC.
- Reinhart, C., Rogoff, K. and Savastano, M. (2003), "Debt intolerance", *Brookings Papers on Economic Activity*, Vol. 1 No. 1, pp. 1-74.

Corresponding author

Nisreen Salti can be contacted at: ns17@aub.edu.lb

For instructions on how to order reprints of this article, please visit our website:

www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com