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DEBT OR DEVELOPMENT? A POLICY ANALYSIS OF CHINESE INFRASTRUCTURE LOANS AND THEIR IMPLICATIONS FOR ENTREPRENEURSHIP AND SUSTAINABLE DEVELOPMENT IN AFRICA

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Abstract

Over the past two decades, China has emerged as Africa's leading bilateral lender, financing large-scale infrastructure projects under the Belt and Road Initiative (BRI). While these investments have accelerated development in critical sectors, concerns persist over debt sustainability, transparency, and long-term economic vulnerability. This paper provides an empirical evaluation of Chinese infrastructure loans to selected African countries from 2000 to 2023. Using customized indices such as the Loan Productivity Ratio (LPR) and Debt Pressure Index (DPI) the study assesses the sectoral distribution, fiscal impact, and geopolitical undercurrents of Chinese lending. Findings reveal a mixed picture: while some countries exhibit high loan productivity and manageable debt levels, others show signs of growing debt distress. The paper concludes by offering policy insights for African governments and Chinese financiers to balance infrastructure-driven growth with prudent fiscal management.

Keywords: Chinese Loans, Infrastructure Finance, Debt Sustainability, Africa-China Relations

JEL classification: H54, H63, O40, O55

1. Introduction

Over the past two decades, China has emerged as a dominant financial partner to many developing regions, with Africa becoming a strategic focal point in the global south. Central to this engagement has been China's extensive provision of infrastructure loans, largely channelled through state-owned financial

institutions such as the China Exim Bank and the China Development Bank (Munyati, 2024). These loans frequently framed within the broader Belt and Road Initiative (BRI) have funded a wide array of infrastructure projects across the continent, including transportation corridors, energy grids, telecommunications systems, and industrial parks.

While many African states have embraced this partnership as a strategic opportunity to bridge infrastructure gaps that have persisted since colonial times, an increasingly polarized discourse has emerged. On one hand, Chinese finance is commended for its scale, speed, and perceived pragmatism, particularly when contrasted with the often conditional and bureaucratic requirements of traditional Western lenders. On the other hand, growing concerns have surfaced regarding the long-term sustainability of these debt-financed investments. Critics warn that the rapid influx of Chinese loans may, in certain contexts, exacerbate sovereign debt distress and expose African economies to fiscal fragility and geopolitical leverage (Mutai et al., 2024). This duality underpins the central dilemma: are Chinese infrastructure loans truly facilitating transformative development, or are they reinforcing cycles of debt dependency?

This paper directly engages with that question by analyzing the volume, sectoral orientation, and fiscal implications of Chinese infrastructure loans to African countries from 2000 to 2023. Drawing from empirical sources such as the China Africa Research Initiative (CARI) and the Global Development Policy Center, the study introduces and applies a set of innovative indices including the Loan Productivity Ratio (LPR), Debt-Loan Disparity Score (DLDS), Debt Sustainability Gap (DSG), and the Debt Pressure Index (DPI) to assess the relationship between external loan exposure and underlying debt sustainability.

The empirical context is both expansive and complex. As of 2023, China has extended 1,306 loans amounting to approximately $182.28 billion to 49 African governments and seven regional borrowers (Global Development Policy Center, 2023). In that year alone, Chinese lenders issued 13 new commitments totalling $4.61 billion to eight African nations and two regional financial institutions. While this marks the first increase in annual lending to Africa since 2016, the level remains significantly lower than the early years of BRI expansion, when annual commitments regularly exceeded $10 billion (Global Development Policy Center, 2023).

The growing engagement, however, has not gone unnoticed by global financial observers. Institutions such as the International Monetary Fund (IMF), the World Bank, and independent scholars have expressed concern over the rapid accumulation of sovereign debt, much of which operates outside the surveillance frameworks of international financial institutions (IFIs). Abbas and Rogoff (2019) point out that successive financial crises have repeatedly revealed hidden or misclassified debt burdens, challenging the validity of sovereign debt statistics. Despite ongoing efforts by the IMF, OECD, and World Bank to maintain reliable debt data repositories, contradictions between their databases persist, making it difficult to assess countries' true exposure. Historical cases such as the misreporting of debt by Greece and Italy during their Eurozone accession illustrate the dangers of fiscal opacity (Alesina, Barbiero, Favero, Giavazzi, & Paradisi, 2019; Dinmore, 2013).

In this regard, Chinese lending has introduced new layers of opacity. Often structured through bilateral channels and state-owned banks, Chinese loans typically involve non-disclosure clauses, collateral-backed arrangements, and revenue-pledged agreements that are rarely subject to public scrutiny. These non-transparent terms raise questions about long-term repayment risks, fiscal stress, and sovereignty erosion. The concern is not merely about debt volume, but about the conditions under which the debt is extended and the strategic assets that may be at stake in the event of default.

Nonetheless, it would be reductive to paint Chinese infrastructure lending in wholly negative terms. As emphasized by *Democracy in Africa* (2025), many

African policymakers and development practitioners argue that Chinese financing has significantly contributed to the continent's modernization drive. Through investments in ports, rail networks, power plants, and industrial corridors, Chinese capital has helped unlock economic potential in underserved regions. Unlike Western aid, which often focuses on soft sectors such as health and education, China's approach has prioritized commercially viable, high-impact infrastructure with tangible economic spillovers although the long-term sustainability and inclusiveness of these benefits remain contested.

This study, therefore, adopts a balanced, data-driven approach to explore the implications of Chinese lending across diverse African contexts. It argues that the effect of such financing is not uniform across the continent, but is shaped by differences in governance quality, fiscal capacity, institutional strength, and absorptive capability. Countries such as Angola, Ethiopia, and Nigeria have exhibited relatively high loan productivity and moderate debt stress, whereas others such as Mozambique, Senegal, and Eritrea have experienced mounting debt burdens with limited returns on investment. The analysis presented here is designed to capture these heterogeneities using macro-financial indicators and country-specific diagnostics.

To achieve this, the study examines the geographical spread of Chinese infrastructure loans across African nations over the 2000–2023 period, explores the sectoral distribution of these loans to identify China's investment preferences, and assesses the changing trend of loan disbursements over time within the broader geopolitical and economic context. It evaluates fiscal sustainability through the application of custom indices (LPR, DLDS, DSG, and DPI), which together provide a nuanced understanding of how Chinese loans interact with domestic debt profiles. Finally, it generates policy insights that can guide both African governments and Chinese lenders toward a more strategic alignment between infrastructure financing and long-term development outcomes.

2. Review of Empirical Studies and Theoretical Framework

2.1 Review of Empirical Studies

Recent scholarly discourse reflects the increasing complexity surrounding China's role as a development financier in Africa. Contrary to the often simplistic narratives of Chinese benevolence or predation, empirical and theoretical evidence reveals a spectrum of motives, actors, and outcomes associated with Chinese overseas lending and investment. Fei et al. (2025) offer a compelling contribution to this literature by investigating the nature and consequences of intra-Chinese competition across multiple African countries. Drawing from multidisciplinary insights and fieldwork in Ethiopia and Nigeria, their study uncovers how varying strategies among Chinese firms particularly in construction, telecommunications, and retail create overlapping competitive pressures that can either enhance or hinder local development. These intra-national dynamics complicate the traditional donor-recipient binary, suggesting that African engagement with Chinese capital is mediated not just by state-level diplomacy, but also by firm-level rivalry and negotiation within the Chinese business ecosystem.

In parallel, the controversial "debt-trap diplomacy" hypothesis, often invoked in critiques of China's global lending practices, has been increasingly scrutinized by scholars. Singh (2020) systematically dismantles this narrative by showing that Chinese loans are not the primary source of debt distress in most African countries. His comparative analysis of Chinese and Western financial relations particularly in Latin America and the Caribbean reveals that China's approach tends to be non-interventionist and structurally distinct from the conditionalities typically associated with Western lenders. Rather than leveraging debt to extract strategic concessions or military footholds, Singh argues that Chinese finance has often expanded the policy space available to borrowing governments, particularly those sidelined by traditional Bretton Woods institutions.

Nonetheless, the impact of Chinese infrastructure loans on African economies remains deeply contested. While some studies emphasize the developmental benefits of such financing highlighting improvements in transport connectivity, power generation, and digital infrastructure others caution against over-optimistic projections. Kodongo and Ojah (2016) and Mahmood et al. (2022), for example, provide empirical support for the hypothesis that infrastructure investment contributes positively to economic growth in Sub-Saharan Africa, especially when aligned with the strategic goals of the Belt and Road Initiative (BRI). Similarly, Chin et al. (2021) observe a strong correlation between infrastructural improvements and short-to-long-term economic performance among BRI member states, reinforcing the view that Chinese capital can act as a growth enabler when properly managed.

However, this consensus is far from universal. Dissenting evidence from Lall (1999), Roy et al. (2014), and Shi et al. (2017) paints a more ambiguous picture, with findings suggesting neutral or even negative effects of infrastructure investment on macroeconomic performance. These contradictions point to the contextual and contingent nature of development finance. Factors such as infrastructure quality, governance standards, local absorptive capacity, and the presence (or absence) of corruption and elite capture significantly mediate the relationship between foreign loans and national development outcomes.

What emerges from this body of work is the need for a nuanced, empirically grounded framework that avoids binary categorizations of Chinese finance as either benevolent or coercive. Instead, as this paper seeks to demonstrate, the long-term implications of Chinese infrastructure loans in Africa depend on the specific interplay of fiscal conditions, governance mechanisms, loan terms, and project execution. The current study contributes to this literature by integrating these variables into a composite analytical model, using custom-designed indices to trace the relationship between loan inflows and debt sustainability across African states from 2000 to 2023.

2.1 Theoretical Framework

This study is anchored in two interrelated theoretical paradigms: Developmental State Theory and Debt Overhang Theory, each offering contrasting yet complementary perspectives on the implications of foreign-financed infrastructure development.

The Developmental State Theory, popularized by Chalmers Johnson (1982), contends that the state can play a central role in driving economic transformation through deliberate planning, strategic investment, and institutional capacity building. According to this framework, state-led infrastructure investments when effectively governed serve as catalytic interventions capable of facilitating industrialization, technological upgrading, and long-term economic growth. In the African context, Chinese infrastructure loans may be interpreted as enablers of developmental state functions, providing governments with the capital necessary to overcome structural bottlenecks and accelerate modernization processes traditionally hindered by capital scarcity and institutional inertia.

In contrast, the Debt Overhang Theory, originally articulated by Krugman (1988) and further expanded by Sachs (1989), warns of the macroeconomic risks associated with unsustainable debt accumulation. The theory posits that when a country's external debt exceeds its capacity to repay, the expected future debt service obligations may discourage both public and private investment. This situation can lead to economic stagnation, reduced fiscal policy space, and increased vulnerability to external shocks. In this light, excessive Chinese lending particularly under opaque terms or in fiscally fragile states could impose long-term liabilities that undermine development goals rather than advance them.

By applying these theoretical frameworks through empirical constructs such as the Loan Productivity Ratio (LPR), Debt Pressure Index (DPI), and Debt-Loan Disparity Score (DLDS), the study positions itself

within the broader scholarly debate over whether Chinese infrastructure loans function as instruments of empowerment or mechanisms of dependency. This dual-theory approach also facilitates context-sensitive interpretation: the same loan portfolio might spur economic development in one country while exacerbating debt distress in another, depending on a range of mediating factors including governance quality, absorptive capacity, and economic structure.

In sum, the theoretical foundation of this research enables a balanced, multidimensional assessment of Chinese financial engagement with Africa, transcending binary judgments and emphasizing the role of institutional and structural conditions in shaping loan outcomes.

3. Data and Methodology

3.1 Data source and Description of Variables

Table 1: Data Source and Description of Variables

Variable	Description	Source
Loan_USD_M	Total value of Chinese infrastructure loan (in millions of USD)	China Africa Research Initiative (CARI), Johns Hopkins University
Debt_to_GDP	Public debt stock as a percentage of GDP	International Monetary Fund (IMF)
DLDS	Debt-Loan Disparity Score: Z-score difference between loan and debt	Author's computation
DSG	Debt Sustainability Gap: Difference between actual and ideal loan	Author's computation
DPI	Debt Pressure Index: Loan squared divided by debt ratio	Author's computation

Notes: CARI – China Africa Research Initiative, Johns Hopkins University;
IMF – International Monetary Fund;
Author's Computation – Analytical indicators derived from loan and debt data through standardized metrics.

Source: Author's Compilation, 2025.

3.2 Estimation Techniques

This study adopts a series of descriptive estimation techniques aimed at quantitatively evaluating the alignment between Chinese infrastructure loans and the debt-carrying capacities of African countries. Rather than employing regression-based econometric models, the study applies standardization and transformation-based analytical methods suitable for cross-sectional data, enabling an objective comparison across countries and the derivation of policy-relevant indicators (Gujarati & Porter, 2009; Wooldridge, 2016).

The first estimation technique employed is z-score standardization, which is a statistical method used to normalize variables with different units and scales. It allows for the comparison of loan amounts and debt-to-GDP ratios across countries by converting them into standard units of deviation from their respective means. This forms the basis for computing the Debt-Loan Disparity Score (DLDS), which is expressed as the difference between the standardized loan and standardized debt burden. According to Asteriou and Hall (2015), z-scores are widely used in cross-country analysis to neutralize scale effects and enable direct comparability across countries with heterogeneous economic sizes.

Secondly, the Debt Sustainability Gap (DSG) is computed to evaluate how much more or less a country

has borrowed compared to what its fiscal capacity would justify. This measure draws from fiscal space modeling approaches used in debt sustainability assessments (Heller, 2005; IMF, 2021). The DSG is calculated by subtracting a fiscal-capacity-adjusted benchmark loan (derived by applying a country's debt-to-GDP ratio to the average loan volume in the dataset) from the actual loan received. This approach mirrors counterfactual estimation logic, often used in fiscal diagnostics, where an ideal reference value is constructed for comparative purposes (Baldacci et al., 2011).

The third metric applied is the Debt Pressure Index (DPI), which incorporates a non-linear transformation by squaring the loan amount and dividing it by the debt-to-GDP ratio. This method is based on the assumption that loan stress is not linearly proportional to debt load large loans in countries with low fiscal resilience can have an exponentially destabilizing effect. Similar risk-amplification logic is found in financial vulnerability modeling and sovereign risk scoring (Reinhart & Rogoff, 2010; Manasse & Roubini, 2009).

In addition to these constructed indicators, descriptive and visual analytics such as horizontal bar charts were employed to display the distribution of DLDS, DSG, and DPI across African countries. Visualization improves clarity and interpretability, facilitating effective policy communication and comparative diagnostics (Field, 2018).

3.3 Model Specification

This study does not employ a traditional multivariate regression model due to the nature of the data and the focus on diagnostic rather than causal inference. Instead, it utilizes analytically derived indicators to model the disparity between loan allocations and debt sustainability among African countries receiving Chinese infrastructure loans. The following model specifications represent the computational framework of the key variables developed in this research.

The first and central analytical model is the Debt-Loan Disparity Score (DLDS), which captures the standardized deviation between a country's received loan volume and its debt-to-GDP ratio. The model is specified as:

$$DLDS_i = \left(\frac{L_i - \mu_L}{\sigma_L}\right) - \left(\frac{D_i - \mu_D}{\sigma_D}\right) \quad (1)$$

Where:

- $DLDS_i$ = Debt-Loan Disparity Score for country i
- L_i = Chinese infrastructure loan to country i
- D_i = Debt-to-GDP ratio for country i
- μ_L μ_D = Sample means of loan and debt ratio respectively
- σ_L,σ_D = Standard deviations of loan and debt ratio respectively

A positive DLDS implies a country receives disproportionately high Chinese loans relative to its debt burden, whereas a negative value signals conservative lending or under-support.

The second analytical model is the Debt Sustainability Gap (DSG), which quantifies the loan deviation from a fiscally adjusted benchmark. This benchmark is calculated by scaling the sample mean of loan volumes by the country's debt-to-GDP ratio. The model is specified as:

$$DSG_i = L_i - \left(\frac{D_i}{100} \times \mu_L\right) \quad (2)$$

Where:

- DSG_i = Debt Sustainability Gap for country iii
- μ_L = Sample average of Chinese loan volumes
- $\frac{D_i}{100} \times \mu_L$ = Benchmark loan level based on fiscal space

A positive DSG indicates a loan amount that exceeds what a country's fiscal space justifies, while a negative value suggests room for increased borrowing.

Finally, the Debt Pressure Index (DPI) is specified to account for the compounded pressure of large loans in the context of a country's debt level. This model amplifies the burden of borrowing in fiscally constrained economies and is specified as:

$$DPI_i = \frac{L_i^2}{D_i} \quad (3)$$

Where:

- DPI_i = Debt Pressure Index for country iii
- L_i^2 = Square of the Chinese loan amount
- D_i = Debt-to-GDP ratio

Higher DPI values signify countries with large loan volumes and relatively weak debt positions a signal of potential financial distress.

These equations serve as the foundation for cross-country diagnostic comparison, allowing for the identification of outliers and the assessment of whether Chinese loan distribution aligns with sustainable development or contributes to the risk of long-term debt instability.

4.0 Presentation and Discussion of Results

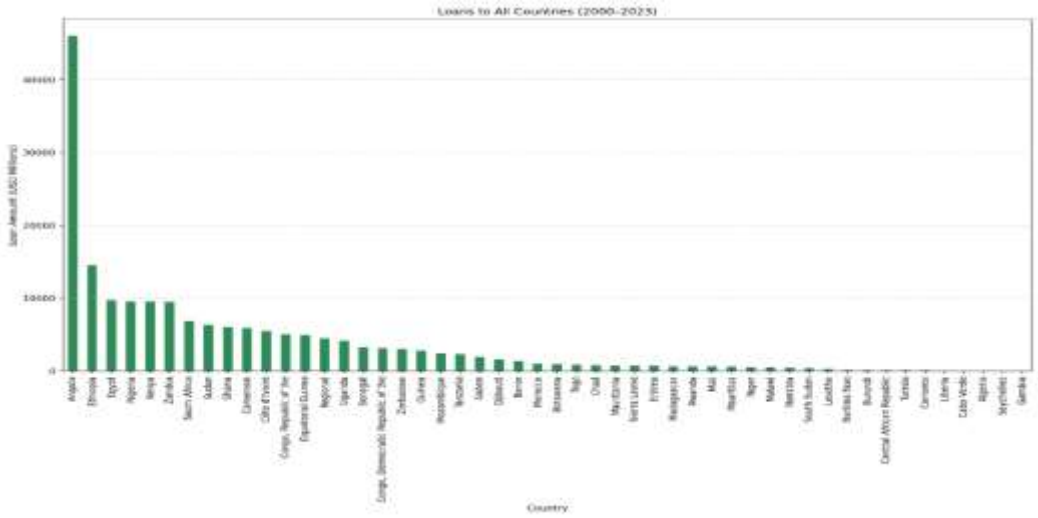
This section presents and discusses the empirical findings of the study, based on the descriptive and analytical techniques outlined in the methodology. The results are organized to sequentially address the distribution of Chinese infrastructure loans, their sectoral and temporal patterns, as well as the relationship between loan volumes and debt sustainability metrics across African countries. Visualizations and tables are used to provide clarity and comparative insights.

4.1 Total Chinese Loan Distribution by Country (2000–2023)

The bar chart below presents the cumulative amount of Chinese infrastructure loans disbursed to African countries between 2000 and 2023. The visualization reveals significant disparities in loan distribution, with a few countries capturing the lion's share of Chinese financing. Most notably, Angola received the highest loan volume over USD 45 billion, far surpassing all other recipients. This is followed by Ethiopia and Egypt, each securing loans exceeding USD 14 billion and USD 9 billion, respectively. Other prominent borrowers include Nigeria, Kenya, Zambia, and South Africa, all receiving loans ranging between USD 6 to 9 billion.

The steep decline from Angola to the median and lower-tier borrowers indicates a highly skewed financing structure, where strategic geopolitical or natural resource considerations may have influenced lending patterns. Smaller economies such as Gambia, Seychelles, and Cabo Verde received less than USD 100 million, indicating limited Chinese financial exposure. These patterns suggest differentiated debt burdens and dependency risks across the continent and provide a foundational reference point for subsequent analyses of debt sustainability, pressure indices, and development trade-offs.

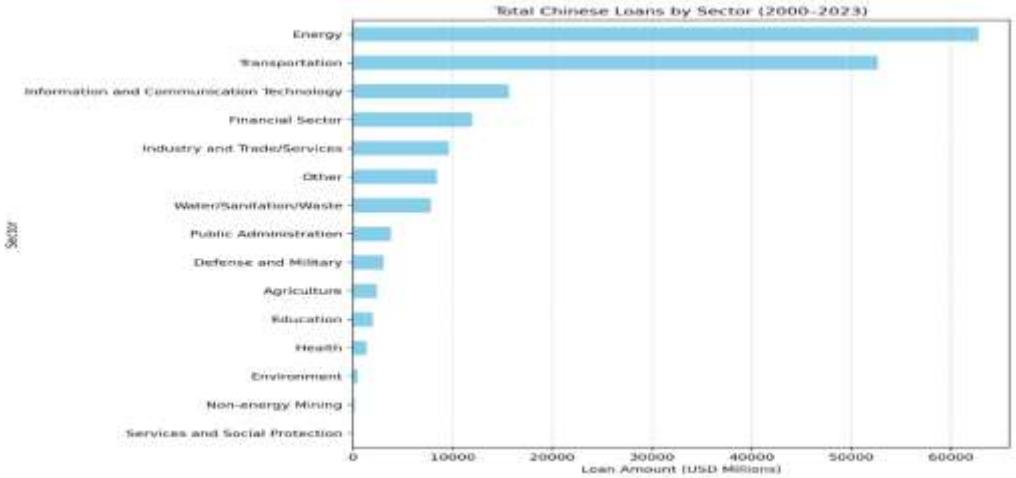
Figure 1: Bar Chart of Total Chinese Loan Distribution (2000–2023)



4.2 Sectoral Distribution of Chinese Loans (2000–2023)

The figure below displays the distribution of Chinese loans across major sectors in Africa over the 2000–2023 period. The chart reveals a heavy concentration in Energy and Transportation, with both sectors collectively absorbing the majority of Chinese infrastructure financing—over USD 110 billion combined. These investments reflect a strategic focus on hard infrastructure with long-term productivity potential. Conversely, social sectors like Health, Education, and Social Protection received minimal funding, highlighting a potential development gap in human capital investment. This skewed allocation raises concerns under the "Debt or Development?" lens—suggesting that while the loans may drive macro-infrastructure growth, they may fall short in directly enhancing social welfare or reducing vulnerability.

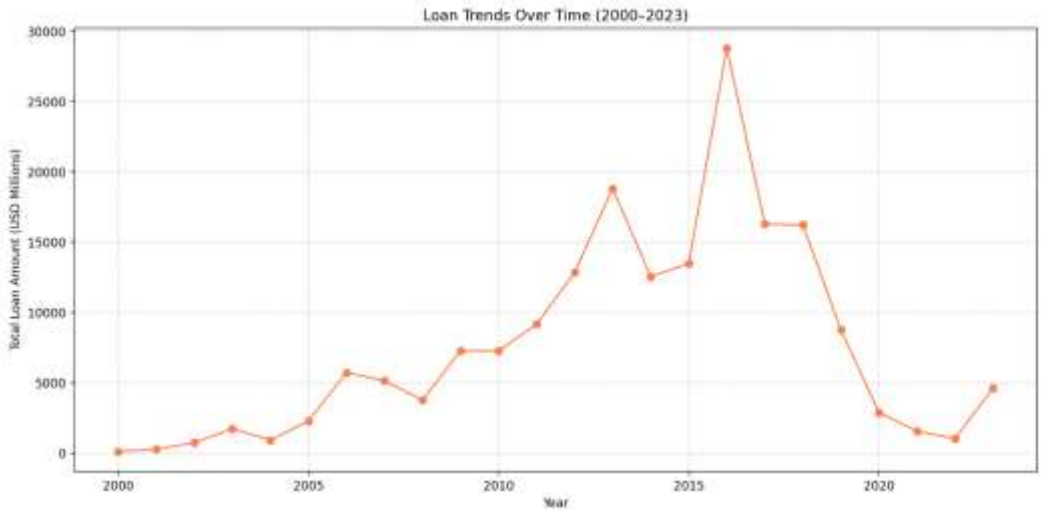
Figure 2: Bar Chart of Chinese Loans by Sector (2000–2023)]



4.3 Temporal Trend of Chinese Loan Disbursement (2000–2023)

The line graph below illustrates the trajectory of Chinese infrastructure loan disbursement to Africa from 2000 to 2023. The trend reveals three distinct phases: a gradual rise from 2000 to 2005, a sharp acceleration peaking in 2016 at nearly USD 29 billion, followed by a steep decline in the post-2016 period. The peak corresponds with China's heightened Belt and Road Initiative (BRI) push, while the drop after 2019 likely reflects rising global debt concerns, borrower fatigue, and China's recalibration of overseas lending amidst its own economic slowdown. The pandemic-era contraction (2020–2022) is especially notable, marking historic lows in loan volume. This dynamic trend underscores the evolving nature of China-Africa finance, raising questions about long-term dependency and the sustainability of external debt-financed development models.

Figure 3: Line Graph of Chinese Loan Trends (2000–2023)



4.4 Debt-to-GDP Ratio Risk Classification by Country

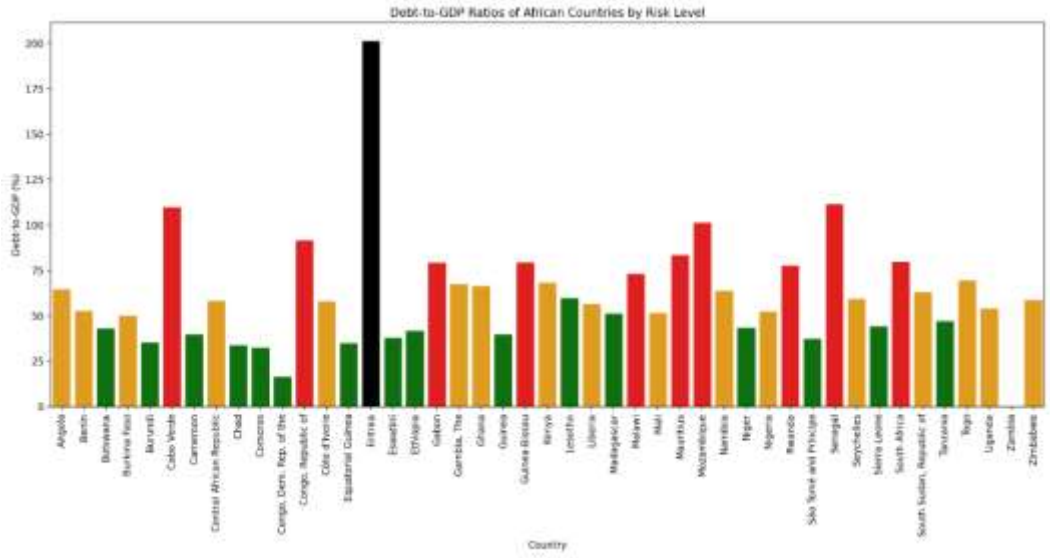
This subsection presents a bar chart of African countries' debt-to-GDP ratios, classified into four risk levels to highlight fiscal vulnerabilities and their implications for sustainable development. The legend categorizes countries as □ Low Risk (Debt-to-GDP < 50%), □ Moderate Risk (50–70%), ● High Risk (70–100%), and ● Critical (≥100%).

The chart reveals considerable variation across countries. A significant number of nations, such as Botswana, Cameroon, and Ghana, fall within the low-risk category, indicating relatively manageable debt burdens. Countries like Kenya, Guinea-Bissau, and Zambia appear in the moderate-risk range, suggesting growing concerns about debt sustainability. Alarmingly, several countries including Cabo Verde, Mozambique, and Senegal are classified as high risk, with debt levels between 70% and 100% of GDP. Equatorial Guinea stands out critically, with a debt-to-GDP ratio exceeding 200%, signaling extreme fiscal distress.

This pattern underscores the precarious balance many African nations face between leveraging debt for infrastructure-led development, often financed by Chinese loans, and maintaining macroeconomic stability. High and critical debt levels could undermine development gains by increasing debt servicing costs, crowding out social spending, and exposing countries to external shocks. Conversely, countries with lower debt

ratios may possess more fiscal space to absorb additional loans for strategic development investments.

Figure 4. Debt-to-GDP Ratios of African Countries by Risk Level here



4.5 Chinese Loan Productivity Ratio by Country

This subsection examines the Chinese Loan Productivity Ratio (LPR) across African countries. The LPR is derived by dividing the total Chinese loan amount (in million USD) by the respective debt-to-GDP ratio of each country. This ratio serves as a proxy for assessing how effectively countries are leveraging Chinese infrastructure loans relative to their existing debt burdens. A higher LPR suggests more efficient borrowing, potentially indicating that the country has the capacity to transform the borrowed funds into productive economic assets without overburdening its fiscal space. Conversely, a lower LPR may reflect inefficiencies in loan utilization or heightened debt sustainability concerns.

The analysis reveals considerable disparities among countries. Angola leads with a remarkably high LPR of 702.04, followed by Ethiopia (345.06) and Nigeria (182.62). These countries appear to manage Chinese loans more productively relative to their debt exposure. In contrast, Liberia (0.93), Central African Republic (1.59), and Burundi (2.66) record the lowest LPRs, raising questions about their ability to translate external financing into sustainable development outcomes. Countries like Mozambique (23.29) and Senegal (28.72), despite receiving significant loan volumes, show moderate productivity levels, reflecting potential vulnerabilities in their fiscal management.

Table 1 presents a detailed breakdown of each country's loan amount, debt-to-GDP ratio, and calculated loan productivity ratio.

Table 1: Chinese Loan Productivity Ratio by Country

Country	Loan (USD Million)	Debt-to-GDP (%)	Loan Productivity Ratio
Angola	45,295.78	64.52	702.04
Ethiopia	14,426.98	41.81	345.06
Nigeria	9,591.05	52.52	182.62
Equatorial Guinea	4,900.32	35.07	139.73

Cameroon	5,818.20	39.87	145.93
Kenya	9,509.53	68.34	139.15
Guinea	2,752.78	39.60	69.51
Uganda	4,162.48	53.96	77.14
Ghana	6,032.45	66.44	90.80
South Africa	6,771.29	79.55	85.12
Zimbabwe	2,978.27	58.57	50.85
Tanzania	2,318.22	47.09	49.23
Senegal	3,200.58	111.43	28.72
Mozambique	2,354.46	101.08	23.29
Gabon	1,822.51	79.24	23.00
Chad	847.60	33.88	25.02
Benin	1,384.57	52.55	26.35
Botswana	873.50	42.95	20.34
Madagascar	704.95	51.27	13.75
Niger	549.89	43.39	12.67
Mali	616.62	51.73	11.92
Togo	888.34	69.50	12.78
Malawi	542.61	72.96	7.44
Rwanda	596.88	77.65	7.69
Namibia	423.42	63.86	6.63
Mauritius	472.35	83.40	5.66
Lesotho	269.26	59.73	4.51
Burkina Faso	207.48	50.16	4.14
Comoros	117.41	32.51	3.61
Eritrea	695.79	201.36	3.46
Burundi	94.03	35.31	2.66
Central African Republic	92.76	58.29	1.59
Liberia	52.71	56.50	0.93

4.7 Debt-Loan Disparity Score (DLDS)

The results of the DLDS analysis are presented in tabular format. Countries with significant disparities are highlighted and discussed in terms of over-loaning or under-loaning relative to debt capacity.

Table 2: Chinese Loan Amounts, Debt-to-GDP Ratios, and DLDS Scores for African Countries (2000–2023)

Country	Chinese Loans (USD Million)	Debt-to-GDP (%)	DLDS Score
Angola	45,295.78	64.52	5.08
Ethiopia	14,426.98	41.81	1.98
Nigeria	9,591.05	52.52	1.03
Equatorial Guinea	4,900.32	35.07	1.01
Cameroon	5,818.20	39.87	0.97
Guinea	2,752.78	39.60	0.60

Chad	847.60	33.88	0.55
Kenya	9,509.53	68.34	0.51
Comoros	117.41	32.51	0.50
Burundi	94.03	35.31	0.41
Uganda	4,162.48	53.96	0.31
Tanzania	2,318.22	47.09	0.30
Botswana	873.50	42.95	0.26
Niger	549.89	43.39	0.20
Sierra Leone	689.00	44.33	0.19
Ghana	6,032.45	66.44	0.13
Zimbabwe	2,978.27	58.57	0.01
Benin	1,384.57	52.55	0.01
Madagascar	704.95	51.27	–0.04
Burkina Faso	207.48	50.16	–0.06
Mali	616.62	51.73	–0.06
South Africa	6,771.29	79.55	–0.20
Liberia	52.71	56.50	–0.29
Central African Republic	92.76	58.29	–0.34
Lesotho	269.26	59.73	–0.36
Namibia	423.42	63.86	–0.48
Togo	888.34	69.50	–0.60
Malawi	542.61	72.96	–0.76
Gabon	1,822.51	79.24	–0.80
Rwanda	596.88	77.65	–0.90
Mauritius	472.35	83.40	–1.11
Mozambique	2,354.46	101.08	–1.45
Senegal	3,200.58	111.43	–1.68
Eritrea	695.79	201.36	–4.91

Note: DLDS = Debt-Loan Disparity Score, calculated as the standardized difference between Chinese loan volume and debt-to-GDP ratio.

Source: Author's Computation from CARI and IMF data, 2025.

The DLDS results reveal stark disparities in loan allocation relative to fiscal space. Angola, with a DLDS of 5.08, received over $45 billion despite a debt-to-GDP ratio of 64.52%, indicating significant overexposure. Ethiopia and Nigeria also show high DLDS scores (1.98 and 1.03, respectively), suggesting loans exceed what their debt profiles would justify. In contrast, Eritrea, with a critical debt-to-GDP ratio of 201.36%, has a DLDS of –4.91, showing major underinvestment. Similarly, Senegal (–1.68) and Mozambique (–1.45) carry heavy debt burdens but receive less in Chinese loans. These patterns question whether Chinese lending is development-driven or selectively strategic, reinforcing the debate around debt sustainability versus infrastructure growth.

4.8 Debt Sustainability Gap (DSG)

This subsection presents the DSG values across all countries in a table. Positive and negative gaps are discussed with implications for long-term debt sustainability.

Table 3: Debt Sustainability Gap (DSG) Across Selected African Countries

Country	Loan (USD Millions)	Debt-to-GDP (%)	DSG
Angola	45,295.78	64.52	42,894.44
Ethiopia	14,426.98	41.81	12,870.88
Nigeria	9,591.05	52.52	7,636.34
Kenya	9,509.53	68.34	6,966.02
Cameroon	5,818.20	39.87	4,334.30
South Africa	6,771.29	79.55	3,810.56
Equatorial Guinea	4,900.32	35.07	3,595.07
Ghana	6,032.45	66.44	3,559.65
Uganda	4,162.48	53.96	2,154.17
Guinea	2,752.78	39.60	1,278.93
Zimbabwe	2,978.27	58.57	798.39
Tanzania	2,318.22	47.09	565.60
Chad	847.60	33.88	–413.36
Benin	1,384.57	52.55	–571.26
Botswana	873.50	42.95	–725.04
Senegal	3,200.58	111.43	–946.67
Sierra Leone	689.00	44.33	–960.90
Niger	549.89	43.39	–1,065.02
Comoros	117.41	32.51	–1,092.57
Gabon	1,822.51	79.24	–1,126.68
Madagascar	704.95	51.27	–1,203.24
Burundi	94.03	35.31	–1,220.15
Mali	616.62	51.73	–1,308.69
Mozambique	2,354.46	101.08	–1,407.58
Burkina Faso	207.48	50.16	–1,659.40
Togo	888.34	69.50	–1,698.35
Namibia	423.42	63.86	–1,953.35
Lesotho	269.26	59.73	–1,953.80
Liberia	52.71	56.50	–2,050.13
Central African Republic	92.76	58.29	–2,076.70
Malawi	542.61	72.96	–2,172.85
Rwanda	596.88	77.65	–2,293.13
Mauritius	472.35	83.40	–2,631.68
Eritrea	695.79	201.36	–6,798.52

Notes: DSG = Debt Sustainability Gap, computed as the difference between actual loan values and the debt-adjusted expected loan values based on average fiscal space.

Source: Author's computation using data from China's Global Infrastructure Lending Database and IMF (2025).

The Debt Sustainability Gap (DSG) analysis provides insights into whether Chinese infrastructure loans align with the fiscal capacities of African nations. Countries such as Angola (DSG = 42,894.44), Ethiopia

(12,870.88), and Nigeria (7,636.34) appear to have received Chinese loans far exceeding what their debt-to-GDP ratios would predict, suggesting potential overfunding relative to fiscal space. This raises concerns about long-term debt sustainability and repayment risks. In contrast, nations like Eritrea (–6,798.52), Mauritius (–2,631.68), and Rwanda (–2,293.13) received relatively limited Chinese financing despite significant debt burdens, reflecting potential underinvestment or geopolitical exclusion. These disparities question the uniformity and developmental intent of Chinese lending, supporting the study's investigation into whether such loans represent a path to genuine development or deepen financial vulnerability across Africa.

4.9 Debt Pressure Index (DPI)

The final subsection presents the DPI scores across countries. This index identifies countries where loan burdens are disproportionately high, helping to flag potential debt stress zones.

Table 4: Debt Pressure Index (DPI) Across Selected African Countries

Country	Loan (USD Millions)	Debt-to-GDP (%)	DPI
Angola	45,295.78	64.52	31,799,555.45
Ethiopia	14,426.98	41.81	4,978,184.17
Nigeria	9,591.05	52.52	1,751,490.46
Kenya	9,509.53	68.34	1,323,254.36
Cameroon	5,818.20	39.87	849,045.21
Equatorial Guinea	4,900.32	35.07	684,721.31
South Africa	6,771.29	79.55	576,372.00
Ghana	6,032.45	66.44	547,718.78
Uganda	4,162.48	53.96	321,094.64
Guinea	2,752.78	39.60	191,358.28
Zimbabwe	2,978.27	58.57	151,444.77
Tanzania	2,318.22	47.09	114,124.57
Senegal	3,200.58	111.43	91,929.81
Mozambique	2,354.46	101.08	54,842.52
Gabon	1,822.51	79.24	41,917.40
Benin	1,384.57	52.55	36,480.35
Chad	847.60	33.88	21,205.22
Botswana	873.50	42.95	17,764.81
Togo	888.34	69.50	11,354.57
Sierra Leone	689.00	44.33	10,708.80
Madagascar	704.95	51.27	9,692.91
Mali	616.62	51.73	7,350.07
Niger	549.89	43.39	6,968.88
Rwanda	596.88	77.65	4,588.17
Malawi	542.61	72.96	4,035.45
Namibia	423.42	63.86	2,807.44
Mauritius	472.35	83.40	2,675.18
Eritrea	695.79	201.36	2,404.27
Lesotho	269.26	59.73	1,213.77
Burkina Faso	207.48	50.16	858.18

Comoros	117.41	32.51	424.01
Burundi	94.03	35.31	250.40
Central African Republic	92.76	58.29	147.62
Liberia	52.71	56.50	49.18

Source: Author's computation using Chinese Loan Database and IMF Debt Ratios, 2025.

The Debt Pressure Index (DPI) offers a novel quantitative lens to evaluate how burdensome Chinese infrastructure loans may be on a country's fiscal health. Countries like Angola (DPI = 31.8 million) and Ethiopia (DPI = 5.0 million) show the highest levels of debt pressure, signifying that their already substantial debt-to-GDP ratios amplify the financial load of incoming Chinese loans. On the other end, countries such as Liberia (DPI = 49.18) and Central African Republic (DPI = 147.62) have comparatively low DPI values, either due to smaller loan volumes or lower debt ratios.

5. Summary, Conclusion, and Policy Implications

This study has empirically examined the complex landscape of Chinese infrastructure lending to Africa from 2000 to 2023, situating it within the broader discourse of whether such financing contributes to sustainable development or heightens debt vulnerability. The findings show that Chinese loans are not evenly distributed across the continent. Countries like Angola, Ethiopia, Nigeria, and Kenya received the lion's share of total disbursements, reflecting geopolitical strategy, resource security, or absorptive capacity. However, the debt burden accompanying this concentration raises long-term questions about equity and sustainability. Smaller economies with weak fiscal buffers received limited support, suggesting a selective rather than developmental approach to lending.

Sectoral analysis indicates that Chinese lending has primarily supported hard infrastructure particularly in energy and transportation while soft sectors such as health, education, and social protection remained largely underfunded. Although such investments may yield productivity gains and foster economic growth, their lack of direct alignment with social needs implies a development gap. The heavy skew toward economic infrastructure suggests that the primary intent of lending may lean more toward strategic economic interests than holistic development. This underinvestment in human capital-related sectors compromises Africa's ability to achieve inclusive and sustainable growth.

Temporal trends in loan disbursement further complicate the narrative. Chinese loan flows rose steadily from 2000, peaked dramatically in 2016, and have declined sharply in the post-2019 era. These shifts coincide with China's Belt and Road Initiative expansion, tightening global debt markets, and internal rebalancing within China. The post-pandemic slump in loan activity reveals growing caution from both lenders and borrowers. The volatility in disbursement patterns undermines financial predictability and introduces risks for long-term project planning and economic stability among African states, many of whom depend on external infrastructure financing to close critical development gaps.

The study's composite indices particularly the Loan Productivity Ratio (LPR), Debt Sustainability Gap (DSG), Debt-Loan Disparity Score (DLDS), and Debt Pressure Index (DPI) provide technical insights into how well countries are managing these loans relative to their debt profiles. Countries such as Angola and Ethiopia exhibit high LPR and DSG values, suggesting relatively productive use of loans. In contrast, nations like Eritrea, Senegal, and Mozambique exhibit negative sustainability gaps and high debt pressure, indicating fiscal stress and poor alignment between debt capacity and borrowing. These disparities challenge the notion that Chinese loans are uniformly developmental and instead suggest context-specific outcomes based on domestic governance, project viability, and fiscal discipline.

From a policy standpoint, African governments must adopt a more strategic and evidence-based approach to infrastructure borrowing. Debt sustainability assessments must precede all external loan commitments, and loan-funded projects must be subject to strict economic and social return criteria. Regional financial surveillance mechanisms should also be strengthened to track borrowing patterns and anticipate stress. On the Chinese side, lending frameworks should incorporate safeguards for debt sustainability and encourage co-financing in underfunded social sectors. Only through a rebalancing of incentives between lender and borrower — and a shift toward more inclusive development financing — can the promise of infrastructure-led growth be fulfilled without exacerbating long-term debt traps.

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