The Debt Laffer Curve: Estimates for 1990-2005

Elena S. Bachvarova[1]

Professor Kent Kimbrough, Faculty Advisor

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Duke University
Durham, North Carolina
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[1] esb8@duke.edu

1 Abstract

This paper shows the Debt Laffer curve for all low- and middle-income countries for the period 1990-2005. Due to data limitations, only 127 of the 149 such countries are represented. Eastern Europe and Asia, with the exception of Myanmar and Lao PDR, do not suffer from debt overhang. Latin American countries tend to borrow around their threshold capacities, with only Nicaragua overborrowing. Africa is split in three—a third of the countries are on the wrong side, a quarter around the peak and the rest on the correct side.

2 Introduction

The debt Laffer curve was first introduced in the context of the "debt overhang" argument by Jeffrey Sachs (1989). Paul Krugman (1989) formalized the actual derivation of the curve and the underlying logic behind it. The curve illustrates a situation in which, if a country is borrowing too much, that is it surpasses a certain endogenous threshold of level of debt, which may result in efficiency losses. That is due partly to the magnitude of the debt burden and the inability of the country to invest part of its income because of servicing the debt. In such cases debt forgiveness is recommended, and it will come at a minimal cost for creditors: a reduction in the face value of the debt will not lead to a reduction in the expected value of the repayments because it will decrease the risk of default.

Over the time sovereign borrowing has taken many forms, most notably, though, is the difference of the composition of sovereign debt between the 1980s and 1990s. In the late 1970s, lending to sovereigns was made possible mainly through commercial loans due to the "petrodollar recycling." This wave of excessive lending was followed by a series of defaults on the 1980s. The situation required the serious intervention of international financial institutions, and there were several approaches to dealing with these debt crises, one of which was the famous Brady plan. After the implementation of the Brady plan in 1990s, sovereign lending transformed. Due to global financial integration and the progressive capital liberalization for some countries, mainly the emerging market economies, a market for high-yielding sovereign bonds emerged. This market enabled many countries to gain access to international debt market but this availability of funds did not diminish the occurrence of debt problems. Overborrowing led to capital account crises in the 1990s, which differ from the preceding crises which were mostly caused by current account

imbalances. More details on crises in the 1980s and 1990s, as well as background on the secondary market for sovereign debt can be found in the literature review.

In order to quantify debt problems, empirical studies on the debt Laffer curve have been done in 1990s by several economists using data from the previous decade. My paper extends the empirical work on the topic with more up-to-date data set that covers the period from 1990 to 2005. The number of countries that I examine is determined by the availability of data, which resulted in a sample of 127 low- and middle-income countries.

There are a couple of reasons why such a study could be potentially useful. One is that the debt Laffer can in principle be used to determine when unilateral debt forgiveness might be beneficial. In addition, it can also be used as part of market-based debt-reduction schemes as suggested by Krugman (1989). A reversal in the effectiveness of high debt burdens suggested by the shape of the Laffer curve was used by the IMF and the World Bank when they launched the Heavily Indebted Poor Countries (HIPC) initiative in the mid-1990s that aimed to reduce the debt burden of low-income countries to sustainable levels. This paper can also be of significance for the purposes of further research of issues surrounding sovereign debt in low- and middle-income countries. The results I have obtained can serve as a data source to facilitate studying patterns of sovereign borrowing behavior, as well as, but not limited to, examining the effectiveness of debt-reduction schemes on individual economies.

The Laffer curve shows that as a country accumulates more debt, after a certain level there is a discrepancy between the face value of the debt and the secondary market price of that debt which indicates that there is inefficiency in the sense that the expected value of the repayments is lower than the actual face value of the claims against the country. Claessens

(1990) discusses in detail the importance of knowing whether a country is on the wrong side of the Laffer curve or not, pointing out as main argument that if a country is on the wrong side of the curve, it is in the best interest of both creditors and lender for there to be voluntary debt forgiveness until the country reaches a level of debt that would have equal or higher expected repayment for the creditors than before but at a lower face value. Another empirical study conducted by Phillips and Woller (1996) supports the hypothesis that bank behavior is consistent with the behavior predicted by the debt relief Laffer curve. One reason why a country might be overborrowing is the presence of readily available funds from many different types of potential creditors who are willing to lend to sovereigns because of the reduced risk associated with national banks compared to commercial borrowers. Another reason why a country might borrow more than it can repay is the knowledge that if the servicing of the debt becomes too difficult, the country can always ask for assistance from either the IMF or the World Bank, or if it is too late for such intervention, it could potentially default on its obligations.

The rest of the paper proceeds as follows. Section 3 gives a theoretical background of the Laffer curve and explains the logic behind the model. Section 4 is a literature review divided in two parts. The first part gives background information on the debt crises of the 1980s and the 1990s and sovereign lending now and in the previous decades. The second part is a description of the secondary market for debt and its usefulness in determining the creditworthiness of a country and its importance in determining the actual market price of already issued debt. Section 5 provides an outline of the empirical strategy to calculate the Laffer curve. Section 6 provides discussion of the data, more specifically the difficulties with obtaining some of the variables, and a detailed description of the model used to

estimate secondary market prices of debt. Section 7 is a discussion and interpretation of the results of the estimation of the debt Laffer curve and Section 8 contains concluding remarks.

3 The Theory behind the Debt Relief Laffer Curve

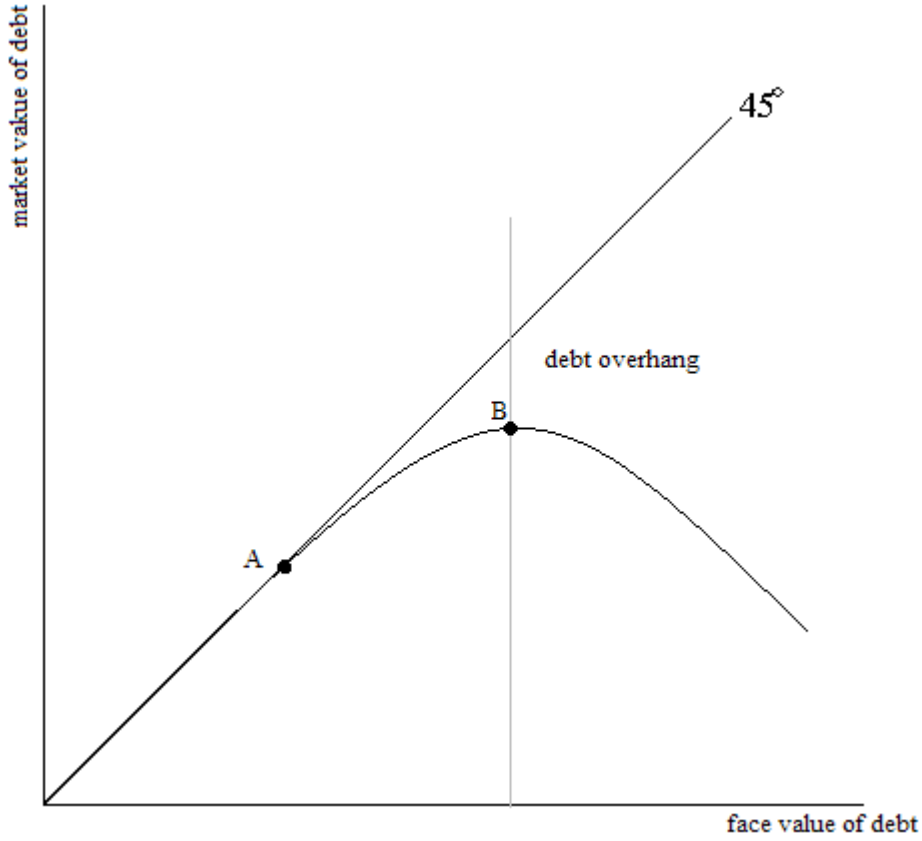
Sachs (1989) makes the argument that "debt rescheduling is an inadequate response to situations in which debt will eventually have to be forgiven" (p. 89). He reasoned that in such cases both debtors and creditors were aware of the need of eventual debt forgiveness, however, at the time he wrote the paper, debt rescheduling rather than debt forgiveness was being officially discussed. Sachs developed a theoretical model, called the "debt overhang for developing counties" which showed that debt forgiveness could not only retain the current market value of the debt instruments but also in fact increase the value of the expected repayments of obligations from debtor countries. That becomes true in the case when a country is borrowing too much and thus has to bear the burden of servicing high levels of debt debt. If the debt is too high, the ability of the country to finance it decreases and thus a probability of default emerges. Creditors take those factors into account when calculating the expected value of repayments they can receive from a sovereign, and if this value is lower than the face value of the debt, it may be the case, as described later, that reducing the face value of the debt will decrease the probability of a country to default either on interest payments or on principal, and thus increase the expected value of the repayments to creditors.

Krugman (1989) discusses the possibility of market-based debt reduction schemes and provides a formal framework for Sachs' theory. Krugman links the ability of countries to service and eventually repay their debt to the actual level of debt. When a country has accumulated too much debt, that is "[w]hen a country's obligations exceed the amount it is likely to be able to pay, these obligations act like a high marginal tax rate on the country: if it succeeds in doing better than expected, the main benefits will accrue, not to the country,

but to its creditors" (p. 9). That will provide the local government with a disincentive to do well and improve its economic performance because all the benefits will go to the creditors rather than to the country. On the other hand, the financing of the debt has to come at the expense of the domestic taxpayers, mostly through taxation of *capital*, which would further discourage investment.

Krugman proceeds to formally discuss the underlying logic of the debt Laffer curve, illustrated in **Figure 1**, pointing out that the relationship between the face value of the debt and the market value of the debt is one-to-one up to a certain point (A in Figure 1). When the face value of rises beyond this point, the market value begins to rise more slowly. The reason for this divergence is the fact that the more a country accumulates debt, the harder it becomes to finance it because of the increased servicing obligations that effectively act as a tax on investment, policy reforms, or other activities that require up-front costs in exchange for future benefits (Pattillo, Ricci, and Poirson 2002). Accumulating more debt then leads to an overall decrease in the market value of it and the marginal return on debt to the right of point A starts to diminish, however, total market value of debt is still increasing. If the level of debt continues to increase past a certain threshold point, the absolute increase in face value cannot compensate for the marginal decrease in market value and thus the country is said to be suffering from a "debt overhang:"

Figure 1: *The Debt Laffer Curve*



When a country has a level of debt at face value that is associated with a lower market value, there are two possibilities: either the country is on the left side of point B or on the right side of it. Here point B is the maximum market value of debt a country can achieve. If the level of debt corresponds to a point on the debt Laffer curve between A and B, the country is said to be on the "right" side of the curve, meaning the correct one. In a situation like this, debt forgiveness will not result in an increase in the market value of the debt. If, however, a country has a level of debt that corresponds to a point on the curve on the right of point B, the country is said to be on the "wrong" side of the Laffer curve, that is, it suffers from debt overhang. In this case debt forgiveness will reduce the face value of a country's debt but actually lead to a rise in the market value of its debt.

4 Literature Review

The Debt Laffer curve has been the subject of economic research primarily with regard to the derivation of the curve and the theoretical framework it is illustrating. Other research on the same topic is related to the decision-making process of domestic policy-makers. The theoretical aspect of the existing literature was covered in the previous section, and the policy analysis is in Section 7, as a part of the analysis of the results of the current paper. The purpose of the literature review in this section is then to provide a historical background of sovereign debt crises in the past decades as well as to explain the secondary market price for debt which plays a crucial role in the estimation of the secondary market prices of debt, which are an indicator for the actual market value of a country's debt.

Crises of the 1980s and the 1990s

When one looks back to the rescheduling deals of the past couple of decades, one could see that debt problems still persist for poor countries. Sachs (2002, p.18) observes that the "poor countries that fell into a debt crisis got neither sufficient help to restore economic growth, nor deep enough debt reduction to reestablish normal relationships with creditors." They also could not recover their economies sufficiently and were not given the opportunity to start anew and Sachs blames that on the way debt rescheduling has been done, namely "to do the minimum possible to prevent outright disaster, but never enough to solve the debt crisis."

Chuhan and Sturzenegger (2005) make an analysis of the debt crises of the past two decades and point out the main issues with them and where the process went wrong.

Sovereign debt[2] has existed for a long time and along with it also debt problems. In the past thirty years though, debt crises have risen dramatically. This rise has been partly geographic due to an increased number of potentially credit-worthy emerging economies and partly due to an increased frequency of crises in countries experiencing them. According to data from Standard & Poor's, there have been eighty-four instances of default[3] or debt rescheduling between 1975 and 2002. **Table 1** summarizes and classifies them based on the type of debt, bank or bond, and the currency in which the debt was issued, local or foreign.

Table 1: *Sovereign Defaults and Sovereign Lending*[4]

Rated Issuers: years in default, 1975-2002			
Issuer	Local Currency Debt	Foreign Currency Bond Debt	Foreign Currency Bank Debt
Argentina	1982, 1989-90, 2002	1989, 2001-02	1982-93
Bolivia		1989-97	1980-84, 1986-93
Brazil	1986-87, 1990		1983-94
Bulgaria			1990-94
Chile			1983-90
Cook Islands			1995-98
Costa Rica		1984-85	1981-90
Croatia	1993-96		1992-96
Dominican Republic	1981-2001		1982-94
Ecuador	1999	1999-2000	1982-95
Egypt			1984
El Salvador	1981-96		
Guatemala		1989	1986
Indonesia			1998-99, 2000, 2002
Jamaica			1978-79,1981-85,1987-93
Jordan			1989-93
Kuwait	1990-91		
Mexico			1982-90
Mongolia	1997-2000		
Morocco			1983, 1986-90
Pakistan		1999	1998-1999

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[2] Appendix A shows aggregate trends in lending to sovereigns and administering aid for the 1990-2005 period.
[3] The definition of default Standard and Poor's use is a very broad one, ranging from missing either an interest or principal payment to outright repudiation of the debt obligation.
[4] Source: Standard & Poor's Sovereign Defaults: Moving Higher Again in 2003?, http://www.standardandpoors.com/emarketing/asia_credit/SovMovingHigher.html, Accessed 10-14-2007

Panama		1987-94	1983-96
Paraguay			1986-92
Peru			1976,1978,1980,1983-97
Philippines			1983-92
Poland			1981-94
Romania			1981-83, 1986
Russia	1998-99	1998-2000	1991-97
Senegal			1981-85, 1990, 1992-96
Slovenia			1992-96
South Africa			1985-87, 1989, 1993
Trinidad and Tobago			1988-89
Turkey			1978-79, 1982
Ukraine	1998-2000		1998-2000
Uruguay			1983-85, 1987, 1990-91
Venezuela	1995-97, 1998	1995-97	1983-88, 1990
Vietnam	1975		1985-98

Unrated Issuers: years in default, 1975-2002			
Issuer	Local Currency Debt	Foreign Currency Bond Debt	Foreign Currency Bank Debt
Albania			1991-95
Algeria			1991-96
Angola	1992-2002		1985-2002
Antigua and Barbuda			1996-2002
Bosnia and Herzegovina			1992-97
Burkina Faso			1983-96
Cameroon			1985-2002
Cape Verde			1981-96
Central African Republic			1981, 1983-2002
Congo, Democratic Republic of			1983-2002
Congo, Republic of			1976-2002
Cote d'Ivoire		2000-02	1983-98
Cuba			1982-2002
Ethiopia			1991-99
Former Yugoslavia		1992-2002	1983-91
Gabon			1986-94, 1999, 2002
Gambia			1986-90
Ghana	1979		1987
Guinea			1983-96
Guinea-Bissau			1986-88, 1991-98
Guyana			1976, 1982-99
Haiti			1982-94
Honduras			1981-2002

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Iran			1978-95
Iraq			1987-2002
Kenya			1994-2002
Liberia			1987-2002
Macedonia			1992-97
Madagascar	2002		1981-84, 1986-2002
Malawi			1982, 1988
Mauritania			1992-96
Moldova		1998, 2002	
Mozambique			1983-92
Myanmar	1984		1998-2002
Nauru			2002
Nicaragua			1979-2002
Niger			1983-91
Nigeria		1986-88, 1992	1982-92
North Korea			1975-2002
Sao Tome and Principe			1987-94
Serbia and Montenegro			1992-2002
Seychelles			2000-02
Sierra Leone	1997-98		1983-84, 1986-95
Solomon Islands	1995-2000		
Sri Lanka	1996		
Sudan			1979-2002
Tanzania			1984-2002
Togo			1979-80,82-84,1988,1991-97
Uganda			1980-93
Yemen			1985-2001
Zambia			1983-94
Zimbabwe		1975-80	2000-02

Chuhan and Sturzenegger note that in economic terms, a default means that the market value of the debt has fallen below the face value of the debt because the market value is supposed to discount for any risk associated with arrears or solvency issues. The authors make a distinction of countries that are unable to pay their obligations either due to liquidity or solvency issues, or are unwilling to pay. These turn out to be very crucial distinctions between countries because the problems that arise require different measures for their

resolution. The crisis of the 1980s has brought the need for a formal framework that was supposed to help with the devising of debt agreements. This framework was designed to deal with liquidity issues because the crisis was perceived to be a temporary one. The main approach was to issue new short-term loans that were supposed to help the countries with the current debt servicing. That was the first phase of the new money approach, which did not prove successful since it only resolved the problem in the very short term. A second phase of the new money approach was supposed to be a bit more long-term oriented, lowering the debt servicing amounts over a period of a few years. In late 1985, the Baker Plan was devised that recognized that debt-servicing problems are tied to stagnant economic growth. The Baker Plan however was not sufficient for the countries to resolve their problems. The new money approach is considered unsuccessful because it did not help the countries involved to get out of the cycle of perpetual rescheduling.

In the 1990s it had become clear that the persistently high or rising levels of debt were indicators of insolvency problems rather than liquidity problems (Sturzenegger, 2002b). In March 1989 the Brady Plan was introduced which provided a "menu" of market-based options with inviolable set of instruments that dealt with the different preferences different creditors had. On the other hand, debtor countries benefited because they were able to achieve lower debt burdens though debt reduction and/or substantial extension of the maturity of the debt instruments. The Brady plan was considered a success because it helped with the reduction of the debt burdens of the countries that defaulted on their loans, however it was not able to increase the financial flows to the defaulted countries.

The crises of the late 1990s were characterized with bond defaults, as opposed to the early 1990s when countries defaulted on bank loans. There was no formal mechanism that

dealt with the resolution of these crises but rather each country received individual resolution. A detailed description of the crisis resolution for eight[5] countries is done by Sturzenegger and Zettelmeyer (2007). They also point out that because of the "spectacular" debt crisis in the 1980s, many countries have been denied access to the international financial markets. These are mostly African countries as well as some Latin American countries. This resulted in fewer debt crises in the later part of the 1990s. Among the restructuring deals, a broad distinction could be made depending on whether the exchange was voluntary or not. In the case of a voluntary exchange, the creditors generally benefit either with higher interest rates or more liquid or tradable bonds, and the debtors are able to reduce the rollover risk in the near and medium term. If the creditors do not want to engage in a voluntary exchange, they may be forced to participate against their will. This will very likely involve some sort of a "haircut" for them and would lead to an effective debt reduction for the debtor country. Bowe and Dean (1997) analyze the debt reduction mechanisms in the early 1990s and conclude that concerted market-based debt reduction is a lot more beneficial for debtor countries than voluntary market-based reduction because it is very likely that there will be enough of a debt reduction to provide incentives for investment and structural adjustment in the medium and long run.

Roodman (2006) discusses the "Third World debt crisis" and makes a distinction between the "true" crisis that began in 1982 and a problem that was not a crisis but rather a persistent issue. The debt crisis was due to excessive lending to middle-income countries and was triggered by global recession and high interest rates. The resulting defaults have led to implosion of these economies and subsequent rise in poverty. The crisis was resolved but the consequences of it still linger. The other issue that gets included in the "Third World

[5] Russia, Ukraine, Pakistan, Ecuador, Argentina, Moldova, Uruguay, and The Dominican Republic,

Debt Crisis" is the debt problem of the poorest countries, mainly the sub-Saharan countries. Roodman calls it a "chronic syndrome" that has evolved gradually and has become worse. These low-income countries are considered to be too risky for commercial creditors to invest in them, and so the countries rely heavily on individual governments aid agencies for bilateral credit or on multinational lenders like the World Bank and the International Monetary Fund. The problem with bilateral lending is that is very closely tied to political relationships, and not many low-income countries could get enough financing this way. Even combined with multilateral credits, the level of financing achieved through these official channels cannot by all means be compared to the level of financing achieved through commercial lending. Another issue with official lenders is their efficiency, in the sense that they are not very quick to resolve debt problems since they are not profit-oriented.

When it comes to debt relief, the debt overhang argument gives incentive for market-based debt reduction. Detragiache (1994) however, ahs done an empirical study in which she showed that a sensible buyback could be achieved even if a country is on the good side of the Laffer curve.

Secondary Market for Debt

The secondary market is where the trading of securities that have already been issued takes place. In this market, creditors have the opportunity to trade among themselves sovereign debt instruments in order to maximize their profits. Since the market takes into account not only the current state of the countries' economies but also weights past economic history and prognoses about the countries future performance, the trading prices in these markets are an invaluable source of information about the creditworthiness of a

country. Buckley (1999) did a thorough analysis of the secondary market of sovereign debt instruments, starting with the origin of the 1980s debt crisis back in 1982. His major finding is that the existence of this market, which was formed mainly because of profit-making reasons, was crucial for achieving a better outcome of the crises at least for the creditors. Buckley (p.299) notes four major effects and consequences of this market, of which the last one plays the biggest role:

> (i) it brought pressure to bear on banks to increase their loan loss provisions;
> (ii) it facilitated the exit of certain banks from LDC lending;
> (iii) it facilitated debt-equity swaps, debt buy-backs and other debt exchanges; and
> (iv) it facilitated the Brady Plan[6].

Buckley argues that the "combined effect of these four factors was so significant that without the secondary market the Brady Plan would probably have been too large a step into the unknown to attract the support of the U.S. Treasury and without the support of, and persuasion of bankers by, the U.S. Treasury, the Brady Plan would not have come to pass" (p. 300). For the debtor countries, the benefits from the existence of the secondary market were directly a consequence of the market rather than the Brady Plan (p. 300):

> The Plan offered little to the debtors as it changed the form of the debt without significantly reducing its amount. The secondary market, however, made possible the formal and informal debt buy-back programmes of the debtors. Buy-backs on the scale witnessed are impossible without a secondary market to provide the debt, and buy-backs proved to be the debtors' most effective source of debt relief.

Buckley also breaks down the evolution of the market in several approximately two-year periods and goes on to describe in great detail the major events during the period, the impetus for the market, the characteristics of the market, the participants, and the impact of

[6] There are four reasons why the secondary market has facilitated the Brady Plan (pp. 299-300):
(i) providing the prototype for loans trading like bonds;
(ii) providing a secondary market for the bonds;
(iii) establishing there was investor appetite for such securities; and
(iv) affording a strong argument for debt relief.

the market. One very useful feature of his analysis is the description of the market volume and the debt traded. For some of the periods that the analyses, he uses data from EMTA to illustrate the average price of the sovereign debt of the most risky debtors at the time.

A conclusion that can be drawn about the existence of a secondary market is that it benefits both debtors and creditors. Chuhan and Sturzenegger (2005) make a suggestion that these markets should strive not only to maximize market value of debt flows but should also appropriately evaluate levels of risk and thus serve as an accurate source of information about the reliability of certain debt flows.

5 Outline of Empirical Strategy

For the estimation of the Laffer curve, I adhere to the methodology Claessens (1990) used, while in the same time I extend the scope of the data. Claessens based his results on a pooled cross-sectional regression using the December 1986, 1987, and 1989 secondary market prices of bank debt for countries. He argued that these prices depend on numerous explanatory variables including debt-to-export ratios, nominal value of the outstanding debt, and the average growth of exports for the past five years. Claessens also included in his regressions two dummy variables that account for the existence of arrears and debt-equity swaps. He assumed a linear relationship between the secondary market price of debt (P) and its face value (D) that was suggested by the data he had collected:

$$P = \beta_0 + \beta_1 \frac{D}{XGS} + \beta_2 XGSGROWTH + \beta_3 DUMMY_1 + \beta_4 DUMMY_2 \qquad (1)$$

where $\frac{D}{XGS}$ is the debt-to-exports ratio, and XGSGROWTH is the real growth rate of exports averaged over the five preceding years. The dummy variables got assigned values depending on the specific year that was taken into account, namely $\text{DUMMY}_1 = 1$ if the country is in arrears and zero otherwise, $\text{DUMMY}_2 = 1$ if the country has had debt-equity swaps or some other sort of debt forgiveness and zero otherwise. The coefficients $\beta_1, \beta_2,$ and β_3 had negative values due to their inverse relationship with the secondary price.

To derive a debt Laffer curve for each country, Claessens noted that the market value of a country's debt, V, is given by:

$$V = PD \qquad (2)$$

To estimate an equation for the market value of debt that would give him the desired shape of the Laffer curve, Claessens multiplied Equation (1) by the face value of the debt, D, and thus obtained an equation that takes the shape of the Laffer curve:

$$V = \beta_0 D + \beta_1 \frac{D^2}{XGS} + \beta_2 DXGSGROWTH + \beta_3 DDUMMY_1 + \beta_4 DDUMMY_2 \quad (3)$$

In order to find out what the peak of the curve would be for each country, he takes the derivative of (3) with respect to the face value of debt, D, and sets it equal to zero. Comparing the face value of debt that is maximizing this market value, D^* to the actual debt shows which countries are on the wrong side of the curve, and which are not. Claessens' study found that only five of the twenty-nine countries he looked at were on the wrong side of the curve, and two others were near the peak. These results suggest that "across-the-board debt forgiveness through a general reduction of the nominal claims outstanding, is not in the interest of the creditors for most highly indebted countries." (p. 1657)

There are other factors that also need to be taken into consideration that were not an issue for the analysis of Claessens since the countries he looked at were relatively alike. As pointed out by Sturzenegger (2002a, p.5),[7] the debt-to-exports ratio is a useful indicator for debt burden, particularly if the country is "relatively isolated from world capital markets and whose only source of foreign exchange are trade related activities," since this ratio is very closely related to the repayment capabilities of the country. The more the country has access to global financial markets, the less important the value of debt-to-exports is and the more important the value of either debt-to-GDP or debt-to-GNP is. However, given that most of the low- and middle-income countries of which my data set is comprised are not as

[7] This paper was published in 2004 in the Journal of Restructuring Finance, vol.1 no. 1: 201-230; however, the journal is not published anymore, but the paper can be found at: http://200.32.4.58/~fsturzen/00007.pdf

integrated in the world capital markets as are high-income countries, it is reasonable to use debt-to-exports as an independent variable.

The analysis of Manasse, Roubini, and Schimmelpfennig (2003, p.26) on the probability of default of a country emphasizes that

> a relatively "risk-free" country type is described by a handful of economic characteristics: low total external debt relative to ability to pay, low short-term debt over foreign reserves, low public external debt over fiscal revenue, and an exchange rate that is not excessively overvalued. Political instability and tight monetary conditions in international financial markets aggravate liquidity problems. The approach suggests that *unconditional* thresholds—for example, looking at debt to output ratios in isolation—are of little value per se for assessing the probability of default; it is the particular combination of different types of vulnerability that may lead to a sovereign debt crisis.

Sturzenegger also discusses the importance of different variables when treating debt issues. For solvency, which is my primary concern rather than liquidity, three additional variables to the ones Claessens uses could potentially enhance the model. However, they are not included in the estimation of the Laffer curve because the real-world secondary market price of debt already accounts for the changes in these variables. The first one is *nominal budget balance as a ratio of GDP* (Sturzenegger 2002a, p.6):

> If the government runs an overall deficit it means that the primary surplus is unable to pay for interest, and therefore that the country us issuing yet more debt. On the other hand, a surplus indicates that the government is purchasing back debt and shows the political feasibility of reducing the debt numbers thus substantially improving the chances of not having debt problems.

The second one is the *ratio of exports of goods and non-factor services to GDP*. This variable shows the likelihood of a debtor country to get foreign resources that would enable it to repay its foreign debt. The higher the ratio, the lower the risk the country is exposed to. The third variable is *real exchange rate misalignment*, which is a measure of the country's

currency overvaluation in percentage points. This variable is not as important as the previous two because it could easily be omitted without causing problems with the analysis of debt issues. Another problem with this one is that is also difficult to measure. A dummy variable that accounts for default history might be useful although it might prove to be statistically insignificant since real secondary market prices already account for the risk associated with potential default.

6 Data

This paper considers data covering the period 1990-2005 using annual data. I used cross-sectional regression since the number of time periods for any one country is not enough to use time-series analysis. I look at 127 (out of 149) low- and middle-income countries for the period from 1990 to 2005. The reason I chose this period is that 1990 is the year in which the first defaults on Soviet debt occurred and also this is where Claessens' analysis stops; 2005 is the most recent year that I could find actual data for as many countries as possible. Since the goal of my paper is to ultimately cover a country sample that is as exhaustive as possible, the data set for this paper poses a challenge in terms of size; however, it also gives the benefit of providing most complete information.

Using the World Bank databases Global Development Finance and World Development Indicators, I have collected data on the main variables used to calculate the Laffer curve, except data on secondary market price of debt. This data is scarce at best, since the main source that Claessens used, Salomon Brothers, no longer exists. There are, however, estimations of secondary market prices of debt in a research paper on the consequences of debt crises for creditors done by Klingen, Weder and Zettelmeyer in 2004. The scope of these estimations encompasses twenty-seven counties from 1986 to 2001. This data pool is small compared to my initial goal but nonetheless provides some benchmark values for the estimation I am going to use for my data. There are two reasons why the number of observations from this study is not enough. First, the period covered by Klingen et. al. does not fully overlap with the period discussed in my paper. The goal of my paper is to calculate the Laffer curve from 1990 to 2005, however, the aforementioned study only has data up until 2001, which will not allow me to look at the most recent development of

sovereign borrowing. The second reason why these observations will not suffice has to do with the scope of the data. Klingen et. al look at twenty seven countries, but the goal of my thesis is to look at as many countries as possible. For these reasons I estimated secondary market prices for all the countries and years that I am interested in looking at. This was done by recovering the secondary price from bond spreads which is a very straightforward calculation. The next several pages provide a detailed explanation of the estimation of secondary market prices of debt.

From 1993 onwards, J.P. Morgan started calculating the Emerging Market Bond Index Plus (EMBI+) which measures the return on emerging market bonds. These are secondary market spreads that measure the credit risk premium over US Treasury bonds. That is, the spreads are simply the difference between the Yield to Maturity Bond and the Yield to Maturity of the corresponding point on the US treasury spot curve. Another important thing to notice is that "since Yield to Maturity is simply the discount rate at which all present value of all future cashflows equals the market price of the bond, all cashflows are discounted at the same (flat) rate." Kim, Byun, and Ying (2004). The index is a composite for most of the emerging market economies, however data is available for individual countries as well. There are several possible sources for obtaining data on spreads. I used data published by Bloomberg LP, where data on bond coupons and maturity for each country is also readily available. Given that, the secondary market price of bonds can be easily recovered using the following two-part formula:

$$P = \frac{C/2}{y/2}\left[1-\left(1+\frac{y}{2}\right)^{-2t}\right]+\frac{100}{\left(1+\frac{y}{2}\right)^{2t}} \quad (4)$$

where C is the coupon rate, annual by convention, cash value; t is the maturity in years with semiannual compounding; y is the annual percentage yield; and P is the price. The first part of the formula discounts the cash flows for the duration of the bond while the second part is the discount on the premium. Data on the coupon rate and maturity is available through the World Bank databases, and the annual percentage yield is derived from the bond spreads:

$$Yield = Spread \times 100 + US\ Treasury\ Bill\ Rate \quad (5)$$

The Spread is multiplied by a hundred simply because it is reported in basis points while the other two variables are reported as percentage values.

Data on the yield spreads from the EMBI+ index is available for the following countries (years are in parentheses): Argentina (1992-2005), Brazil (1992-2005), Bulgaria (1995-2005), Colombia (1999-2005), Ecuador (1996-2005), Egypt (2001-2005), Mexico (1992-2005), Morocco (1997-2005), Nigeria (1992-2005), Panama (1997-2005), Peru (1997-2005), Philippines (1992-2005), Poland (1995-2005), Russian Federation (1997-2005), South Africa (2002-2005), Turkey (1999-2005), Ukraine (2001-2005), Uruguay (2001-2004), and Venezuela (1992-2005).

From the data above I calculated the secondary market price of debt for these emerging market countries. However, for the rest of the countries in my sample, I had to estimate bond spreads in order to recover their price of debt. That was easily achieved following the methodology of Min (1998), who uses a linear model for the determination of spreads:

$$LogS = \alpha + \Sigma \beta_i x_i + \varepsilon_i$$

$$\alpha = Log\left(1 + i^*\right)$$

where S is the yield on the securities, i* is the risk-free rate (in this case, the yield on the three-month US Treasury Bill), x is an economic determinant of default, and ε is the error term.

Following Min (1998), the economic determinants of default are separated in four categories (summarized in **Table 2**): liquidity and solvency variables, macroeconomic fundamentals, external shocks, and dummy variables. Liquidity and solvency variables include ratio of total external debt to GDP (DGDP), international reserves to GDP (RGDP), current account to GDP (CGDP), debt-service-to-exports ratio (DSX), growth rate of imports (IMG), growth rate of GDP (GDPG), and growth rate of exports (EXG). Macroeconomic fundamentals include terms of trade (TOT), annual inflation measured by the CPI (INF), and nominal exchange rate (RXI). External shocks are measured by the real oil price (ROP) and the three-month US Treasury bill rate (TBILL). A dummy variable for Latin American countries is included as well.

Min (1998) discusses thoroughly the expected signs on the different variables and his empirical results are consistent with prevailing theory. When a variable has a negative impact on the overall economy of a country or affects its creditworthiness in a negative way, then the expected sign in the regression should be negative since spreads are a measurement of the risk associated with lending. In the same way, if a variable is affecting the economic standing in a negative way, the expected sign in the regression will be positive because an improvement in these values will lead to a decrease in the spreads because of an improvement of the creditworthiness of the country. More specifically, for the liquidity and solvency variables, the variables with an expected positive sign will be the ratio of total external debt to GDP (DGDP), current account to GDP (CGDP), debt service-to-exports

ratio (DSX), and growth rate of imports (IMG). The rest of this group—international reserves to GDP (RGDP), growth rate of GDP (GDPG), and growth rate of exports (EXG), will have a negative sign. For the macroeconomic fundamentals, annual inflation measured by the CPI (INF) and nominal exchange rate (RXI) are expected to be positively correlated with the spreads while the terms of trade (TOT) are expected to be negatively correlated. When looking at external shocks, rising oil prices as well as an increase in the US Treasury bill rate should impact negatively the countries in the sample and thus the expected sign of these variables is positive.

Table 2: *Economic Determinants of Default*

Category	Variable	Expected Sign in the Regression
Liquidity and solvency variables	DGDP—total external debt to GDP	Positive
	RGDP—international reserves to GDP	Negative
	CGDP—current account to GDP	Positive
	DSX—debt-service-to-exports ratio	Positive
	IMG—growth rate of imports	Positive
	GDPG—growth rate of GDP	Negative
	EXG—growth rate of exports	Negative
Macroeconomic fundamentals	TOT—terms of trade	Negative
	INF—annual inflation measured by the CPI	Positive
	RXI—nominal exchange rate	Positive
External shocks	ROP—real oil price	Positive
	TBILL—three-month US Treasury bill rate	Positive

Estimating the bond spreads using Min's (1998) methodology produced the following regression using data only on countries where actual spread data was available, t-statistic in parentheses:

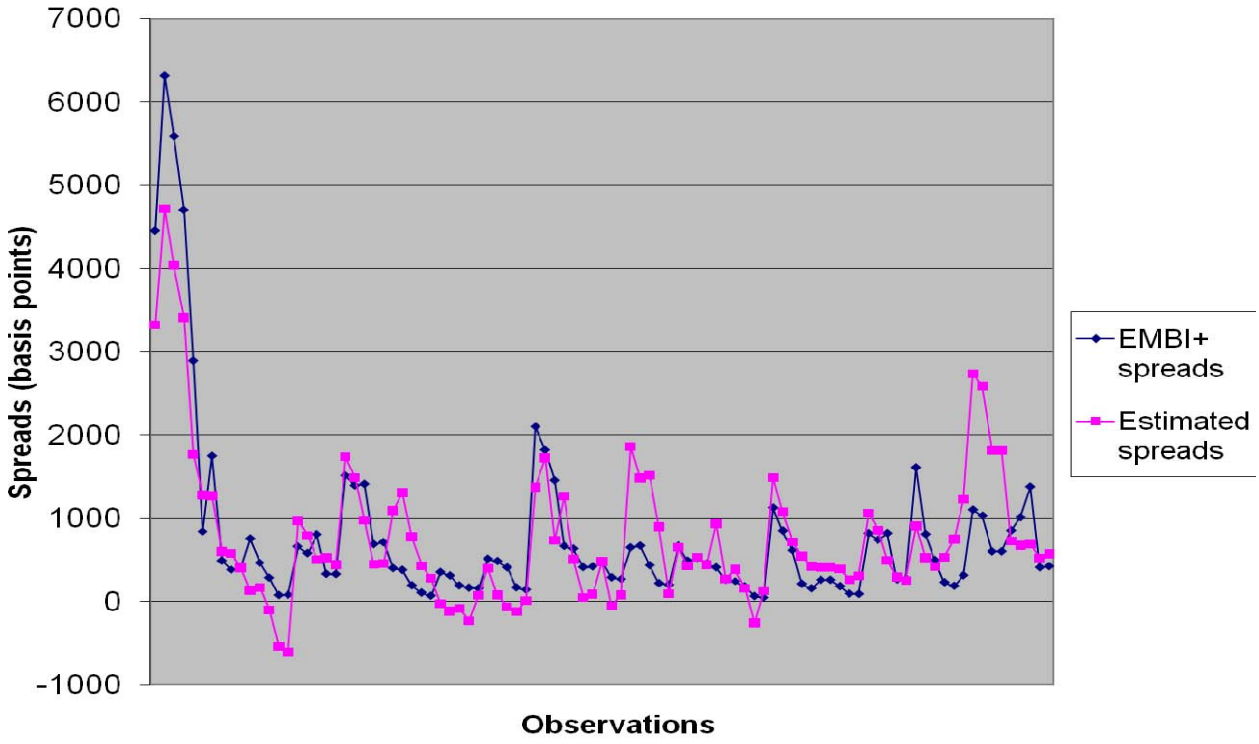
Table 3: *Regression used for the estimation of bond spreads*

Dependent variable: **SPREAD**

Constant	323.7348
	(0.70)
Latin	-363.9844
	(-2.12)
DGDP	11.69733
	(5.87)
RGDP	-2968.397
	(-3.00)
CGDP	3307.812
	(2.36)
DSX	-22.60578
	(-2.78)
IMG	4.403466
	(0.39)
GDPG	.7808462
	(0.02)
EXG	-19.68503
	(-1.77)
TOT	-6.593173
	(-1.67)
INF	9.996269
	(0.93)
RXI	-.0003743
	(-1.88)
ROP	3.75969
	(1.59)
TBILL	25.25689
	(0.31)
$R^2 = 0.7071$	
F-statistic (13, 81) = 6.21	
Prob > F = 0.000	
Number of observations = 95	

Using the above coefficients, I calculated spreads for all countries in my dataset in order to obtain information about their creditworthiness based on these major economic variables. An illustration of the relation between the estimated spreads and the actual spreads can be seen in **Figure 2**.

Figure 2: *Comparison between actual EMBI+ spreads and estimated spreads following Min (1998)*



An important thing about the estimated spreads is that while they fit pretty well on average, there were occasions when the estimated spreads turned out to be negative mostly due to missing data on some of the variables determining the spreads. In order to produce a more accurate set of secondary prices, I used a combination of estimated spreads for the observations where there was no data and actual spreads when there were existing values of the EMBI+. This enabled the calculation first of bond yield with equation (5) and subsequently, secondary market prices of debt using equation (4) and thus resolved the issue

of the missing values[8] needed for estimating a Laffer curve. However, missing data on maturity and coupon rate forced me to eliminate about ten percent of the data set because secondary prices could not be calculated.

After obtaining estimated secondary market of debt, as described above, I went back to the original debt Laffer equation derived by Claessens (1990), equation (3), I was able to obtain an estimation of the following regression coefficients illustrated in **Table 4**.

Table 4*: Regression estimating the market value of debt (the debt Laffer equation)*

Dependent variable: **V**, with robust standard errors in parentheses

Constant	-8.98e+08 (3.66e+08)
D	0.947076 (0.0621837)
$\frac{D^2}{XGS}$	-0.0010551 (.0002389)
DXGSGROWTH	0. 0029364 (.0032813)
$DDUMMY_1$	-0.1852648 (0.0638462)
$DDUMMY_2$	0. 2026786 (.0606617)
$R^2 = 0.8156$	
F-statistic (5, 1307) = 131.31	
Prob > F = 0.000	
Number of observations = 1313	

[8] There is a brief discussion in Appendix B about the dataset chosen for this regression.

Taking the derivative of this equation with respect to D and setting it equal to zero, gives an equation for D*, the face value of debt that maximizes its market value:

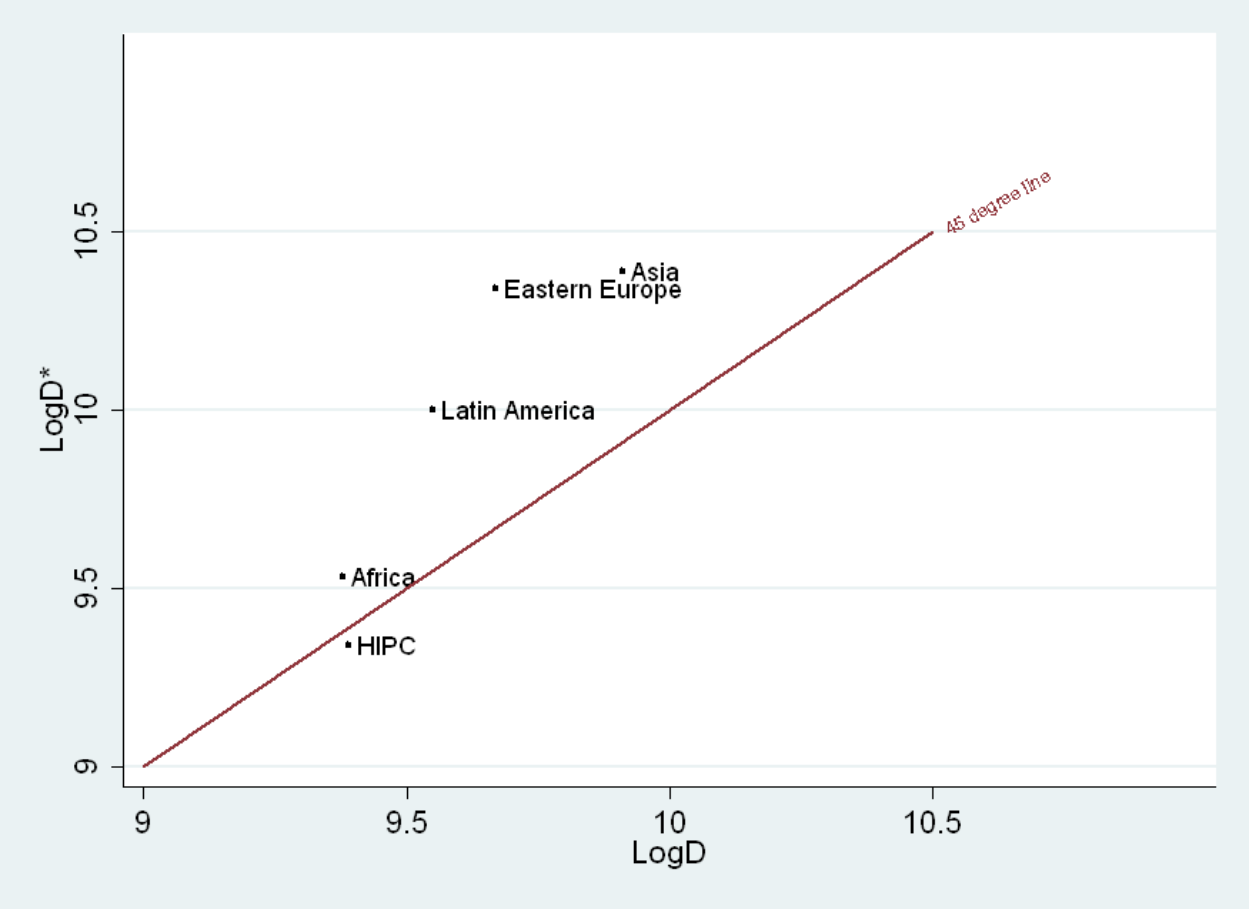
$$D^* = 448.809 + 1.392\,XGSGROWTH - 87.795\,DUMMY_1 + 96.047\,DUMMY_2$$

After substituting the values for the dummies, exports, and export growth for each country and year, a Laffer curve is estimated. If the difference between D* and the actual face value of the debt is negative, then that signifies that a country is on the wrong side of the Laffer curve. If the difference is around zero, then the country is around the peak of the curve, while if it is positive it is on the right (i.e. correct) side of the Laffer curve.

7 Discussion of the Results

The results of the estimation of the Debt Laffer curve, as illustrated in **Figure 3**, show that in general, on average for the whole 1990-2005 period, heavily indebted poor countries[9] are persistently on the wrong side of the Laffer curve, while if one looks solely at the results geographically, the regions are always on the right side of the curve.

Figure 3: *D* versus D, select aggregates, 1990-2005, logs*



[9] Due to missing observations, not all of the 41 heavily indebted countries are included in the data set. The missing countries are Afghanistan, Democratic Republic of Congo, Liberia, and Somalia.

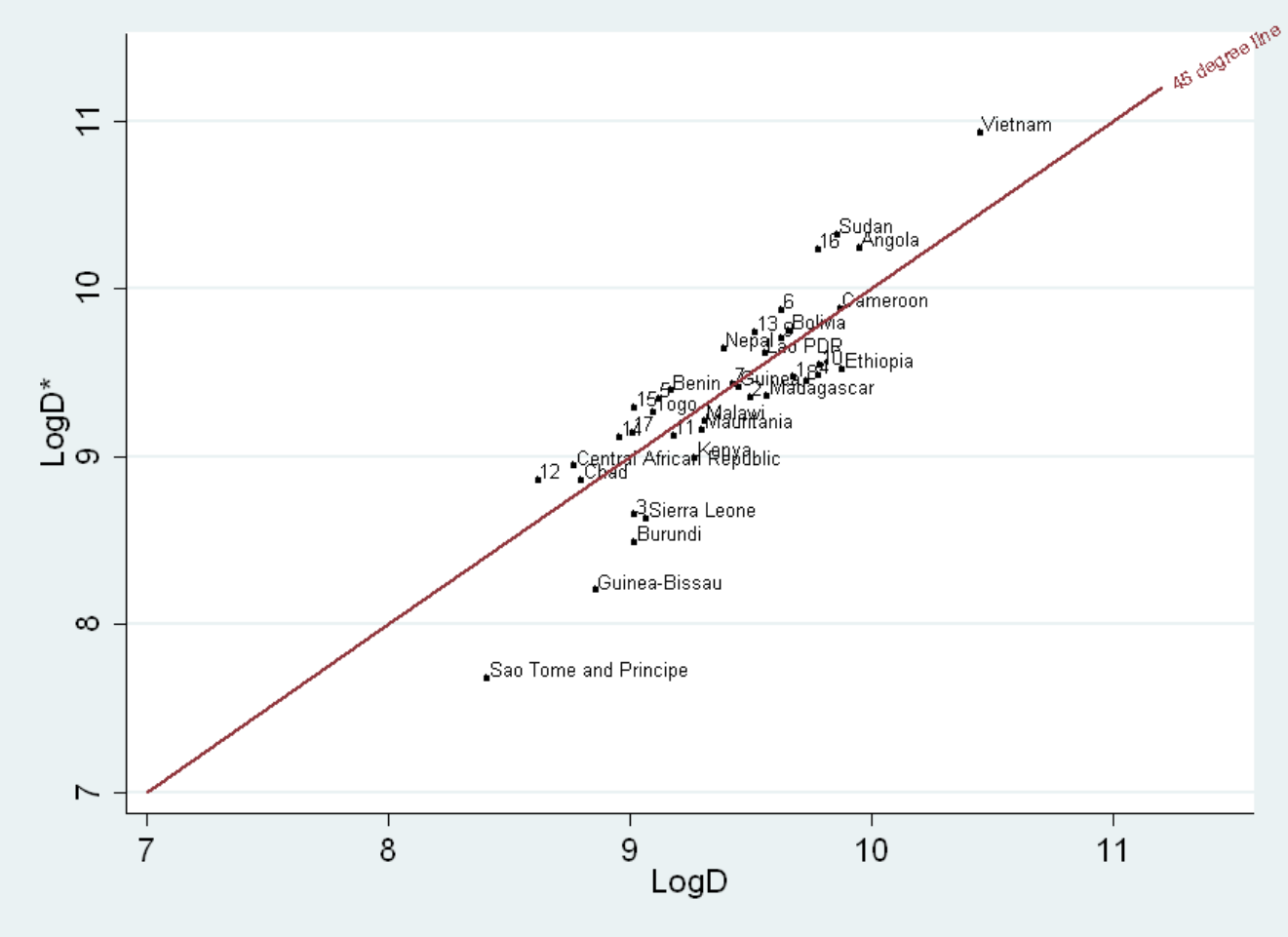
Due to space limitations, a complete list of all countries' position for every year of the period can be found at the end of this section, just before the section 8 Conclusion. The visualizations of the results there allows not only for a possibility to look at countries based on their location but also to compare their development temporally. Probably one of the most important findings is the shift for many African countries from the wrong to the correct side of the Laffer curve. Since most of the countries that are doing this shift are also part of the HIPC initiative, it can be concluded from this paper that the initiative is successful in reducing the overall debt burden of many poor countries.

Of the countries that are on the wrong side of the Laffer curve, the majority are part of the HIPC initiative, while the rest are mostly emerging market countries in Latin America that have experienced some type of financial crises during the 1990s and early 2000s. The reason why Africa appears on the correct side of the curve is that even though most HIPC countries are in Africa and suffer from debt overhang, not all African countries are on the wrong side of the curve. That also explains why Africa as a whole is closer to the threshold value rather than being completely under the 45-degree line that crosses the figure. This line separates countries that are on the correct side of the Laffer curve from countries that suffer from debt overhang. If a country is on the wrong side of the Laffer Curve, then the level of the face value of the debt that is maximizing its market value, D*, will be lower than the actual level of debt, D. On Figures 3-8, these are the countries that are below the 45-degree line.

Of the HIPC countries, as illustrated on **Figure 4**, it is important to note that not all are on the wrong side of the curve. There are also countries that have experienced short periods of debt problems and have been on the wrong side of the curve for a period ranging

from one to several years but on average seem to be doing well enough. Countries like Benin, The Gambia, Ghana, Guyana, Kyrgyz Republic, Nepal, Senegal, and Togo never appear on the wrong side of the curve. Even though they do not suffer from debt overhang they are still part of an initiative that is designed to reduce their overall debt burden. Overall, between 1990 and 1992, approximately half of these countries were on the wrong side and the other half were on the right side of the curve. Then, in the period 1993-1996, larger proportion of the HIPCs moved to the wrong side of the curve, and only after 1997, a positive shift is observed. It is not until 2000-2001 when a noticeable large number of countries move to the right side.

Figure 4: *D* versus D, Heavily Indebted Poor Countries, 1990-2005, logs*



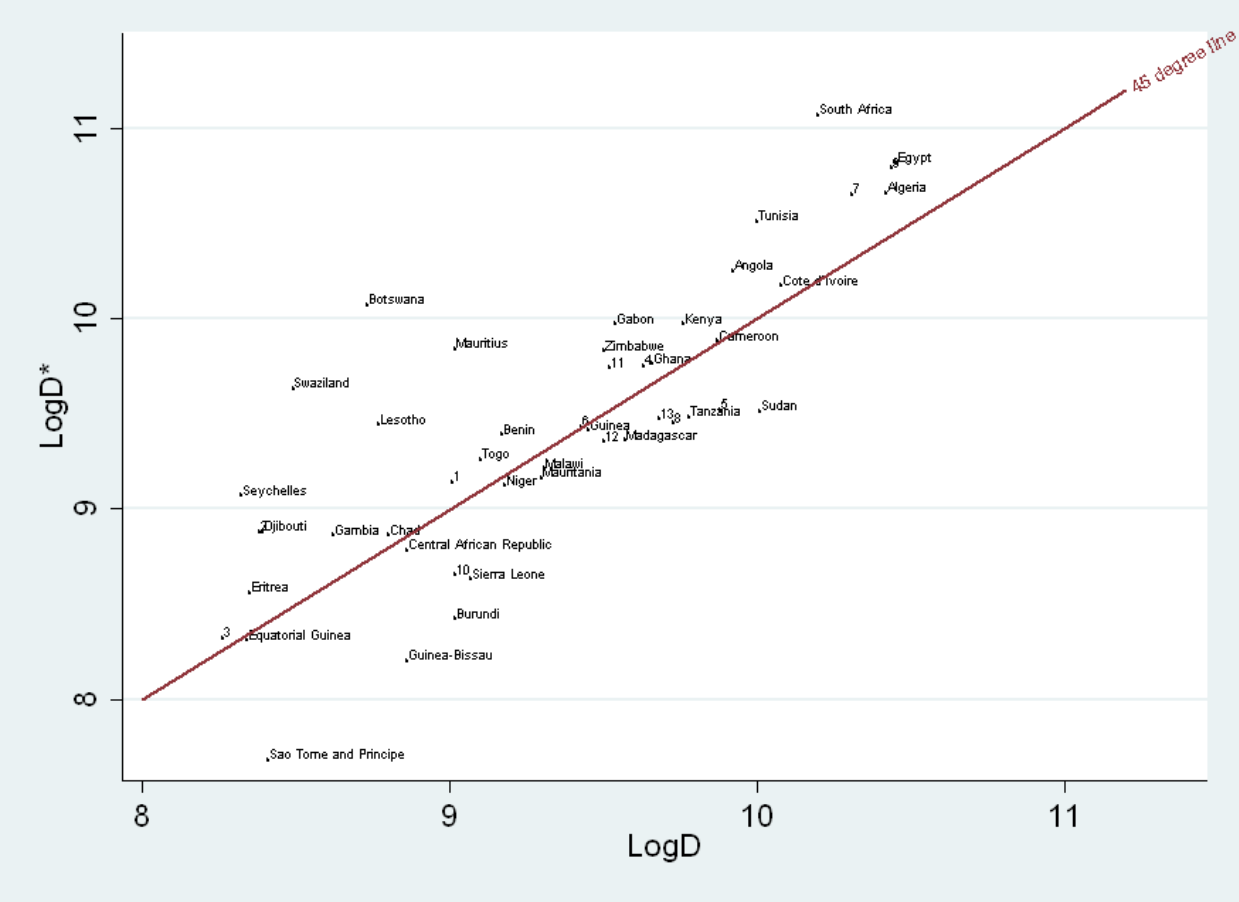
List of numbered countries:

1 Zambia	7 Mali	13 Senegal
2 Uganda	8 Mozambique	14 Ghana
3 Rwanda	9 Myanmar	15 Kyrgyz Republic
4 Tanzania	10 Nicaragua	16 Yemen
5 Guyana	11 Niger	17 Burkina Faso
6 Honduras	12 Gambia	

Looking at continents, it is visible that the countries with the most debt-related problems are predominantly in Africa but not all African countries are on the wrong side of the Laffer curve. There are forty nine African countries in the data set (out of fifty fife, including the islands[10]), of which, as shown in **Figure 5**, seventeen are perpetually on the wrong side of the curve, ten are experiencing occasional difficulties with their level of debt, and the rest seem to faring well in terms of debt-related issues. Throughout the period, the African countries follow a similar pattern to the HIPC countries, with starting out in 1990-1992 with more than half of the countries in the continent on the right side of the curve. Then, a shift for several countries is observed from the right to either a threshold level of debt or debt overhang in 1993-1994, among which are Angola, Cameroon, Congo, and Niger. From 1995 onward, however, these countries move back to sustainable levels of debt according to this model, and in 2004-2005, less than seven African countries suffer from debt overhang.

[10] The countries that were not included in this paper due to lack of data are Canary Islands, Democratic Republic of Congo, Liberia, Libya, Namibia, and Somalia. Looking at the living standards in these countries, it can be inferred that they are performing poorly economically, and it is possible that they also have persistent debt-related problems. That will have a negative influence on the overall performance of Africa as a whole during the period 1990-2005 and that means that the actual position of the continent may be closer to the 45-degree line than illustrated on Figure 3.

Figure 5: *D* versus D, Africa, 1990-2005, logs*



List of numbered countries:

1 Burkina Faso	6 Mali	11 Senegal
2 Cape Verde	7 Morocco	12 Uganda
3 Comoros	8 Mozambique	13 Zambia
4 Congo	9 Nigeria	
5 Ethiopia	10 Rwanda	

The good standing of countries such as Botswana, Egypt, Lesotho, Mauritius, Morocco, Seychelles, South Africa, Swaziland, and the rest of twenty-two countries that are performing well, balances the overall performance of Africa, and is the reason why in Figure 3, Africa as a continent, is on the correct side of the Laffer curve. This result shows the danger of making generalizations about such big continents without evaluating individual countries. If one looks only at Figure 3, it appears that Africa will not be requiring any debt

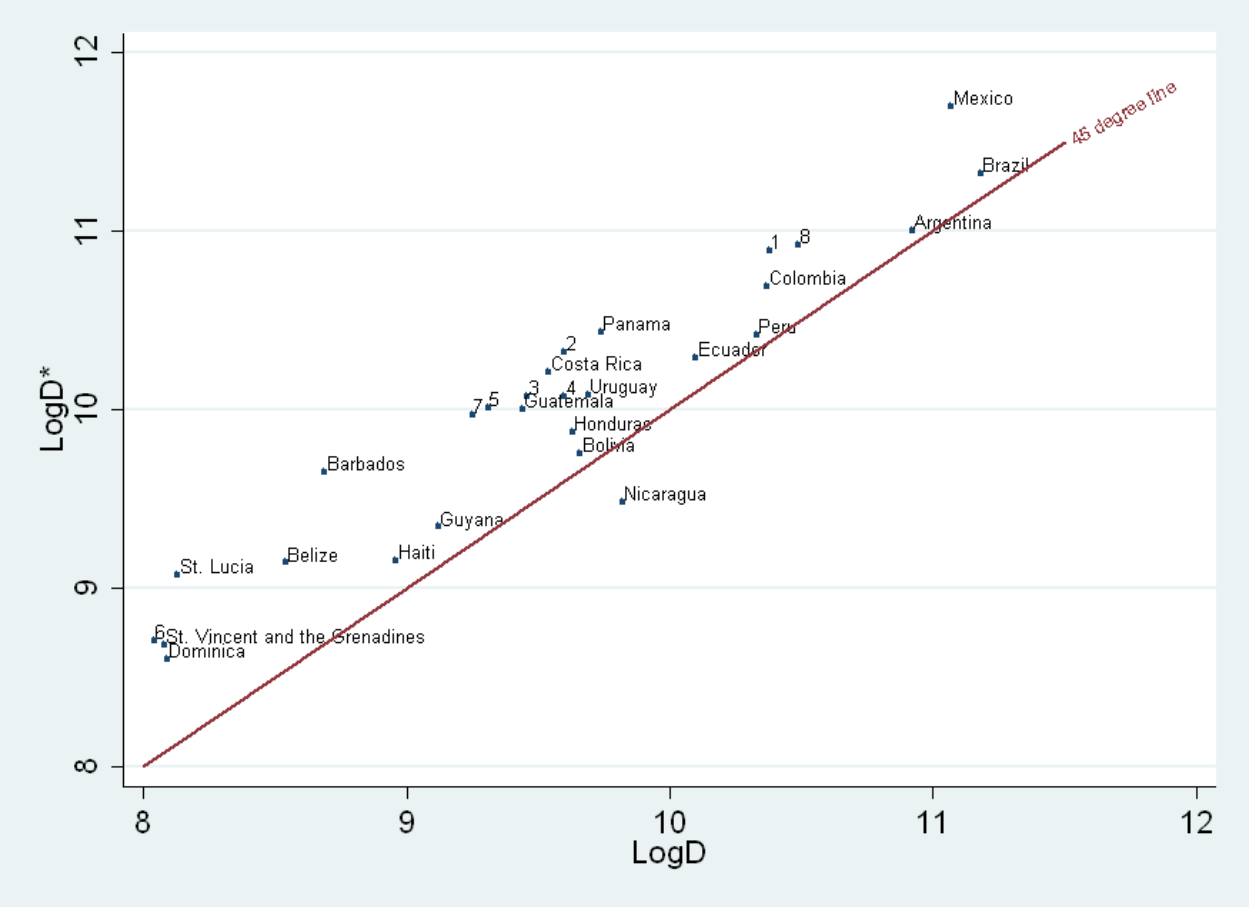
forgiveness. That, however, is true only of the countries that do not have extreme debt-related problems. The rest of the continent requires assistance, and the inclusion of these countries in the HIPC initiative is recognition of these countries' problems.

Of the Latin American countries, shown on **Figure 6**, there is data on nineteen out of twenty[11] independent[12] countries as well as data on Barbados, Belize, Dominica, Guyana, Jamaica, Trinidad and Tobago, and the independent British overseas territories[13] St.. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines which are both geographically and economically tied to Latin America but are technically not part of it. Out of those twenty eight countries, Argentina, Bolivia, Haiti, and Peru have had periods where they have been on the wrong side of the Laffer curve for several years and overall tend to be closer to the threshold debt levels. Of the Latin American countries, only Nicaragua is experiencing severe problems. Belize, Brazil, Ecuador, and Guyana have been generally on the correct side of the curve with episodically reaching and surpassing the peak values for a year or two during the crises of the early 1990s. Argentina's pre-default years are also captured by the study, showing that the country was on the wrong side of the curve in 1991-1992. During the Brazilian crisis of 1994, several countries are affected in terms of debt overhang. Bolivia, Haiti and Peru are on the wrong side of the curve between 1994 and 1996. In 1998, Bolivia and Brazil are borrowing on the verge of their capacity. The second wave of debt problems for Argentina can also be observed here, with the country making an encore appearance on the wrong side of the curve in 2002-2004. It is useful to note that the debt restructuring initiatives the country has undergone in the past several years have led to a

[11] There is no data on Cuba.
[12] European territories that are not independent sovereigns are not included here.
[13] They are part of the British monarchy but are neither part of Britain, nor the EU.

reduction of the debt burden, and as of 2005, the country is back on the correct side of the curve.

Figure 6: *D* versus D, Latin America, 1990-2005, logs*



List of numbered countries:

1 Chile	4 Jamaica	7 Trinidad and Tobago
2 Dominican Republic	5 Paraguay	8 Venezuela, RB
3 El Salvador	6 St. Kitts and Nevis	

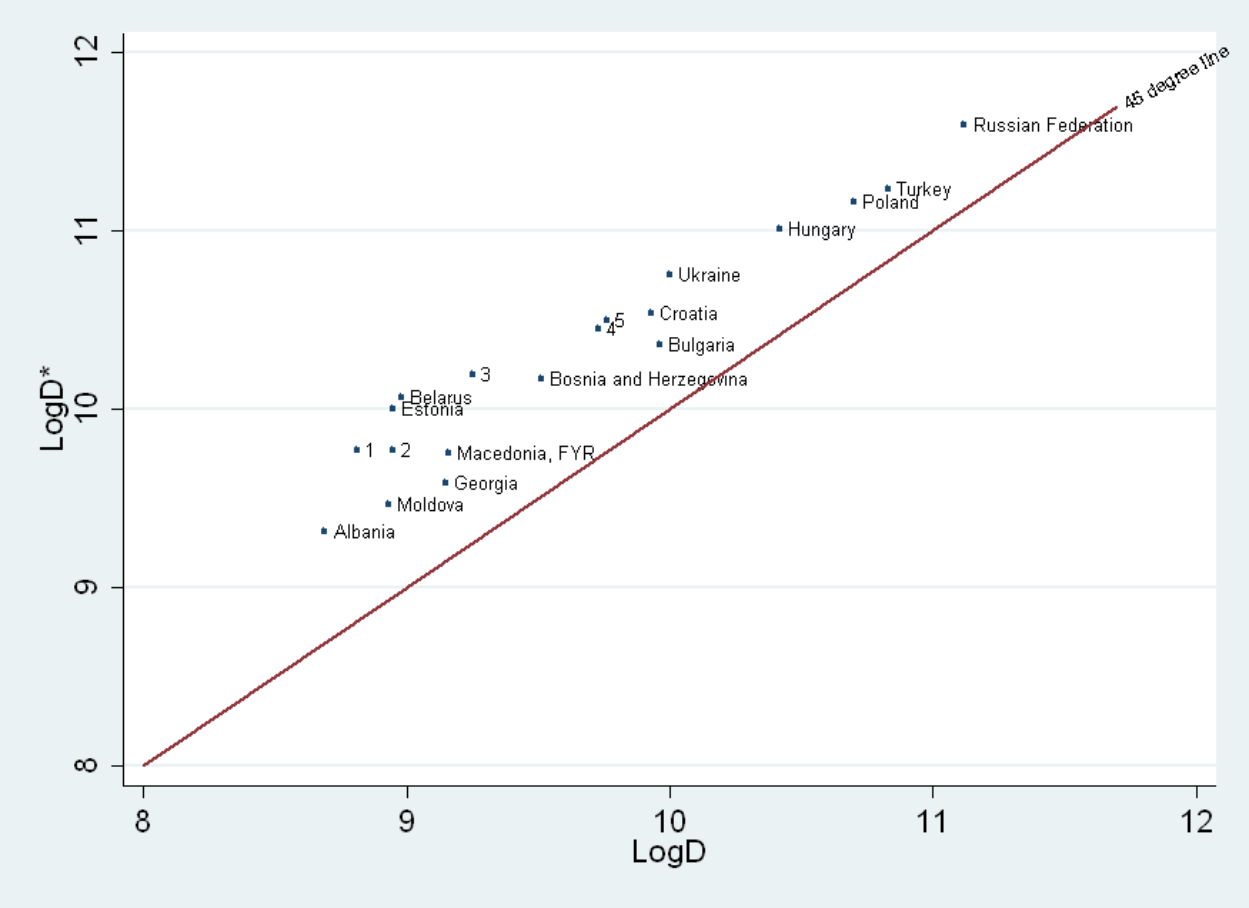
The results here show that countries like Guyana are not some of those that need immediate extensive debt forgiveness if one looks only at the debt levels. According to the findings of here, Guyana is almost always on the right side of the debt Laffer curve, and only in 1994-95 does the country reach its maximum level of sustainable debt. However, Guyana is the only country that was ever excluded from the HIPC initiative. The decision

was made in July 2007 after a set of several 100% debt write-offs in 200 5 and 2006 which decreased the face value of the country's debt to foreign creditors by more than 70% and thus helping the Guyana's economic development (U.S. Department of State 2007), which in return will enable the country to pay the rest of its obligations without the need of further forgiveness.

Of the countries in Eastern Europe[14] (**Figure 7)** only Albania was on the wrong side of the Laffer curve in 1991, and Bulgaria was approaching its critical value during the same year. Compared to the rest of the sample, these nineteen countries[15] perform best. That is due both to their individual efforts to improve economic performance, as well as to their proximity to the European Union. Many of these countries were or still are trying to join the EU and thus are subjected to a lot of accession requirements that are designed to stabilize and improve their economies. Parts of those requirements include maintaining reasonable levels of debt. These levels are uniform for all countries, and are well below the country-specific threshold levels of debt. The countries in the sample that already joined the EU are Hungary, Latvia, Lithuania, Poland, and Slovak Republic—in May 2004, and Bulgaria and Romania in January 2007. Croatia, Macedonia FYR, and Turkey have strived for EU membership for a long time and are recognized as official candidates for accession which binds them to follow a disciplined economic policy.

[14] It is important to note that there are four countries in the world that are considered geographically part of two continents, Europe and Asia—Azerbaijan, Georgia, Russian Federation, and Turkey. Because of that overlap of Eastern Europe and West Asia, these four countries appear in the analysis estimates for both regions.
[15] There are no observations for Serbia and Montenegro due to the politically volatile situation during the sample period. As of 2006, Montenegro is independent from Serbia.

Figure 7: *D* versus D, Eastern Europe, 1990-2005, logs*



List of numbered countries:

1 Azerbaijan	3 Lithuania	5 Slovak Republic
2 Latvia	4 Romania	

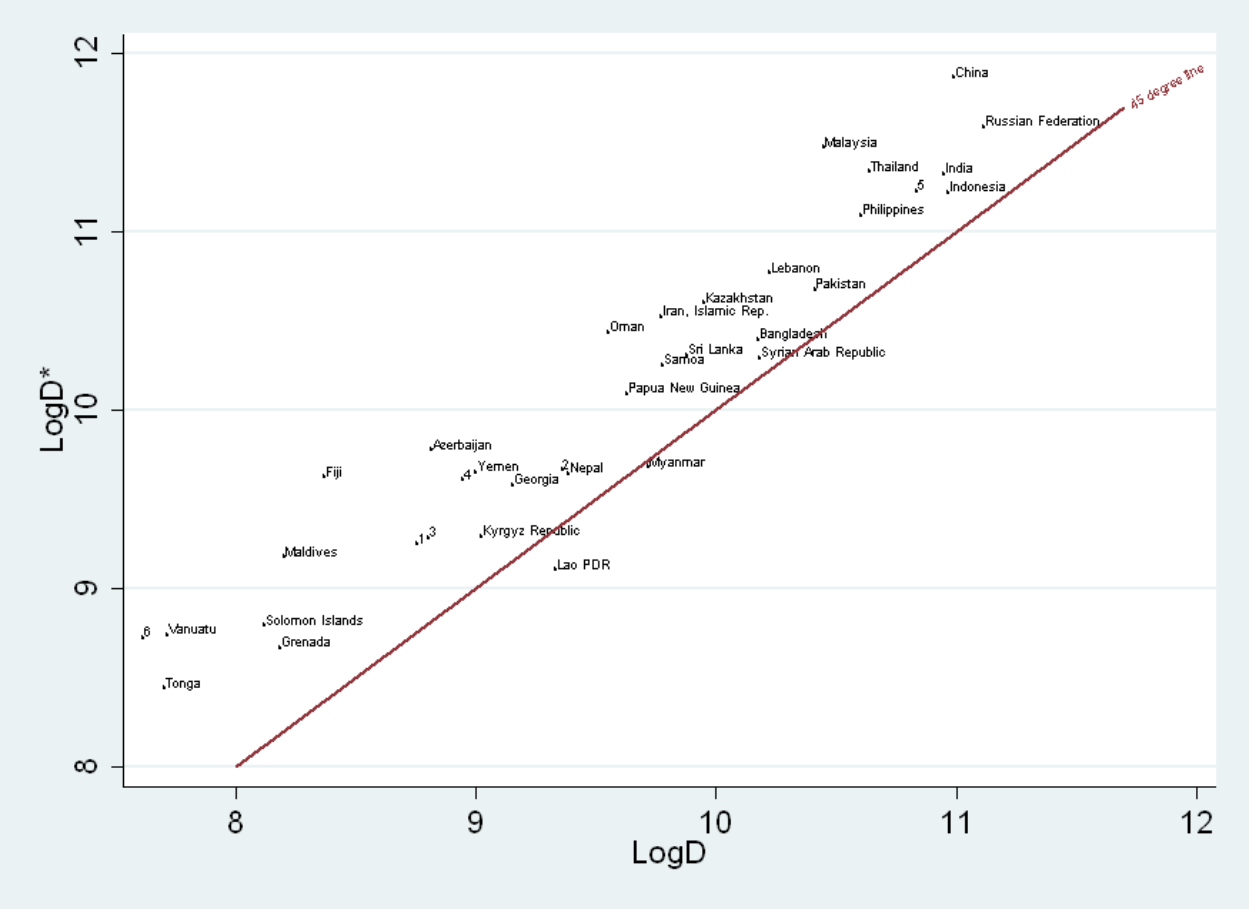
Of the Asian countries (**Figure 8)** there is data on twenty nine countries that fall into the category of low- and middle-income countries,[16] as well as data on seven countries that belong to the Pacific region but because of their proximity and economic ties with Asia are included here[17]. Of that sample, only Lao PDR was persistently on the wrong side of the Laffer curve. Bangladesh, Cambodia, and Myanmar were having debt problems in the

[16] Countries that were not included because of missing data are as follows: Turkmenistan and Uzbekistan (Central Asia), North Korea (East Asia), Indonesia (Southeast Asia), Afghanistan and Bhutan (South Asia), and Iraq, Jordan, and West Bank and Gaza (West Asia).

[17] Fiji, Grenada, Papua New Guinea, Samoa, Solomon Islands, Tonga, and Vanuatu.

beginning of the 1990s, while Syria was around the peak in 1991-1993 and 1995 and then in 1998 when moved on the wrong side for a year, and later on shifted back to safer levels of debt. Samoa was suffering from debt overhang in 2004 and 2005. Nepal was around the peak in 1990 but the rest of the time it was on the correct side. All other Asian and Pacific countries that were observed did not exhibit any severe debt problems.

Figure 8: *D* versus D, Asia, 1990-2005, logs*



List of numbered countries:

1 Armenia	3 Mongolia	5 Turkey
2 Cambodia	4 Tajikistan	6 Vietnam

The findings of this paper show that countries that suffer from debt overhang tend to be geographically close to each other. The inverse is also correct, namely that countries that do well are in close proximity to very strongly performing countries because the better-off

sovereigns have a vested interest in keeping their neighbors and trading partners in good economic standing. When talking about help from outside sources, either creditors or major international financial institutions, the results here are consistent with Sachs (2002), namely that debt relief for the poorest should not be based on arbitrary criteria, because the peak value of the Laffer curve is indeed somewhat endogenous to a country and varies across regions. For HIPC countries, debt forgiveness/cancellation should not be done arbitrarily but should be done on a case-by-case basis, emphasizing on the future development of the country and dealing with poverty issues. Sachs' findings are consistent with the findings of Arslanalp and Henry (2006) that debt burden is not the main problem of these countries, but rather poor financial institutions and corrupt governments that do not manage funds with the countries' best interests in mind. Sachs however thinks that not including debt forgiveness and only relying on foreign aid will not help these severely troubled countries to get out of their unfortunate situation.

Debt relief and implications for policymakers

Chuhan and Zettelmeyer (2007) discuss the implications of a debt problem for the domestic policymaker. Following Manasse, Roubini, and Schimmelpfennig (2003), they find that indebtedness thresholds depend on the country that is being analyzed and cannot be determined on a one-size-fits-all manner. Useful measures of the factors that might account for these differences are the debt history of the country, the quality of its domestic financial and legal institutions, the political stability, the level of reserves, the structure of the debt. While some of these are directly observable and one can measure them easily, others are not as easily compared. It is fairly easy to juxtapose the financial institutions of a developed

country like the United States to the same ones on Haiti—clearly it is the case that the United States has an advantage in this case. The issue here is that we are not comparing two so very different countries. One can argue that there are differences between the institutions among the emerging market countries but these differences are very hard to quantify. Relying only on "measurable" variables introduces omitted variable problems because sound financial systems do play a major role in the determination of risk of investments in a foreign country.

For the domestic policymaker there are two types of policies that need to be implemented—those that deal with crisis prevention and those that deal with crisis preparation (Sturzenegger and Zettelmeyer 2007). Crisis prevention policies have to be implemented a long time before a potential for a crisis develops in order to minimize the probability of it happening as well as to minimize the costs. The crisis preparation policies are the ones that prepare the economy for dealing with an immediate crisis, one that can no longer be avoided.

It is not hard to establish what the best type of policies for a "safe" country are, however the implementation of these policies may can be very costly, because for example, it may be very difficult or even impossible for a developing country to borrow long-term or in domestic currency. There are several categories of such policies discussed by the authors and they are: debt levels, debt structures, international reserves, financial sector regulation and supervision.

When it comes to HIPC countries, the same caveats apply, but the problem there is much more exacerbated. It is very common that the local government suffers from underdeveloped financial system, high levels of debt, low levels of international reserves

and an unfavorable debt structure. Arslanalp and Henry (2006) argue that for the HIPC countries, since they have other more pressing issues to deal like political instability and weak institutions, do not suffer from a debt overhang, contrary to what the results of the current paper show about at least eighteen countries, or at least that a debt relief program will not be as beneficial as foreign aid. Sachs (2002) acknowledges the fact that debt relief for the poorest should not be based on seemingly arbitrary criteria like a 150 percent of debt-to-exports ratio but he also believes that debt relief should be administered to these countries along with foreign aid so that they could be granted a "fresh start" with their economies. Agénor and Aizenman (2005) further specify that debt relief may not be fully beneficial unless it is accompanied by reforms aimed at reducing financial sector inefficiencies.

Table 5: *Complete list of countries' position on the Debt Laffer Curve, By years and regions, 1990-2005*

Country index to accompany Table 5

1	Albania
2	Algeria
3	Angola
4	Argentina
5	Armenia
6	Azerbaijan
7	Bangladesh
8	Barbados
9	Belarus
10	Belize
11	Benin
12	Bolivia
13	Bosnia and Herzegovina
14	Botswana
15	Brazil
16	Bulgaria
17	Burkina Faso
18	Burundi
19	Cambodia
20	Cameroon
21	Cape Verde
22	Central African Republic
23	Chad
24	Chile
25	China
26	Colombia
27	Comoros
28	Congo, Rep.
29	Costa Rica
30	Cote d'Ivoire
31	Croatia
32	Djibouti
33	Dominica
34	Dominican Republic
35	Ecuador
36	Egypt, Arab Rep.
37	El Salvador
38	Equatorial Guinea
39	Eritrea
40	Estonia
41	Ethiopia
42	Fiji
43	Gabon
44	Gambia, The
45	Georgia
46	Ghana
47	Grenada
48	Guatemala
49	Guinea
50	Guinea-Bissau
51	Guyana
52	Haiti
53	Honduras
54	Hungary
55	India
56	Indonesia
57	Iran, Islamic Rep.
58	Jamaica
59	Kazakhstan
60	Kenya
61	Kyrgyz Republic
62	Lao PDR
63	Latvia
64	Lebanon
65	Lesotho
66	Lithuania
67	Macedonia, FYR
68	Madagascar
69	Malawi
70	Malaysia
71	Maldives
72	Mali
73	Mauritania
74	Mauritius
75	Mexico
76	Moldova
77	Mongolia
78	Morocco
79	Mozambique
80	Myanmar
81	Nepal
82	Nicaragua
83	Niger
84	Nigeria
85	Oman
86	Pakistan
87	Panama
88	Papua New Guinea
89	Paraguay
90	Peru
91	Philippines
92	Poland
93	Romania
94	Russian Federation
95	Rwanda
96	Samoa
97	Sao Tome and Principe
98	Senegal
99	Seychelles
100	Sierra Leone
101	Slovak Republic
102	Solomon Islands
103	South Africa
104	Sri Lanka
105	St. Kitts and Nevis
106	St. Lucia
107	St. Vincent and the Grenadines
108	Sudan
109	Swaziland
110	Syrian Arab Republic
111	Tajikistan
112	Tanzania
113	Thailand
114	Togo
115	Tonga
116	Trinidad and Tobago
117	Tunisia
118	Turkey
119	Uganda
120	Ukraine
121	Uruguay
122	Vanuatu
123	Venezuela, RB
124	Vietnam
125	Yemen
126	Zambia
127	Zimbabwe

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong
1990	3	46	18	2	46	18	4	35	82	16			25	81	7
	11		30	3		27	8		90	54			42		62
	12		41	11		30	10			92			47		80
	17		50	14		38	12			93			55		
	20		62	17		41	15			118			56		
	22		68	20		50	24						57		
	23		72	21		68	26						70		
	44		73	22		72	29						71		
	49		79	23		73	33						85		
	52		80	28		79	34						86		
	53		82	36		95	37						88		
	60		95	43		97	48						91		
	69		97	44		100	52						96		
	83		100	49		108	53						102		
	98		108	60		112	58						104		
	125		112	65		119	75						110		
			119	69		126	87						113		
			126	74			89						115		
				78			105						118		
				83			106						122		
				84			107						125		
				98			116								
				99			121								
				109			123								
				114											
				117											
				127											
1991	3	46	18	2	46	18	8		4	54	16	1	25	110	7
	11		22	3		22	10		82	92			42		62
	12		30	11		28	12		90	93			47		80
	17		41	14		30	15			118			55		
	20		50	17		38	24						56		
	23		62	20		41	26						57		
	44		68	21		50	29						70		
	49		72	23		68	33						71		
	52		73	27		72	34						81		
	53		79	36		73	35						85		
	60		80	43		79	37						86		
	69		82	44		95	48						88		
	83		95	49		100	52						91		
	98		100	60		108	53						96		
	125		108	65		112	58						102		
			112	69		119	75						104		
			119	74		126	87						113		
			126	78			89						115		
				83			105						118		
				84			106						122		
				98			107						125		
				99			116								
				109			121								
				114			123								
				117											
				127											

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong
1992	3	46	12	3	28	18	8		4	1			25	7	19
	11	49	18	11	46	22	10		12	16			42	110	62
	17		22	14	49	30	15		52	40			47		80
	20		30	17		38	24		82	54			55		
	23		41	20		41	26		90	63			56		
	44		50	21		50	29			92			57		
	51		52	23		68	33			93			70		
	53		62	27		69	34			118			71		
	60		68	32		72	35						77		
	83		69	36		73	37						81		
	98		72	43		79	48						85		
	125		73	44		95	51						86		
			79	60		100	53						88		
			80	65		108	58						91		
			82	74		112	75						96		
			95	78		119	87						102		
			100	83			89						104		
			108	84			105						113		
			112	98			106						115		
			119	99			107						118		
				109			116						122		
				114			121						125		
				117			123								
				127											
1993	11	3	12	11	3	18	4	35	12	1			5	110	19
	17	23	18	14	23	20	8	51	52	9			7		62
	44	46	20	17	46	22	10		82	16			25		80
	53	49	22	21	49	28	15		90	31			42		
	60	51	30	27		30	24			40			47		
	98		41	32		38	26			54			55		
	125		50	36		41	29			63			56		
			52	43		50	33			66			57		
			62	44		68	34			92			61		
			68	60		69	37			93			70		
			69	65		72	48			101			71		
			72	74		73	53			118			77		
			73	78		79	58						81		
			79	84		83	75						85		
			80	98		95	87						86		
			82	99		100	89						88		
			83	109		108	105						91		
			95	114		112	106						96		
			100	117		119	107						102		
			108	127			116						104		
			112				121						113		
			119				123						115		
													118		
													122		
													125		

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong
1994	11	3	12	11	3	18	4	51	12	1			5		62
	17	46	18	14	27	20	8		52	9			7		80
	44	51	20	17	46	22	10		82	16			19		
	53		22	21	114	23	15		90	31			25		
	60		23	32		28	24			40			42		
	98		30	36		30	26			54			47		
	125		41	43		38	29			63			55		
			49	44		41	33			66			56		
			50	60		49	34			76			57		
			52	65		50	35			92			61		
			62	74		68	37			93			70		
			68	78		69	48			94			71		
			69	84		72	53			101			77		
			72	98		73	58			118			81		
			73	99		79	75			120			85		
			79	103		83	87						86		
			80	109		95	89						88		
			82	117		100	105						91		
			83	127		108	106						94		
			95			112	107						96		
			100			119	116						102		
			108				121						104		
			112				123						110		
			119										113		
													118		
													122		
													125		
1995	3	46	12	3	27	18	4		12	1			5	110	62
	11		18	11	46	20	8		52	6			6		80
	44		20	14		28	10		82	9			7		
	51		30	21		30	15		90	16			19		
	53		41	32		41	24			31			25		
	60		49	36		49	26			40			42		
	98		50	38		50	29			54			47		
	125		52	43		68	33			63			55		
			62	44		69	34			66			56		
			68	60		72	35			76			57		
			69	65		73	37			92			59		
			72	74		79	48			93			61		
			73	78		83	51			94			70		
			79	84		95	53			101			71		
			80	98		100	58			118			77		
			82	99		108	75			120			81		
			83	103		112	87						85		
			95	109		119	89						86		
			100	114			105						88		
			108	117			106						91		
			112				107						94		
			119				116						96		
							121						102		
							123						104		
													113		
													118		
													122		
													125		

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	Peak	wrong	right	peak	wrong	right	peak	wrong
1996	3	20	12	3	20	18	4		12	1			5		62
	11	30	18	11	30	41	8		52	6			6		
	44	83	41	14	83	49	10		82	9			7		
	46		49	21		50	15			16			19		
	51		50	28		68	24			31			25		
	53		52	36		69	26			40			42		
	60		62	38		72	29			54			47		
	80		68	43		73	33			63			55		
	98		69	44		79	34			66			56		
	124		72	46		95	35			67			57		
	125		73	60		100	37			76			59		
			79	65		108	48			92			61		
			82	74		112	51			93			70		
			95	78		119	53			94			71		
			100	84			58			101			77		
			108	98			75			118			80		
			112	99			87			120			81		
			119	103			89						85		
				109			90						86		
				114			105						88		
				117			106						91		
							107						94		
							116						96		
							121						102		
							123						104		
													110		
													113		
													118		
													122		
													124		
													125		
1997	3	20	18	3	20	18	4		82	1			5		62
	11	72	41	11	72	41	8			6			6		
	12		49	14		49	10			9			7		
	30		50	21		50	12			16			19		
	44		62	28		68	15			31			25		
	46		68	30		69	24			40			42		
	51		69	36		73	26			45			45		
	52		73	43		79	29			54			47		
	53		79	44		83	33			63			55		
	60		82	46		95	34			66			56		
	80		83	60		100	35			67			57		
	98		95	65		108	37			76			59		
	124		100	74		112	48			92			61		
	125		108	78		119	51			93			70		
			112	84		126	52			94			71		
			119	98			53			101			77		
			126	99			58			118			80		
				103			75			120			81		
				109			87						85		
				114			89						86		
				117			90						88		
							105						91		
							106						94		
							107						96		
							116						102		
							121						104		
							123						110		
													113		
													118		
													122		
													124		
													125		

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	Peak	wrong	right	peak	wrong	right	peak	wrong
1998	3	12	18	3	28	18	4	12	82	1			5		62
	11		20	11		20	8	15		6			6		110
	30		41	14		41	10			9			7		
	46		62	21		68	24			16			19		
	49		68	30		69	26			31			25		
	51		69	36		72	29			40			42		
	52		72	39		73	33			45			45		
	53		73	43		79	34			54			47		
	60		79	46		83	35			63			55		
	80		82	49		95	37			66			56		
	98		83	60		97	48			67			57		
	124		95	65		100	51			76			59		
	125		97	74		108	52			92			61		
			100	78		112	53			93			70		
			108	84		119	58			94			71		
			112	98		126	75			101			77		
			119	99			87			118			80		
			126	103			89			120			81		
				109			90						85		
				114			105						86		
				117			106						88		
							107						91		
							116						94		
							121						96		
							123						102		
													104		
													113		
													118		
													122		
													124		
													125		
1999	3	72	18	3	72	18	4		82	1			5	110	62
	11		20	11		20	8			6			6		
	12		41	14		39	10			9			7		
	30		49	21		41	12			13			19		
	46		62	28		49	15			16			25		
	51		68	30		68	24			31			42		
	52		69	36		69	26			40			45		
	53		79	43		79	29			45			47		
	60		82	46		83	33			54			55		
	80		83	60		95	34			63			56		
	98		95	65		97	35			66			57		
	119		97	74		100	37			67			59		
	124		100	78		108	48			76			61		
	125		108	84		112	51			92			70		
			112	98		126	52			93			71		
			126	99			53			94			77		
				103			58			101			80		
				109			75			118			81		
				114			87			120			85		
				117			89						86		
				119			90						88		
							105						91		
							106						94		
							107						96		
							116						102		
							121						104		
							123						113		
													118		
													122		
													124		
													125		

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong
2000	3	17	18	3	17	18	4		82	1			5		62
	11	20	41	11	20	41	8			6			6		
	12	68	49	14	68	49	10			9			7		
	30	119	62	21	119	69	12			13			19		
	46		69	28		79	15			16			25		
	51		79	30		83	24			31			45		
	52		82	36		95	26			40			47		
	53		83	39		97	29			45			55		
	60		95	43		100	33			54			56		
	72		97	46		108	34			63			57		
	80		100	60		112	35			66			59		
	98		108	65		126	37			67			61		
	124		112	72			48			76			70		
	125		126	74			51			92			71		
				78			52			93			77		
				84			53			94			80		
				98			58			101			81		
				99			75			118			85		
				103			87			120			86		
				109			89						88		
				114			90						91		
				117			105						94		
							106						104		
							107						110		
							116						113		
							121						118		
							123						122		
													124		
													125		
2001	3		17	3		17	4		82	1			5		62
	11		18	11		18	8			6			6		
	12		41	14		41	10			9			7		
	20		49	20		49	12			13			19		
	30		50	21		50	15			16			25		
	46		62	28		69	24			31			45		
	51		69	30		83	26			40			47		
	52		82	36		95	29			45			55		
	53		83	43		97	33			54			56		
	60		95	46		100	34			63			59		
	68		97	60		108	35			66			61		
	72		100	65			37			67			70		
	79		108	68			48			76			71		
	80			72			51			92			77		
	98			74			52			93			80		
	112			78			53			94			81		
	119			79			58			118			85		
	124			84			75			120			86		
	125			98			87						88		
				99			89						91		
				103			90						94		
				109			105						104		
				114			106						110		
				117			107						113		
				119			116						115		
							121						118		
							123						122		
													124		
													125		

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong
2002	3	79	18	3	79	18	8		4	1			5		
	11		41	11		41	10		82	6			6		
	12		49	14		49	12			9			7		
	20		50	20		50	15			13			19		
	30		68	21		68	24			16			25		
	46		69	28		69	26			31			45		
	51		82	30		83	29			40			47		
	52		83	36		95	33			45			55		
	53		95	43		97	34			54			56		
	60		97	46		100	35			63			59		
	72		100	60		108	37			66			61		
	80		108	65			48			67			64		
	98			72			51			76			70		
	112			74			52			92			71		
	119			78			53			93			77		
	124			84			58			94			80		
	125			98			75			101			81		
				99			87			118			85		
				103			89			120			86		
				109			90						88		
				114			105						91		
				117			106						94		
				119			107						104		
							116						110		
							121						111		
							123						113		
													115		
													118		
													122		
													124		
													125		
2003	3	82	18	3	119	18	8	82	4	1			5		
	11	119	41	11		41	10			6			6		
	12		49	14		49	12			9			7		
	20		50	20		50	15			13			19		
	30		68	21		68	24			16			25		
	44		83	28		83	26			31			45		
	46		95	30		95	29			40			47		
	51		100	36		100	33			45			55		
	52		108	43		108	34			54			56		
	53			44			35			63			59		
	60			46			37			66			61		
	72			60			48			67			64		
	79			65			51			76			70		
	80			72			52			92			71		
	98			74			53			93			77		
	112			78			58			94			80		
	124			79			75			101			81		
	125			84			87			118			85		
				98			89			120			86		
				99			90						88		
				103			105						91		
				109			106						94		
				114			107						104		
				117			116						110		
							121						111		
							123						113		
													118		
													122		
													124		
													125		

year	HIPC			Africa			Latin America			Eastern Europe			Asia		
	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong	right	peak	wrong
2004	3	108	18	3	108	18	8		4	1			5		96
	11		49	11		49	10			6			6		
	12		50	14		50	12			9			7		
	30		68	21		68	15			13			19		
	41		95	28		95	24			16			25		
	44		100	30		100	26			31			45		
	46			36			29			40			47		
	51			41			33			45			56		
	52			43			34			54			59		
	53			44			35			63			61		
	60			46			37			66			64		
	72			60			48			67			70		
	79			65			51			76			71		
	80			72			52			92			77		
	82			74			53			93			80		
	83			78			58			94			81		
	98			79			75			118			85		
	112			83			82			120			86		
	119			84			87						88		
	124			98			89						91		
	125			99			90						94		
				103			105						104		
				109			106						110		
				114			107						111		
				117			116						113		
				119			121						118		
							123						122		
													124		
													125		
2005	3		18	3		18	4			1			5		96
	12		68	14		68	8			6			6		
	30		95	21		95	10			9			7		
	41		100	28		100	12			13			19		
	44			30			15			16			25		
	46			36			24			31			45		
	51			41			26			40			47		
	52			44			29			45			59		
	53			46			33			54			61		
	60			60			34			63			64		
	79			65			35			66			70		
	82			74			37			67			71		
	108			78			48			76			81		
	112			79			51			92			85		
	119			84			52			93			86		
	124			99			53			94			88		
	125			103			58			118			91		
				108			75			120			94		
				109			82						104		
				117			87						110		
				119			89						111		
							90						113		
							105						118		
							106						122		
							107						124		
							121						125		
							123								

8 Conclusion

Evaluating a debt Laffer curve is useful in determining whether a country is suffering form a debt overhang; however, a further consideration of other country specific factors should be taken into account if debt relief actions are to be undertaken. Other very important factors, which the debt Laffer curve cannot control for, as discussed by Claessens (1990) and other authors, are for example the amount of resources a country has available for investment, the political structure and the domestic financial system, are crucial for the determination of the willingness and ability of a country to repay its debt, or the necessity of debt relief. Thus the estimation of a debt Laffer curve should only be used as an initial indicator that a country might be experiencing debt problems. In the case of the HIPC countries, if the results of the estimation show that some countries are not overborrowing at a given point in time, then it is useful to reevaluate the cost-effectiveness for creditors when continuing forgiving debt. And in the case of countries whose debt levels are fluctuating around the threshold debt values, some forgiveness might be useful as a preemptive measure to avoid debt overhang, provided that there is no (or very minimal) reduction in the expected value of the repayments. Otherwise, the reduction will come at the sole expense of the creditors and will not promote discipline when it comes to future borrowing.

References

Agénor, Pierre-Richard and Joshua Aizenman. (2005). Financial sector inefficiencies and the debt Laffer curve. *International Journal of Finance & Economics, 10(1), 1-13*

Arslanalp, Serkan, and Henry, Peter B. (2006). Helping the Poor to Help Themselves: Debt Relief or Aid. In *Sovereign Debt at the Crossroads: Challenges and Proposals for Resolving the Third World Debt Crisis*, ed. Chris Jochnick and Fraser A. Preston. Oxford: Oxford University Press.

Bowe, Michael, and James Dean. (1997). Has the Market Solved the Sovereign Debt Crisis? *Princeton Studies in International Finance* 83. *August*

Buckley, Ross P. 1999. *Emerging Markets Debt: An Analysis of the Secondary Market*. London, UK: Kluwer Law International

Chuhan, Punam, and Federico Sturzenegger. (2005). Default Episodes in the 1980s and 1990s: What Have We Learned? In *Managing Economic Volatility and Crises*, ed. Joshua Aizenman and Brian Pinto, 471-519. Cambridge: Cambridge University Press

Claessens, Stijn. (1990). The Debt Laffer Curve: Some Estimates *World Development. 18(12), December, 1671-1677*

Cohen, Daniel. (1996). The Sustainability of African Debt. *Policy Research Working Paper 1621, Washington, DC: World Bank*

Detragiache, Enrica. (1994). Sensible Buybacks of Sovereign Debt. *Journal of Development Economics, 43, 317-333*

Kim, Gloria, Byun, Jennie and Ying, Alvin. (2004). Emerging Markets Bond Index Plus: Rules and Methodology. *Emerging Market Research. J.P. Morgan Securities Inc. December*

Klingen, Christoph, Beatrice Weder, and Jeromin Zettelmeyer. (2004). How Private Creditors Fared in Emerging Debt Markets, 1970-2000. *IMF Working paper 04/13. Washington, DC: International Monetary Fund*

Krugman, Paul. (1989). Market-based Debt-reduction Schemes. *NBER Working Paper No. 2587. Washington, DC: National Bureau of Economic Research*

Manasse, Paolo, Nouriel Roubini, and Axel Schimmelpfennig. (2003). Predicting Sovereign Debt Crises. *IMF Working paper 03/221. Washington, DC: International Monetary Fund*

Merrill Lynch. (2002). *Emerging Markets Debt Monthly*

Min, Hong. (1998). Determinants of Emerging Market Bond Spread: Do Economic Fundamentals Matter? *World Bank Policy Research Working Paper No. 1899, Washington, DC: World Bank*

Pattillo, Catherine, Luca Ricci, and Hélène Poirson. (2002). *External Debt and Growth Finance & Development, 39(2), Washington, DC: International Monetary Fund*

Phillips, Kerk and Gary Woller. (1996). Commercial Banks and the Debt Relief Laffer Curve: An Empirical Investigation. *Contemporary Economic Policy, 14(2), 107-123*

Rieffel, Lex. (2003). *Restructuring Sovereign Debt: The Case for Ad Hoc Machinery*. Washington, DC: Brookings Institution Press

Roodman, David. (2006). Creditor Initiatives in the 1980s and 1990s. In *Sovereign Debt at the Crossroads: Challenges and Proposals for Resolving the Third World Debt Crisis*, ed. Chris Jochnick and Fraser A. Preston, 13-34. Oxford: Oxford University Press

Sachs, Jeffrey. 1989. “The Debt Overhang of Developing Countries.” In *Debt, Stabilization and Development, Essays in Memory of Carlos F. Diaz-Alejandro*, ed. By Ronald Findlay. Oxford: Blackwell.

Sachs, Jeffrey. 2002. “Resolving the Debt Crisis of Low-Income Countries" *Brookings Papers on Economic Activity 1.*

Sturzenegger, Federico. 2002a. “Toolkit for the Analysis of Debt Problems.” *Journal of Restructuring Finance* 1, no. 1: 201-230.

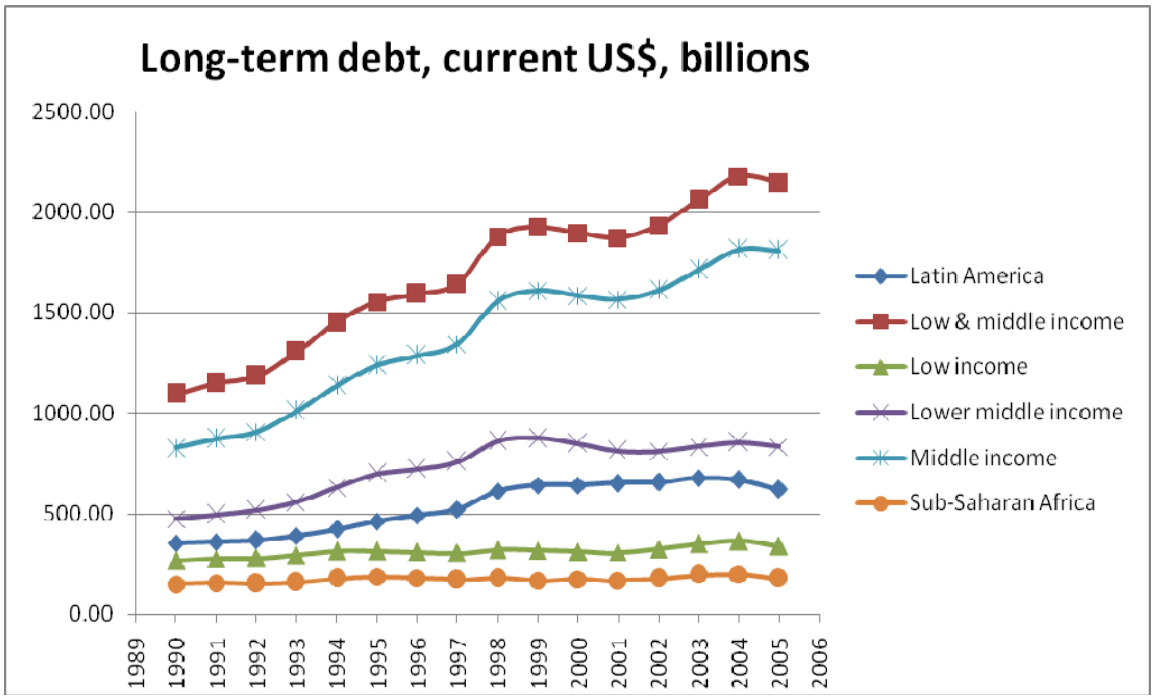
Sturzenegger, Federico. 2002b. “Default Episodes of the 90s: Fact Book and Preliminary Lessons.” Universidad Torcuato Di Tella, Buenos Aires.

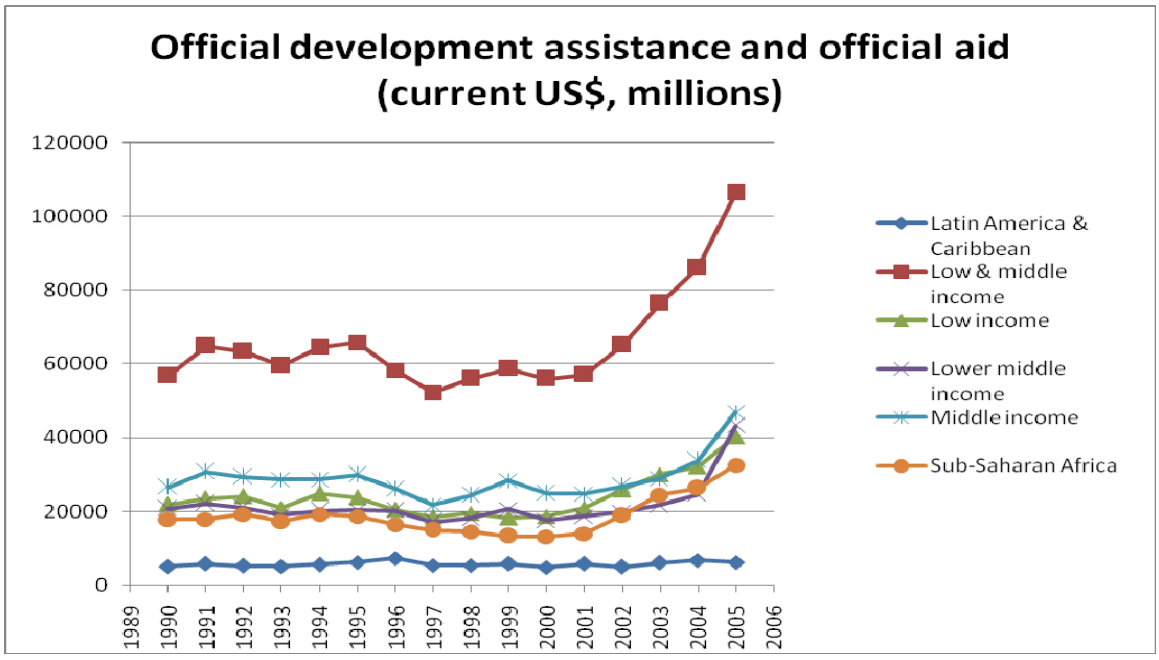
Sturzenegger, Federico, and Jeromin Zettelmeyer. 2005. “Haircuts: Estimating Investor Losses in Sovereign Debt Restructurings, 1998-2005.” Working Paper 05/137. Washington, DC: International Monetary Fund.

Sturzenegger, Federico, and Jeromin Zettelmeyer. 2007. *Debt Defaults and Lessons from a Decade of Crises*. Cambridge, MA and London, England: The MIT Press.

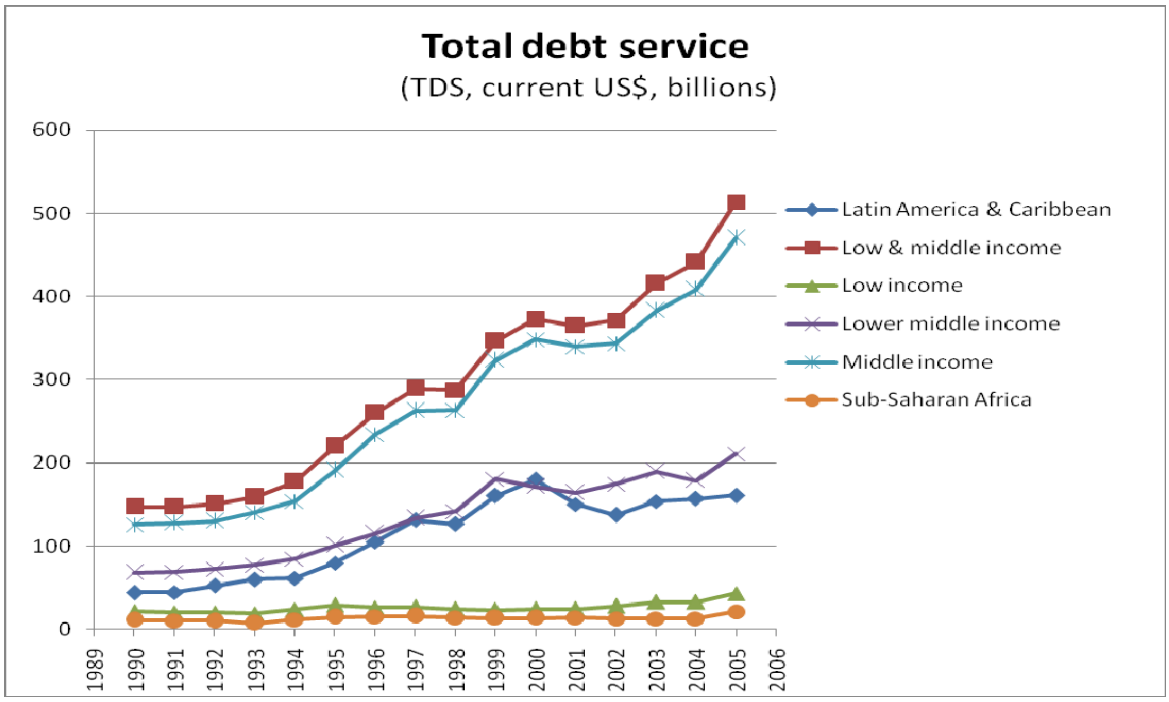
U.S. Department of State. 2007. Background Note: Guyana. *Bureau of Western Hemisphere Affair.* December. http://www.state.gov/r/pa/ei/bgn/1984.htm Accessed on 03-05-2008.

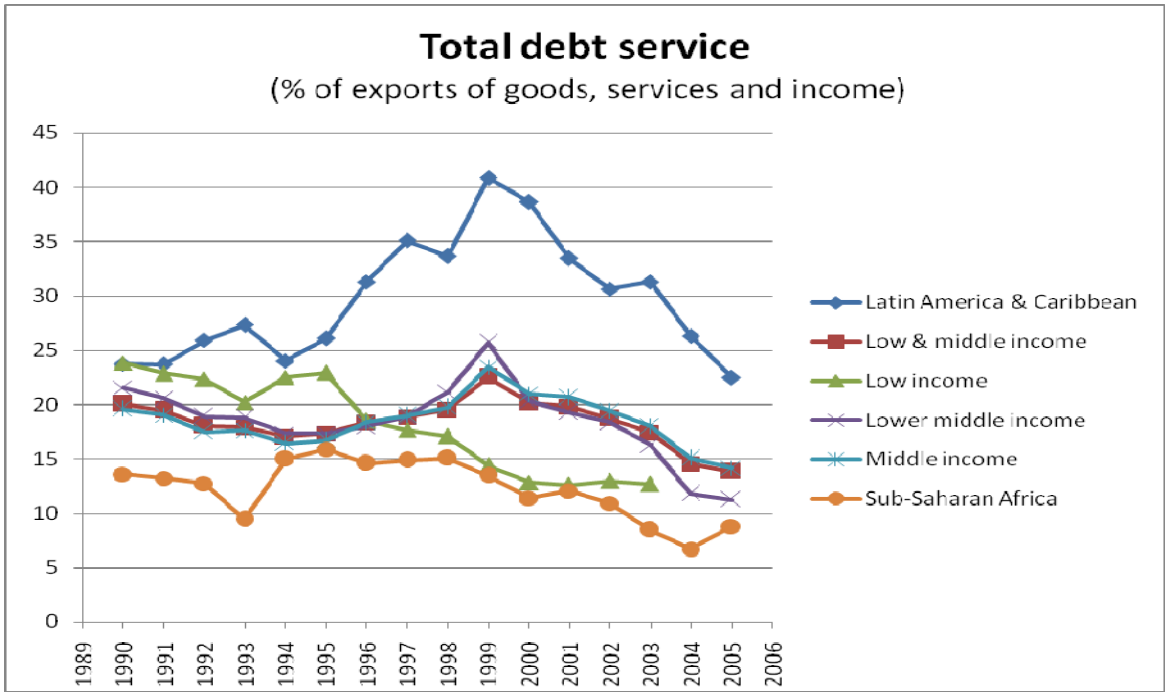
Appendix A
Aggregate trends in lending to sovereigns and administering aid, 1990-2005[18]

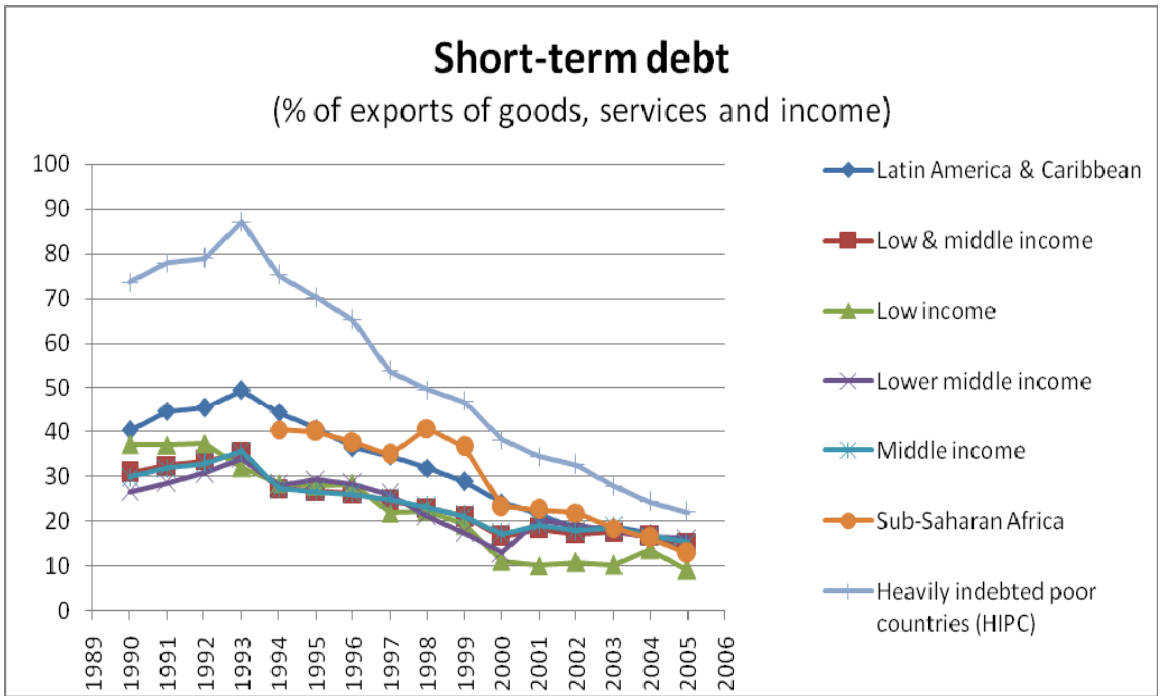




[18] Source: The World bank: World Development Indicators


Total debt service
(TDS, current US$, billions)
600
500
400
300
200
100
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Latin America & Caribbean
Low & middle income
Low income
Lower middle income
Middle income
Sub-Saharan Africa


Total debt service
(% of exports of goods, services and income)
45
40
35
30
25
20
15
10
5
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Latin America & Caribbean
Low & middle income
Low income
Lower middle income
Middle income
Sub-Saharan Africa


Short-term debt
(% of exports of goods, services and income)
100
90
80
70
60
50
40
30
20
10
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Latin America & Caribbean
Low & middle income
Low income
Lower middle income
Middle income
Sub-Saharan Africa
Heavily indebted poor countries (HIPC)

Appendix B

Estimating the Debt Laffer Curve

There were a total of four regressions that could be potentially useful to estimate the Debt Laffer curve. After the estimation of the bond spreads there were several options to choose from as to how to proceed with the calculation of secondary prices:

- Using only estimated spreads only for the countries with the most complete data sets (column 1)
- Using a combination of actual and estimated spreads only for the countries with the most complete data sets (column 2)
- Using only estimated spreads but include all countries and let STATA generate the missing values (column 3)
- Using a combination of actual and estimated spreads and let STATA generate the missing values (column 4)

All the regressions had a very high R^2 and the joint F-statistic was very large. All four regressions could be used to make inferences about the shape of the Laffer curve; however, there are some issues that need to be taken into account. The first two options, while providing somewhat more accurate information, were eliminating a significant portion of my data set, namely from the beginning of the 1990s to about 1997. This would have made my Laffer-curve estimations for the early- and mid-1990s not as reliable. The regression that I chose used the last option since it used the most comprehensive data set, and estimated values were only used when there were no actual values present.

Regression estimating the market value of debt (the debt Laffer equation)

Dependent variable: V, with robust standard errors in parentheses

variable	**1**	**2**	**3**	**4**
Constant	-9.09e+08	-1.44e+09	-4.97e+08	-8.98e+08
	(5.46e+08)	(4.90e+08)	(3.63e+08)	(3.66e+08)
D	1.11276	0.9158197	1.081927	0.947076
	(0.1011726)	(0.0593936)	(0.0903935)	(0.0621837)
$\frac{D^2}{XGS}$	-0.0015897	-0.0009364	-0.0016042	-0.0010551
	(.0002728)	(0.0002062)	(0.0002701)	(.0002389)
DXGSGROWTH	-0.0005002	0.0046087	0.0000586	0. 0029364
	(0.0038397)	(0.0028265)	(0.0037291)	(.0032813)
$DDUMMY_1$	-0.2535471	-0.1528256	-0.2932125	-0.1852648
	(0.072735)	(0.0643234)	(0.0641553)	(0.0638462)
$DDUMMY_2$	0.1952484	0.1734751	0.2406943	0. 2026786
	(0.092137)	(0.058237)	(0.0913028)	(.0606617)
	$R^2 = 0.7868$	$R^2 = 0.8273$	$R^2 = 0.7969$	$R^2 = 0.8156$
	F-statistic (5, 902) = 72.80	F-statistic (5, 1001) = 142.87	F-statistic (5, 1307) = 78.87	F-statistic (5, 1307) = 131.31
	Prob > F = 0.000	Prob > F = 0.000	Prob > F = 0.000	Prob > F = 0.000
	Number of observations = 908	Number of observations = 1007	Number of observations = 1309	Number of observations = 1313