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檢視中國債務陷阱
Examining the Chinese Debt-Trap Diplomacy

陳家威
Chia-Wei Chen

指導教授：何泰寬博士
Advisor: Tai-kuang Ho, Ph.D.

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Chapter 1: Introduction

As China's economic influence continues to grow, its lending practices to developing countries have come under scrutiny. The concept of "debt-trap diplomacy" (hereinafter DTD), whereby China extends excessive loans to countries in exchange for political or economic concessions, has become a topic of heated debate (Chellaney, 2017). While some argue that the debt-trap problem poses a significant threat to the economic and political stability of vulnerable countries, others contend that it is overstated.

From the political science aspect, an analysis from the Belfer Center for Science and International Affairs states that China utilizes DTD as a technique to achieve strategic objectives, such as projecting power across South Asian trading routes, undermining regional opposition to its South China Sea claims, and supporting its naval efforts to break out into the Pacific (Parker and Chefitz, 2018). Critics of this phenomenon argue that claims of DTD are often exaggerated or based on incomplete information. For example, Brautigam (2020) argues that the debt-trap is based on a flawed understanding of Chinese lending practices and the histories of the target countries, and that China is not strategically pursuing the DTD on developing countries.

The opacity in Chinese lending practices has been a longstanding challenge in the analysis of the DTD problem (Horn, Reinhart and Trebesch, 2021). The lack of transparency in the Chinese lending system, whereby loan terms, conditions and collateral requirements are not always disclosed to the borrowers, makes it difficult for economists and policymakers to fully grasp the magnitude of the issue. Therefore, it has been challenging to assess the sustainability of debts of borrowing countries and their ability to service their obligations, as well as the potential impact of China's lending practices on the economy of low income developing countries (LIDC), especially those in the Belt and Road Initiatives (BLI). As a result, recent studies on whether DTD is a myth have primarily been conducted normatively in the field of political science, rather than a positive economics analysis (See, e.g., Himmer and Rod, 2023; Chen, 2020).

However, with the emergence of new and detailed data on Chinese lending practices, recent studies have begun to unveil the nature and implications of the China debt. In this thesis, I aim to shed light on whether a country fell into the debt-trap by applying a new and detailed data provided by Horn, Reinhart and Trebesch (2021), hereinafter referred to as the "HRT database", on the sovereign debt model proposed by Na, Schmitt-Grohé, Uribe and Yue (2018), to provide insights into the sustainability of the debt of borrowing countries. By calibrating the model for a particular country, a set of tradable-output levels which would cause the country to default could be obtained, given its current debt level. Following the approach of Hinrichsen (2021), this set is presented graphically with each data point on the space representing a debt-output pair for a specific year. This visual representation allows for an examination of whether the country has been in the default zone but has managed to avoid default due to other enforcement mechanisms, in this case might be the political leverage from China.

Conducting calibration on all countries to match the model requires enourmous amount of work, therefore it is optimal to narrow down the sample countries to those that provides the most insight on the DID issue. I consider countries 1. that is constantly receiving loans from other international institutes, 2. that indicates an increasing amount of debt from China that eventually exceeds other creditors, and 3. in which China launches large infrastructure programs. In particular, the default sets for Sri Lanka and Pakistan are examined in this thesis. I will further provide the basic backgrounds for the two sample countries in later sections.

HRT Database

China's official external lending is predominantly undertaken by state-owned entities and the government itself[1]. However, unlike other major economies, the Chinese government does not report or publish any data on its official international lending or outstanding overseas debt claims. This lack of transparency creates challenges for rating agencies, as official lending to sovereigns is not a regular part of their activities. Moreover, China is not a member of the Paris Club, which tracks sovereign borrowing from official bilateral creditors, and does not divulge data on its official flows with the OECD's Creditor Reporting System (Horn, Reinhart and Trebesch, 2021).

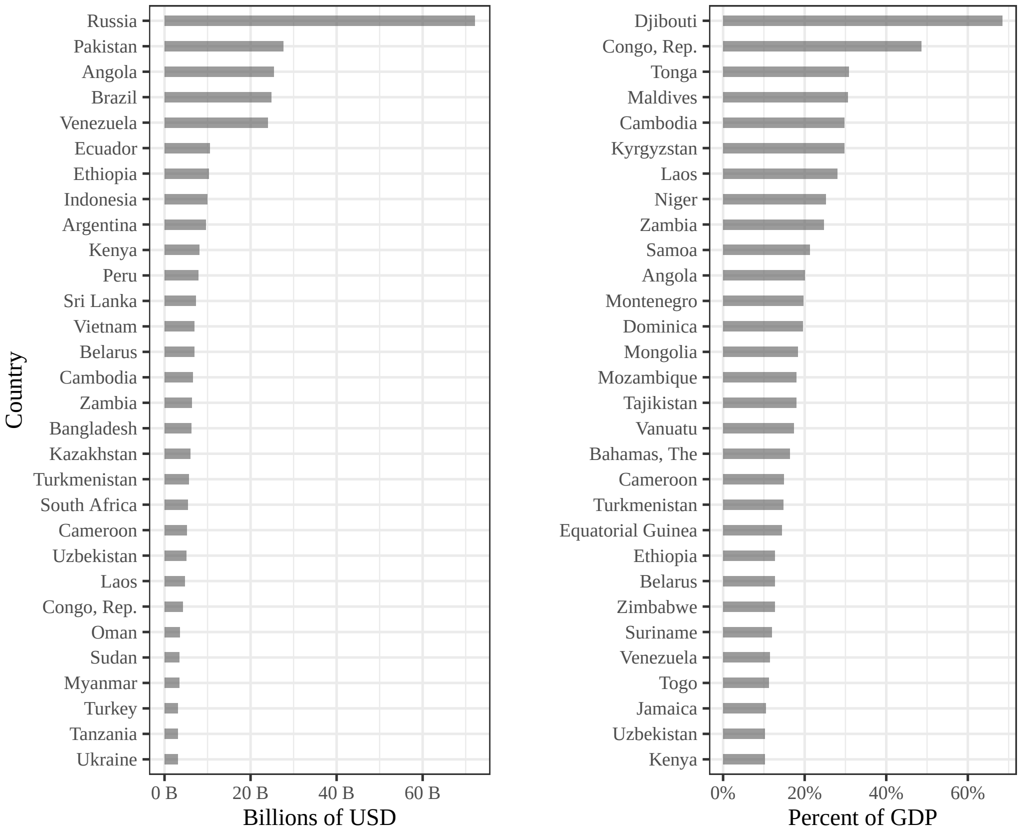
Horn, Reinhart and Trebesch (2021) combines a variety of sources to construct a consensus database of Chinese official loans. The HRT database spans from 1949, the establishment of the People's Republic of China, to 2017. It contains a granular dataset of 2151 loans and 2824 grants with information such as the creditor agent, borrower type, commitment, maturity, etc. It also provides an aggregate panel data of the external debt to China for each country.

The top 30 countries with the largest debts to China's official creditors are displayed in Figure 1a. Notably, Russia owes China over $70 billion, while Pakistan's debt amounts to $27 billion, both topping the list. Brazil and Venezuela are among the top 10 countries with the highest debt to China in Latin America. Contrary to what many people believe, African countries have not borrowed much from China. However, if we consider the ratio of Chinese debt to GDP in Figure 1b, some African countries appear to be highly indebted to China. Djibouti, for instance, has an alarming ratio of 68.5% of its GDP consisting of Chinese debt, while Tonga, Niger, and Zambia have ratios exceeding 10%.

A main finding in Horn, Reinhart and Trebesch (2021) is that China had become the

[1] These include China's state-owned policy banks, such as China Development Bank (國家開發銀行, CDB) and China Export-Import Bank (中國進出口銀行, Exim), as well as China's state-owned commercial banks such as Industrial and Commercial Bank of China (中國工商銀行, ICBC) or Bank of China (中國銀行, BoC)

Figure 1: Debt to China Statistic by Country in 2017



(a) Top 30 Debtor by Total Debt in USD (b) Top 30 Debtor by Dept-to-GDP Ratio

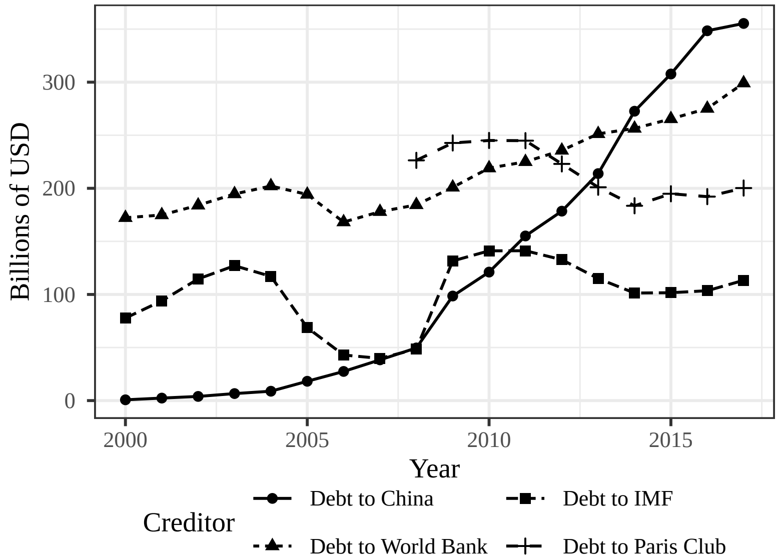
Source: HRT Database (2021)
Note: The figure on the left presents the top 30 countries in amount of total external debt to China in 2017. The figure on the right compares by the China-debt-to-GDP ratio.

world's largest creditor to developing countries after 2013, surpassing the amount of World Bank. Figure 2 shows the change of the total amount of debt from different main creditors, including China, World Bank[2], IMF, and the aggregation of all countries in the Paris Club. The debt amount started to rise rapidly after 2000, when the China government launched the "Go Out Policy" in 1999. In 2017, the debt to China had reached \$355 billion, while the debt to World Bank was \$300 billion.

This database allows researchers to obtain a more precisely estimated amount of total

[2]Including the International Development Association (IDA) and the International Bank for Reconstruction and Development (IBRD)

Figure 2: Change of Aggregate Public Debt for Different Official Creditors



Source: HRT Database (2021)
Note: The figure shows the change in the aggregate external public debt that the developing countries owed to different official creditors. These include China, World Bank (excluding China), IMF, and all 22 Paris Club governments. It is obvious that China had become the largest official creditors in the world according to the estimation of Horn, Reinhart and Trebesch (2021).

debt of a country, and gauge the amount of debt that is considered superfluous and onerous for it. In the next sections, I briefly explain the two countries I will examine in my thesis, and demonstrate the importance of choosing it as a benchmark example.

Sri Lanka

In the original article where the terminology "Debt-trap Diplomacy" was coined, Chellaney (2017) specifically mentioned the predicament faced by the Sri Lankan government. He argues that the Chinese government supported large infrastructure projects in Sri Lanka and provided heavy loans to their government, and as the project eventually failed to repay the debt, the country is then ensnared in the concessions to China. Figure 3a shows the change in composition of the creditors to Sri Lanka.

The issue of the Hambantota port is regarded as a typical example of a debt-trap for some scholars (Moramudali, 2020). The construction of the port was initiated in 2007 and entrusted to the state-owned Chinese companies, China Harbour Engineering Company and Sinohydro Corporation. The project was valued at $361 million, of which Exim Bank financed 85% at a yearly interest rate of 6.3%.

China's involvement in Sri Lanka's infrastructure development was facilitated by President Mahinda Rajapaksa, during which China became Sri Lanka's leading investor and lender. This gave China significant diplomatic leverage over Sri Lanka. However, when Rajapaksa was unexpectedly defeated in the early 2015 election by Maithripala Sirisena, who campaigned on the promise to extricate Sri Lanka from the Chinese debt trap, work on major Chinese projects was suspended.

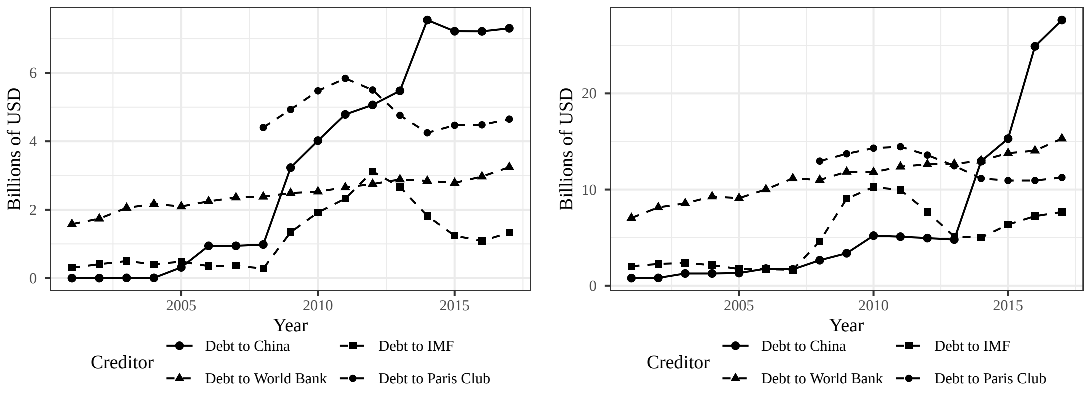
However, Sri Lanka's government was already on the brink of default, and Sirisena eventually acquiesced to a series of Chinese demands[3], including the sale of an 70% stake in the Hambantota port to China Merchants Port (CM Port) and a 99-year lease. Notably, as argued by Moramudali (2019), the lease did not write off the loans obtained to construct Hambanota port. The proceeds from the lease were used to boost the country's dollar reserves in 2017-18, especially in preparation for the large amount of external debt that needed to be serviced when international sovereign bonds matured in early 2019. This means that the lease is not a debt-equity-swap, as common narratives elaborated (Moramudali, 2020). Sri Lanka eventually declared a suspension on payment on most foreign debt from Aril 12, 2022. Whether Sri Lanka was indeed already under the extreme "brink of default" during 2015 is a major gap in the literature of sovereign default that has not yet been investigated.

Pakistan

Similar to Sri Lanka, we observe the abrupt increase on the debt to China, as it already has a relatively high debt to other official creditors. Figure 3b shows the change in composi-

[3]This narrative origins from Chellaney (2017). Brautigam (2020), however, provides a different narrative. She mentioned that "*The proceeds were used to increase Sri Lanka's US dollar reserves in 2017-18 with a view to the repayment of maturing international sovereign bonds …Therefore, the sale of Hambantota was originally a fire sale designed to raise money to deal with larger debt problems.*"

Figure 3: Debt to All Creditors



(a) Sri Lanka (b) Pakistan

Source: HRT Database (2021)
Note: The figure shows the change in the external public debt that Sri Lanka and Pakistan owed to different official creditors. These include China, World Bank (excluding China), IMF, and all 22 Paris Club governments.

tion of creditors to Pakistan. Pakistan is the centerpiece of the China Pakistan Economic Corridor (CPEC), a 3000 km corridor that connects China with the Arabian sea. CPEC serves as an important network as it reduces the passage for China's energy import from the Middle Eastern countries (Wikipedia contributors, 2023).

China has launched enormous amounts of infrastructure in Pakistan after 2015. These items include a deep water port, road and rail lines, and most importantly, energy sector projects. Up to 2018, the estimation of the total value of projects under the CPEC is $62 billion, out of which around $33 billion is allocated for energy projects (Hurley, Morris and Portelance, 2019). China is expected to finance about 80 percent of this amount. The private investments for energy projects in Pakistan will be financed by the Exim Bank of China at an interest rate of 5-6%. Private Independent Power Producers (IPP) will be responsible for constructing the energy projects under CPEC, instead of the governments of China or Pakistan. In turn, the government of Pakistan will be legally bound to buy electricity from these companies at rates that were agreed upon before. However, despite this significant investment, some projects have already been cancelled, such as three major road projects that were cancelled at the end of 2017 (Hurley, Morris and Portelance, 2019).

In the case of Pakistan, the sudden increase of debt to China draws the attention of researchers and journalists. For example, a report from the Financial Time titled “Pakistan is on the brink” states that Pakistan is following Sri Lanka into default. Given the recent frequent analogy drawn between Pakistan and Sri Lanka, it is essential to analyze Pakistan from the perspective of the sovereign default model.

The remaining chapters are organized as follows: In Chapter 2, a comprehensive literature review is conducted on the topics of Debt-trap diplomacy and sovereign default models. Chapter 3 outlines the specific sovereign debt model that will be applied in this study. Chapter 4 presents the calibration of the model and provides the corresponding empirical results. Finally, Chapter 5 concludes the thesis.

Chapter 2: Literature Review

Whether the DTD is just a conspiracy used as an instrument for the western countries to justify its political strategy, or is it in fact causing stress on the receiving counties intentionally, is continuously under great debates and defenses.

Chellaney (2017) first stated that the infrastructures supported financially by the China government in Sri Lanka is burdensome and causing small and poor countries to endure the unsustainable loans, forcing them to cede strategic leverage to China. From a political aspect, two researchers from the Belfer Center for Science and International Affairs Parker and Chefitz (2018) propose that China may pursue three main strategic objectives using this approach. These objectives include: expanding its “String of Pearls” to address the “Malacca Dilemma[1]” and extend its influence along crucial South Asian trade routes, destabilizing and fragmenting the regional coalition led by the United States that challenges China’s claims in the South China Sea, and facilitating the People’s Liberation Army Navy (PLAN) in advancing beyond the ”Second Island Chain” and into the open waters of the Pacific Ocean. This is considered as the reshaping of “soft” infrastructure that China is hoping to enhance (Hillman, 2018). An analysis on the contract of 100 China’s long foreign lending suggests that the terms of these agreements feature unusual confidentiality clauses, seek advantages over other creditors through collateral arrangements, and potentially grant influence over debtors’ policies. These contract characteristics, along

[1]The Strait of Malacca, located between Malaysia and Indonesia, is one of the busiest and most critical shipping routes in the world, connecting the Indian Ocean and the Pacific Ocean. The “Malacca dilemma” refers to the strategic vulnerability faced by China due to its heavy dependence on the Strait of Malacca for maritime trade and energy imports (Parker and Chefitz, 2018).

with their creative design to manage credit risks and enforcement hurdles, portray China as a powerful and commercially astute lender to developing nations (Gelpern et al., 2022). Hurley, Morris and Portelance (2019) studies the debt sustainability in BRI countries by examining their dept-to-GDP ratio versus the share of China's debt. Following the threshold of 50-60 percent rising debt-to-GDP ratio constructed by Chudik et al. (2015), they identify eight countries[2] that are particularly risky.

In stark contract, critics of the DTD narrative often argue the benefit of China's lending on the receiving country, and state that the concerns are often exaggerated. Eom, Brautigam and Benabdallah (2018) argues that at the time (2018) Chinese loans did not play a significant role in causing debt distress in Africa. Brautigam (2020) indicates that debtor countries have voluntarily accepted Chinese loans and report positive experiences, suggesting that concerns over Chinese infrastructure funding are exaggerated, as many view China as an appealing economic model and development partner. In the case of Sri Lanka, Brautigam (2020) also argues that the project of Hambantota Port was the concept of former President Mattala Rajapaksa, and that Chinese Banks have shown willingness to assist their restructuring of existing loans. The Rhodium Group reviews 40 cases of China's external debt renegotiations, and finds that not only are asset seizures a rare occurrence, but China is limited in the leverage in negotiation due to external events such as change in leadership (Kratz, Feng and Wright, 2019).

Notably, governments of the indebted countries often defends their own decision of loan. The Minister of Finance of the Trinidad and Tobago, for instance, argued that choosing a loan without the need for retrenchment, currency devaluation, or other adverse measures, especially when the interest rates are similar, is an obvious and favorable choice[3]. The former President of Sri Lanka also defended that the Hambantota Port is not a debt-trap.

[2]These countries are Djibouti, Kyrgyzstan, Laos, the Maldives, Mongolia, Montenegro, Pakistan, and Tajikistan

[3]Loop News "Imbert: Choosing between IMF, Chinese loan a 'no-brainer,"'June 15, 2021

To my best knowledge, there are so far no empirical study on the issue of DTD based on an economic model with microfoundation. My thesis contributes to the literature of DTD by conducting the first empirical result based on a sovereign debt model calibrated with the data of receiving countries under debate, to investigate whether the loans provided by China indeed push the countries to the brink of default, and report counterfactual results of China not lending the considerable amount of loans to the countries of the BRI. Sovereign debt models under the Eaton-Gersovitz framework has been widely used to analyze default (Eaton and Gersovitz, 1981). Developed by Aguiar and Gopinath (2006) and Arellano (2008), several important features are included in the framework recently. For instance, Schmitt-Grohé and Uribe (2016) extends the model by implementing the nominal wage rigidity into the model, and Na et al. (2018) further investigates the role of government's optimal policy under wage rigidity in a decentralized economy to study the Twin Ds phenomenon. In the output models mentioned above, output cost is set exogenously with an ad hoc loss function; Mendoza and Yue (2012) endogenizes output cost by combining sovereign default and business cycle. A rich literature examines the default episodes using calibration on Argentina (Arellano, 2008; Schmitt-Grohé and Uribe, 2016; Mendoza and Yue, 2012; Na et al., 2018). Hinrichsen (2021) examines the effect of war reparations on countries' default set using data from France in the 1870s, Germany in the 1930s, and Finland in the 1940s. Ho and Ritschl (2023) investigate transfer protection in the Dawes Plan by calibrating the German economy during the 1920s.

Chapter 3: Analytic Model

So far, most discussions on China's debt trap have been limited to narrative statistics. To objectively assess this issue, we adopt the up-to-date sovereign debt default model in the literature as a tool for our empirical analysis. Na et al. (2018) proposes a model to study the Argentine economy; Hinrichsen (2021) uses the model to study the enforcement of sovereign debt under war reparations. The model in my thesis strictly follows Na et al. (2018) and Hinrichsen (2021).

International debt often lacks enforcement, and governments hold the decision of whether to repay the debt or default, based on the comparison of future values (Eaton and Gersovitz, 1981). Therefore, default can be considered an optimal policy for a country that faces unsustainable debt levels. By defaulting, the country avoids the burden of paying interest on the debt, but it also faces the consequence of being excluded from the international credit market for a period of time. As a result, the country would have to rely solely on its own financial resources until it regains access to international credit markets. Moreover, studies have pointed out that sovereign debt defaults are often accompanied by a devaluation of the currency; Reinhart (2002) refers to this phenomenon as "Twin Ds." Empirical analysis by Na et al. (2018) further observes that the devaluation rate often decreases after the time of default, suggesting that the Twin Ds phenomenon is the joint result of an optimal policy. They proposed a model that incorporates two key frictions: limited commitment to repay external debts and downward nominal wage rigidity. It is a decentralized version of the Eaton-Gersovitz sovereign debt model. The model predicts that default will occur only after a series of increasingly negative output shocks. Prior to default, domestic absorption experiences a severe contraction, which leads to a decline in demand for labor. However, due to downward nominal wage rigidity, real wages fail to adjust downward, resulting in involuntary unemployment. To prevent this situation, the optimal policy is to devalue the domestic currency, thereby reducing the real value of wages. As a result, both the model and the data show that default episodes are usually accompanied by significant currency devaluations (Na, Schmitt-Grohé, Uribe and Yue, 2018).

Therefore, for the sovereign debt model, I closely follow Na et al. (2018) to examine the set of conditions under which default is the optimal decision. The calibrated model will then serve as a benchmark metric that allows us to investigate whether China has potentially trapped heavily indebted poor counties into default, using the approach proposed by Hinrichsen (2021).

3.1 Households

The model assumes that the economy is populated by a large number of representative households who maximize their expected lifetime utility

$$E_0 \sum_{t=0}^{\infty} \beta^t U(c_t), \tag{1}$$

where $\beta \in (0,1)$ denotes the discount factor, and c_t represents the consumption good, which is composed of tradable consumption c_t^T and nontradable consumption c_t^N. Assume that c_t follows an aggregate technology

$$c_t = A(c_t^T, c_t^N), \tag{2}$$

where A is an increasing, concave, and linearly homogeneous function that captures characteristics such as the ratio or elasticity of substitution between tradable and nontradable consumption. The period utility function $U(c_t)$ follows the standard assumption, which is a strictly increasing and strictly concave function.

Assume that the household only has access to the one-period and non-state-contingent bond. The household spends on consumption of tradable and nontradable goods, along with their debt which comes due in the current period. Its resources consist of labor incomes, dividend incomes, lump-sum transfers from the government, and incomes from borrowing from foreign lenders. The household is also endowed with tradable goods, which follow a stochastic process. The budget constraint of the representative household is then

$$P_t^T c_t^T + P_t^N c_t^N + P_t^T d_t = P_t^T \tilde{y}_t^T + W_t h_t + (1 - \tau_t^d) P_t^T q_t^d d_{t+1} + F_t + \Phi_t, \qquad (3)$$

where $P_t^T (P_t^N)$ denotes the nominal price of tradable (nontradable) goods, d_t the bond denominated in tradable goods which is due in period t, q_t the price of debt to be repaid at $t+1$, $\tilde{y}_t^T$ the endowment of tradable goods to the household, W_t the nominal wage, h_t the hours worked, τ_t^d the tax on debt, F_t a lump-sum transfer from the government, and finally Φ_t the nominal profits from owning firms. The household's working hour is bounded by an upper limit

$$h_t \leq \bar{h}, \qquad (4)$$

and it takes the working hour h_t as given.

The household's problem is to choose $\{c_t, c_t^T, c_t^N, d_{t+1}\}$ such that its utility (1) is maximized subject to the budget constraints (2) – (4) and the no-Ponzi-game debt limit. Further, denote the relative price of nontradable in terms of tradable goods as $p_t \equiv \frac{P_t^N}{P_t^T}$, we have the following first order conditions

$$p_t = \frac{A_2(c_t^T, c_t^N)}{A_1(c_t^t, c_t^N)} \tag{5a}$$

$$\lambda_t = U'(c_t)A_1(c_t^T, c_t^N) \tag{5b}$$

$$(1-\tau_t^d)q_t^d\lambda_t = \beta E_t\lambda_{t+1}, \tag{5c}$$

where λ_t is the Lagrange multiplier. $A_1(\cdot,\cdot) = \frac{\partial A}{\partial c_t^T}$ and $A_2(\cdot,\cdot) = \frac{\partial A}{\partial c_t^N}$ is respectively the first derivative of the aggregation function with respect to tradable and nontradable consumption.

3.2 Firms

Perfectly competitive firms produce nontradable goods y_t^N according to the production technology

$$y_t^N = F(h_t), \tag{6}$$

where F is strictly increasing and strictly concave. Each firm maximizes its profit by choosing the amount of labor. Profit is given by

$$\Phi_t(h_t) = P_t^N F(h_t) - W_t h_t, \tag{7}$$

and the optimal labor demand is then

$$P_t^N F'(h_t) = W_t.$$

Dividing both side by the price of tradable goods, and define $w_t \equiv \frac{W_t}{P_t^T}$ as the real wage in terms of tradable goods, the first order condition can be written as

$$p_t F'(h_t) = w_t. \tag{8}$$

3.3 Downward Nominal Wage Rigidity

The key assumption in Schmitt-Grohé and Uribe (2016) and Na et al. (2018) is the downward nominal wage rigidity. As the wage is unable to be adjusted to a lower level, involuntary unemployment is inevitable, hence the government has the incentive to allow devaluation. The model imposes a lower bound to the growth rate of nominal wage

$$W_t \geq \gamma W_{t-1}, \qquad \gamma > 0. \tag{9}$$

This implies that the growth rate $\frac{W_t - W_{t-1}}{W_{t-1}} \geq \gamma - 1$. When this inequality is unbinding ($W_t > \gamma W_{t-1}$), the economy is fully employed ($h_t = \bar{h}$). However, if the condition binds, the economy might have unemployment ($h_t < \bar{h}$). This relationship can be written as the following equation

$$(\bar{h} - h_t)(W_t - \gamma W_{t-1}) = 0. \tag{10}$$

3.4 Government

We assume here that, under the lack of enforcement in the international credit market, the government has the option to benevolently free up domestic balance sheet by choosing to default or not. Denote I_t as the indicator of whether the government chooses to honor its debt in period t. If the government repays in this period ($I_t = 1$), the country will be able to borrow in the following period, hence $d_{t+1} > 0$. However, if the government chooses to default ($I_t = 0$), then the country will enter the status of financial autarky and is unable to have any sovereign debt in the next period, hence $d_{t+1} = 0$. The above scenario can be written as a slackness condition

$$(1 - I_t)d_{t+1} = 0. \tag{11}$$

To model the duration of financial exclusion, assume that once the country is in bad standing in the international credit market, it can regain reputation and access to financial markets with probability $\theta \in [0, 1)$, and remain in bad standing with probability $1 - \theta$. This implies that the country has an average exclusion duration of $\frac{1}{\theta}$ periods[1].

Assume that the government distributes the proceeds from the debt tax to households as a lump-sum payment. If the government honors the debt, it repays d_t, but if the government decides to default, it will not make any payments to foreign lenders, and instead will return any payments made by households directly to them. The budget constraint for the government can then be expressed as

$$f_t = \tau_t^d q_t^d d_{t+1} + (1 - I_t) d_t, \tag{12}$$

where $f_t \equiv \frac{F_t}{P_t^T}$ is the lump-sum transfer in terms of tradable goods. Right-hand side of the equation states that the transfer to households will include d_t when $I_t = 0$, which is when the country decides to default. Nevertheless, the transfer of debt tax will be zero after default since $d_{t+1} = 0$ when $I_t = 1$, according to Equation (11).

3.5 Foreign Lenders

The behavior of foreign lenders is not explicitly modeled in this framework, but as all rational agents, the expected marginal benefit of lending to the domestic country must be equivalent to the opportunity cost of funds. Let r^* represent the opportunity cost for the foreign lenders; this could be the world interest rate. Since q_t is the price of debt that repays one unit of d_{t+1} tomorrow, the return on the debt is $\frac{1}{q_t}$. The lenders take the risk of default into consideration, therefore, the expected return will actually be lower. Assume that foreign lenders are risk neutral and don't require risk premium, this gives

$$\frac{\Pr(I_{t+1} = 1 \mid I_t = 1)}{q_t} = 1 + r^*. \tag{13}$$

[1]The expected exclusion period $= \sum_{t=1}^{\infty} t\theta(1-\theta)^{t-1} = \theta \sum_{t=1}^{\infty} t(1-\theta)^{t-1} = \frac{1}{\theta}$.

Equivalently, the equation can be written as

$$I_t \left[q_t - \frac{E_t I_{t+1}}{1+r^*} \right] = 0.$$

3.6 Competitive Equilibrium

Under equilibrium, the households' consumption equals the production of firms

$$c_t^N = y_t^N. \tag{14}$$

The tradable goods are purely endowed exogenously under an AR(1) process

$$\ln\left(y_t^T\right) = \rho \ln\left(y_{t-1}^T\right) + \mu_t, \tag{15}$$

where $\mu_t \overset{\text{iid}}{\sim} \mathcal{N}(0, \sigma_\mu^2)$ is an i.i.d. shock, and $|\rho| \in [0, 1)$ is the autocorrelation parameter. When the country decides to default, it is in bad standing, hence it faces an output loss defined by $L(y_t^T)$. The loss function is non-negative and increasing in the tradable goods. The endowment of tradable goods to the household is then

$$\tilde{y}_t^T = \begin{cases} y_t^T - L(y_t^T) & \text{if } I_t = 0 \\ y_t^T & \text{otherwise} \end{cases} \tag{16}$$

When the country defaults ($I_t = 0$), the endowment decreases.

Price of debt offered by foreign lenders q_t should be equal to the price of the domestic debt q_t^d, but only during the good standing

$$I_t(q_t^d - q_t) = 0. \tag{17}$$

The market clearing condition can be established by combining various equations, including the household budget constraint (3) and (4), the firm's production function (6) and profit equation (7), the government's constraint on debt (11) and lump-sum return (12), and conditions from (14), (16), and (17). Eventually, the clearing condition for tradable goods is

$$c_t^T = y_t^T - (1 - I_t)L(y_t^T) + I_t(q_t d_{t+1} - d_t) \tag{18}$$

Assume that the law of one price applies to tradable goods. The foreign currency price of tradable goods is denoted as P_t^{T*}, while the nominal exchange rate is represented by $\mathcal{E}_t$. The law of one price states that the price of tradable goods in the domestic currency is equal to the foreign currency price multiplied by the nominal exchange rate.

$$P_t^T = P_t^{T*}\mathcal{E}_t$$

This implies that the price of a tradable good should be the same in both domestic and foreign currency terms in an efficient market. Without loss of generosity, the foreign-currency price of the tradable goods is normalized to 1 ($P_t^{T*} = 1$), hence the nominal price for tradable goods can be expressed as the nominal exchange rate

$$P_t^T = \mathcal{E}_t. \tag{19}$$

For convenience, also define the devaluation rate of domestic currency as

$$\epsilon_t \equiv \frac{\mathcal{E}_t}{\mathcal{E}_{t-1}} = \frac{P_t^T}{P_{t-1}^T}. \tag{20}$$

The conditions are now sufficient to define a competitive equilibrium.

Definition 1 (Competitive Equilibrium in Na et al. (2018))**.** A competitive equilibrium is a set of stochastic process $\left\{c_t^T, h_t, w_t, d_{t+1}, \lambda_t, q_t, q_t^d\right\}$ satisfying

$$
\begin{aligned}
c_t^T &= y_t^T - (1 - I_t)L(y_t^T) + I_t(q_t d_{t+1} - d_t), && (21)\\
(1 - I_t)d_{t+1} &= 0, && (22)\\
\lambda_t &= U'(A(c_t^T, F(h_t)))A_1(c_t^T, c_t^N), && (23)\\
(1 - \tau_t^d)q_t^d \lambda_t &= \beta E_t \lambda_{t+1}, && (24)\\
I_t(q_t^d - q_t) &= 0, && (25)\\
\frac{A_2(c_t^T, F(h_t))}{A_1(c_t^t, F(h_t))} &= \frac{w_t}{F'(h_t)}, && (26)\\
w_t &\geq \gamma \frac{w_{t-1}}{\epsilon_t}, && (27)\\
h_t &\leq \bar{h}, && (28)\\
\left(h_t - \bar{h}\right)\left(w_t - \gamma \frac{w_{t-1}}{\epsilon_t}\right) &= 0, && (29)\\
I_t\left[q_t - \frac{E_t I_{t+1}}{1 + r^*}\right] &= 0, && (30)
\end{aligned}
$$

given processes $\left\{y_t^T, \epsilon_t, \tau_t^d . I_t\right\}$ and initial conditions w_{-1} and d_0.

As proven by Na et al. (2018), if the government is able to set the devaluation rate and the tax on debt freely, then the stochastic process of the variables $\left\{c_t^T, h_t, d_{t+1}, q_t\right\}$ can be determined by the process of $\left\{y_t^T, I_t\right\}$ and the initial debt level d_0.

As discussed previously, the decision of I_t is an optimal policy for the government due to lack of commitment to repay in the international credit market. Furthermore, the default decision of the government in the next period $t+1$ is also affected by the current decision. To see this argument, first notice that the default decision in $t+1$ is determined by the state variables $\left\{y_{t+1}^T, d_{t+1}\right\}$. However, d_{t+1} is determined in period t, which means that the government in period t understands that it is able to affect the default decision in $t+1$ via the choice of d_{t+1}. As y_{t+1}^T follows a first-order Markov process, the expected value of y_{t+1}^T is a function of y_t^T, hence the expected value for the default decision on period t

is actually a function of y^T and d_{t+1}. Recall that the price for the debt q_t is related to the probability of default in the next period, according to Equation (13), it can be expressed in the contemporary variables

$$q_t = q(y_t^T, d_{t+1}). \tag{31}$$

On the one hand, this provides us the economic intuition that the government internalizes the fact that its choice of debt in the next period can affect the price of the debt. On the other hand, this allows us to clarify the dependencies of variables in the value function.

3.7 Default Decision

Following the standard Eaton-Gersovitz framework, this model considers the following three value functions: value of continuing to repay the debt v^c, value of being in good standing v^g, and value of being in bad standing v^b.

Under the period of being in good financial standing, the value for the government to continue repaying the debt is the maximum value of the utility gained by the households this period, plus the discounted value of being in a good financial standing, subject to the households' budget constraints. Formally,

$$\begin{aligned} v^c(y_t^T, d_t) = \max_{\left\{c_t^T, h_t, d_{t+1}\right\}} \quad & \left\{U\left(A\left(c_t^T, F(h_t)\right)\right) + \beta E_t v^g\left(y_{t+1}^T, d+t+1\right)\right\} \\ \text{s.t} \quad & c_t^T + d_t = y_t^T + q(y_t^T, d_{t+1})d_{t+1} \\ & h_t \leq \bar{h}. \end{aligned} \tag{32}$$

Where the first constraint is obtained by setting $I_t = 1$ in Equation (18), and the second is the constraint on working hour.

If the country is in bad standing, the consumption on tradable goods experiences a loss. The government has probability θ of regaining access to international financial markets, and probability $1-\theta$ of continuing in bad standing. During the period in bad standing, the country obtains no international borrowing, hence, the state variable for debt is excluded.

Formally,

$$v^b(y_t^T) = \max_{\{h_t\}} \quad \left\{U\left(A\left(y_t^T - L(y_t^T), F(h_t)\right)\right) + \beta E_t\left[\theta v^g\left(y_{t+1}^T, 0\right) + (1-\theta)v^b\left(y_{t+1}^T\right)\right]\right\}$$
$$\text{s.t} \quad h_t \leq \bar{h}. \tag{33}$$

The tradable consumption $c_t^T = y_t^T - L(y_t^T)$ again follows Equation (18) by setting $I_t = 0$, and is substituted explicitly into the value function.

If the country is in good standing, the government has the freedom to choose which is best for the country: to continue or to default. The decision is made by comparing the value functions of the two scenarios, given the current output shock for tradable goods and the current level of debt

$$v^g(y_t^T, d_t) = \max\left\{v^c(y_t^T, d_t), v^b(y_t^T)\right\}. \tag{34}$$

Define the default set $D(d_t)$ as the set of tradable-output levels y_t^T examined by the government in period t, in which the government's optimal respond is to default. Formally,

$$D(d_t) = \left\{y_t^T : v^b(y_t^T) > v^c(y_t^T, d_t)\right\}. \tag{35}$$

In other words, given a current debt level d_t, if the government observes that y_t^T is inside $D(d_t)$, it chooses to default.

Under rational expectations, the foreign lenders recognize the default set, hence the price for debt is determined by Equation (13), given by

$$q(y_t^T, d_{t+1}) = \frac{1 - \Pr\left\{y_{t+1}^T \in D(d_{t+1}) \mid y_t^T\right\}}{1 + r^*}. \tag{36}$$

Note that the price of debt enters the value function of continuing, $v^c(y_t^T, d_t)$.

It is obvious that the optimal labor supply is $h_t = \bar{h}$ since all functions, F, A, U, are monotonic, which implies that under the freedom to choose the devaluation rate and the tax on debt, the government can ensure full employment. Denote $w^f(c_t^T)$ the equilibrium wage function under full employment given the consumption of tradable goods. Combining Equation (8) and the Euler equation in (5a) and impose the optimal policy $h_t = \bar{h}$, we have

$$w_t = w^f(c_t^T) \equiv \frac{A_2(c_t^T, F(\bar{h}))}{A_1(c_t^T, F(\bar{h}))} F'(\bar{h}). \tag{37}$$

Knowing that the wage has downward nominal rigidity, the government sets the devaluation rate accordingly. The downward rigidity (10) states that

$$\gamma \leq \frac{W_t}{W_{t-1}} = \frac{w_t}{w_{t-1}} \frac{P_t^T}{P_{t-1}^T} = \epsilon \frac{w_t}{w_{t-1}},$$

where the second equal sign comes from Equation (20). Substitute the wage under full employment, we get

$$\epsilon_t \geq \gamma \frac{w_{t-1}}{w^f(c_t^T)}. \tag{38}$$

This is the family of optimal devaluation policies. Following Na et al. (2018) and Hinrichsen (2021), we assume that the government chooses the minimal devaluation target that stabilizes nominal wages, that is, $\epsilon_t = \gamma \frac{w_{t-1}}{w^f(c_t^T)}$.

Chapter 4: Empirical Results

Typically, a model under the Eaton-Gersovitz framework does not have an analytical solution. Therefore, the optimal default set defined by Equation (35), as well as the value functions and the policy functions, must be obtained numerically via the technique of value function iteration (VFI). This requires the assignment of functional forms as well as structural parameters that matches the economy. I follow the functional forms and the calibration approach introduced in Na et al. (2018) and Hinrichsen (2021).

Functional Forms

Following Na et al. (2018), the periodic utility function is assumed to be the constant relative risk aversion (CRRA) type

$$U(c_t) = \frac{c_t^{1-\sigma} - 1}{1-\sigma}, \tag{39}$$

where σ is the inverse of elasticity of intertemporal substitution of the consumption. The aggregator function for tradable and non-tradable consumption takes the constant elasticity of substitution (CES) form

$$c_t = A(c_t^T, c_t^N) = \left[a\left(c_t^T\right)^{1-\frac{1}{\xi}} + (1-a)\left(c_t^N\right)^{1-\frac{1}{\xi}}\right]^{\frac{1}{1-\frac{1}{\xi}}}. \tag{40}$$

The CES aggregator states that the share of tradable consumption is $a \in [0, 1]$, and the elasticity of substitution between the tradable and non-tradable consumption is ξ. More over, assume that the inter- and intratemporal elasticity of substitution is equivalent. That is,

$$\xi = \frac{1}{\sigma}. \tag{41}$$

In the equilibrium, consumption of tradable goods c_t^T and the external debt d_t are now independent of the activities in the nontradable sector under this restriction (See Uribe and Schmitt-Grohé, 2017, Chapter 8.5). The production technology for the nontradable goods follows a simple form

$$y_t^N = F(h_t) = h_t^{\alpha}. \tag{42}$$

The loss-function in Equation (16) is positive and increasing with y_t^T, and following Chatterjee and Eyigungor (2012), I adopt the ad-hoc quadratic form with two parameters

$$L(y_t^T) = \max\left\{0, \delta_1 y_t^T + \delta_2 \left(y_t^T\right)^2\right\}. \tag{43}$$

This is also adopted in Na et al. (2018).

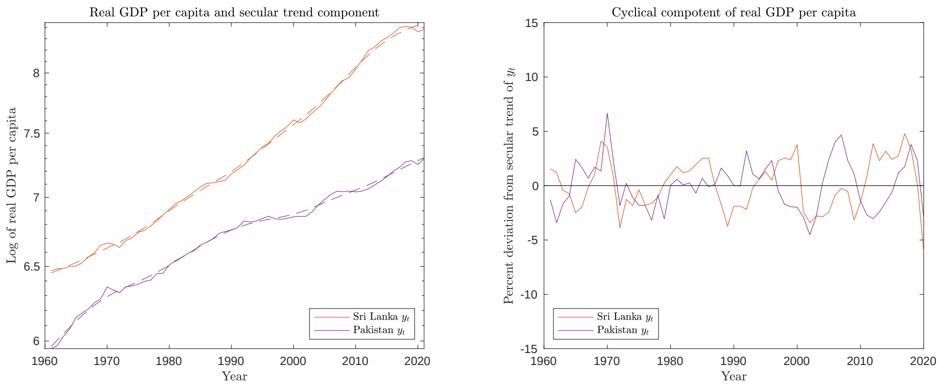
Calibration of Sri Lanka

The model is calibrated to Sri Lanka before 2007, when the Chinese government started to provide the increasing amount of loans (see Figure 3a).

I proxy the output process of Equation (15) by the detrended log-real-GDP of Sri Lanka from 1980 to 2021. Considering that the seasonality in the quarterly data for Sri Lanka might impose a higher volatility estimated in the AR(1) process, I follow Hinrichsen (2021) and estimate the annual data over 1980 to 2021. I obtain the cyclical component of the output by filtering the time series with an HP-filter with smoothing parameter λ set to 100. Estimation of the AR(1) on the cyclical component thus yields $\rho = 0.9114$ and $\sigma_u = 0.0123$[1]. Figure 4 presents the decomposition of the log-real-GDP.

[1] Since the AR(1) estimation is conducted on annual data, the estimated coefficients must be quarterized. Specifically, $\rho = 1 - \frac{1-\hat{\rho}}{4}$, and $\sigma_u = \frac{\hat{\sigma}}{\sqrt{4}}$, where $\hat{\rho}$ and $\hat{\sigma}$ are the estimated parameters for the AR(1) via

Figure 4: Decomposition of log-real-tradable-GDP for Sri Lanka and Pakistan



Source: World Bank national accounts data.
Note: The cyclical component in the right is obtained by the HP-filter with smoothing parameter $\lambda = 100$ for the log-real-GDP in the left. The quarterized AR(1) estimation for Sri Lanka yields $(\rho, \sigma_u) = (0.9114, 0.0123)$, and for Pakistan yields $(\rho, \sigma_u) = (0.9008, 0.0111)$

The global risk-free world interest rate r^* is set to match the 3-month treasury bill rate during the period, which is roughly 4% annually, or 1% for one quarter. This is in line with Chatterjee and Eyigungor (2012). The probability of reentry is difficult to assess since Sri Lanka encountered its first default in April 12, 2022, and is not yet undergoing the process of restructuring. As a result, following Chatterjee and Eyigungor (2012) and Hinrichsen (2021), I set the probability of reentry to 0.0385, which implies that the country will be in default on average for about 6.5 years, matching the median of default spans for past 100 systemic crises (Reinhart and Rogoff, 2014).

Calibration on other structural parameters regarding the Sri Lanka economy follows Jegajeevan (2016). The author estimates the Sri Lanka economy with a DSGE model, and based on her calibration, the share of labor is set as 65%. As the author adopts a CES aggregator for the home and foreign consumption as well, I directly refer to her estimation; that gives $a = 0.35$ and $\xi = 0.78$[2]. This implies that $\sigma = 1/\xi = 1.28$.

OLS.

[2] Jegajeevan (2016) calibrates the share of foreign goods (tradable goods) based on the average expenditure on imported goods of 35% according to the consumer price index. The elasticity of substitution between tradable and nontradable goods is obtained via the posterior mean of the Bayesian estimation within 2008 to 2014.

Table 1: Calibration for Sri Lanka

Parameter	Description	Value
ρ	Autocorrelation of output	0.9114
σ_u	Standard deviation of output	0.0123
r^*	Risk-free rate	0.01
θ	Probability of reentry	0.0385
α	Labor share in non-tradable goods sector	0.65
a	Share of tradable consumption	0.35
ξ	Intratemporal elasticity of substitution of consumption	0.78
σ	Inverse of intertemperal elasticity of substitution of consumption	1.28
β	Discount factor	(…)
δ_1	Coefficient of the linear term in loss function	(…)
δ_2	Coefficient of the quadratic term in loss function	(…)
$\bar{h}$	Labor endowment	1

Note: The time unit is one quarter. AR(1) is performed on annual tradable GDP data but quarterized following the approach of Hinrichsen (2021).

Following Na et al. (2018), the rest of the parameters $(\beta, \delta_1, \delta_2)$, which is respectively the subjective discount factor and the two parameter for the loss function, is chosen to match three equilibrium outcomes: (i) the average debt-to-GDP ratio in periods of good standing is 84% per quarter; (ii) the frequency of default is 1.37 times per century; and (iii) the average output loss is 10.5% per year conditional on being in financial autarky. The average debt-to-GDP ratio to be targeted is motivated by the fact that the average annual debt-to-GDP ratio in the data is about 42%[3]. Multiplying this by an average of 50% haircut implies that about 21% of the debt is secured annually[4]. Since we are dealing with a model with quarterly period, this results in the 84% debt-to-GDP ratio. The average frequency of default is justified by the fact that Sri Lanka experienced its first default on 2022 since its independence in 1948; this give an average of 1.37 times per century[5]. Finally, following the default of Sri Lanka since April 2022, the GDP growth is -7.4%,

[3]Data source: International Debt Statistics. The value is calculated by averaging the nominal debt-to-GDP ratio over 2000 to 2010. The same approach is conducted when calibrating Pakistan.

[4]In the mode, we assume that the country defaults on 100% of the debt, hence this approach is necessary to handle the case of a haircut.

[5]$\frac{1}{2022-1948} \times 100 \approx 1.37$

-11.5%, and -12.4%, for the subsequent three quarters[6]. This implies a geometric mean of -10.5%. Table 2 summarizes the calibrated parameters and their sources.

Calibration of Pakistan

The calibration strategy for Pakistan is similar to that of Sri Lanka. The parameters for the output process is obtained from the cyclical component of the HP-filter on the annual log-real-GDP for Pakistan, which yields $\rho = 0.9008$ and $\sigma_u = 0.0111$ (see Figure 4). The risk-free interest rate remains to be 1%. Pakistan decided to default in January 1999(Kundi, 2016), and received its last debt treatment from the Paris Club on December 13, 2001[7]. Accordingly, the reentry period is set to 8 quarters, or $\theta = 0.125$. I refer to the calibration of Rehman et al. (2020) for the other structural parameters, as they estimate a small open economy DSGE model calibrated in Pakistan to study the effect of workers' remittances. The labor share is set as 0.4 to match the capital share in real GDP accordingly. The share of tradable consumption $a = 0.22$ is calibrated according to the ratio of domestic and import consumption. The intratemporal elasticity of substitution of consumption $\xi = 0.5$ and $\sigma = 2$, following standard business-cycle studies (Rehman et al., 2020; Uribe and Schmitt-Grohé, 2017). Finally, the triplet $(\beta, \delta_1, \delta_2)$ is also chosen to follow the three equilibrium results: (i) the average debt-to-traded-GDP ratio in periods of good standing is 68% per quarter; (ii) the frequency of default is 2.6 times per century; and (iii) the average output loss is 10.5% per year conditional on being in financial autarky. The average debt-to-GDP-ratio is 34% in the data in average, once again multiplying it with a 50% haircut ratio yields a 17% of annual secured debt, which gives a 68% secured debt-to-GDP ratio quarterly. Pakistan is currently (2023) facing the potential "risk" of default[8]. However, considering both the present situation and the historical context, including the previous default in 1998, the average frequency of default occurrences in Pakistan from its year

[6]Data Source: Central Bank of Sri Lanka

[7]"Debt Stock Restructuring Agreement Between the Paris Club and Pakistan", Press Release of Paris Club, Dec 13, 2001

[8]"Pakistan is at risk of default", *Economist*, Feb 7, 2023

Table 2: Calibration for Pakistan

Parameter	Description	Value
ρ	Autocorrelation of output	0.9008
σ_u	Standard deviation of output	0.0111
r^*	Risk-free rate	0.01
θ	Probability of reentry	0.125
α	Labor share in non-tradable goods sector	0.4
a	Share of tradable consumption	0.22
ξ	Intratemporal elasticity of substitution of consumption	0.5
σ	Inverse of intertemperal elasticity of substitution of consumption	2
β	Discount factor	(…)
δ_1	Coefficient of the linear term in loss function	(…)
δ_2	Coefficient of the quadratic term in loss function	(…)
$\bar{h}$	Labor endowment	1

Note: The time unit is one quarter. AR(1) is performed on annual tradable GDP data but quarterized following the approach of Hinrichsen (2021).

of independence in 1947 to 2023 is approximately 2.6 times per century[9]. Finally, the average output loss during default is set exactly the same as that of Sri Lanka in order to capture characteristics of the recent volatile global economic environment[10].

Value Function Iteration

The approximated equilibrium is obtained by conducting value function iteration(VFI) over an $n_y \times n_d$ discretized and equally spaced state space, where $n_y = 200$ is the number of grids for output process and $n_d = 200$ is the number of grid for debt (Na et al., 2018). Denote $[\underline{y}^T, \overline{y}^T]$ as the lower and upper bound of output grid. Following Uribe and Schmitt-Grohé (2017), this is set as $[-4.2\sigma_u, 4.2\sigma_u]$. Also following the authors, since the average debt levels for both countries do not exceed 150%, the upper bound for debt is set as 1.5, therefore the debt range for the VFI is $[\underline{d}, \overline{d}] = [0, 1.5]$.

[9] $\frac{2}{2023-1947} \times 100 \approx 2.6$. This is similar to the calibration target for Argentina in Na et al. (2018).

[10] The average output loss in Pakistan during its defualt in 1998, according to the cyclical component estimated, is -1.7% in 1998, -1.9% in 1999. These numbers are, however, too small in comparison to the observed output loss of Sri Lanka during its default in 2023. Refering to the loss in Sri Lanka allows us to better caputure the loss during autarky.

Due to the continuous assumption of the AR(1) process of y_t^T (since we assume μ_t to be normal), the discretized method used in VFI is not directly applicable. Schmitt-Grohé and Uribe (2016) and Na et al. (2018) deal with this issue by constructing a transition probability matrix over the grids of the AR(1) output process. A time series of 10 million observations was generated based on Equation (15). Each observation was then assigned to the nearest grid point among the 200 discrete values of $\ln y^T$. The discretized series was analyzed to calculate the probabilities of transitioning from one discrete state to another in consecutive periods. To obtain the transition probability matrix, a 200×200 matrix was initialized with zeros. For each pair of consecutive observations, the corresponding element in the matrix was incremented by 1. After considering all the observations, the matrix was normalized by dividing each row by the sum of its elements. This resulted in the estimated transition probability matrix, which effectively captured the covariance matrices of order 0 and 1. (Uribe and Schmitt-Grohé, 2017).

The equilibrium dynamics can be simulated once the VFI is conducted. Following Schmitt-Grohé and Uribe (2016) and Na et al. (2018), a simulation of based on the policy function is conduct 1.1 million time. After discarding the first 0.1 million periods, the periods in which a default occurs are identified, and a window of 12 quarters prior to and 12 quarters after each default episode is extracted. The median is then computed period by period across all windows, and the period of default is normalized to 0.

Chapter 5: Conclusion and Discussion

Bibliography

Aguiar, Mark and Gita Gopinath (2006) "Defaultable Debt, Interest Rates and the Current Account," *Journal of International Economics*, 69 (1), 64–83, Matlab code for programs attached.

Arellano, Cristina (2008) "Default Risk and Income Fluctuations in Emerging Economies," *American Economic Review*, 98 (3), 690–712.

Brautigam, Deborah (2020) "A critical look at Chinese 'DTD': the rise of a meme," *Area Development and Policy*, 5 (1), 1–14.

Chatterjee, Satyajit and Burcu Eyigungor (2012) "Maturity, Indebtedness, and Default Risk," *American Economic Review*, 102 (6), 2674–99.

Chellaney, Brahma (2017) "China's Debt-Trap Diplomacy," Project Syndicate, January.

Chen, Wanjing Kelly (2020) "Sovereign debt in the making: Financial entanglements and labor politics along the belt and road in Laos," *Economic Geography*, 96 (4), 295–314.

Chudik, Alexander, Kamiar Mohaddes, M. Hashem Pesaran, and Mehdi Raissi (2015) "Is There a Debt-threshold Effect on Output Growth?," Cambridge Working Papers in Economics 1520, Faculty of Economics, University of Cambridge.

Eaton, Jonathan and Mark Gersovitz (1981) "Debt with Potential Repudiation: Theoretical and Empirical Analysis," *The Review of Economic Studies*, 48 (2), 289–309.

Eom, Janet, Deborah Brautigam, and Lina Benabdallah (2018) "The Path Ahead: The 7th Forum on China-Africa Cooperation," SAIS-CARI Briefing Papers 01/2018, Johns Hopkins University, School of Advanced International Studies (SAIS), China Africa Research Initiative (CARI).

Gelpern, Anna, Sebastian Horn, Scott Morris, Brad Parks, and Christoph Trebesch (2022) "How China Lends: A Rare Look into 100 Debt Contracts with Foreign Governments," *Economic Policy*, eiac054.

Hillman, Jonathan (2018) "China's Belt and Road Initiative: Five Years Later," Center for Strategic and International Studies, January.

Himmer, Michal and Zdeněk Rod (2023) "Chinese debt trap diplomacy: reality or myth?" *Journal of the Indian Ocean Region*.

Hinrichsen, Simon (2021) "Essays on War Reparations and Sovereign Debt: Two Hundred Years of War Debts and Default, from the Napoleonic Wars to Iraq," Ph.D. thesis, London School of Economics and Political Science.

Ho, Tai-kuang and Albrecht Ritschl (2023) "Seniority Reversals and Endogenous Sudden Stops: Some Transfer Problem Dynamics," *Working Paper*.

Horn, Sebastian, Carmen M. Reinhart, and Christoph Trebesch (2021) "China's overseas lending," *Journal of International Economics*, 133, 103539.

Hurley, John, Scott Morris, and Gailyn Portelance (2019) "Examining the debt implications of the Belt and Road Initiative from a policy perspective," *Journal of Infrastructure, Policy and Development*, 3 (1), 139–175.

Jegajeevan, Sujeetha (2016) "Understanding Sri Lankan Business Cycles Through an Estimated DSGE Model," in *Conference Proceedings, 9th International Research Conference (2016), Central Bank of Sri Lanka, Colombo*.

Kratz, Agatha, Allen Feng, and Logan Wright (2019) "New Data on the "Debt Trap" Question," Rhodium Group, April.

Kundi, Mansoor Akbar (2016) "Paris Club, International Debt Regime and Pakistan," *Pakistan Horizon*, 69 (4), 15–25.

Mendoza, Enrique G. and Vivian Z. Yue (2012) "A General Equilibrium Model of Sovereign Default and Business Cycles," *The Quarterly Journal of Economics*, 127 (2), 889–946.

Moramudali, Umesh (2019) "Is Sri Lanka really a victim of China's 'debt trap'," *The Diplomat*, 14.

——— (2020) "The Hambantota port deal: Myths and realities," *The diplomat*, 1, 2020.

Na, Seunghoon, Stephanie Schmitt-Grohé, Martín Uribe, and Vivian Yue (2018) "The Twin Ds: Optimal Default and Devaluation," *American Economic Review*, 108 (7), 1773–1819.

Parker, Sam and Gabrielle Chefitz (2018) "Debtbook Diplomacy," *Belfer Center for Science and International Affairs*.

Rehman, Muhammad, Sajawal Khan, Zafar Hayat, and Faruk Balli (2020) "A small open economy DSGE model with workers' remittances," *Journal of Economic Studies*, 47 (6), 1339–1361.

Reinhart, Carmen M. (2002) "Default, Currency Crises, and Sovereign Credit Ratings," *The World Bank Economic Review*, 16 (2), 151–170.

Reinhart, Carmen M. and Kenneth S. Rogoff (2014) "Recovery from Financial Crises: Evidence from 100 Episodes," *American Economic Review*, 104 (5), 50–55.

Schmitt-Grohé, Stephanie and Martín Uribe (2016) "Downward Nominal Wage Rigidity, Currency Pegs, and Involuntary Unemployment," *Journal of Political Economy*, 124 (5), 1466 – 1514.

Uribe, Martín and Stephanie Schmitt-Grohé (2017) *Open Economy Macroeconomics*: Princeton University Press.

Wikipedia contributors (2023) "China-Pakistan Economic Corridor — Wikipedia, The Free Encyclopedia," [Online; accessed 12-May-2023].