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Debt relief and institutional reform: a focus on Heavily Indebted Poor Countries

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Abstract

This paper presents a model that links debt relief to the quality of institutions in a country. An important result is that a country needs to achieve some *minimum* threshold of institutional quality in order to benefit from debt relief. For the empirical analysis, I employ 12 measures of institutional quality to study the institutional environment in Heavily Indebted Poor Countries (HIPCs). The results indicate that HIPCs have weak institutions—much weaker than other developing countries. This suggests that in order for the HIPC debt-relief program to be successful, institutional reform should form an integral part of the program.

JEL classification: F34, F35, O19

Keywords: Debt relief; Governance; Heavily Indebted Poor Countries; Institutions

1. Introduction

The debt burden of Heavily Indebted Poor Countries (HIPCs) is massive.[1] For many of these countries, their external debt is over two times their GNP and debt servicing eats up a large share of scarce foreign exchange. For example, the ratio of debt stock to GNP for Sao Tome and Guinea-Bissau in 1998 was 680% and 500%, respectively (cf., World Bank, 2000). In 1995, Rwanda and Malawi spent 79% and 76%, respectively, of their export revenue on

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debt servicing. Interestingly, a bulk of the debt is owed to developed countries and multilateral lending institutions, such as the World Bank and the IMF.

Over the past few years, there has been increased pressure from developing countries and several influential non-governmental organizations (NGOs), such as the Heritage Foundation, Oxfarm International, and Jubilee 2000, to provide debt relief to HIPCs. For example, recent ministerial meetings of the IMF and the World Bank were plagued with protesters demanding a cancellation of the debt of Third World countries. Indeed, the main reason for forming Jubilee 2000 was to rally support for the cancellation of "the crushing debt of impoverished countries before the new millennium."

In response to the pressure from governments and NGOs, the World Bank and IMF introduced the HIPC Initiative in September 1996. The criteria for eligibility were considered too stringent, hence in September 1999 the Enhanced HIPC Initiative was launched. Unlike previous debt remission programs that focused on private and bilateral debt, the Initiative included for the first time write downs of IMF and World Bank claims. The main objective of the Initiative is to reduce the external debt of eligible countries to *sustainable levels*—i.e., the country should be able to meet its current and future external debt-service obligations in full, without recourse to debt relief, rescheduling, or the accumulation of arrears.

While the HIPC Initiative temporarily reduces a country's external debt, long-term debt sustainability will be achieved only if the country implements polices that enhance economic growth. This paper focuses on one key determinant of economic growth: *good governance and institutions*. I present a model that links debt relief to private foreign investment and the quality of institutions in a country. The idea is that poor countries need foreign capital to augment domestic capital in order to spur investment and growth. When sovereign countries cannot be compelled to repay foreign investors, countries need to achieve some *minimum* level of institutional quality in order to attract private foreign investment (Asiedu & Villamil, 2000). I show that debt relief decreases the threshold of institutional quality required to attract foreign investment. Furthermore, when the threshold is achieved, debt relief promotes foreign investment and increases welfare. An important implication of the result is that if a country's institutions are too weak, it may still not achieve the minimum threshold required to attract foreign investment, despite debt forgiveness. For the empirical analysis, I use data on 12 measures of institutional quality from four sources to study the institutional environment in HIPCs. The data suggest that on the average, HIPCs have weak institutions—much weaker than other developing countries. Thus, in order to increase the effectiveness of the HIPC Initiative, institutional reform should form a central part of the HIPC program.

The analysis is consistent with several empirical studies that link institutional quality to foreign investment and economic growth (e.g., Campos, Lien, & Pradhan, 1999; Knack & Keefer, 1995; Mauro, 1995; Olson, Sarna, & Swamy, 2000; Wei, 2000). The analysis is also consistent with the empirical results of Collier and Dollar (1999) and Burnside and Dollar (2000) who find evidence that foreign aid induces growth only in countries that have good institutions.

The remaining sections are organized as follows. Section 2 provides a brief description of the HIPC Initiative and Section 3 discusses the model and the related literature. Section 4 describes the data and discusses the empirical results and Section 5 concludes.

2. The HIPC Initiative—a brief description[2]

The main objective of the HIPC Initiative is to alleviate the debt burden of countries for which traditional debt-relief measures through the Paris Club and multilateral agencies has proved inadequate.[3] Specifically, the HIPC Initiative reduces a country's external debt burden to *sustainable levels*. A country's external debt is deemed sustainable if the NPV Debt/Exports is less than 150% or for small open economies, the NPV Debt/Government Revenues is less than 250%. To qualify for debt relief under the initiative, a country has to satisfy the following criteria:

(i) It must be eligible for concessional assistance, the primary requirement being a per capita income of less than $885 in 1999;
(ii) The country's debt burden must be deemed "unsustainable" even after the country has exhausted all other debt-relief options; and
(iii) The country must have established a track record of adherence to IMF and World Bank policies.

As of December 2001, 42 countries were classified as HIPCs, out of which 24 have received debt relief and 14 are yet to be approved for assistance (Table 1). The debt burden of four countries, Angola, Kenya, Vietnam, and Yemen, was deemed sustainable and therefore do not qualify for HIPC assistance. Table 1 provides data on debt indicators for HIPCs.

3. The model

Consider an economy with an infinite time horizon and agents of two types: domestic and foreign. Domestic agents are identical and have a common risk neutral utility function.[4] The domestic country has access to a constant returns to scale production function $f(\cdot)$ which requires two inputs, labor and capital. Let $f(\cdot)$ denote output per capita, which satisfies the Inada conditions. Labor is provided inelastically by domestic residents. Risk neutral foreign agents provide capital to supplement domestic capital and earn a competitive return given by the gross world interest rate r, which we assume is constant over time. Let k, k^f, and k^d be the aggregate, foreign, and domestic capital stock per capita, respectively. Assume that capital depreciates completely, that the domestic capital stock is constant, and that the foreign capital stock is elastic (i.e., we consider a small open economy). Assume further that the country's domestic capital stock is less than the optimal capital stock. The domestic country does not invest abroad, and its capital stock neither depreciates nor can be augmented. As a consequence, the country's current output net of interest payments is consumed in the current period. The host country chooses an investment plan to maximize the present discounted utility of income denoted by

$$W_t = \sum_{s=t}^{\infty} \beta^{s-t} y_s$$

with $0 < \beta < 1$ and $y_t = f(k_t) - r(k_t - k^d)$. As is standard (cf., Yaari, 1965), β is the discount factor with $\beta = \theta\rho$, where θ is the probability of survival, an idiosyncratic factor which reflects

Table 1
Debt indicators for Heavily Indebted Poor Countries (HIPCs), 1995

Country	GDP per capita($)	Debt service (% exports)	External debt (% exports)	External debt (% GNP)
Angola	210	12	299	500
Benin*	359	7	221	82
Bolivia*	876	29	418	81
Burkina Faso*	235	11	278	54
Burundi	160	28	831	117
Cameroon*	564	21	448	126
Central Africa Republic	335	8	472	86
Chad*	210	5	276	64
Comoros	438	2	332	94
Congo, Dem. Rep	125	1	748	242
Congo, Rep	671	15	482	350
Cote d'Ivoire	666	23	418	210
Ethiopia*	101	19	1277	180
Gambia*	339	15	237	114
Ghana	378	25	368	92
Guinea*	531	25	454	93
Guinea-Bissau*	217	52	3031	380
Guyana*	657	17	328	386
Honduras*	654	31	256	124
Kenya	319	30	249	85
Lao PDR	382	6	522	123
Liberia	NA	NA	NA	NA
Madagascar*	225	39	565	144
Malawi*	162	76	484	142
Mali*	249	47	455	123
Mauritania*	436	39	460	231
Mozambique*	140	17	1586	338
Myanmar		23	444	NA
Nicaragua*	346	14	1419	677
Niger*	200	55	476	87
Rwanda*	202	79	1041	80
Sao Tome*	303	62	2679	613
Senegal*	521	48	229	89
Sierra Leone	180	37	913	145
Somalia	NA	29	NA	NA
Sudan	236	12	2552	280
Tanzania*	168	38	571	149
Togo	308	49	234	116
Uganda*	297	62	523	63
Vietnam	272	1	342	128
Yemen	NA	NA	NA	NA
Zambia*	360	31	481	215
Average for HIPCs	343	24	689	186
Average for developing countries		16	140	38

Source: Global Development Finance (2000), on CD-ROM.
Notes: The countries marked with asterisks have received some form of debt relief under the HIPC Initiative.

the "patience" of decision-makers in a particular country, and $\rho = 1/r$ is the common pure discount factor determined by the world market. θ may also be interpreted as a measure of the reliability of a country's institutions.

In any period t, the host country has the option to renege on foreign investment agreements. The consequence of this action is that the host loses access to international capital markets in subsequent periods. If default occurs in any period t, for all future periods $s > t$, foreign investors abstain from the market (i.e., $k_s = k^d$ and $k_s^f = 0$). Whether the poor country will repay a loan is governed by an incentive constraint. The discounted present value from being "bad" and reneging on a loan in period t and remaining autarkic thereafter is given by

$$B(k_t) = f(k_t) + \sum_{s=t+1}^{\infty} \beta^{s-t} y_s = f(k) + \frac{\beta}{1-\beta} f(k^d)$$

The discounted present value of being "good" and honoring a contract in period t and maintaining access to foreign investment is given by

$$G(k_t) = \sum_{s=t}^{\infty} \beta^{s-t}[f(k_s) - r(k_s - k^d)] = \frac{1}{1-\beta}[f(k) - r(k - k^d)]$$

The host country faces a stationary problem, hence $B(k)$ and $G(k)$ are time invariant. The poor country will repay the loan if $B(k) \leq G(k)$, for each k.

The problem solved by a benevolent social planner can now be specified. The planner chooses a stationary level of aggregate investment k to maximize $W(k)$ subject to a repayment incentive constraint which ensures that the host will honor investment agreements.

Problem 1. Choose k to maximize $W(k) = 1/(1-\beta)[f(k) - r(k - k^d)]$ subject to:

$$B(k) \leq G(k), \quad \forall k \tag{1}$$

As in Asiedu and Villamil (2000), the solutions to Problem 1 are characterized by restrictions on the discount factor that segment the unit interval into three cases. The equilibrium is determined by a comparison of β and the relevant case on the unit interval. Define two critical thresholds by:

β^*: The minimum discount factor required to sustain the unconstrained optimal level of investment, k_u^*, where $f'(k_u^*) = r$, and

$\underline{\beta}$: The minimum discount factor required to attract some foreign investment.

Foreign investors effectively compare the poor country's idiosyncratic $\beta(\theta, r)$ and the relevant subinterval (Fig. 1): Case 1 prevails when $\beta \in (0, \underline{\beta})$, Case 2 prevails when $\beta \in (\underline{\beta}, \beta^*)$, and Case 3 prevails when $\beta \in (\beta^*, 1)$. In the Case 1 equilibrium, β is too low and no foreign investment occurs. In Case 2, the country sustains some foreign investment, however, the level of investment is constrained (i.e., the marginal product of capital is greater than the return on capital). In Case 3, the country receives the unconstrained optimal level of investment (i.e., the marginal product of capital is equal to the return on capital). The results have two important implications. First, countries have to demonstrate some *minimum* level of institutional quality

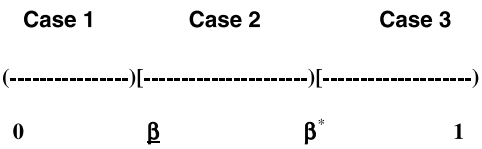

Fig. 1.

(i.e., $\beta \geq \underline{\beta}$) in order to receive any private foreign investment. Second, a country will receive the unconstrained optimal level of investment only if the country's discount factor exceeds the threshold, β^*. I next show how debt forgiveness affects the threshold discount factors, capital flows and welfare. The results are summarized in Claim 1.

Claim 1. *Debt forgiveness reduces the critical thresholds $\underline{\beta}$ and β^*. Furthermore, when the enforcement constraint binds, debt relief increases the level of foreign investment and improves welfare.*

Proof. See Appendix A. □

Claim 1 suggests that debt forgiveness shrinks the bad interval, $(0, \underline{\beta})$, and lengthens the good interval, $(\beta^*, 1)$, and thereby increases the likelihood that a country will sustain some private foreign investment or receive the unconstrained optimal investment. It is important to note that if a country's β is too low, it may still not achieve the minimum threshold required to attract foreign investment, despite debt forgiveness. Thus, in order to reap the full potential benefits of debt forgiveness, HIPCs must have good institutions. In the next section, I use data from four sources to analyze the quality of institutions in HIPCs.

4. The data

The analysis is based on a dataset of measures of institutional quality in (up to) 150 countries. To gain robustness, I use data from four different sources: Political Risk Services (1995), the Heritage Foundation, Freedom House (2000), and the *World Human Rights Guide*. Since the data are from different sources, there are different numbers of observations for different variables. There are 12 indicators of institutional quality. These indicators can be broadly classified into two types: (i) Governance and (ii) Civil and Political Liberties. The governance variables include measures of efficiency within the judiciary, the extent to which private contracts are enforced and corruption in government. The definitions and sources for all the variables are summarized in Table 2.

All the data are averaged from 1990 to 1995, a year before the HIPC Initiative was launched, except for the data on government regulation and property rights from the Heritage Foundation. These data are not available prior to 1995, hence I report only the data for 1995 from that source. Data on political rights, civil liberties, government regulation, and property rights have been transformed such that higher numbers indicate better institutions. The data from Freedom House and the Heritage Foundation have been employed in several studies as measures of institutional

Table 2
Description and sources of measures of institutional quality

Measures of institutional quality	Description and sources
I. Governance	
• Corruption in Government (CORRUPT)	Corruption in government. Low ratings indicate "high government officials are likely to demand special payments" and "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, police protection or loans." Scale from 0 to 10 Source: Political Risk Services. *International Country Risk Guide* (ICRG)
• Risk of Contract Repudiation (CONTRACT)	Lower scores indicate that the government is likely to repudiate or unilaterally change the terms of contracts with foreign investors. Scale from 0 to 10 Source: ICRG
• Risk of Expropriation (EXPROP)	Lower scores indicate that the government is likely to confiscate and force nationalization of foreign enterprises. Scale from 0 to 10 Source: ICRG
• Bureaucracy Quality (BUREAU)	Higher scores indicate that the bureaucracy is insulated from political pressures and "has the strength and expertise to govern without drastic changes in policies with interruption of government services when governments change." Scale from 0 to 6 Source: ICRG
• Government Regulation (GOVREG)	Lower scores imply that government regulations are burdensome on business and corruption is prevalent. Scale from 1 to 5 Source: Heritage Foundation. Holmes, Johnson, and Kirkpatrick (2000)
• Property Rights (PROP)	Score is based on the extent to which the government enforces laws that protects private property. Higher score implies more property rights. Scale from 1 to 5 Source: Heritage Foundation. Holmes et al. (2000)
• Rule of Law (RULELAW)	"Reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes." Higher scores indicate "sound political institutions, a strong court system and the provisions for an orderly succession of power." Scale from 0 to 6 Source: ICRG
• Independence of Courts (COURT)	Higher score indicates more independence. Scale from 1 to 4 Source: *World Human Rights Guide*. Charles Humana
II. Political and Civil Rights	
• Political Rights (PRIGHT)	Measures the extent to which individuals can "participate freely in the political process." Higher values indicate more freedom. Scale from 1 to 7 Source: Freedom House
• Civil Liberties (CRIGHT)	Measures the "freedom to develop views, institutions, and personal autonomy apart from the state." Higher values indicate more civil liberty. Scale from 1 to 7 Source: Freedom House
• Independence of Unions (UNION)	Higher score indicates more independence. Scale from 1 to 4 Source: *World Human Rights Guide*. Charles Humana
• Independence of the Media (MEDIA)	Higher score indicates more independence. Scale from 1 to 4 Source: *World Human Rights Guide*. Charles Humana

Table 3
Correlations between institutional indicators

	Governance								Political and Civil Rights			
	CORRUPT	CONTRACT	EXPROP	BUREAU	GOVREG	PROP	RULELAW	COURT	PRIGHT	CRIGHT	UNION	MEDIA
CORRUPT	1.0000											
CONTRACT	0.4418	1.0000										
EXPROP	0.4709	0.8793	1.0000									
BUREAU	0.5482	0.5919	0.5470	1.0000								
GOVREG	0.3166	0.4489	0.3978	0.4362	1.0000							
PROP	0.2083	0.6364	0.6428	0.4926	0.5864	1.0000						
RULELAW	0.5857	0.6116	0.6287	0.5398	0.4387	0.5301	1.0000					
COURT	0.3162	0.4688	0.5285	0.3558	0.2311	0.3715	0.3932	1.0000				
PRIGHT	0.2970	0.4210	0.4626	0.2523	0.3478	0.4304	0.3447	0.6838	1.0000			
CRIGHT	0.3191	0.4460	0.4755	0.2377	0.3837	0.4708	0.3804	0.7091	0.9440	1.0000		
UNION	0.2896	0.3925	0.4357	0.2696	0.2457	0.2134	0.2066	0.6649	0.6009	0.6320	1.0000	
MEDIA	0.1338	0.4208	0.4176	0.2120	0.1496	0.1599	0.1874	0.7216	0.6811	0.7176	0.6903	1.0000

Table 4
Means of measures of institutional quality for developing countries, 1990–1995

Measure of institutional quality	HIPC			Non-HIPC			Test for difference in means (*t*-values)
	N	Mean	S.D.	*N*	Mean	S.D.	
I. Governance							
CONTRACT	31	4.409	1.564	54	6.679	1.516	−6.57***
EXPROP	31	5.759	1.506	54	7.633	1.429	−5.70***
CORRUPT	31	2.782	0.959	54	3.088	0.975	−1.40
RULELAW	31	2.328	0.746	54	3.253	1.074	−4.24***
BUREAU	31	2.196	0.768	54	3.010	1.031	−3.67***
GOVREG	23	2.174	0.576	58	2.844	0.970	−3.10***
PROP	23	2.253	0.593	58	3.207	0.913	−3.33***
COURT	27	2.037	0.940	50	2.840	0.817	−3.90***
II. Political and Civil Rights							
UNION	27	2.296	1.068	50	2.740	0.922	−1.91*
MEDIA	27	2.222	1.013	50	2.940	0.912	−3.17***
PRIGHT	40	2.885	1.527	110	4.183	1.947	−3.88***
CRIGHT	40	3.140	1.204	110	4.096	1.637	−3.45***

*Significance at the 0.10 level.
**Significance at the 0.05 level.
***Significance at the 0.01 level.

quality (e.g., Alesina & Dollar, 2000; Burnside & Dollar, 2000; LaPorta, Lopez-de-Silanes, Shleifer, & Vishny, 1999). The ICRG dataset (measures of Corruption, Contract Repudiation, Government Bureaucracy, Risk of Expropriation, and the Rule of Law) has also been used by several researchers as measures of the quality of governance. For example, Knack and Keefer (1995) and Olson et al. (2000) find these measures to be associated with economic growth.

Table 3 presents correlations between the variables. The data, although from different sources, are highly correlated. For example, the measures of Political Rights (PRIGHT) and Civil Liberties (CRIGHTS) from Freedom House are highly correlated with the data from the *World Human Rights Guide*, which measure the Independence of the Media (MEDIA), Unions (UNION) and Courts (COURT). This lends more credence to the data.

Table 4 reports the averages of the institutional variables for HIPCs and non-HIPC developing countries. Two points stand out from Table 4. First, on the average, HIPCs have weaker institutions than non-HIPCs. For example, the average of the indexes for property rights, political rights, and risk of contract repudiation are about one-third lower in HIPCs (lower numbers indicate inefficient institutions) than in non-HIPCs. Second, with the exception of the corruption index, the differences in the means for all the variables are highly significant. Note that the corruption index reported by ICRG measures the levels of corruption in various countries. Campos et al. (1999) argue that a good measure of corruption should take into account not only the level of corruption but also the "predictability" of corruption—i.e., the likelihood that the favor being sought would be delivered after a bribe is paid. Unfortunately, data on the predictability of corruption are not readily available.

5. Conclusion

This paper presents a model that links debt relief to the quality of institutions in a country. An important result is that a country needs to achieve some *minimum* threshold of institutional quality in order to benefit from debt relief. For the empirical analysis, I use data on 12 measures of institutional quality from four different sources to analyze the institutional environment in HIPCs. The analysis indicates that most HIPCs have weak institutions—much weaker than other developing countries. This suggests that in order to reap the full benefits of debt relief, HIPCs need to improve their institutions.

One way to promote good governance in HIPCs is to make institutional reform a central part of the HIPC Initiative. Debt forgiveness can be phased in over time and be made contingent upon agreement by the recipient country to improve it's institutions. Incremental debt relief may be granted to HIPCs that embark on institutional reform. Here, subsequent stages of debt forgiveness may be viewed as a "reward" for successful reform.[5]

The paper concludes by noting that multilateral organizations, such as the World Bank, have in recent times emphasized institutional reform in developing countries. For example, the World Bank has spent over $380 million on legal and judicial reform in 84 countries (cf., World Bank, 2001). Indeed, institutional reform is one of the important aspects of the Comprehensive Development Framework proposed by Mr. James Wolfensohn, the President of the World Bank. At the second Global Conference on Law and Justice at St Petersberg in July 2001, Wolfensohn noted that "an effective legal and judicial system is not a luxury, but a key component of a well-functioning state and an essential ingredient in long-term development." Thus, the HIPC Initiative provides a good opportunity for the international community to promote good governance in developing countries.

Notes

1. See Easterly (1999) for an explanation of why some countries are heavily indebted.
2. For a more detailed description of the HIPC Initiative, see IMF (2001).
3. The Paris Club is an informal group of developed nations that meet regularly to coordinate a common approach to restructuring the debt service on official loans owed to them. Paris Club members include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Norway, The Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and the United States.
4. This part of the paper draws from Asiedu and Villamil (2000).
5. See Asiedu and Villamil (2002) for a model where countries receive foreign aid as a reward for not expropriating private foreign investment.

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Appendix A. A sketch of the proof for the derivation of $\underline{\beta}$ and β^*

The solutions to Problem 1, are described by one of three cases. Let k_u^* denote the optimal capital sequence when (1) does *not* bind (the unconstrained optimal plan) and k_c^* denote the plan when (1) binds (the constrained optimal plan). Then:

Case 1. When $B(k) > G(k)$ for all $k > k^d$, the constraint set is empty and no foreign investment occurs.

Case 2. When the constraint binds, $f'(k) > r$ and $k = k_c^*$ is the optimal investment plan.

Case 3. When the constraint does not bind, $f'(k) > r$ and $k = k_u^*$ is the optimal investment plan.

In Case 1, the benefit from expropriation exceeds the gain from not expropriating for all levels of investment. As a result, the host will always expropriate. Foreign investors realize the incentive for the host to expropriate, hence in equilibrium no foreign investment occurs. In Case 2, the constraint binds and this leads to under investment relative to the unconstrained optimal plan (i.e., Case 3). In the autarky equilibrium, $B(k)$ cuts $G(k)$ at k^d from below. This implies $B'(k^d) < G'(k^d)$ and $\beta f'(k^d) < r$. Define

$$\underline{\beta}(k^d, r) = \frac{r}{f'(k^d)} \tag{A.1}$$

Then, when $\beta < \underline{\beta}$, autarky occurs hence $\underline{\beta}$ is the minimum discount factor required to attract foreign investment.

Define an investment plan k, as self-enforcing (i.e., no expropriation occurs) if and only if $B(k) \leq G(k)$, i.e., $0 < [r(k - k^d)/f(k) - f(k^d)] \leq \beta < 1$.

Substitute $k = k_u^*$ and $r = f'(k_u^*)$ in (2) and define β^* as:

$$\beta^*(k^d, r) = \frac{(k_u^* - k^d) f'(k_u^*)}{f(k_u^*) - f(k^d)} \tag{A.2}$$

Then, k_u^* is self-enforcing if and only if $\beta(\theta, r) \geq \beta^*$, and β^* is the minimum discount factor required to attract foreign investment to the unconstrained level of investment, k_u^*.

Proof of Claim 1. Suppose that in addition to borrowing from private international capital markets, the host can borrow from a multilateral agency. Assume further that the multilateral agency forgives the country's debt. The penalty for expropriation is that the host country permanently loses access to private and official loans. Let γ be the fraction of outside investment provided by the multilateral agency. Then, the amount of investment provided by the multilateral organization is $\gamma(k - k^d)$. The remaining outside investment, $(1 - \gamma)(k - k^d)$, is provided by private foreign investors. The utility from expropriation, $B(k)$, is unchanged. The utility from not expropriating, $G(k)$, is now given by

$$G(k) = \frac{1}{1 - \beta}[f(k) - r(1 - \gamma)(k - k^d)] \qquad \square$$

The autarky equilibrium occurs if and only if $B(k)$ cuts $G(k)$ at k^d from below, i.e., $B'(k^d) < G'(k^d)$. This implies $\beta f'(k^d) < r(1-\gamma)$. Thus, the smallest discount factor required to attract foreign investment, $\underline{\beta}$, is given by

$$\underline{\beta}(k^d, r, \gamma, \tau) = \frac{r(1-\gamma)}{f'(k^d)} \tag{A.3}$$

Under loan subsidy, the unconstrained optimal investment plan, k_u^*, is self-enforcing if and only if $B(k_u^*) \leq G(k_u^*)$ This implies k_u^* is self-enforcing if and only if $\beta \geq \beta^*$, where β^* is defined by:

$$\beta^*(r, k^d, \gamma) = \frac{r(1-\gamma)[k_u^* - k^d]}{f(k_u^*) - f(k^d)} \tag{A.4}$$

When the incentive constraint binds, $B(k) = G(k)$, and k_u^* satisfies

$$\beta[f(k_c^*) - f(k^d)] - (k_c^* - k^d)[r(1-\gamma)] = 0 \tag{A.5}$$

and welfare is given by

$$y_c^* = \frac{1}{1-\beta}[f(k_c^*) - r(1-\gamma)(k_c^* - k^d) \tag{A.6}$$

Eqs. (A.1)–(A.4) indicate that the threshold discount factors are lower under debt forgiveness than otherwise. Differentiating (A.5) and (A.6) with respect to γ yields:

$$\frac{\mathrm{d}k_c^*}{\mathrm{d}\gamma} = -\frac{r(k_c^* - k^d)}{\beta f'(k_c^*) - r(1-\gamma)]}$$

$$(1-\beta)\frac{\mathrm{d}y_c^*}{\mathrm{d}\gamma} = [(f'(k_c^*) - r(1-\gamma)]\frac{\mathrm{d}k_c^*}{\mathrm{d}\gamma} + r(k_c^* - k^d)$$

Note that $B(k)$ cuts $G(k)$ at k_c^* from below and therefore $[\beta f'(k_c^*) - r(1-\gamma)] < 0$. Then, $(\mathrm{d}k_c^*/\mathrm{d}\gamma) > 0$ and $(\mathrm{d}y_c^*/\mathrm{d}\gamma) > 0$.

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