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Debt Sustainability and Debt Composition

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1 Introduction

There are two problems with standard debt sustainability analysis (DSA) exercises. The first relates to the fact that debt sustainability exercises often mix the concept of external sustainability with that of fiscal sustainability. The second has to do with the fact that DSA exercises tend to focus on the *level* of debt without considering its *composition*. The objective of this paper is to propose an approach for building a debt indicator that keeps into account both the level and the composition of debt.

Our paper relates to three strands of the literature on external and fiscal sustainability. The first strand focuses on the transfer problem and on the relationship between external sustainability and the behavior of the real exchange rate (Keynes, 1929). The second strand focuses on the conceptual definition of debt and fiscal sustainability and discusses why evaluating sustainability is particularly difficult in emerging and low income countries (see, among others, Akyüz, 2007, Wyplosz, 2006, and Izquierdo and Panizza, 2006). The third strand consists of a set of empirical papers which aims at estimating the determinants of a debt crisis (three influential papers are Kraay and Nehru 2006, Detragiache and Spilimbergo, 2001, and Manasse, Roubini, and Schimmelpfennig, 2003).

We expand on this literature in three directions. With respect to the first strand of the literature, we present a detailed discussion on how different theoretical approaches can lead to different definitions of external sustainability. With respect to the second strand, we try to be careful in highlighting the differences and interactions between external and fiscal sustainability. In particular, we try to go beyond the careful analysis of Akyüz (2007) and discuss how different concepts of sustainability relate to different types of debt. With respect to the third strand of the literature, we try to jointly evaluate how debt levels and debt composition affect the probability of a default episode. We find that debt composition plays a key role in determining the probability of a debt crisis and that any ratio of public debt should give more weight to foreign currency external debt with private creditors than to other forms of debt.

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The paper is organized as follows: Section 2 reviews the literature on external and fiscal sustainability; Section 3 discusses optimal and feasible debt decompositions; Section 4 discusses some empirical testes of the relationship between debt composition the probability of a debt default episode; Section 5 concludes.

2 Different types of debt, different vulnerabilities

> The Dawes Committee divided the problem of the payment of German Reparations into two parts--into the *Budgetary* Problem of extracting the necessary sum of money out of the pockets of the German people and paying the to the account of the Agent-General, and the *Transfer* Problem of converting the German money so received into foreign currency.
>
> As time as gone on, opinion has become even more sharply divided that it was on the question whether this dichotomy has theoretical and practical significance. The view has been widely expressed that the Transfer Problems is of quite secondary importance and that, so long as the Budgetary Problem is solved, the Transfer Problems will, in the main, solve itself. The following note is directed to a theoretical discussion of this issue. (Keynes, 1929, p. 1)

Debt sustainability exercises for developing countries have traditionally concentrated on external debt. This is due to the paramount importance of the transfer problem and to the fact that, until the early 1990s, most external debt of developing countries was public and most public debt of developing countries was external. However, the crises on the 1990s and 2000s where characterized by either the presence of massive private external debt or a large stock of domestic public debt.[1] In the current environment, about half of long term debt of developing countries is issued by private borrowers (Figure 1) and more than 50 percent of public debt is issued domestically (Figure 2).

Therefore, when people talk about debt sustainability they have in mind different definitions of debt. Some think about external debt sustainability and the associated transfer problem, others focus on public debt sustainability and the associated budgetary problem. Some even claim that there is no transfer problem associated with the presence of external private debt and that only external public debt should be of concern.[2]

Those who worry about external sustainability are interested in checking whether the country can generate the foreign currency necessary to service the external debt. However, they do not look at whether the different sectors of the economy are able to generate the resources necessary to pay their own debts. Those who worry about public debt sustainability look at the evolution of total public debt without worrying that servicing the public debt may require scarce foreign currency.

Both concepts are important, but mixing them up adds confusion to the debt sustainability discussion. The objective of this section is to clarify the differences between different types of debt in terms of the different types of vulnerabilities that they create. We fill first examine the main issues linked to external sustainability, then move to fiscal (public debt) sustainability, and

[1] Akyüz (2007) presents a concise discussion of the external and internal drivers of these crises.

[2] This latter view is often referred to as the Lawson doctrine and takes its name from a 1988 speech of the British Chancellor of the Exchequer Nigel Lawson who, while commenting on the UK current account deficit, stated that: "..in the past…UK current account deficits were almost invariably associated with large budget deficits, poor economic performance, low reserves and exiguous net overseas assets. The present position could not be more different." Ironically, within one year from this speech the UK entered into a deep recession.

then conclude the section with a discussion of the interactions between these two concepts of sustainability.

2.1 External Sustainability

The observation that in order to repay its external debt a country needs to earn foreign currency on a net basis was at the basis of Keynes' (1929) criticism of those who thought that a large external debt is mainly a budgetary problem.

The key difference between external and domestic debt is that the ability of generating international currency to pay interest and principal is not directly related to a country's ability to grow or to broaden its tax base. Thus, debt-to-GDP or the debt-to-revenues ratios are not adequate measures of a country's ability to repay its external debt. Even the often used debt-to-exports ratio is problematic because a large export sector is not sufficient to generate the needed resources if import growth outpaces export growth. Unless a country's external debt is issued in its own currency, the money necessary to cover international obligations on a net basis (i.e., without creating new debt) can only be generated in presence of a current account surplus. This means that net foreign debt is always a debt that has to be repaid in terms of internationally tradable goods and services.[3]

The accumulation of large net foreign liabilities is always the outcome of a persistent current account deficit. Thus, in order to evaluate whether a given amount of debt is sustainable or not, it is necessary to understand the mechanisms that drive the behavior of the current account. This, however, leads us into deep water because economic theory offers two distinct models to explain such behaviour. Indeed, general explanations for current account imbalances are difficult to find. Considering the theoretical positions of different schools of thought, there is not even consensus on whether current account disequilibria should be approached mainly from the angle of the trade flows or from that of capital flows. However, this is a crucial decision for evaluating external sustainability. The “trade view” stresses the fact that the current account balance reflects the difference between current receipts and expenditures for internationally traded goods and services and income payments. The “capital view” focuses on the fact that the current account balance equals the gap between domestic saving and domestic investment. Although being based on a tautology, the latter is the dominating view in both economic discussions and policy prescriptions, including external debt sustainability analysis exercises.

According to the capital view, if economic agents in a country decide to save a higher share of disposable income than can be put to productive use domestically, a net capital outflow is the natural consequence. Similarly, a current account deficit and a net capital inflow is the normal outcome of a situation in which domestic investment is higher than domestic savings. In such a world, the trade and the current account balances are the result of the voluntary saving and investment decisions of domestic agents. Consequently, in a world of liberalised financial markets, savings always flow toward their best use, i.e., toward countries with profitable investment opportunities. It is in this sense that an increase in the external debt of a country or a region is seen as a consequence of its superior investment opportunities and the current account deficit is just an outcome of the preferences of all partners in trade and finance. This is why the US Council of Economic Advisors renamed the current account deficit of the United States a “capital import surplus.”

There are two problems with this capital view. The first is its inherent tautological nature. The second is its inability to explain the outcomes of conflicting preferences in a global setting. Despite being well founded in microeconomic decision making, this approach cannot explain

[3] In theory this is also true when external debt is denominated in a country's own currency, but countries that can issue the currency in which their debt is denominated have the options to debase their debt by printing more money.

how the autonomous decisions of agents in all countries in the world to save more than to invest generates the unavoidable result of at most *n-1* countries achieving a current account surplus while at least one country, despite its willingness to reach a surplus, has to end up with a deficit. In other words, the fallacy of composition (the current account of the world always exactly equals nil) systematically excludes a truly voluntary decision of all participating players.

The trade view of global imbalances is more substantive in its main message because it does not just describe movements of imports and exports as result of voluntary decisions of economic agents but it points to shocks in trade flows induced by large and unforeseen changes in the relative prices between tradable and non-tradable goods and services and in the relative prices of tradable goods between countries (sometimes called the international competitiveness of countries, UNCTAD, 2006). According to this view, changes in commodity prices can explain the current account swings of producers of important commodities like oil. The trade view also emphasizes the important role of large swings in the exchange rate and points out that changes in the exchange rate that overshoot the "fundamentals" are major determinants of current account imbalances.

Hence, the relationship between national saving and the trade balance is more complex than in the pure capital approach, as it involves voluntary decisions as well as forced adjustments by all relevant groups of agents, including policy-makers. Analyzing debt sustainability under these conditions is similar to traditional Keynesian balance of payments analysis. This is a useful approach as there is evidence that large swings in the terms of trade like those following oil price hikes have immediate and quantitatively significant consequences for trade and current account balances. In the same vein, the reduction of deficits in countries with a sizable share of tradable industrial goods usually goes hand in hand with a devaluation of the nominal and the real value of the currencies affected. Indeed, empirical evidence has shown that changes in the real effective exchange rate have the potential to reduce deficits or to induce swings in the trade and current account from deficit to surplus (Bundesbank 2007).

In light of this evidence, a large current account deficit accompanied by a real appreciation and a loss in overall competitiveness is a stronger indicator of non-sustainability of the resulting debt than a deficit which is not accompanied by a loss of competitiveness. It is sometimes claimed that developing countries need to accept large inflows and the resulting currency appreciation because they do not posses enough own savings and hence they need to import capital in order to invest and grow. However, this line of arguments loses persuasive power in a world where developing countries as a whole are both growing and investing at unprecedented pace and are net exporters of capital.

Moreover, as the 2004 US Economic Report of the President has put it: "The desirability of positive net capital flows and a current account deficit depend on what the capital inflows are used for. Household borrowing – an excess of household spending or investment over saving - provides a useful analogy. Household debt could reflect borrowing to finance an extravagant vacation, a mortgage to buy a home, or a loan to finance education. Without knowing its purpose, the appropriateness of the borrowing cannot be judged. Similarly for countries, borrowing from abroad can be productive or unproductive."[4] (p. 256). Thus, debt piled up against one or the other activity appears in different light and debt sustainability cannot be evaluated on the basis of macroeconomic ratios only.

One of the key messages of the Keynesian branch of balance of payments analysis developed some 40 years ago is that the swing in the current account necessary for repayment of overall debt can be achieved **without** a (relative) fall in real income of the debtor country only if an improvement in competitiveness leads to an expenditure switching between traded and non-traded goods in the debtor country. Obviously, creditors need to accept the concomitant loss in competitiveness and in market shares. This illustrates that debt sustainability analysis exercise

[4] http://www.gpoaccess.gov/usbudget/fy05/pdf/2004_erp.pdf

may need to take into account potential retaliation of creditors in their attempt to avoid the loss of market shares which is implied by the attempt of debtors to repay their debt.

This symmetric relationship between debtors and creditors implies that any attempt of a creditor to repatriate funds (on a net basis) destroys the funds. There is no autonomous net outflow of capital as any reduction of the net flow to debtor countries reduces the current account surplus in the creditor country. This kind of interrelationship between debtor and creditor was at the root of Germany's Transfer Problem after the First World War. Keynes' harsh criticism of the reparations imposed on Germany was based on the unwillingness of the allies to accept the harsh truth that in order to allow Germany to pay the reparations in international money they would have to run trade deficits.

The dominance of the goods market as described above is not a general rule or a "law", it just follows from the fact that in many cases the shock, the event that triggered the adjustment of net trade flows and net capital flows, has been the movement of prices and not the voluntary decision of economic agents (in some cases adjustment are brought about by sudden changes in the direction of capital flows or Sudden-Stop episodes). In other words, whereas in most cases it is useless to philosophize about the causality of endogenous variables like capital and goods, price shocks on the goods market, the money market, and on currency markets very often contain enough exogenous elements to allow for a clear judgement about the causal link between the capital market and the goods market.

An example of this situation is an oil shock.[5] After such a shock, the producers recycle their higher revenues by either immediately buying more goods from oil importing countries or by buying them at a later stage. In the second case, oil producers will buy financial assets and temporarily credit the oil bill. Clearly, oil producers cannot refuse to recycle their capital because this would mean to ask for immediate payment in kind but, at the same time, to refuse the kind of goods produced by oil importing countries. In this case, the producer would not obtain any benefit from a favourable change in its terms of trade ("terms of trade" can only be defined reasonably if there are traded - and that means demanded - goods on the import side of the oil producing countries). Under such scenario, oil producers would force oil consumers to immediately adjust their oil consumption downwards. Then, there would be no fall in the demand for other goods - and the pain of adjustment would be fully borne by the oil consumers whereas the oil producers' income position would remain unchanged (with more oil in the ground but changed consumer behaviour and/or better technologies to save oil in place).[6] However, if demand for oil is inelastic, the oil producer has to recycle its oil revenues by either demanding goods produced by oil importers or by exporting capital. As there is no alternative to this outcome interest rate signals or policy changes in the oil consuming countries are not needed to recycle the petrodollars. With inelastic demand, once the price shock has happened, the recycling of capital is no longer a chapter of price theory or interest rate theory but a chapter of international accounting and macroeconomic consistency. It these cases, it is normally wrong to conclude that idle savings or capital in the surplus countries has been used to finance the deficit. It is only due to the price shock that oil producers increased their surplus of revenues over expenditure (profit) which otherwise would not have been there. Additional capital (or money) is temporarily credited to the deficit region to realise the transaction which creates capital in the capital exporting countries in

[5] The same reasoning applies to any other (national and international) market where there can be temporary monopolies due to the invention and successful marketing of new products (productivity shocks with stable wages).

[6] For oil importers this kind of forced adjustment is only painful in a naive world where preferences are fixed forever. In reality it is just one of the day to day adjustments which we are used to. It may mean to wear a pullover during dinner or to reduce useless car rides. Demand, in this case, is **forced** to become elastic. Preferences will adapt sooner or later and the loss in utility will disappear (people may improve their health as they learn to enjoy walking or biking instead of driving).

the least analysis. That is why interest rate differentials (higher in the deficit region than in the surplus region) or other price incentives like the expectation of a revaluation of the deficit countries exchange rate may happen but *they are not the cause* of the net capital flow. Hence, changes in the interest rate differentials or the exchange rate expectations may not quickly follow changes in the direction and the dimension of the net capital flows.

Thus, if a country or a region faces a sharp real revaluation, the concomitant net inflow of capital should not be interpreted as a sign of strength or as the result of a decision of investors to "save" in favour of this region. A sign of strength would be an inflow without an overvaluation. Otherwise, devaluing countries are exporting capital as the necessary complement of their success on the goods market and not as autonomous resource transfer. As the movement in relative prices *is the cause* of capital flows, it is inconsistent to complain about the negative effects of the overvaluation and to praise the net capital inflow at the same time.[7]

Hence, under normal circumstances, a real devaluation is the shock necessary to restore the ability to generate foreign currency and repay the debt. In fact, even if the devaluation may have an immediate negative effect in terms of confidence of foreign investors, the evidence shows that only a devaluation can allow a debtor country to repay its external debt without suffering a recession (at least, relative to the creditor countries). Thus, a real devaluation is ultimately the only way to regain credibility in the capital market.

If price shocks and the resulting capital flows are closely related, the conditions for debt repayment of developing countries have to be seen in a new and different light. It is not sufficient to offer the traditional panacea of "open markets for products from the South." Creditor countries need to be ready to lose market shares in favour of the debtor countries and allow for a turnaround of their current accounts. This is a quite different thing than just to "open a market". Debtor countries need to penetrate the markets of manufactured goods which, as a rule, is accomplished by means of an undervalued currency and **falling** terms of trade. Thus, the creditor countries' policies of strengthening their own competitiveness against the low wage countries is in direct contradiction with the notion of "open markets" as a relief for debtors.

These considerations bear some important lesson for the analysis of external sustainability: (i) The analogy with calculations of sustainable government debt is misleading and we should refrain from following this path of analysis; (ii) If foreign debt is the result of negative exogenous shocks, it is never sustainable (unless one expects a future positive shock of equal magnitude); (iii) Any attempt of measuring sustainability needs to include a thorough analysis of the causes of the indebtedness. Analyses purely based on debt levels and on the forecast of some macroeconomic variables will lead to nowhere.

It is difficult to find a useful measure of debt sustainability in a world where developing countries are exposed to large real and financial shocks. In such a world, external sustainability analysis becomes akin to crisis prevention analysis and should focus on identifying conditions that may help avoiding idiosyncratic shocks and adopt policies aimed at minimizing the effect of these shocks, when they do happen.

2.2 Fiscal Sustainability

[7] McKinnon (1984, p.14) has argued that "With smoothly functioning capital markets, little or no change in the 'real' exchange rate is necessary to transfer saving from one country to another". Krugman (1987, p. 15) comments this as follows: "What is wrong with this argument should be immediately clear. It confuses the question of whether a change in the savings rate will be reflected in a change in the distribution of world expenditure with the question of whether a change in that distribution necessitates a change in relative prices. The latter question is a question about goods markets, not capital markets." In the light of the arguments made above it should be clear that even more relevant than Krugman's point is the causal nexus in a world where "a change in the distribution of world expenditure is *caused* by a price shock on the goods market".

The term "fiscal sustainability" is often used without having a clear definition in mind.[8] Drawing on an analogy with household behavior, a country's policies are defined as fiscally sustainable if they lead to a situation in which the country can satisfy its budget constraint. However, Mendoza (2003) suggests that this is an imprecise definition of sustainability. He points out that the "true" budget constraint is an accounting identity that, by definition, is always satisfied. A government, for instance, can decide to satisfy its budget constraint by not paying (via outright default) or by inflating away its debt. In this sense, any analysis of fiscal sustainability ultimately reflects a value judgment on the cost and benefits of alternative adjustment mechanisms. Standard fiscal sustainability analysis implicitly assumes that adjustments through the level and composition of tax revenue or primary expenditure are preferable to adjustments via default or inflation (Mendoza, 2003). On the basis of this assumption, the International Monetary Fund defines a policy stance as sustainable if: "a borrower is expected to be able to continue servicing its debt without an unrealistically large future correction to the balance of income and expenditure" (IMF, 2002, page 4).

Formal tests of sustainability tend to be problematic and rather demanding in terms of data requirement. Thus, analysts have developed rule of thumb indicators aimed at checking whether current policies can stabilize or reduce a given debt ratio The starting point is usually the current period budget constraint that can be written as:

$$\Delta d = (r - g)d - ps \qquad (1)$$

Where *d* is the debt to GDP ratio, *r* the steady state real interest rate, *g* the long-run growth rate of real GDP, and *ps* the primary surplus divided by GDP. A positive value of Δd indicates that the debt-to-GDP ratio is expanding and may be interpreted as an unsustainable policy. The above equation is often rewritten as $ps = (r - g)d$, and *ps* is interpreted as the primary surplus required to stabilize the debt-to-GDP ratio for a given real interest rate, growth rate of the economy, and initial stock of debt. Because of its simplicity, this equation is probably the most commonly used indicator of fiscal sustainability.[9]

There are several caveats that apply to the indicator discussed above. First, it is not solidly based on any well-specified definition of sustainability and it mostly focuses on stabilizing a particular debt-to-GDP ratio but it does not say anything about the optimality of this ratio. Second, the indicator does not establish necessary conditions for long-run sustainability. There are good reasons why a country may want to run a deficit and it may be sub-optimal to prevent a country from conducting counter-cyclical policies because these policies would lead to overshooting a fiscal ratio that corresponds to a long-run equilibrium. Third, evaluating the above equation requires assumptions on GDP growth, interest rate, government expenditures and

[8] This section draws on Izquierdo and Panizza (2006).

[9] Buiter (1985) suggests an alternative indicator of sustainability, defined as: $SUS = ps - (g - r)\frac{W}{GDP}$. Where *W* is public sector net worth and all the other variables are defined as above. The second term on the right hand side of the equation is equal to the primary surplus that keeps the public sector wealth-to-GDP ratio constant. Blanchard (1990) defines a set of sustainability indicators that require computing the constant tax rate that satisfies t^* = E($e + (r - g)d$), where t^* measures taxes over GDP and e government expenditure over GDP. This technique can be used to compute short-run (where expectations are replaced with current values of *e*, *r*, and *g*) or, depending on the length of the period for which expectations are taken, medium and long-run indicators. Blanchard (1990) points out that t^* can be interpreted as the annuity value of expected future spending and transfers plus the difference between expected real interest rate and growth rate multiplied by the current debt-to-GDP ratio.

revenues, and implicitly assume that these variables are exogenous.[10] However, most of these variables tend to be endogenous and correlated with each other. It is unrealistic to assume that changes in the primary deficit will have no effect on the interest rate and growth, or that changes in growth do not affect the primary surplus. In fact, deficits incurred to finance public investment should be treated differently from deficits incurred to finance current expenditure. According to current practice, public sector adjustment strategies bundle together current expenditure and public investment. The Rio Group (a permanent mechanism of political consultations and interaction between 19 Latin American countries) put forward a proposal aimed at excluding investment expenditure from fiscal deficit targets. The main argument in favor of this proposal is that, as current expenditure tends to be difficult to adjust (because it is mostly composed of wages and entitlement programs), investment is the typical adjustment variable when the deficit exceeds the target. The proposal argues that the inclusion of investment expenditures in the target budget balance considers every increase in debt as a reduction in government wealth, implicitly assigning no value to investment expenditure as an addition to net wealth. The Rio Group, instead, would favor the adoption of sustainability indicators similar to the one proposed by Buiter (1985, see footnote 9).

Finally, the indicator does not take into account a host of factors that characterize the situation of most developing countries and greatly increase uncertainty. In particular, developing countries often have limited capacity to raise taxes (because of a large informal sector), have a volatile revenues base, are subject to large external shocks (both real and financial) that increase the volatility of GDP growth and that of debt service, and are characterized by large levels of liability dollarization. All these elements complicate the management of fiscal policy and greatly increase the difficulty of evaluating sustainability. Thus, if we modify the Equation (1) to include some of the elements that are common to developing countries we would obtain:

$$\Delta d = \left[\alpha r^{dl} + \beta r^{ds} + \gamma \frac{(1+\rho+r^{f})(1+\varepsilon)-1}{1+\pi} \right] d + \\ + \left[(1-\alpha-\beta-\gamma) \frac{(1+r^{f})(1+\varepsilon)-1}{1+\pi} - g \right] d - ps \qquad (2)$$

Where α is the share of debt denominated in local currency at a fixed (long-term) interest rate, and r^{dl} is the corresponding real interest rate. β is the share of debt denominated in local currency at a floating (short-term) interest rate and r^{ds} is the corresponding real interest rate. γ is the share of debt denominated in foreign currency, ε is nominal depreciation, π is inflation, r^{f} is the international interest rate, and ρ is country risk. (1- α - β - γ) is official debt contracted with multilateral or bilateral institutions.[11] Contrary to OECD countries, in the typical developing country, β and γ tend to be high and α tends to be small. If it is often difficult to

[10] The current approach is to deal with uncertainty by stress-testing standard sustainability analysis with shocks to the main macroeconomic variables. Some authors are now developing probabilistic models of sustainability that specifically keep into account volatility in macroeconomic variables (see, for instance, Barnhill and Kopits, 2003, Hausmann, 2003, Croce and Juan Ramon, 2003, Mendoza and Oviedo, 2003).

[11] We assume that this debt is contracted at the international interest rate. In some cases the actual rate will be higher (when the debt is not concessional) and in others, lower. However, this does not change our analysis as long as the interest rate applied to this type of debt has limited volatility.

predict the behavior of the variables in Equation (1), think how hard it is to deal with Equation (2)![12]

2.3 Interactions between external and fiscal sustainability

There are important linkages between external and fiscal sustainability. The most obvious among these linkages is that about 50 percent of external debt of developing countries is public debt and about 50 percent of public debt of developing countries is issued externally. But there are also less obvious linkages. Consider, for instance, a country with no public debt but a large external private debt. The inability of private borrowers to service this debt can lead to a currency and banking crisis which can then have negative implications on fiscal sustainability. However, crisis can also originate in the market for domestic debt. The Mexican crisis of 1994/1995 originated in the market for CETES which are domestic currency domestic bonds and the Russian crisis of 1998 originated in the GKO market which are domestic currency bonds.

The most important interaction between fiscal and external sustainability has to do with the behaviour of the exchange rate and, unfortunately, this interaction introduces an unpleasant trade-off. This can be see by recalling that Section 2.1 argued that a real devaluation is a necessary condition for restoring external sustainability and Section 2.2 pointed to the fact that a large share of public debt in developing countries is denominated in foreign currency and, as a consequence, a large devaluation can lead to a sudden jump in the debt-to-GDP ratio (for evidence along these lines see Campos, Jaimovich, and Panizza, 2006).[13]

Hence, a currency appreciation can jointly have a positive effect on fiscal sustainability and a negative effect on external sustainability. However, if this situation is associated with a rapid deterioration of the current account, the improvement in fiscal conditions will only be temporary. This is exactly the problem with the Lawson doctrine which may lead governments to ignore their external financial fragility which will eventually lead to a currency crisis and a fiscal crisis. However, this trade-off also implies that allowing for a currency devaluation in presence of foreign currency debt may lead to a debt crisis and possibly to a costly debt default. This is why some developing countries suffer from "fear of floating".

As a change in the composition of public debt and a switch to domestic borrowing can reduce these asymmetries and improve the trade-off discussed above, several developing countries are now retiring external public debt and substituting with domestically issued debt. According to some commentators and economists, this switch in debt composition will shield

[12] Real External Shocks (like a terms of trade shock) tend to be larger in developing countries. This affects the volatility of GDP growth and hence makes g difficult to estimate. Liability Dollarization and Original Sin **(**Eichengreen, Hausmann, and Panizza, 2005, refer to the fact that most developing countries do not borrow long-term in the country's own currency (hence, they have high values of β and γ). Because of pervasive liability dollarization, developing countries tend to suffer from "fear of floating" (Calvo and Reinhart, 2002, Hausmann, Panizza and Stein, 2001) and are afraid to let their exchange rate depreciate. This results in loss of competitiveness and excessively high domestic interest rates. At the same time, episodes of financial contagion and the possibility of self-fulfilling fiscal crises affect country risk and increase the volatility of the cost of servicing foreign currency debt. These shocks may lead to multiple equilibria: a country that under a tranquil condition may have a perfectly sustainable policy stance may suddenly jump to an unsustainable situation just because fear of default leads international investors to ask for larger risk premia (thus relatively low debt-to-GDP ratios lead to very poor credit ratings).

[13] This is the reason why the literature on original sin and currency mismatches (Eichengreen, Hausmann and Panizza, 2005) argues that external borrowing may be dangerous even in absence of a transfer problem. As the external debt of developing countries tend to be in foreign currency, a country's ability to repay its debt will depend on the behavior of the real exchange rate which, in developing countries tends to be very volatile (Hausmann, Panizza, and Rigobon, 2006). There should be no vulnerabilities for countries, like the United States, that can borrow abroad in their own currency (or better in a currency they can print).

developing countries from future debt crises. While it is true that domestic debt tend to be safer (from the issuer's point of view), the recent switch from external to domestic borrowing may lead countries to trade one type of vulnerability for another. For instance, countries that are switching from external to domestic debt could be trading a currency mismatch for a maturity mismatch and excessive domestic borrowing could have a negative effect on monetary credibility and thus lead to high domestic interest rates (Calvo, 1988).

These interactions between external and fiscal sustainability point to the fact that domestic debt should be included into DSA exercises. Currently, this is not common practice for at least two reasons. The first reason has to do with the fact that while domestic debt may have an effect on external sustainability, the vulnerabilities of domestic debt are different from those of external debt. Thus, it would be wrong to simply sum the two types of debt. The second reason is more pragmatic and has to do with the fact that it is hard to find data on the level and composition of domestic debt. Even worse, we do not even have a good definition of domestic and external debt. In fact, while the official definition of external debt focuses on the residence of the creditor (external debt is debt owed to non-residents), most countries classify external and domestic debt based on the place of issuance and the legislation that regulates the debt contract (external debt is debt issued in foreign countries and under the jurisdiction of a foreign court).[14]

3. Decomposing debt

In this section we recognize that public and external debt are not monolithic entities and discuss ideal and feasible decompositions of external and public debt.

The ideal decomposition of external debt

External debt should be classified along three dimensions: (a) maturity and currency characteristics; (ii) type of lender; (iii) type of borrower. With respect to the first dimension, short-term debt and foreign currency debt tend to be riskier (from the borrower's point of view) than long-term domestic currency debt. With respect to the second dimension, borrowing from official lenders (both bilateral and multilateral) tend to be safer because these creditors are not affected by financial contagion and, compared to private lenders, tend to be a more stable source of funds. With respect to the third dimension, public debt may lead to both transfer and budget problems and may be riskier than private debt which only has a transfer problem (but private debt may have budgetary implication through contingent liabilities).

Using these three dimensions, external debt could be classified in at least 12 categories (Table 1).[15] Each of these categories has a different level of risk.

The ideal decomposition of domestic public debt

In the case of domestic debt, it would be optimal to have information on the maturity and currency composition of the debt. In particular, the ideal source of information would classify domestic public debt in the 8 cells of Table 2, with the north-west cells having the lowest risk and the south-east cells having the highest risk.

What can we do with the data we do have

[14] For a detailed discussion of these issues, see Panizza (2007).

[15] The table is not exhaustive because it does not consider things like export credit which are often granted by official lenders to private borrowers. Moreover it does not considered domestic currency debt indexed to the price level and more exotic instruments like GDP-indexed or commodity linked bonds, at the same time the cells in light gray are theoretically possible but often empty.

Tables 1 and 2 list the information we would like to have. However, the available data are much more restrictive.

The World Bank's Global Development Finance (GDF) dataset is the main source of data on external debt. There are three problems with this dataset: (i) It does not report information on the share of domestic currency debt; (ii) It does not contain any information on the composition of short-term debt; (iii) It has limited information on the net present value of debt. The first is not a big issue because few developing countries are issuing external debt denominated in domestic currency (even though the situation is changing) and for these countries with can use BIS data to estimate the domestic currency share. The second, however, is a major problem because it does not allow us to separate total external debt into public and private external debt. The third is also an important problems but we can address it by complementing GDF data with NPV data assembled by Dikhanov (2007).

We start by using GDF data to decompose external debt into four components:

$$ED = ST+LTPR+LTPUPC+ LTPUOC \quad (3)$$

Where ED is total external debt, ST is total short-term external debt, LTPR is long term private external debt, LTPUPC is long-term public external debt owed to private creditors (banks and bonds), and LTPUOC is long-term public external debt owed to official creditors (multilateral and bilateral). Figure 1 shows the evolution of the level and composition of external debt for all developing countries for which we have data.[16] Total external debt (measured of as a share of GDP) of developing countries peaked in 1987 and it is now at a level similar to that prevailing in the late 1970s. However, there have been dramatic changes in the composition of external debt. While in the late 1970s, most external debt was owed by the public sector, in 2006 about 50 percent of external long term debt was owed by private creditors. As official debt is often extended at conditions which are more favorable than those applied by the private sector, we use the dataset assembled by Dikhanov (2007) to compute the net present value of official public debt. Dikhanov (2007) reports the NPV for total public external debt, we assume that the book value of debt extended by private creditors (LTPUPC) is equal to its market value and we recover the NPV of official public debt (NPVOC) by subtracting LTPUPC from the data assembled by Dikhanov.[17] We can then use this net present value to decompose external debt as follows:

$$ED1 = ST+LTPR+LTPUPC+ NPVOC \quad (4)$$

Note that as NPVOC< LTPUOC, then ED1<ED.

With respect to domestic debt the situation is even more complicated. Until recently, there was no dataset with a good coverage of total domestic public debt. Jaimovich and Panizza (2006) and Panizza (2007) were a first effort to collect such data. However, these datasets do not include information on the composition of domestic debt. Jeanne and Guscina (2006) and Cowan, Levy Yeyati, Panizza and Sturzenegger (2006) contain information on debt composition but cover relative small samples of countries (13 emerging markets in the case of Jeanne and Guscina, and 22 Latin American and Caribbean countries in the case of Cowan et al.). Given the limited data on the composition of domestic debt, we decompose public debt as:

[16] The figure decomposes LTPUOC into its concessional (LTPUOCC) and non-concessional (LTPUONC) components.

[17] Formally: NPVOC= NPVPUTD- LTPUPC. Where NPVPUTD is the net present value of total long-term external public debt (this is the value reported by Dikhanov (2007) and NPVOC is the net present value of debt extended by public creditors.

$$PU = DD + LTPUPC + NPVOC \quad (5)$$

Where DD is domestic public debt and the other variables are defined as above. There are two problems with this decomposition. First, it does not include short-term external public debt. Second, while external debt is often measured at the central or general government level, domestic debt is often measured at the central government level. Figure 2 describes the evolution of the level and composition of public debt for all developing countries for which we have data and shows the increasing importance of domestic debt.

4 Debt composition and the probability of a debt crisis

The objective of this section is to study how debt level and composition affect the probability of a debt crisis. We do so by using a probit estimation method and model the probability of a debt crisis by using the following specification:

$$\Pr\left(D_{i,t} = 1\right) = \Phi\left(\beta' X_{i,t-1}\right) \quad (5)$$

Within this set up, $D_{i,t}$ is a dummy variable that takes value one in the year in which country *i* suffers a debt crisis and zero otherwise and $X_{i,t-1}$ is a set of explanatory variables measured in the period that precedes the debt crisis. We estimate the above model using an unbalanced panel of up to 78 developing countries covering the 1980-2006 period.

In order to estimate the model of Equation (5), we need a workable definition of debt crisis. The existing literature uses two different ways to define a debt crisis. Some papers (e.g., Kraay and Nehru, 2006 and Detragiache and Spilimbergo, 2001) look at arrears on external debt, Paris club rescheduling, and large IMF programs. Other papers (e.g., Manasse et al, 2003, Levy Yeyati and Panizza, 2006, Borensztein and Panizza, 2006) focus on the Standard & Poors' definition of selective defaults. The main advantage of the first definition is that it tends to be broader and also include countries that suffered from debt distress episodes but did not formally default on their external debt. Moreover, this definition may include debt crises in low income countries that are not covered by S&P. The main advantage of the S&P definition is that it provides a more precise timing of the crisis and contains information on how long it took to resolve the debt crisis.[18] In our baseline estimations we will use the S&P definition of debt default, but we will also check whether our results are robust to using the Detragiache and Spilimbergo's (2001) classification of debt crisis.

Using the S&P definition, we identify 91 debt default episodes (Table 3). About two thirds of these episodes took place in the 1980s and the remaining third in the 1990-2006 period. The two regions with the highest number of episodes are Sub- Saharan Africa and Latin America. One caveat with our dataset is that we have limited information on debt composition for the 1980s, hence our statistical exercise does not include all the defaults listed in Table 3. In fact, some of our regressions include as little as 23 default episodes.

[18] In estimating our model, we recognize that the resolution of a defaults episode is usually a lengthy process (Borensztein, and Panizza, 2006, show that the average default episode lasted approximately 8 years in the 1970s and 1980s and 4 years in the 1990s) and that it would not be appropriate to treat the period during which the country is in default as either a "tranquil" period or to consider it as the same as the first year of the default episode. As a consequence, we only include in our sample the first year of each default episode and exclude all the other years of the default episode. Thus, if a country defaulted in 1985 and remained in default until 1992, we drop from our sample the entire 1986-1992 period.

Our set of explanatory variables can be divided into two sub-groups. The first group includes various measures of debt level and composition. These variables, which are discussed in the previous section, are the focus of our analysis. The second group of variables includes nine macroeconomic and institutional variables that are likely to be correlated with the probability of a debt crisis.

We use the following macroeconomic and institutional variables; (i) GDP growth (GR). As Levy Yeyati and Panizza (2006) showed that recessions tend to precede default episodes, we expect a negative relationship between GDP growth and the probability of default. (ii) International reserves over GDP (RES). As large war chests of reserve can help in dealing with liquidity crises, we expect a negative relationship between international reserves and the probability of default. (iii) Trade openness (OPEN). The relationship between openness and the probability of default is uncertain. On the one hand, more open countries tend to receive larger external trade shocks. On the other hand, for any given external financial shocks, more open countries require a smaller adjustment of the real exchange rate and this may reduce the probability of default (Calvo et al., 2001). (iv) Undervaluation of the exchange rate (UNDER). Defaults often go hand in hand with large devaluations and large devaluations are more likely to happen in presence of overvalued exchange rates (Goldfajn and Valdes, 1999). Thus, we expect a negative relationship between undervaluation and the probability of default. (v) The growth rate of private credit (GRCR). As credit booms often precede defaults episodes, we expect a positive correlation between GRCR and the probability of default. (vi) The fiscal and current account balance (FBAL, CBAL). Defaults may be driven by fiscal problems or large current account deficits. (vii) Inflation (INF) can be an index of low policy credibility and thus we expect a positive correlation between INF and the probability of default. (viii) Control of corruption (CORR). As Kraay and Nehru (2006) showed that good policies and institutions play an important role in reducing the probability of a debt distress episode, we expect a negative correlation between CORR and the probability of default (unfortunately, we do not have access to the CPIA which is the time-varying measure of institutions and policies used by Kraay and Nehru, 2006).

Before discussing the results, it should be mentioned that there are at least two problems with our econometric exercise. The first has to do with the quality and coverage of public debt data. The second has to do with the fact that debt structure is likely to be endogenous with respect to the probability of default. Countries that are getting close to the point of default may not be able to borrow long term from private creditors and are more likely to rely on financing from official creditors (especially multilateral institutions). Hence, in the years preceding the default event we will observe a switch in debt composition which, in our estimates, may bias downward the estimated relationship between LTPR and LTPUPC and the probability of default and bias upward the estimated relationship between LTPUOC and the probability of default. At this stage, besides acknowledging it and discussing the possible direction of the bias, there is not much we can do to address the endogeneity problem. However, in future work, one could use more sophisticated econometric techniques (for instance, Rigobon, 2003) to deal with endogeneity.

4.1 Results

Table 4 reports our baseline estimates. Columns 1-5 only include external debt, columns 6-8 include both external debt and domestic public debt. Before discussing the effect of debt level and composition, we describe the relationship between the probability of default and the macroeconomic and policy variables.

We find a negative and often statistically significant effect of GDP growth and international reserves. The undervaluation variable has the expected negative coefficient but is never statistically significant. Trade openness is often associated with a lower probability of debt default, but the coefficient is statistically significant in less than half of the regressions (and in

one case is positive and statically significant). Credit growth has the expected positive sign and is statistically significant in 4 out of 8 regressions. Inflation has often the expected positive sign but it is never statistically significant and control of corruption has the expected negative sign but is never statistically significant. The fiscal balance has the expected negative sign and is statistically significant in 3 out of 8 regressions and the current account balance has the expected negative sign but is statistically significant only in 1 regression.

We are now ready to describe the effect of the debt variables. Column 1 looks at the impact of total external debt (measured as a share of GDP) and finds that this variable has a *negative* and marginally significant correlation with the probability of default. This indicates that total debt may be too broad of an indicator to capture the relationship between external debt and the probability of a default episode. Column 2 decomposes external debt into its short-term and long-term components and finds that both coefficients are negative but not statistically significant. In column 3, we find the first evidence of the importance of debt composition. We now find that short-term external debt and long-term private external debt have positive but not statistically significant coefficients (the coefficients are also of equal magnitude), that long-term public debt owed to official creditors has a negative and non-significant coefficient, and long-term public debt owed to private creditors has a positive and statistically significant coefficient. This is consistent with our hypothesis that borrowing from the market is riskier than borrowing from official lenders. Note that the bias introduced by reverse causality would go against finding such a result. In fact, in the period before a crisis, private creditors are likely to refuse to roll-over their loans (and thus they contribute to the crisis) and official creditors may step-in with emergency financing. This behavior should amplify the coefficient for official debt and shrink that for debt owed to private creditors.

In column 4, we check if debt composition can play a role in shielding countries from external financial shocks. In particular, we interact LTPUPC and NPVOC with an external financial shock (we use the demeaned level of the US interest rate). The interacted variables tell us whether the behavior of the US interest rate (a measure of global liquidity) affects different types of debt in a different way. We find that such external financial shock increases the relationship between the level of external debt and the probability of default for both LTPUPC and NPVOC. However, the impact on LTPUPC is seven times larger than that on NPVOC. This indicates that the relationship between default risk and debt with private creditors is much more sensitive to external shocks than the relationship between default risk and debt with official creditors.

The discussion of Section 3 suggests that external debt denominated in domestic currency is likely to be less risky than external debt denominated in foreign currency. To check whether the currency composition of LTPUPC affects the vulnerabilities arising from this type of debt we interact LTPUPC with a variable that takes value one for countries with low levels of original sin. These are a handful of countries which can borrow abroad in their own currency.[19] So, we now have two coefficients attached to LTPUPC:

$$\beta_1 LTPUPC + \beta_2 (LTPUPC * LOWOSIN) \qquad (6)$$

Where LOWOSIN is a dummy variable that takes value 1 for countries with low original sin and zero otherwise. β_1 measures how LTPUPC affects the probability of a debt default in countries with high original sin and $\beta_1 + \beta_2$ measures how LTPUPC affect the probability of a debt default in countries with low original sin. Column 5 shows that the interacted coefficient is negative and statistically significant. Moreover, the magnitude of the coefficient is similar to the one of the

[19] We define as having low original sin all countries that have an average level of original sin below 0.8. For a discussion of the index of original sin see Eichengreen, Hausmann, and Panizza (2005).

non-interacted variable and hence $\beta_1 + \beta_2$ is close to zero, indicating that in countries with low levels of original sin there is no statistically significant correlation between LTPUPC and the probability of a debt crisis.

In column 6 we introduce domestic public debt (the sample becomes smaller because of the limited information of the level of domestic public debt). We find no significant correlation between domestic public debt and the probability of default and a negative and significant effect of external public debt owed to official creditors. All the other components of external debt (including private debt) are positively and significantly correlated with the probability of default and have coefficients of similar magnitude. One interesting finding of column 6 is the negative (albeit not significant) correlation between domestic public debt and the probability of default. Another interesting finding is that the inflation coefficient switches sign (from positive to negative). This is not surprising, when we control for domestic debt we explicitly recognize that the government has an alternative mechanism for diluting its debt obligations and this mechanism is inflation.[20]

In column 7 we introduce the interaction with the external financial shock, but in this case we find no difference between different types of external debt. In column 8 we still find that external debt is less dangerous in countries with low levels of original sin.

Robustness analysis

In Table 5 we instrument debt composition with its lagged value (admittedly not the best identification strategy) and find results that are similar to those of Table 4 (however, the interactions with low original sin are no longer significant). In Table 6, we augment the S&P definition of default with that developed by Detragiache and Spilimbergo (2001) and find results that are similar to those of Table 4. In Table 7, we control for period fixed effects and still find results that are similar to those of Table 4. In Table 8, we move from annual data to three-year averages. In these regressions the probability of a default episode in time *t* to *t+3* is modeled as a function of the behavior of the explanatory variables over the *t-4* to *t-1* period. We still find results that are similar to those of Table 4.

4.2 Credit Ratings

One problem with the empirical analysis of Tables 4-8 is that debt defaults are rare events. Hence, our dependent variable cannot discriminate between countries that went very close to a default episode but did not default and countries where the probability of default was close to zero. In this section, we use the same set of explanatory variables used in the previous section to explain sovereign credit ratings. In particular, our dependent variables takes value one for countries with AAA S&P credit rating and increases by one point for every notch down the credit rating scale (up to 20 for countries with a CC credit rating).

By focusing on credit ratings we can discriminate between countries on the verge of default (i.e. countries with a CC rating) and countries that are far away from default (countries with an investment grade rating). Moreover, the semi-continuous nature of credit ratings allows us to control for country fixed effects and thus reduce potential omitted variable bias. There are two problems associated with working with credit ratings. First, credit rating data are available for a relatively small set of countries and a short period. Second, credit ratings tend to be a subjective perception of the probability of default and research has shown that, in some cases, they are lagging rather than leading indicators of the probability of default (El Khuory, 2008).

[20] In Chapter 2 of *A Tract on Monetary Reform* Keynes (1924) noted that most governments prefer inflation to explicit default but discussed that, given its distributional effects, this is not necessarily an optimal policy.

Table 9 reports our random effects regressions. Column 1 shows that total debt (external plus domestic public debt) is significantly correlated with credit ratings. While the coefficient is statistically significant, the point estimate is rather low and indicates that doubling the debt to GDP ratio would lead to a 0.7 notches reduction in credit rating. Column 2 shows that the effect of long-term debt is positive and that of short-term debt is negative. This is a puzzling result which may be driven by endogeneity. Column 3 shows that external debt owed to private creditors has a negative effect on credit ratings, while other forms of long-term borrowing have no significant correlation with credit rating. The effect of PUPRC is large. The point estimate suggests that doubling this type of debt would lead to a 10-notches drop in credit ratings. We still find the puzzling result that larger short-term debt is significantly correlated with higher credit ratings. In column 4, we find no differential effect of the external financial shock, but in column 5, we still find that external debt is less risky in countries that can borrow abroad in their own currency. Column 6 shows that higher domestic debt is associated with lower credit ratings, but the coefficient attached to the domestic debt variable is about one third that of PUPRC. This suggests that public external debt with private creditors is three times riskier than domestic public debt. Columns 7 and 8 look at the effect of external shocks and original sin. While the interacted terms go in the right direction, they are never statistically significant.

Table 10 reports fixed effects regression. The results are basically identical to those obtained with the random effects regressions.

5 Conclusions

This paper argues that different types of debt can be ranked by risk and the risk ranking is more or less the following: (i) external public debt with private creditors in foreign currency; (ii) domestic public debt; (iii) external public debt with official creditors. With respect to private debt, the regressions do not yield a consistent message.

Although the increasing importance of domestic borrowing is often recognized, most debt sustainability analyses in both middle and low income countries concentrate on external debt. The standard justification for this approach is that external and domestic public debt have different default risk and hence cannot be simply added to each other to form a single indicator of total public debt. While much more work is needed to establish relative risk, estimates along the line suggested in this paper could be used to build an aggregated debt ratio which gives different weights to different types of debt. Such debt ratio, where "riskier" types of debt have a higher weight than safer types of debt, would be superior to the current practice of either assigning the same weight to all types of debt or of assigning a weight of one to all types of external debt and a weight of zero to all other types of debt.

Better information on debt structure and more research on vulnerabilities arising from different types of debt could help in designing such an indicator. This would, in turn, improve debt management and reduce the probability of debt crises through better tracking of debt risks. As the main obstacle to conducting such research is data availability, an international agreement aimed at providing better and comparable data on debt structure would really be a global public good (see Action 5 in the Shadow Consensus discussed in Panizza, 2008).

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Table 1: Ideal classification of external debt

	Private sector debt	Public sector debt		
		Private Lenders	Official lenders	
			Concessional	Non-concessional
Domestic Currency Long-term	Bonds Bank loans	Bonds Bank loans	X	X
Domestic Currency Short-term	Bonds Bank loans	Bonds Bank loans		
Foreign Currency Long-term	Bonds Bank loans	Bonds Bank loans	X	X
Foreign Currency Short-term	Bonds Bank loans	Bonds Bank loans		

Table 2: Ideal classification of domestic public debt

	Long-term	Short-term
Domestic currency nominal	X	X
Domestic currency indexed to prices	X	X
Domestic currency indexed to the interest rate	X	X
Foreign currency	X	X

Table 3: Distribution of default episodes, S&P definition

Region	1980-1989	1990-2006	**Total**
EAP	2	3	**5**
ECA	5	6	**11**
LAC	25	8	**33**
MNA	4	1	**5**
SAS	0	1	**1**
SSA	25	11	**36**
Total	**61**	**30**	**91**

Table 4: Probit Estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	-0.002							
	(1.95)*							
llt_y		-0.008						
		(0.71)						
lst_y		-0.011	0.024	0.042	0.023	0.004	0.000	0.002
		(0.27)	(0.54)	(1.28)	(0.52)	(3.24)***	(3.23)***	(3.52)***
lpuprc_y			0.114	0.069	0.126	0.004	0.000	0.002
			(4.73)***	(3.52)***	(5.41)***	(3.95)***	(3.06)***	(4.47)***
lnpvoff_y			-0.003	-0.006	-0.003	-0.000	-0.000	-0.000
			(1.42)	(2.62)***	(1.45)	(4.00)***	(1.22)	(4.11)***
lpriv_y			0.025	0.014	0.020	0.003	0.000	0.002
			(0.56)	(0.46)	(0.48)	(2.39)**	(2.34)**	(2.68)***
ldomd_y						-0.000	-0.000	-0.000
						(0.65)	(0.79)	(1.12)
losin_int1					-0.108			-0.002
					(3.08)***			(3.44)***
lnpvoff_yint				0.001			0.000	
				(3.27)***			(1.05)	
lpuprc_yint				0.007			0.000	
				(1.69)*			(0.31)	
lgr	-0.076	-0.083	-0.046	-0.040	-0.039	-0.001	-0.000	-0.001
	(2.62)***	(2.54)**	(1.93)*	(2.23)**	(1.71)*	(1.19)	(1.53)	(0.94)
lres	-0.294	-0.303	-0.209	-0.122	-0.200	-0.011	-0.000	-0.006
	(2.51)**	(2.49)**	(2.18)**	(1.53)	(2.29)**	(3.47)***	(3.06)***	(3.62)***
lopen	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.72)*	(1.42)	(0.64)	(1.04)	(0.99)	(1.74)*	(1.66)*	(2.33)**
lunder	-0.007	-0.008	-0.007	-0.006	-0.008	-0.000	-0.000	-0.000
	(0.94)	(0.98)	(1.16)	(1.42)	(1.33)	(1.20)	(1.49)	(1.48)
lcr	0.017	0.013	0.025	0.019	0.025	0.001	0.000	0.001
	(1.01)	(0.87)	(1.60)	(1.67)*	(1.71)*	(1.69)*	(2.03)**	(1.85)*
lbal	-0.096	-0.095	-0.067	-0.056	-0.061	-0.006	-0.000	-0.004
	(1.15)	(1.07)	(0.99)	(1.13)	(0.95)	(2.41)**	(2.70)***	(2.97)***
lcabp	-0.000	-0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.44)	(0.65)	(0.05)	(0.65)	(0.11)	(0.85)	(2.08)**	(0.68)
linf	0.019	0.020	0.006	0.005	0.003	-0.000	-0.000	-0.000
	(1.56)	(1.54)	(0.70)	(0.76)	(0.38)	(0.72)	(0.29)	(1.16)
lcorr	-0.003	-0.002	-0.005	-0.003	-0.004	-0.000	-0.000	-0.000
	(0.68)	(0.49)	(1.38)	(1.09)	(1.31)	(1.32)	(0.97)	(1.71)*
Observations	1097	1097	1097	1088	1097	734	731	734

Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Instrumental Variables Probit Estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	-0.035							
	(0.90)							
llt_y		-0.582						
		(1.79)*						
lst_y		0.614	0.706	3.273	0.606	15.183	48.633	16.450
		(0.92)	(0.52)	(1.83)*	(0.45)	(2.97)***	(2.25)**	(2.99)***
lpuprc_y			1.931	0.596	2.480	2.253	1.927	3.198
			(2.23)**	(0.55)	(2.64)***	(0.63)	(0.37)	(0.77)
lnpvoff_y			-0.063	-0.380	-0.065	-2.205	-2.345	-2.410
			(1.35)	(1.76)*	(1.46)	(2.32)**	(2.72)***	(2.40)**
lpriv_y			0.525	-0.056	0.404	-1.828	-3.791	-1.227
			(0.40)	(0.04)	(0.31)	(0.38)	(0.61)	(0.24)
ldomd_y						3.790	3.290	3.560
						(0.94)	(0.75)	(0.81)
losin_int1					-2.176			-3.334
					(1.25)			(0.55)
lnpvoff_yint				0.059			-0.360	
				(2.00)**			(1.09)	
lpuprc_yint				0.465			1.123	
				(2.41)**			(1.06)	
lgr	-1.367	-1.658	-1.125	-2.869	-1.040	-13.095	-6.534	-14.346
	(2.38)**	(2.90)***	(1.66)*	(2.80)***	(1.54)	(2.50)**	(0.94)	(2.55)**
lres	-5.862	-5.444	-5.446	-3.982	-5.408	-16.311	-15.720	-18.736
	(3.64)***	(3.39)***	(3.36)***	(2.26)**	(3.42)***	(3.01)***	(2.36)**	(3.15)***
lopen	0.003	0.002	-0.002	-0.001	-0.003	0.012	-0.028	0.011
	(1.26)	(0.77)	(0.58)	(0.23)	(0.89)	(0.84)	(1.06)	(0.68)
lunder	-0.093	-0.119	-0.134	-0.216	-0.173	-0.471	0.008	-0.586
	(0.47)	(0.59)	(0.62)	(0.88)	(0.75)	(0.80)	(0.01)	(0.89)
lcr	0.506	0.247	0.645	0.332	0.672	-1.871	-3.012	-2.349
	(1.14)	(0.54)	(1.25)	(0.63)	(1.29)	(0.80)	(0.99)	(0.92)
lbal	-1.572	-1.613	-0.904	-3.935	-0.742	-19.178	12.788	-23.292
	(0.90)	(0.91)	(0.49)	(1.66)*	(0.40)	(2.02)**	(0.56)	(2.27)**
lcabp	-0.015	-0.025	-0.010	0.014	-0.009	0.108	0.054	0.102
	(1.10)	(1.69)*	(0.65)	(0.81)	(0.63)	(1.36)	(0.49)	(1.24)
linf	0.212	0.227	0.066	0.398	0.005	5.213	-3.075	5.603
	(0.66)	(0.72)	(0.21)	(1.02)	(0.02)	(1.70)*	(0.55)	(1.71)*
lcorr	-0.028	-0.010	-0.068	-0.056	-0.061	-0.384	0.283	-0.498
	(0.37)	(0.13)	(0.85)	(0.64)	(0.75)	(1.06)	(0.49)	(1.24)
Observations	1049	1049	1049	1030	1049	683	676	683

Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%, All debt variables are instrumented with their lagged values.

Table 6: Probit Estimations, alternative definition of default

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	-0.003							
	(2.32)**							
llt_y		-0.015						
		(1.02)						
lst_y		-0.020	0.004	0.026	0.003	0.013	0.002	0.009
		(0.44)	(0.08)	(0.61)	(0.05)	(2.36)**	(1.99)**	(2.55)**
lpuprc_y			0.133	0.088	0.153	0.012	0.001	0.010
			(4.12)***	(3.09)***	(5.07)***	(2.79)***	(2.37)**	(3.50)***
lnpvoff_y			-0.004	-0.007	-0.004	-0.001	-0.000	-0.001
			(1.67)*	(2.35)**	(1.68)*	(3.34)***	(1.53)	(3.53)***
lpriv_y			0.037	0.027	0.031	0.012	0.001	0.009
			(0.66)	(0.62)	(0.59)	(2.18)**	(2.20)**	(2.47)**
ldomd_y						-0.001	-0.000	-0.002
						(0.55)	(0.59)	(0.93)
losin_int1					-0.168			-0.012
					(3.82)***			(3.72)***
lnpvoff_yint				0.001			0.000	
				(2.89)***			(1.10)	
lpuprc_yint				0.009			0.000	
				(1.53)			(0.27)	
lgr	-0.066	-0.075	-0.039	-0.039	-0.031	-0.004	-0.001	-0.003
	(1.91)*	(1.97)**	(1.26)	(1.54)	(1.05)	(1.09)	(1.27)	(0.82)
lres	-0.399	-0.410	-0.322	-0.227	-0.304	-0.046	-0.005	-0.033
	(2.85)***	(2.79)***	(2.49)**	(1.98)**	(2.60)***	(4.16)***	(3.88)***	(4.31)***
lopen	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.29)	(1.14)	(0.83)	(1.10)	(1.26)	(0.89)	(0.78)	(1.46)
lunder	-0.010	-0.011	-0.010	-0.010	-0.012	-0.001	-0.000	-0.001
	(1.14)	(1.21)	(1.36)	(1.62)	(1.53)	(1.29)	(1.44)	(1.52)
lcr	0.013	0.006	0.020	0.015	0.021	0.000	0.000	0.000
	(0.70)	(0.41)	(1.00)	(0.94)	(1.10)	(0.03)	(0.06)	(0.10)
lbal	-0.119	-0.138	-0.102	-0.089	-0.096	-0.031	-0.004	-0.026
	(1.50)	(1.59)	(1.39)	(1.47)	(1.38)	(2.68)***	(2.87)***	(3.49)***
lcabp	-0.001	-0.001	-0.000	-0.000	-0.000	-0.000	0.000	-0.000
	(0.78)	(1.11)	(0.49)	(0.06)	(0.42)	(0.28)	(0.03)	(0.41)
linf	0.013	0.015	0.001	0.002	-0.003	-0.001	-0.000	-0.001
	(0.96)	(1.00)	(0.11)	(0.19)	(0.31)	(0.74)	(0.52)	(1.17)
lcorr	-0.003	-0.002	-0.005	-0.003	-0.004	-0.001	-0.000	-0.000
	(0.62)	(0.42)	(1.21)	(0.95)	(1.16)	(1.23)	(1.01)	(1.41)
Observations	1097	1097	1097	1088	1097	734	731	734

Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Probit Estimations, controlling for period fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	-0.002							
	(2.01)**							
llt_y		0.002						
		(0.20)						
lst_y		-0.023	0.020	0.039	0.018	0.003	0.000	0.001
		(0.71)	(0.49)	(1.26)	(0.46)	(3.40)***	(3.23)***	(3.49)***
lpuprc_y			0.086	0.060	0.099	0.003	0.000	0.002
			(3.46)***	(3.09)***	(4.23)***	(4.12)***	(4.04)***	(4.80)***
lnpvoff_y			-0.003	-0.005	-0.003	-0.000	-0.000	-0.000
			(1.42)	(2.46)**	(1.43)	(3.87)***	(1.03)	(3.66)***
lpriv_y			0.039	0.023	0.032	0.002	0.000	0.001
			(0.93)	(0.77)	(0.81)	(2.33)**	(2.24)**	(2.67)***
ldomd_y						-0.000	-0.000	-0.000
						(0.18)	(0.72)	(0.74)
losin_int1					-0.100			-0.001
					(3.06)***			(3.66)***
lnpvoff_yint				0.001			0.000	
				(2.81)***			(0.86)	
lpuprc_yint				0.001			-0.000	
				(0.27)			(0.16)	
lgr	-0.071	-0.074	-0.045	-0.036	-0.038	-0.001	-0.000	-0.000
	(2.96)***	(2.78)***	(2.04)**	(2.16)**	(1.79)*	(0.95)	(1.26)	(0.73)
lres	-0.173	-0.188	-0.133	-0.098	-0.126	-0.007	-0.000	-0.004
	(1.90)*	(2.04)**	(1.53)	(1.42)	(1.60)	(3.30)***	(3.26)***	(3.53)***
lopen	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.93)*	(1.56)	(0.20)	(0.39)	(0.59)	(2.12)**	(2.22)**	(2.79)***
lunder	-0.010	-0.011	-0.009	-0.007	-0.010	-0.000	-0.000	-0.000
	(1.55)	(1.52)	(1.62)	(1.67)*	(1.75)*	(1.83)*	(2.00)**	(2.05)**
lcr	0.015	0.015	0.022	0.016	0.022	0.001	0.000	0.000
	(1.09)	(1.24)	(1.48)	(1.57)	(1.60)	(2.36)**	(3.07)***	(2.37)**
lbal	-0.045	-0.037	-0.045	-0.038	-0.040	-0.005	-0.000	-0.003
	(0.65)	(0.50)	(0.76)	(0.82)	(0.70)	(2.55)**	(2.97)***	(3.50)***
lcabp	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.01)	(0.14)	(0.50)	(0.67)	(0.54)	(2.22)**	(2.94)***	(2.02)**
linf	0.018	0.018	0.008	0.005	0.004	-0.000	-0.000	-0.000
	(1.89)*	(1.83)*	(1.00)	(0.89)	(0.62)	(0.87)	(0.40)	(1.16)
lcorr	-0.002	-0.001	-0.004	-0.002	-0.003	-0.000	-0.000	-0.000
	(0.45)	(0.19)	(1.08)	(0.95)	(1.09)	(1.37)	(1.02)	(1.47)
Observations	1097	1097	1097	1088	1097	734	731	734

Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%. Period fixed effects included in the estimations but not reported in the table.

Table 8: Probit Estimations, 3-year periods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	-0.007							
	(2.00)**							
llt_y		-0.065						
		(1.39)						
lst_y		0.127	0.189	0.298	0.192	0.152	0.003	0.138
		(0.64)	(0.93)	(2.02)**	(0.94)	(3.04)***	(2.89)***	(3.15)***
lpuprc_y			0.388	0.111	0.432	0.091	0.001	0.086
			(3.26)***	(1.23)	(3.50)***	(2.81)***	(1.33)	(2.94)***
lnpvoff_y			-0.012	-0.024	-0.012	-0.002	-0.000	-0.001
			(1.73)*	(2.10)**	(1.73)*	(0.78)	(1.28)	(0.71)
lpriv_y			0.100	0.070	0.109	0.040	0.001	0.041
			(0.41)	(0.48)	(0.44)	(0.83)	(1.08)	(0.90)
ldomd_y						-0.099	-0.002	-0.095
						(3.67)***	(2.43)**	(3.38)***
losin_int1					-0.198			-0.035
					(1.00)			(0.96)
lnpvoff_yint				0.004			0.000	
				(2.20)**			(1.77)*	
lpuprc_yint				0.063			0.000	
				(2.74)***			(1.93)*	
lgr	-0.145	-0.181	-0.047	-0.114	-0.040	-0.003	-0.001	-0.003
	(1.08)	(1.29)	(0.41)	(1.48)	(0.36)	(0.14)	(1.19)	(0.15)
lres	-0.910	-0.895	-0.748	-0.335	-0.741	-0.247	-0.004	-0.222
	(2.12)**	(2.05)**	(1.76)*	(1.08)	(1.77)*	(2.68)***	(2.14)**	(2.71)***
lopen	0.001	0.001	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.72)*	(1.34)	(0.24)	(0.74)	(0.41)	(1.46)	(1.91)*	(1.63)
lunder	0.006	0.003	0.004	-0.000	0.003	-0.000	-0.000	-0.000
	(0.21)	(0.09)	(0.18)	(0.01)	(0.11)	(0.05)	(0.34)	(0.10)
lcr	0.047	0.013	0.064	0.006	0.066	0.012	-0.000	0.012
	(0.92)	(0.26)	(1.31)	(0.20)	(1.36)	(0.97)	(0.96)	(1.08)
lbal	0.610	0.670	0.622	0.385	0.609	-0.087	-0.000	-0.092
	(1.90)*	(1.86)*	(1.94)*	(1.52)	(1.87)*	(0.79)	(0.22)	(0.93)
lcabp	-0.005	-0.006	-0.003	-0.001	-0.003	0.000	0.000	0.000
	(1.60)	(2.22)**	(1.16)	(0.55)	(1.10)	(0.19)	(1.60)	(0.19)
linf	0.021	0.013	-0.030	-0.013	-0.037	-0.015	-0.000	-0.015
	(0.38)	(0.22)	(0.66)	(0.39)	(0.85)	(1.91)*	(0.84)	(2.06)**
lcorr	-0.027	-0.026	-0.030	-0.013	-0.029	-0.007	-0.000	-0.007
	(1.70)*	(1.71)*	(2.06)**	(1.34)	(2.08)**	(1.85)*	(1.10)	(1.99)**
Observations	373	373	373	373	373	249	249	249

Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Credit ratings, random effects estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	0.675							
	(2.96)***							
llt_y		6.049						
		(6.91)***						
lst_y		-8.301	-7.802	-7.518	-7.574	-5.806	-5.331	-5.831
		(3.80)***	(3.59)***	(3.44)***	(3.49)***	(2.67)***	(2.42)**	(2.68)***
lpuprc_y			10.171	9.187	11.099	9.654	8.768	10.323
			(7.61)***	(6.52)***	(7.70)***	(6.79)***	(5.50)***	(6.45)***
lnpvoff_y			0.122	0.191	0.082	0.188	0.266	0.157
			(0.52)	(0.82)	(0.35)	(0.81)	(1.16)	(0.67)
lpriv_y			-1.463	-1.748	-1.735	-1.270	-1.528	-1.397
			(1.10)	(1.30)	(1.29)	(0.98)	(1.15)	(1.07)
ldomd_y						2.662	2.315	2.459
						(3.09)***	(2.64)***	(2.74)***
losin_int1					-5.195			-2.877
					(1.67)*			(0.87)
lnpvoff_yint				0.046			0.037	
				(1.06)			(0.86)	
lpuprc_yint				-0.293			-0.183	
				(1.14)			(0.65)	
lgr	-2.562	-2.084	-1.880	-2.031	-1.928	-1.543	-1.607	-1.568
	(3.46)***	(3.02)***	(2.78)***	(2.90)***	(2.86)***	(2.27)**	(2.27)**	(2.30)**
lres	-2.942	-2.936	-2.746	-3.345	-2.447	-3.865	-4.227	-3.627
	(2.05)**	(2.18)**	(2.03)**	(2.51)**	(1.80)*	(2.84)***	(3.19)***	(2.62)***
lopen	-0.010	-0.011	-0.000	-0.001	-0.002	-0.003	-0.003	-0.005
	(1.89)*	(2.05)**	(0.03)	(0.12)	(0.39)	(0.59)	(0.62)	(0.83)
lover	0.564	1.267	0.952	0.959	0.971	1.086	1.052	1.076
	(1.16)	(2.64)***	(2.03)**	(1.98)**	(2.08)**	(2.36)**	(2.20)**	(2.34)**
lcr	0.411	0.727	0.764	0.761	0.778	1.036	1.018	1.029
	(0.76)	(1.44)	(1.55)	(1.51)	(1.58)	(2.16)**	(2.06)**	(2.15)**
lbal	-20.434	-15.919	-15.101	-14.436	-14.944	-14.456	-14.268	-14.471
	(5.11)***	(4.19)***	(4.08)***	(3.75)***	(4.05)***	(3.93)***	(3.75)***	(3.94)***
lcabp	0.084	0.073	0.076	0.077	0.078	0.095	0.095	0.096
	(4.26)***	(3.87)***	(4.12)***	(4.09)***	(4.26)***	(5.18)***	(5.06)***	(5.22)***
linf	1.903	2.003	1.324	1.274	1.254	1.078	1.001	1.039
	(2.79)***	(3.13)***	(2.08)**	(1.91)*	(1.98)**	(1.75)*	(1.54)	(1.69)*
lcorr	0.122	0.070	0.044	0.030	0.071	0.117	0.092	0.128
	(1.09)	(0.66)	(0.42)	(0.28)	(0.68)	(1.15)	(0.86)	(1.25)
Observations	342	342	342	342	342	332	332	332
N of countries	40	40	40	40	40	37	37	37

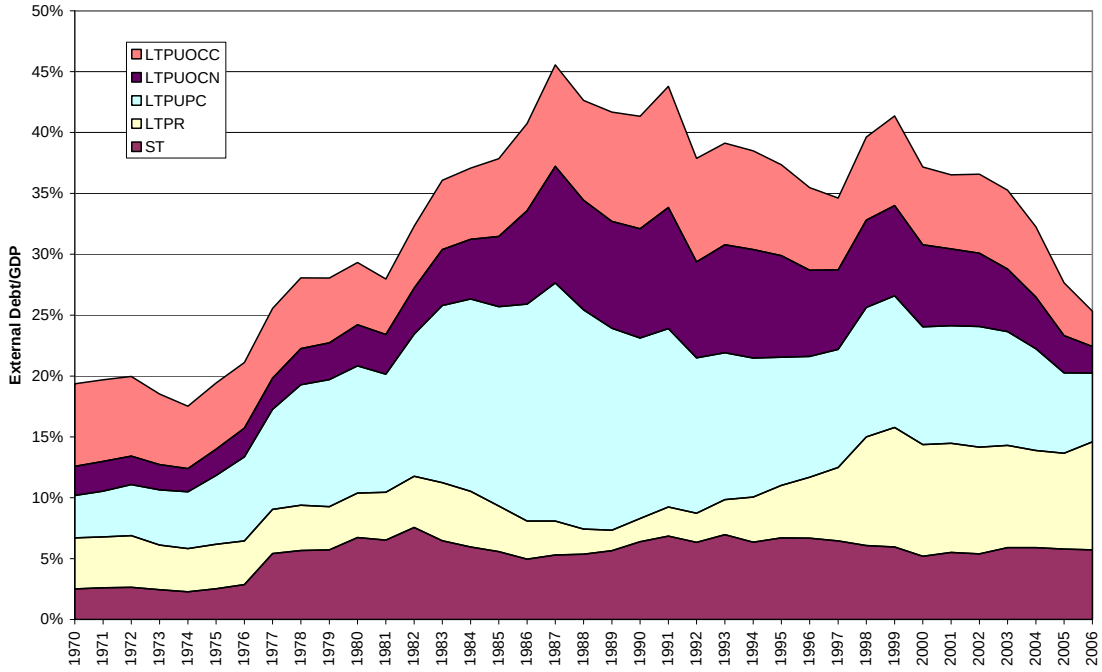
Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Credit ratings, fixed effects estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
led_y	0.819							
	(2.82)***							
llt_y		5.867						
		(5.88)***						
lst_y		-9.934	-8.197	-8.157	-7.938	-6.545	-6.653	-6.551
		(4.16)***	(3.54)***	(3.49)***	(3.43)***	(2.83)***	(2.81)***	(2.83)***
lpuprc_y			11.804	11.642	12.863	10.832	10.899	11.367
			(7.88)***	(7.53)***	(7.83)***	(6.77)***	(6.25)***	(6.14)***
lnpvoff_y			0.104	0.108	0.061	0.115	0.126	0.093
			(0.37)	(0.38)	(0.21)	(0.41)	(0.45)	(0.33)
lpriv_y			-1.439	-1.627	-1.773	-1.234	-1.302	-1.346
			(1.01)	(1.14)	(1.24)	(0.89)	(0.92)	(0.96)
ldomd_y						3.096	3.039	2.906
						(3.32)***	(3.18)***	(2.93)***
losin_int1					-5.533			-2.266
					(1.55)			(0.58)
lnpvoff_yint				0.041			0.024	
				(0.95)			(0.56)	
lpuprc_yint				-0.170			0.010	
				(0.66)			(0.04)	
lgr	-2.462	-2.131	-1.731	-1.786	-1.791	-1.497	-1.473	-1.517
	(3.32)***	(3.07)***	(2.56)**	(2.61)***	(2.66)***	(2.18)**	(2.12)**	(2.20)**
lres	-2.093	-2.389	-1.334	-1.546	-0.813	-2.970	-2.989	-2.717
	(1.20)	(1.46)	(0.85)	(0.97)	(0.50)	(1.88)*	(1.88)*	(1.66)*
lopen	-0.012	-0.011	0.002	0.002	-0.001	-0.002	-0.002	-0.004
	(1.85)*	(1.78)*	(0.33)	(0.37)	(0.16)	(0.34)	(0.31)	(0.55)
lover	0.434	1.211	1.100	1.134	1.119	1.242	1.216	1.226
	(0.88)	(2.44)**	(2.31)**	(2.34)**	(2.35)**	(2.61)***	(2.50)**	(2.57)**
lcr	0.385	0.682	0.724	0.736	0.715	1.028	1.045	1.011
	(0.70)	(1.31)	(1.45)	(1.47)	(1.44)	(2.09)**	(2.11)**	(2.05)**
lbal	-18.127	-14.581	-14.304	-13.732	-14.219	-14.027	-13.971	-14.071
	(4.42)***	(3.72)***	(3.81)***	(3.60)***	(3.79)***	(3.75)***	(3.69)***	(3.76)***
lcabp	0.089	0.075	0.071	0.072	0.073	0.091	0.091	0.091
	(4.39)***	(3.83)***	(3.80)***	(3.82)***	(3.92)***	(4.85)***	(4.84)***	(4.87)***
linf	1.814	1.980	1.161	1.050	1.070	1.010	0.918	0.973
	(2.66)***	(3.07)***	(1.82)*	(1.60)	(1.68)*	(1.63)	(1.43)	(1.56)
lcorr	0.181	0.115	0.101	0.098	0.121	0.168	0.156	0.171
	(1.56)	(1.05)	(0.96)	(0.91)	(1.14)	(1.61)	(1.45)	(1.63)
Observations	342	342	342	342	342	332	332	332
N. of countries	40	40	40	40	40	37	37	37

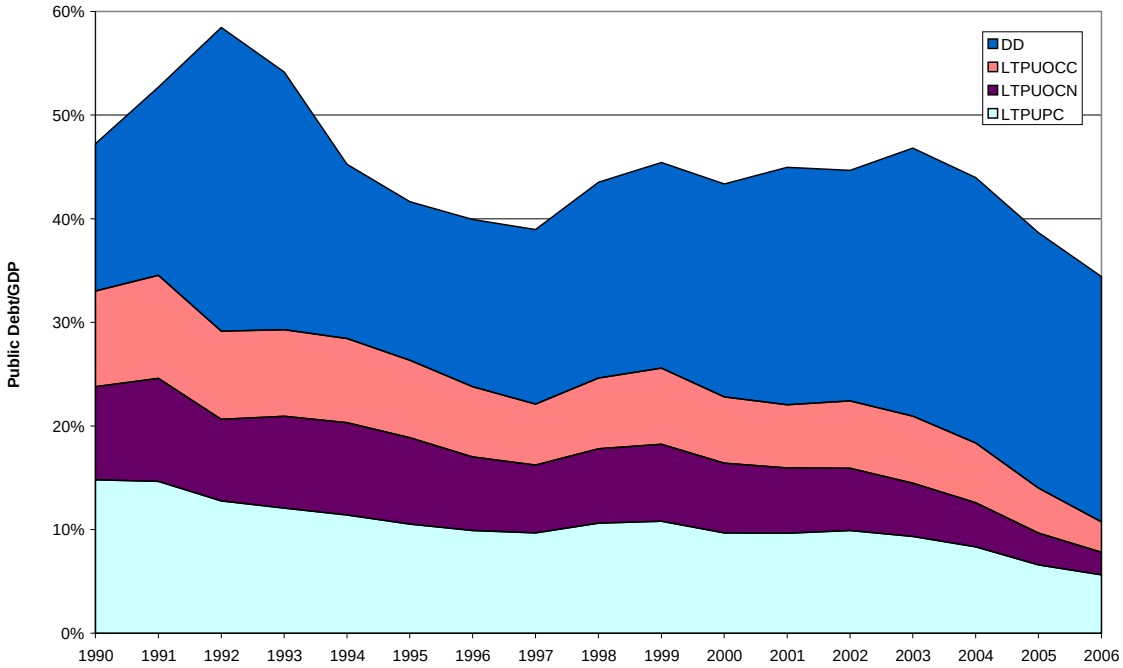
Robust z statistics in parentheses, standard errors clustered at the country level, * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1: Level and Composition of External Debt in Developing Countries



Source: Authors' elaborations based on GDF data

Figure 2: Level and Composition of Public Debt in Developing Countries



Source: Authors' elaborations based on GDF and Panizza (2007) data