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DEBT OVERHANG, FINANCIAL SECTOR DEVELOPMENT AND ECONOMIC GROWTH

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Abstract

This paper uses panel data of 20 high external debt countries selected from Asia and Latin-America to investigate the financial sector development-debt-growth nexus within the framework of an endogenous growth and financial development mechanism. First, we found that among 20 high external debt countries, the external debt-to-GDP ratio is significantly negatively correlated with economic growth rates, indicating that excessive debt is detrimental to the growth of an economy. Second, we introduced the simultaneous GMM equations between financial sector development and economic growth to evaluate the interaction effects among economic growth, external debt, and financial sector development. In empirical results, we find that the negative impact of high debt on growth appears to operate through a strong negative effect, in terms of compulsion to resort to financially repressive policies. In addition, we also find a two-way relationship between financial sector development and economic growth.

Keywords: Debt Overhang Hypothesis, Dynamic Panel Data, Dynamic GMM, Financial Sector Development, Economic Growth
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I. *Introduction*

Since the 1990s, policy-makers and citizens around the world have been increasingly concerned that high external indebtedness in many developing countries is limiting financial development and economic growth. Both theoretical and policy discussions indicate that the effect of debt on growth may be felt through all the main sources of growth. The most commonly cited channel by which large debt is thought to hinder growth is the so-called "debt overhang."[1] Conceptually, "debt overhang" implies that when external debt grows beyond certain limits, investors expect lower returns, because of apprehensions of higher and progressively more distortionary taxes being imposed to service the debt. Furthermore, given the uncertainties regarding what portion of the debt will actually be serviced with the countries' own resources, new domestic and foreign investment is discouraged, and this, in turn, slows capital accumulation.[2]

Another strand of the "debt overhang" theory emphasizes the point that large debt stocks increase expectations that debt tends to be financed by distortionary measures (i.e., inflation or other punitive taxes or arbitrary expenditure cuts). Under such uncertainty, private investors will prefer to exercise their option of waiting, and, as a result, may choose to invest less, or may divert their resources to high risk avenues offering quick financial returns, which gives rise to financial fragility that often leads to crises and/or reverse resources flows that damage growth.[3]

A "debt overhang" may affect growth not only in terms of volume of investment, but it may also lower productivity growth. Many authors have argued for a broader interpretation of the "debt overhang" theory since any activity that requires capital costs to be incurred for increasing output in the future will be discouraged, as part of the proceeds of the existing output will have go towards payments to creditors (Corden, 1989). Another relevant model is Calvo (1998), which links the debt and growth problem to capital flight. In a relatively simple model, high debt is associated with low growth since a higher distortionary tax burden on capital is required to service the debt, leading to a lower rate of return on capital, and lower investment and growth.

Empirical literature on debt and growth has followed two strands. One set of papers has attempted to directly test the potential crowding-out effect of debt on investment.[4] The second approach fits in with empirical growth literature, and investigates the reduced form effect of

[1] Krugman (1988) and Sachs (1989) pointed out that when a greater portion of a country's output is used to pay off the heavy interest on foreign debt, it indicates that the country has a debt overhang.

[2] Pattillo et al. (2004) pointed out that a doubling of debt in high debt countries is associated with about a 1 percent reduction in output growth, but they identify the causes as a reduction in the rate of total factor productivity growth and capital accumulation, rather than in reverse flows that emerge from externally financed development that causes the debt stock buildup.

[3] Clements et al. (2003) pointed out that when a country faces overly high debt, it will prompt manufacturers to undertake investment plans that may earn profits rapidly, and discard investment plans with a potentially high yield and high value-addition. The change in investment behavior and the uncertainty of interest expenses in relation to foreign debt will further reduce the investment incentive, and become unfavorable to economic development, making it more difficult for the objectives of economic reformation to be achieved.

[4] For example, in middle-income countries, Warner (1992) concludes that the debt crisis did not depress investment, while Serven and Solimano (1993) and Elbadawi et al. (1997), on the other hand, find evidence in support of the debt overhang hypothesis.

debt on growth in cross-country regressions, with particular focus on the presence of nonlinear relationships.[5] Empirical studies have sought to provide evidence of effects of "debt overhang" by demonstrating that debt stock ratios (i.e. debt stock as a percentage of exports or GDP), which represent expected future taxes to service debt, are negatively correlated with investment and growth in regression analysis. Panel regressions on a cross-section of credit-constrained economies have shown that the debt-to-GDP ratio is significantly and negatively associated with investment-to-GDP ratio, and with per capita income growth.[6] Sen et al. (2007) tested and verified the "debt overhang" hypothesis based on data from Argentina, Brazil, Columbia, Mexico, China, India, Indonesia, the Philippines, Korea, Thailand and Venezuela, using several panel data models, including pooled ordinary least squares, the so-called two-way fixed effects, two-way random effects models, the two-stage least squares instrumental variables model, and the first-differenced GMM and system GMM models.

The above literature leads us to the view that a country's economic growth is affected by foreign debt through a variety of channels. Voluminous findings from empirical studies also support the "debt overhang" hypothesis. A country with high debt is usually associated with high economic uncertainty and instability, which is unfavorable for development of financial intermediaries of the country, which in turn hinders economic growth.[7] Thus, the financial intermediaries play a vital role, among other channels of foreign debt, that affect the economic growth of a country.

A growing part of literature in recent years shows that emergence of financial intermediaries and markets lowers the costs of researching potential investments and projects, exercising corporate control, managing risks, and mobilizing savings. Economies with better-developed financial intermediaries and markets, therefore, enjoy higher growth rates. Earlier studies, including Goldsmith (1969), McKinnon (1973) and Shaw (1973), have suggested that the financial sector has played an important role in economic growth. McKinnon (1973) and Shaw (1973) show that financial sector development gives rise to increased savings and capital accumulation, and hence economic growth. Cross-country studies have uncovered a contemporaneous correlation between the level of financial sector development and economic growth. King and Levine (1993) show that this correlation exists across a variety of measures that capture both the efficiency and the extent of the financial sector development.[8]

A number of recent studies on endogenous growth also favor the positive role played by financial intermediaries in the process of economic growth (e.g., Amable and Chatelain, 2001; Benhabib and Spiegel, 2000) . These researchers support the view that financial sector development may raise the savings rate, stimulate investment, reduce the cost of external

[5] Other previous empirical studies on nonlinear effects of debt on growth include Cohen (1997) and Elbadawi et al. (1997).

[6] Pattillo et al. (2002) find evidence of debt overhang. Using a panel data set comprising 93 developing countries, for the period 1969-1998, they suggest that at a debt stock of 35-40 percent of GDP, the average effect of debt on real per capita GDP growth becomes negative.

[7] Presbitero (2006) points out that the stock of debt has another effect on economic performance, due to uncertainty associated with a high level of external debt (i.e. high and volatile inflation, interest rates) . Risks of default, rescheduling and arrears are likely to increase volatility of future capital inflows and additional lending. It also causes misallocation of resources, due to short-termism, which reduces efficiency and productivity of capital, leading to a slowdown of economic growth.

[8] Odedokun (1996) employs time series data for 71 developing countries and shows that financial intermediation promotes economic growth in some 85% of the countries.

finance, enhance the efficiency of capital allocation, and ensure more productive technological choices, all of which, in turn, lead to higher economic growth.

One of the relatively more important among recent papers, Levine (1998), finds that this channel of financial sector development explains economic growth. Levine et al. (2000) apply GMM techniques developed for dynamic panels, and provide more evidence that the level of development of financial intermediation has a strong and causal effect on economic growth. Levine (2002) further shows that the impact of financial sector development on growth manifests itself mainly through total factor productivity rather than through capital accumulation or the savings rate.[9] Christopoulos and Tsionas (2004) and Fase and Abma (2003) use time-series studies to find unidirectional causality from financial sector development to economic growth, while Calderon and Liu (2003) find bidirectional causality between financial sector development and economic growth. Likewise, numerous endogenous growth models also support a bidirectional relationship between financial sector development and economic growth (e.g., Greenwood and Smith, 1997).[10]

In general, external indebtedness and sovereign risk have both increased, which has driven up the risk premium and thus boosted interest rates. When more resources are absorbed by public consumption, fewer resources are available for private investment, leading to lower economic growth rates. Consequently, the stock markets decline. Erosion in private wealth (or investment) on account of a rise in foreign indebtedness accentuates the crowding out of private consumption, on account of a decline in wealth. Hence, a country burdened with a larger ratio of government debt to domestic income ends up with lower economic growth, a higher interest rate, a lower valuation of the stock market, and a higher degree of foreign indebtedness.[11]

A number of economic theories and empirical studies also indicate that a country with excessive debt is usually associated with high economic uncertainty and instability. Its government may be compelled to adopt financially repressive policies for controlling inflation, to meet financial needs with seigniorage (i.e. monetization of deficit), and to reduce government spending on interest paid on government debt. This will affect development of the financial intermediaries of a country and hinder economic growth.[12] Caballero and Krishnamurthy (2003) propose that financial repression of emerging markets is a significant factor behind the large share of dollar-denominated external debt present in these markets. They also show that

[9] Beck et al. (2000) used data of 63 countries covering the period from 1960 to 1995 in an empirical analysis, and the findings indicated that the sum of the development of financial intermediaries and the real per capita GDP, and the total productivity factor growth rate, were positively associated. This meant that the higher the level of development of the financial intermediaries in a country, the higher the economic growth rate, and the total factor of production growth rate.

[10] Patrick (1966) proposes the "stage of development" hypothesis, according to which financial sector development leads to growth in early stages of development, but this impact diminishes gradually as an economy develops, and the impact of growth on financial sector development begins to predominate after a certain level of development has been reached. It is also possible that both impacts take place simultaneously, and/or that there are other factors that drive both.

[11] Van der Ploeg (1996) analyses a small open economy with overlapping generations, endogenous growth, and a risk premium on foreign debt. A balanced-budget increase in public consumption or a rise in government debt raises the ratio of foreign debt to domestic income and the interest rate, but depresses economic growth.

[12] Roubini and Sala-i-Martin (1992) present a theoretical and empirical analysis of the relationship between financial repression and long-term growth. They show that policies of financial repression reduce the growth rate of the economy.

limited financial sector development reduces the incentives for foreign lenders to enter emerging markets. This, in turn, increases the cost of external finance and depresses economic growth.

In sum, the above literature indicates that excessive debt does affect the operations of the financial markets of a country, i.e. it accentuates uncertainty and instability (of the financial markets), which eventually affects the development of the financial intermediaries and discourages investment. These factors, in turn, affect the efficiency of resource allocation and economic growth. Yet, there is no literature in empirical studies, so far, shedding light on effect of foreign debt and development of financial intermediaries on economic growth. As such, the use of an empirical model to capture the relationship between debt and the financial intermediaries and economic growth deserves further study.

In this paper, data of 20 Asian and Latin American countries tracking changes in their debt and growth have been used. The dynamic data empirical model was applied to test if there was an excessive debt in these Asian and Latin American countries, through the straight line evaluation method. This paper is different from that of Sen et al. (2007) and covers more sample countries, through direct selection; the 20 Asian and Latin American countries are with high debt (not deliberately selected), and hence, are more representative. After confirming the status of excessive debt in these countries, the empirical model with the structural formula is applied to evaluate the association between debt, development of the financial sector, and economic growth, and to explore the determinants of economic growth and financial sector development of a country.

In addition, the relationship between debt and the financial sector, and its effect on economic growth, is also studied. For this, the simultaneous generalized method of moment method is used for evaluation. The aim is to identify the effects of debt on economic growth in the selected Asian and Latin American countries and assess the channels that affect the process. This paper is different from extant literature as it focuses on how foreign debt affects economic growth through development of the financial sector.

Empirical studies in this paper are in two parts. First, the excessive debt status of the 20 Asian and Latin American countries selected is confirmed. Second, factors critical for economic growth and development of the financial sector of a country are to be explored. At the same time, the role of foreign debt in this process, and its effects on development of the financial sector and economic growth are also assessed. The remainder of the paper is organized as follows. An introduction to the empirical model adopted in this paper is given in Section 2. Data processing and analysis of the empirical findings is presented in Section 3. Section 4 concludes the paper.

II. *The Empirical Model*

In this section, we use different traditional approaches to test the "debt overhang" hypothesis. In order to investigate the impact of "debt overhang" on growth via financial sector development, we conduct a preliminary exercise with panel simultaneous equations of growth and financial sector development models. This section describes (i) the empirical model of the "debt overhang" hypothesis; and (ii) the system specification which makes up the theoretical premise in the GMM framework used to study the relationship between debt, financial sector

development and economic growth.

1. The Empirical Model of the "Debt Overhang" Hypothesis

We have applied the following regression equation for testing the "debt overhang" hypothesis:

$$\Delta \ln Y_{it} = \alpha_{it} + \beta X_{it} + \gamma D_{it} + \varepsilon_{it}, \quad (1)$$

where $\Delta \ln Y_{it}$ is the dependent variable (the log first difference of per capita GDP), X_{it} represents the set of explanatory variables (including the log of lagged GDP per capita, the log first difference of gross fixed capital formation as percent of GDP, and the log first difference of the labor force growth rate), and D_{it} comprises the debt variables (including the log first difference of external debt as percent of GDP, and the log first difference of debt service as percent of exports of goods, services and income). ε_{it} is the error term, and the subscripts i and t represent the country and time, respectively.

Furthermore, we use different traditional approaches including ordinary least squares (OLS), the fixed effects model, and a more recent estimator (differenced generalized method of moments) to test the "debt overhang" hypothesis. The first method does not account for the presence of country effects, and thus results may be affected by an omitted variables bias. Therefore, we also estimate regressions with fixed effects. In the presence of fixed effects, however, the results using traditional panel data estimation (fixed effects) are biased by the presence of the lagged income variable among the regressors.[13] There are other problems, especially in growth empirics, such as the endogeneity of the regressors, measurement errors, and omitted variables' problems. To overcome the difficulty, we use the first differenced generalized method of moments (DGMM) to correct for the endogeneity of debt and other control variables, and for the bias introduced by the lagged income variable in the presence of fixed effects.

The GMM estimator is developed by Arellano and Bond (1991). The Arellano-Bond GMM technique is specifically designed to address econometric problems induced by unobserved group-specific effects, and the joint endogeneity of explanatory variables in lagged-dependent-variable models, such as growth regressions. Arellano and Bond (1991) have shown that consistency of the GMM estimator depends on the validity of the instrumental variables, and the assumption that the differenced error terms do not exhibit second-order serial correlation. The variables selected should satisfy the needs of high association between the independent and the dependent (or explained) variables, but have no association with the residuals (which is orthogonal).

There are two tests used to test the validity of the instrumental variables, as suggested by Blundell and Bond (1998). The first is the Sargan test of over-identifying restrictions, which tests the overall validity of the instrumental variables by analyzing the sample analog of the moment conditions used in the estimation process.[14] The second test is the autoregression (AR)

[13] Pattillo et al. (2004) point out that presence of the fixed effects introduces a correlation between the lagged income variable and the residuals, which biases the results. In particular, the coefficient of the lagged income variable is negatively biased.

[14] Under the null hypothesis of validity of the instrumental variables, this test has a χ^2 distribution with (J – K)

test, which examines the hypothesis that the error term is not serially correlated in both the single difference regression and the system difference-level regression.[15] The dependent variable in this paper is per capita GDP growth. Generally, the dynamic processing of adjustment should be considered for the growth variable. As such, the dynamic effect must be introduced to the GMM model. In this paper, the DGMM method was adopted to avoid problems inherent to the variables, and the missing explanation for dependent variables.[16] In the process of testing the "debt overhang" hypothesis, we select lagged variables, that include independent and dependent variables, to solve the problem of instability in the evaluation.

2. System Specification of Debt, Financial Sector Development and Economic Growth

In this paper, a structural formula is used for analysing the data showing development of the financial sector and economic growth, in order to explore how debt affects economic growth of a country through its financial sector development. Economic growth primarily comes from accumulation of factors of production and increase in marginal productivity of the factors (return on factors), as well as the overall upgradation of general factors of production. The empirical method adopted in this paper is the model of Odedokun (1996). The neo-classical model of growth proposed by Odedokun (1996) is based on the total production function of a single sector of a country, and takes financial sector development as an input factor, from the broad sense of factor input, in order to assess the relationship between financial sector development and economic growth. By following the standard literature and improving upon the theoretical postulation of Odedokun (1996), we specify economic growth relationship as:[17]

$$y_t = f(K_t, L_t, FD_t, Z_t), \tag{2}$$

where subscript t refers to time, y is the real per capita GDP, K is the real per capita physical capital stock, L is the total labor force, FD represents the proxy of financial sector development (the ratio of domestic credit plus stock market capitalization to GDP), and Z is the vector of other decisive growth determinants. Likewise, we specify a financial sector development relationship as:

$$FD_t = g(y_t, R_t, W_t), \tag{3}$$

where R is the average interest rate, W is the vector of other decisive financial sector development determinants, and y and FD are the same as in (2). It used to be common in the literature to employ some indicators of money stock, over GDP, as a proxy for financial sector development.[18] Liang and Teng (2006), for instance, propose that the proxy poses significant

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degrees of freedom, where J is the number of instrumental variables and K the number of regressors. The reason for using this statistic, as opposed to the Sargan statistic, is that it is robust to heteroskedasticity and autocorrelation.

[15] The autoregression (AR) test examines the hypothesis that the error term is not serially correlated in both the difference regression and the system difference-level regression.

[16] The DGMM method was developed by Hansen (1982) and applied to empirical analysis of dynamic data by Caselli and others (1996).

[17] Odedokun (1998) had studied the relationship between financial sector development and economic growth in developing countries, and also set the total production factor function as Equation (2).

[18] For example, McKinnon (1973) had used M2 as a substitute variable on the degree of financial sector development in a country.

problems of interpretation because monetary aggregates: (1) measure more the extent of monetization rather than financial development, especially for the developing economies; (2) make no differentiation of liabilities among financial institutions; and (3) cannot represent the actual volume of funds channeled to the productive sector. Therefore, we sum domestic credit with stock market capitalization and divide by GDP as the indicator of financial development.[19]

For exploring the relationship between development of financial intermediaries and economic growth, this paper introduces an equation that is a compression of Equations (2) and (3) as the basis for subsequent evaluation of the formula to find out the causal relationship between financial sector development and economic growth. Most economic theories suggest that the real per capita GDP is positively associated with development of the financial sector in a country. Yet, opinions on the effect of interest rates on the development of the financial sector vary. Generally, excessive debt intensifies uncertainty and instability in financial markets, which result in increased risk premium or high inflation. This phenomenon is unfavorable for financial sector development in a country. Therefore, the interest rate also plays a vital role. For highlighting the effect of foreign debt on financial sector development in a country, caused through interest rate fluctuations, this paper adopts the average nominal interest rate of the market as the explained variable.

The endogeneity problem is resolved by specifying and estimating simultaneous systems of equations, thus not by using lagged variables and the GMM estimation technique, in a single equation. Because the impact of "debt overhang" on growth is mainly channeled through its effects on financial sector development, it is necessary to include a financial sector development equation in the system.[20] The econometric model specification, based on equations (2) and (3), is as follows:

$$\Delta \ln y_{it} = \alpha_0 + \alpha_1 \Delta \ln K_{it} + \alpha_2 FD_{it} + \alpha_3 \Delta \ln L_{it} + \alpha_4 DG_{it} + \alpha_5 DS_{it} + \alpha_6 STD_{it} + u_{it}, \quad (4)$$

$$FD_{it} = \beta_0 + \beta_1 \Delta \ln y_{it} + \beta_2 R_{it} + \beta_3 DG_{it} + \beta_5 DS_{it} + \beta_6 O_{it} + \varepsilon_{it}, \quad (5)$$

where y is real GDP per capita, K is gross fixed capital formation,[21] FD is the proxy for financial sector development, L is the total labor force, DG is external debt as percent of GDP, DS is the debt service ratio as percent of exports of goods, services and income, STD is short-term debt as percent of external debt, R is the average interest rate, and O is the Openness indicator (exports plus imports as percent of GDP). The dependent variable in equation (4) is growth in real GDP per capita, and equation (5) is the proxy for financial sector development.

Equations (4) and (5) could raise concerns regarding simultaneity bias in our regressions, due to potential endogeneity. Current GDP growth may be influenced by FD, debt burden indicators such as debt to GDP, and debt service to exports of goods, services and income ratio.

[19] Rajan and Zingales (1998) use a similar indicator to measure the overall level of financial sector development. They emphasize in their study that the initial level of financial sector development is a leading indicator, rather then a causal factor, for financial markets to anticipate faster economic growth.

[20] In the process of linearization of equations (2) and (3), equation (2) uses debt variables (including the ratio of foreign debt to GDP, interest on debt to exports of goods and services, and short-term debt to total foreign debt) as other critical factors affecting economic growth. Similarly, equation (3) adopts the debt variables, and the indicator for the level of deregulation (ratios of exports and imports to GDP) as other critical factors affecting financial sector development.

[21] Capital stock in kind is difficult to measure. Therefore, we have used the formation of fixed capital as the substitute variable. Barro (1991), Levine and Renelt (1992) had adopted this method.

It is also argued that growth may be an important determinant of FD; for example, a more rapidly growing economy provides a higher degree of financial sector efficiency than a slowly growing economy.

Thus we perform a preliminary exercise with a panel simultaneous equation of growth and financial sector development models. The simultaneous estimation does not seem to perform well as it has anomalous signs on some of the coefficients. This may be, in part, due to the sample size being small, relative to the number of explanatory variables: the total of twelve variables is to be simultaneously solved. Moreover, in using a systematic method to consistently estimate coefficients, all equations in the system must be properly specified, implying that the instrumental variables must be exogenous (Wooldridge, 2002). Therefore, we do not pursue a simultaneous solution. The advantage of using GMM for evaluation is that we do not need to know the exact distribution of the residuals, and to set a number of limits; and yet we could obtain a solid evaluation result.[22] Therefore, the structural formula helps provide the cross effect of the explanatory and the dependent variables, in the regression equation.

III. *Data and Empirical Results*

In this section, selected sample variables are subjected to the panel unit root test, to find out the relationship between foreign debt and economic growth in the selected Asian and Latin American countries. After confirming the level of excessive debt in these countries, the empirical model under the structural formula is applied to explore the associations between foreign debt, development of the financial sector, and economic growth. The effect of foreign debt on development of the financial sector and economic growth is also assessed.

1. Data Description and Unit Root Tests

All data are mainly taken from the World Development Indicators (WDI) 2006, of the World Bank, over the period 1982-2004, but data for the simultaneous GMM model cover the period 1991-2004.[23] The countries are selected on the basis of data availability. Descriptive statistics for all variables are provided in the Appendix. In this paper, 20 emerging countries in Asia and Latin American have been selected for research. They are the top ten countries in each of the above two regions, in terms of debt as a proportion to GDP (Table 1).[24] We use data for 20 Asian and Latin American countries, namely, China, India, Indonesia, Korea, the

[22] Baltagi (2001) suggested that if the conventional dynamic data analysis method for evaluation of the model is used, the coefficients will be biased. As such, the GMM method is applied in two stages for assessing the parameters under the model. Under this situation, assessments at stages 1 and 2 will be heteroskedasticity-consistent, whether the residuals varies heterogeneously or not. At the same time, the standard deviation will be stable, irrespective of whether the variation is homogenous or heterogeneous.

[23] Due to data (e.g., the ratio of domestic debt to GDP, and stock market capitalization to GDP) availability constraints, only the period 1991-2004 is covered.

[24] These countries have also been selected because this paper compares its results with results of empirical research conducted by Sen et al. (2007), which has explored the issue of excessive debt of Asian and Latin American countries and discovered that excessive debt adversely impacts the economic performance of these Asian and Latin American countries.

TABLE 1. COMPARATIVE FEATURES OF ASIAN AND LATIN AMERICAN DEBT

	1990		2000	
	Debt stock (billion US$)	Debt as % of GDP	Debt stock (billion US$)	Debt as % of GDP
Asian countries				
China	55	15.6%	146	12.3%
India	84	26.4%	99	21.7%
Indonesia	70	61.1%	144	87.5%
Korea	35	13.3%	134	26.3%
Philippines	31	69.0%	58	76.8%
Thailand	28	32.9%	80	65.0%
Malaysia	15	34.8%	42	46.4%
Pakistan	21	51.7%	33	44.7%
Sri Lanka	6	73.0%	9	56.1%
Bangladesh	12	41.3%	16	34.5%
Turkey	49	32.8%	117	58.9%
Latin American countries				
Argentina	62	44.0%	147	51.9%
Brazil	120	26.0%	243	40.5%
Colombia	17	42.8%	34	40.5%
Mexico	104	39.8%	150	25.9%
Chile	19	63.4%	37	49.2%
Ecuador	12	117.0%	14	86.0%
Panama	6	122.2%	7	60.6%
Venezuela	33	70.5%	38	32.6%
Peru	20	76.2%	29	54.0%

Note: Total debt stock (US$ billion) and total debt as a % of GDP.
Source: Sen et al. (2007).

Philippines, Thailand, Malaysia, Pakistan, Turkey, Bangladesh, Sri Lanka, Argentina, Brazil, Colombia, Mexico, Chile, Ecuador, Venezuela, Peru, and Panama. For the Asian and Latin American sample, since data availability varies, we use population instead of labor force data. All variables are as defined and reported by the International Monetary Fund.

Before performing the estimations, unit root tests are conducted to examine the stationarity properties of the variables, and to ensure that incorrect inferences are not reached due to spurious regressions. To this end, we employ the panel unit root test of Levin et al. (2002), since their test incorporates a degree of heterogeneity, by allowing for fixed effects and unit specific time trends.[25] The variables in levels, namely, lny, lnK and lnL, are found to be insignificant at 5% level by the Levin et al. (2002) panel test, implying that they are non-stationary. The first differences of these variables reject the null of the unit root. Therefore, it follows that the variables are characterized as being integrated, of order one. For other variables, test results indicate that there exists stationarity in levels (Table 2). These results are consistent with Equations (4) and (5), in that the stationary variables are specified in levels, while the non-stationary variables are first differenced.

[25] Following Levin et al. (2002), null and alternative hypotheses are $\rho_i = 1$, where $i = 1,...,N$, and $\rho_1 = \rho_2 = ... = \rho_N < 1$, respectively. The alternative hypothesis assumes the same degree of stationarity across countries.

TABLE 2. UNIT ROOT TESTS—1982～2004

	Statistic	Prob.	Lag
Δlny	−8.14***	0.00	2
ΔlnK	−8.38***	0.00	1
ΔlnL	−10.46***	0.00	2
DG	−5.00***	0.00	2
FD	−5.52***	0.00	2
STD	−3.39***	0.00	1
DS	−2.93***	0.00	2
R	−3.60***	0.00	2
O	−1.96**	0.03	2

Note: *** and ** indicate rejection of the unit-root hypothesis at the significance level of 1% and 5%, respectively.

2. Empirical Results of the "Debt Overhang" Hypothesis

First, we summarize the results in terms of the relationship between economic growth and the burden of external debt. Each of the three methods of estimation considers two alternative measures of debt, i.e. external debt-to-GDP ratio, and debt service to exports of goods, services and income ratio. Table 3 presents coefficients estimated from the per capita growth equation, from which it can be seen that we employ three estimation methods (POLS, fixed effects, and DGMM) and two debt measures. Results for the control variables all appear reasonable in the growth regression, and are similar to earlier findings. By focusing on variables of interest, the debt variables, we show the coefficients for the debt variables. The last row in each table reports the p values for the Sargan test, which cannot reject the null hypothesis of the over-identified restrictions, i.e. the null hypothesis that the instrumental variables are appropriate cannot be rejected.

Table 3 shows that the coefficient of external debt to GDP is negative and statistically significant. The coefficient ranges from -0.14 (for DGMM estimation) to -0.10 (for POLS estimation), indicating that high external debt decreases the growth rate of the economy by 0.10 to 0.14 percentage points for the 20 Asian and Latin American countries. In addition, the coefficient of debt service to exports of goods, services and income ratio is negative and significant for the 20 Asian and Latin American countries (for the POLS and DGMM estimation methods).[26]

Thus, on average, economic growth in these countries has been approximately 0.1 percentage point below what it would have been without the heavy external debt burden. This result strongly suggests that a high level of external debt has caused a significant slowdown of economic growth in Asian and Latin American countries. The estimated results of all the three methods unanimously support the "debt overhang" hypothesis. Since the DGMM estimate of DG is slightly higher than the estimated values of OLS and FE, these estimates may have been biased downwards due to inclusion of weak instrumental variables. Furthermore, growth of

[26] The result is congruent with the assessment of Sen et al. (2007), which implied that excessive debt was unfavorable to economic growth in Asian and Latin American countries. But Sen et al. (2007) further compared countries in Asia and Latin America, and discovered that excessive debt resulted in negative economic growth to a greater extent in Latin America, compared to Asia.

TABLE 3. PANEL ESTIMATION OF ASIAN AND LATIN AMERICAN DEBT AND GROWTH—1982～2004

Variables	OLS	FE	DGMM
lny (-1)	0.004(31.63)***	−0.03(43.96)***	−0.10(2.00)**
ΔlnKG	0.16(42.10)***	0.15(121.10)***	0.18(4.97)***
ΔlnL	−0.47(9.14)***	−0.46(26.24)***	−1.11(0.41)
ΔlnDG	−0.10(35.40)***	−0.11(121.28)***	−0.14(5.32)***
ΔlnDS	0.004(3.03)**	−0.00003(0.09)	−0.01(1.44)*
Adjusted R^2	0.96	0.99	0.53
DW statistic	1.89	2.05	
F- statistic	2339.24[0.00]	5498.025[0.00]	
J- statistic			24.08
p-Value (Sargan test)			0.067

Note: t-statistics are in parentheses, probability of F- statistic is in bracket. ***, **, * indicate 1%, 5%, and 10% level of significance, respectively.

gross fixed capital formation to GDP ratio is found to contribute positively to economic growth for all the three estimation methods (0.16, 0.15, and 0.18 percentage point, respectively). It is statistically significant in all models. We also find that growth in labor force contributed negatively and significantly to economic growth (except in the case of the DGMM model).

After the selected countries were confirmed to be in excessive debt,[27] when reviewed individually, some of these countries have already reached the level of excessive debt, some have not. These 20 countries as a whole, however, have reached the level of excessive debt and the structural formula was used to assess how debt affected financial sector development and economic growth. We apply the simultaneous GMM model to equations (4) and (5) to evaluate cross effects between debt, decisive growth determinants, and financial sector development.

Table 4 reports the GMM estimation results for relationship between debt and growth. The last row in table reports p values for the Sargan test, which cannot reject the null hypothesis of over-identifying restrictions. That is, the null hypothesis, that the instrumental variables are appropriate, cannot be rejected. We find that the development of a country's financial sector helps raise its economic growth rate. Similarly, a country's economic growth also helps development of its financial sector, and a bidirectional relationship exists between the two. In other words, two-way causality exists between economic growth (Δlny) and financial sector development (FD). We also discover that the impact of economic growth on financial sector development is much greater than the impact of financial sector development on economic growth.

Except for the proxy variable for financial sector development, impacts of other variables on economic growth in equation (4) are (1) The growth rate of gross fixed capital formation (ΔlnK) has a significant positive effect on economic growth, suggesting that capital accumulation is the main driving force behind a country's economic growth; (2) The growth of the labor force (ΔlnL) has a significant negative effect on economic growth, because economic growth of these countries is mainly driven by increases in productivity or capital accumulation;

[27] By definition, a country is considered to have reached an excessive level of debt when its debt (generally measured as a proportion of its GDP) becomes so high that the probability of debt repayment declines, and, consequently, there is a negative slope in its Debt Laffer Curve.

TABLE 4. GDP GROWTH AND FINANCIAL DEVELOPMENT EQUATIONS USING GMM IN ASIAN AND LATIN AMERICAN COUNTRIES—1991～2004

	Dependent variable (Δlny)			Dependent variable (FD)	
	Coefficient	t-statistic		Coefficient	t-statistic
Constant	0.02	3.86***	Constant	0.34	3.34***
ΔlnK	0.15	20.18***	Δlny	2.21	3.30***
FD	0.01	2.89***	R	−3.44	−2.71***
ΔlnL	−0.31	−3.32***	DG	−0.97	−8.78***
DG	−0.02	−2.52**	O	1.03	15.49***
STD	0.02	0.75	DS	0.87	5.73***
DS	−0.01	−1.79*			
Adjusted R^2	0.74		Adjusted R^2	0.49	
J- statistic	0.42				
p-Value (Sargan test)	0.999				

Note: Same as Table 3.

and (3) Our analysis of the debt indicators reveals that both the debt-to-GDP ratio (DG), and the debt service to exports of goods, services and income ratio (DS), have significant negative effects on economic growth. Therefore, the "debt overhang" hypothesis is proved from our empirical results. In addition, we also find that the short-term debt to external debt ratio (STD) does not have a significant effect on economic growth.[28]

In the financial sector development equation, other variables, besides economic growth, also affect financial sector development. Interest rate (R) has a significant negative effect on financial sector development, suggesting that high-debt countries tend to impose restrictions on interest rates to avoid high debt service, and, therefore, high interest rates are detrimental to financial sector development.

A causality test has been conducted (Table 5) to further confirm the correlation between DG (debt to GDP ratio) and R (interest rate), thereby highlighting the influence of external debt on the financial development of a country, taking into account effects of interest rate fluctuations. The results show that DG would influence R, and R would affect DG. In other words, there is a bidirectional causality between the two. The results of the causality test (which shows that DG affects R) and, therefore, suggests that excessive debt may causes interest rate fluctuations and forces the government to adopt financially repressive policies.[29] On the other hand, as R influences DG, changes in the interest rate too influence the level of debt. The possible reason is that rise of interest rate cause an increase of interest expenses, and consequently a higher level of debt.[30]

[28] When the ratio between short-term debt to total debt rises, a country has to prepare for larger repayments of debt at any given time. Under normal circumstances, long-term debt is the primary factor affecting the real economic performance of a country. As such, short-term debt to total debt ratio insignificantly affects the economic growth of a country.

[29] A key point is that the crowding out argument, which suggests that the government should be careful not to let its actions raise domestic interest rates too much, does not necessarily imply that forcing interest rates down to artificially low levels is beneficial since this is likely to reduce domestic savings.

[30] From Table 5, it is apparent that results of the Granger Causality Test have indicated weak causality; only few have a statistical significance level above 5%. This may be due to the fact that the study has adopted nominal interest rate, which may rise because of high risk premium or inflation rate in highly leveraged economies (nations with high

TABLE 5. GRANGER CAUSALITY TEST RESULT

Dependent variable	Independent variable	Chi-sq	Prob.	Causal correlation
DG	R	3.0046*	0.0830	
R	DG	2.8220*	0.0930	

Note: * indicate 10% level of significance.

The rise in risk premium or inflation rate in a highly-indebted country results in rise in its market interest rates. Table 4 shows that interest rate (R) has a significant negative influence on the development of financial sectors (the coefficient is -3.44). The reason is, possibly, that the government has to enforce interest rate control measures in order to lower interest costs. This, however, adversely affects the growth of the financial sector.

Interest rates mentioned in this paper refer to the average nominal interest rates, instead of real interest rates (which include the effects of inflation).[31] The purpose is to highlight the fact that excessive debt increases uncertainty and instability in financial markets, which will subsequently cause higher risk premiums or excessive inflation (the inflation effect).Therefore, if inflation in a high-debt country rises, its nominal interest rate also rises and becomes detrimental to its financial sector development.[32] Also, the degree of openness of a country (O) has a significant positive effect on its financial sector development, because financial liberalization of a country helps raise its competitiveness and efficiency, and is beneficial to its financial sector development. Besides, our analysis of the debt indicators reveals that the debt-to-GDP ratio (DG) has a significant negative effect on financial sector development, while the debt service to exports of goods, services and income ratio (DS) has a significant positive effect on financial development.[33]

IV. *Conclusions*

The financial sector plays an important role in economic growth. A robust financial sector not only boosts savings, and hence increases capital accumulation, but also makes use of funds more efficient, thereby channeling more investment into production and stimulating economic growth. However, a nation with excessive debt suppresses its financial sector development, which hinders economic growth. In order to understand how financial sector development and economic growth are affected by "debt overhang," and whether it strengthens or weakens the

DG). Other external factors could also push market interest rates (R) up, which could in turn result in increase of interest payments. Debt burden would also become heavier with rising DG. However, it is possible that other factors have contributed to the increased DG (i.e. increase in government budget deficit, lower nominal GDP growth, and so forth), and this could make the causality between DG and R less apparent.

[31] Laubach (2009), using a similar approach, has also adopted the nominal interest rate to replace the real interest rate.

[32] For example, Boyd et al. (2001) pointed out that inflation distorts normal activities in financial markets and further creates information asymmetry, that reduces returns on investments. Besides, Azariadis and Smith (1996) also discovered that in countries with high inflation, further inflation creates conflicts within the financial markets that are detrimental to financial sector development and significantly lowers their economic growth rates.

[33] This is probably the higher the ratio of interest on debt to exports of goods and services, the higher will be the degree of liquidity required on part of domestic enterprises to seek financing from domestic financial markets. This in turn contributes to development of the financial sector in a country.

relationship, we introduce the simultaneous GMM equation between financial sector development and economic growth, to evaluate the cross-effects between relevant determinants of debt and economic growth and financial sector development.

We first test the hypothesis that "debt overhang" exists. By using panel least squares (both POLS and fixed effects) and first differenced GMM, we find that among the 20 high debt countries selected from Asia and Latin America, external debt as percent of GDP is significantly negatively correlated with economic growth rate, indicating that excessive debt is detrimental to the growth of an economy. After these countries were confirmed to have excessive debt, the structural formula was used to explore the association between foreign debt, development of the financial sector, and economic growth. We incorporate the proxy for financial sector development, debt indicators, and other variables, such as determinants of economic growth, into our simultaneous GMM model, for empirical analysis. The results show that a country's financial sector development helps raise its economic growth rate, and in turn, the growth of a country's economy enhances its financial sector development. In this paper, we find a two-way relationship between financial sector development and economic growth — financial markets develop as a consequence of economic growth, which, in turn, provides a stimulant to real growth. Our findings are consistent with observations of Patrick (1966) and a number of endogenous growth models which predict two-way causality between financial sector development and economic growth. Furthermore, we discover that excessive debt suppresses a country's financial sector development and, therefore, hinders economic growth.

This paper also discovers that financial repression may resorted to, in order to deal with high levels of debt, and that affects economic growth in the country. When a country has excessive foreign debt, there is an increase in risk premium or inflation, and the resultant surge of interest rates, compelling the government to impose financially repressive policies. As the market interest rate goes up, the government is forced to adopt financial repression policies, which explains one of the aspects of negative correlation between interest rate and financial development. However, there are other important factors that could affect the nature of relationship between the two. This is unfavorable for development of the financial sector in a country, and also hinders economic growth of the country.

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Appendix A. Descriptive Statistics

Empirical Model I—1982～2004

	Δlny	lny(-1)	ΔlnKG	ΔlnL	ΔlnDG	ΔlnDS
Mean	0.0236	7.4158	−0.0057	0.0177	0.0037	−0.0194
Median	0.0283	7.6061	0.0040	0.0179	−0.0018	−0.0222
Max.	0.1468	9.4129	0.5595	0.0291	0.9408	3.0753
Mini.	−0.1641	5.3384	−0.7856	−0.0329	−0.6596	−2.5097
St. Dev.	0.0456	1.0094	0.1308	0.0055	0.1663	0.3228
Skewness	−1.1246	−0.2522	−0.7191	−1.7986	1.0278	0.8893
Kurtosis	5.4687	1.9844	9.3072	17.4560	8.3267	30.3942
Obs.	440	440	440	440	440	440

Empirical Model II—1991～2004

	Δlny	FD	ΔlnK	ΔlnL	DG
Mean	0.0254	0.6921	0.0549	0.0238	0.4832
Median	0.0300	0.4530	0.0828	0.0243	0.4653
Max.	0.1468	3.3617	0.7081	0.0914	1.5845
Mini.	−0.1543	0.0895	−1.1384	−0.0400	0.1216
St. Dev.	0.0421	0.6256	0.2131	0.0160	0.2207
Skewness	−1.0967	1.8397	−1.8220	−0.2603	1.2340
Kurtosis	5.8129	6.4038	9.7670	6.8539	6.4983
Obs.	260	260	260	260	260

	STD	DS	R	O
Mean	0.2414	0.2591	0.0563	0.6425
Median	0.2135	0.2296	0.0580	0.5241
Max.	0.4867	1.1788	0.1000	2.2888
Mini.	0.1238	0.0341	0.0000	0.1473
St. Dev.	0.0847	0.1811	0.0222	0.4567
Skewness	0.8269	1.8285	−0.3157	1.8075
Kurtosis	2.6726	7.2786	2.7178	5.9124
Obs.	260	260	260	260