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Can Better Land Governance Reduce Capital Flight and Brain Drain? Evidence from Cameroon

Marius Bendoma^{1,2,*}

¹Higher School of Economics and Management, University of Douala, Douala, Cameroon

²Laboratory of Analysis and Research in Mathematical Economics (LAREM), University of Yaoundé II, Yaoundé, Cameroon

*Correspondence author: Marius Bendoma, bendoma@yahoo.fr

Abstract

This study examines whether improved land governance is associated with lower levels of capital flight and brain drain in Cameroon. It develops a Cameroon Land Governance Index (CLGI) covering four dimensions: recognition of customary land rights, decentralization of land administration, transparency and anti-corruption mechanisms, and diaspora investment facilitation. Using annual data for 2000-2023, the study applies an instrumental-variable two-stage least squares (IV-2SLS) approach to estimate the relationships between land governance, capital flight, and the stock of highly educated Cameroonian migrants residing in OECD countries. The results indicate that stronger land governance is significantly associated with lower levels of both capital flight and brain drain. More secure, transparent, and predictable land institutions may strengthen confidence in domestic investment and reduce incentives to transfer financial resources abroad. Similarly, improved land governance may enhance domestic economic anchoring by supporting asset accumulation, entrepreneurship, and long-term investment opportunities for highly educated citizens. The study contributes to the literature by introducing a context-specific measure of land governance and by establishing an integrated empirical link between land institutions, financial-capital retention, and human-capital retention. The findings suggest that land-governance considerations may be relevant to broader strategies for institutional strengthening, investment promotion, diaspora mobilization, and sustainable development in Cameroon.

Keywords

Land governance, Capital flight, Brain drain, Institutional quality, Property rights, Cameroon, Two-stage least squares

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1. Introduction

Land is a strategic economic asset, a factor of production, and an institutional foundation for investment, wealth accumulation, and long-term economic activity in developing countries. Beyond its productive function, land governance shapes how households, firms, communities, and public authorities access, use, protect, and transfer land resources. From the perspective of the New Institutional Economics, the quality of institutions matters because rules governing property rights, access to resources, and economic exchanges influence incentives, transaction costs, and the predictability of economic activity [1]. In the land sector, however, effective governance cannot be reduced to the formal recognition of individual ownership. It also requires credible protection of rights, recognition of legitimate customary arrangements, transparency, accountability, equitable access, and accessible dispute-resolution mechanisms [2,3]. These issues are particularly important in African countries, where statutory and customary land institutions frequently coexist. Land governance in such contexts involves the interaction of multiple institutional orders rather than a simple transition from customary to formal systems. Cameroon provides a relevant setting for examining these dynamics. The land reforms introduced by the 1974 ordinances established a predominantly centralized framework in which the State exercises extensive authority over national land, while customary tenure has received relatively limited recognition within the formal legal system. The coexistence of statutory rules and customary practices may therefore generate uncertainty concerning the allocation, protection, and adjudication of land rights, as well as unequal access to land resources and land-related conflicts [4].

The quality of land administration is also affected by transparency, accountability, administrative complexity, and corruption. Limited access to information, discretionary procedures, delays in land registration, and unequal treatment may increase transaction costs and weaken confidence in the institutions responsible for managing land resources. Evidence from Cameroon indicates that governance deficiencies affect both the efficiency and the credibility of land administration [5]. Consequently, land governance should be understood not merely as a technical system for registering land, but as part of the broader institutional environment within which economic agents evaluate the security and profitability of domestic activities. The potential macroeconomic implications of land governance have received considerably less attention than its effects on tenure security, agricultural investment, land access, and land-related conflicts. One potentially important but underexplored implication concerns capital flight. The literature on African capital flight has primarily emphasized macroeconomic instability, external indebtedness, corruption, weak governance, and uncertainty regarding the protection of domestic assets [6,7]. When investors and wealth holders perceive domestic institutions as unreliable or assets as insufficiently protected, they may transfer financial resources to foreign jurisdictions. Insecure or unpredictable land institutions may contribute to this process by increasing the risks associated with land-dependent investment in agriculture, real estate, infrastructure, manufacturing, and entrepreneurship. A similar institutional mechanism may influence the retention of human capital. The literature on brain drain has traditionally focused on wage differentials, employment opportunities, education, and international returns to skills [8,9]. These factors remain central to migration decisions, but highly educated individuals may also consider whether they can establish businesses, acquire productive assets, accumulate wealth, and plan for the future in their home country. In this respect, land governance may affect brain drain indirectly by shaping the expected returns to domestic entrepreneurship, asset accumulation, and long-term investment.

The relationship between land governance and capital and human-capital retention is therefore theoretically plausible through an institutional-confidence mechanism. Secure and predictable land institutions may strengthen confidence in domestic investment, reduce transaction costs, facilitate the productive use of assets, and improve expectations concerning future economic opportunities. Conversely, insecure tenure, administrative opacity, and discretionary land management may encourage economic agents to diversify their assets abroad or seek professional and entrepreneurial opportunities outside the country. These mechanisms suggest that land governance may constitute a common institutional channel affecting both financial-capital retention and human-capital retention. This perspective is particularly relevant to Cameroon, which combines a complex land-tenure system, centralized land administration, governance challenges, substantial international mobility of skilled workers, and persistent difficulties in domestic capital accumulation. The country's institutional environment may influence not only land-related outcomes but also broader decisions concerning investment, entrepreneurship, migration, and the location of wealth. The availability of OECD data on immigrants and educational attainment makes it possible to approximate brain drain using the stock of highly educated Cameroonian migrants residing in OECD countries [10]. Macroeconomic and institutional controls from the World Development Indicators and the Worldwide Governance Indicators further allow the analysis to distinguish the potential contribution of land governance from broader economic and governance conditions [11,12].

The existing literature nevertheless remains fragmented. Studies on land governance have mainly examined tenure security, land access, agricultural investment, institutional pluralism, and land-related conflicts [2,5,13,14]. Research on capital flight has focused on macroeconomic instability, external borrowing, corruption, financial governance, and international financial transactions [6,7]. Studies on brain drain have emphasized education, employment opportunities, wage differentials, and international returns to skills [8,9]. Although these strands of literature recognize the importance of institutions and economic incentives, they have rarely been integrated into a common empirical framework. In particular, limited empirical attention has been devoted to land governance as a specific institutional channel influencing both the retention of financial capital and the retention of human capital. This study addresses this gap by examining

whether land governance is associated with lower capital flight and lower brain drain in Cameroon. It develops a Cameroon Land Governance Index (CLGI) that captures four dimensions: recognition of customary land rights, decentralization of land administration, transparency and anti-corruption mechanisms, and diaspora investment facilitation. The study then applies an instrumental-variable two-stage least squares (IV-2SLS) approach to investigate the relationship between the CLGI and two outcomes: capital flight and the stock of highly educated Cameroonian migrants residing in OECD countries. The empirical framework controls for relevant macroeconomic, institutional, and structural determinants of the two outcomes. The study makes three contributions. First, it extends the land-governance literature beyond conventional land-sector outcomes by examining its potential implications for financial-capital and human-capital retention. Second, it introduces a multidimensional, context-specific index designed to capture the institutional features of land governance in Cameroon. Third, it brings together two outcomes that are generally studied separately, capital flight and brain drain, within a common institutional framework based on investment security, asset accumulation, and domestic economic opportunity.

The central research question is therefore whether better land governance is associated with lower capital flight and lower brain drain in Cameroon. Given the limited number of annual observations and the assumptions required for instrumental-variable identification, the findings are interpreted as evidence of an estimated relationship consistent with the proposed institutional mechanism rather than as definitive proof that land-governance reforms alone cause reductions in capital flight or brain drain.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature and develops the theoretical framework linking land governance to capital flight and brain drain. Section 3 presents the data, describes the construction of the CLGI, and outlines the econometric strategy. Section 4 presents the empirical results, robustness checks, discussion, and policy implications. Section 5 concludes the study by summarizing the main findings, limitations, and directions for future research.

2. Literature Review and Theoretical Framework

2.1 Land Governance, Institutions, and Economic Outcomes

The New Institutional Economics literature has long emphasized the importance of institutions in shaping economic incentives, reducing uncertainty, and influencing development trajectories. Institutions affect economic behavior by defining the rules governing access to resources, the protection of property rights, the enforcement of contracts, and the organization of economic exchanges [1]. From this perspective, economic performance depends not only on the availability of productive resources but also on the quality, credibility, and predictability of the institutions responsible for allocating and protecting them.

Land governance occupies a particularly strategic position within this institutional framework because land is simultaneously an economic asset, a factor of production, a source of collateral, and an important component of social and political relations. Secure land rights can reduce uncertainty, encourage productive investment, facilitate the development of land markets, and strengthen the capacity of households and firms to accumulate wealth [2,13]. The economic significance of land institutions therefore extends beyond agricultural production. Secure access to land can also support housing, entrepreneurship, infrastructure development, and the establishment of long-term productive activities. Land governance refers to the legal, institutional, administrative, and customary arrangements through which land rights are defined, allocated, registered, transferred, protected, and contested. It should not be equated exclusively with the formal registration of individual ownership. In many societies, collective and customary institutions play an important role in allocating and managing land resources. Where such arrangements are recognized and supported by credible rules, they may contribute to effective resource management, social stability, and the legitimacy of land-related decisions [15]. International principles of responsible land governance similarly emphasize tenure security, equitable access, recognition of legitimate tenure rights, participation, transparency, accountability, and accessible dispute-resolution mechanisms [3,14,16].

The effectiveness of land reform therefore depends not only on the formal legal framework but also on the capacity of institutions to reconcile statutory rules with socially legitimate practices. This issue is particularly relevant in African countries, where statutory and customary land institutions frequently coexist. Such legal pluralism may provide flexibility and local legitimacy, but it may also generate uncertainty when formal rules do not adequately recognize customary rights or when multiple sources of authority overlap. In these circumstances, institutional reforms may create tensions between statutory requirements and established local practices. In Cameroon, the centralized framework established by the 1974 land reforms has historically given the State a predominant role in the administration and allocation of land, while customary tenure has received relatively limited formal recognition. This configuration contributes to a persistent gap between statutory rights and customary practices. Such legal pluralism may increase uncertainty concerning the allocation and protection of land rights and may contribute to land conflicts, unequal access to land resources, and difficulties in securing long-term investments [4]. The quality of land administration is also closely related to transparency and institutional accountability. Administrative complexity, limited access to information, discretionary decision-making, and corruption can increase transaction costs and reduce confidence in land institutions. Evidence concerning the Cameroonian land sector indicates that governance weaknesses may affect the efficiency, accessibility, and credibility of

land administration [5]. More broadly, responsible land-governance frameworks identify transparency, accountability, participation, and accessible dispute-resolution mechanisms as essential elements of effective land institutions [16].

Decentralization represents another potentially important dimension of land governance. Bringing administrative decisions closer to local communities may improve responsiveness, reduce administrative distance, and facilitate the integration of local knowledge into land-management processes. However, decentralization does not automatically produce better governance. Its effectiveness depends on the clarity of responsibilities, the availability of financial and technical resources, coordination between central and local authorities, and the capacity of local institutions to perform their assigned functions. Human capital is also a fundamental component of long-term economic development because improvements in skills, knowledge, and productive capabilities can generate broader effects on productivity, innovation, employment, and economic growth [17]. Cameroon's broader decentralization process therefore provides an important institutional context for examining whether greater local involvement can improve the management of land resources and strengthen the conditions for local economic development [18-21].

It is important, however, to distinguish between broad development concepts and the specific outcomes examined in this study. Economic performance generally refers to measurable outcomes such as investment, productivity, employment, income, and economic growth. Economic development encompasses broader improvements in living standards, structural transformation, human-capital accumulation, and social inclusion. Sustainable development additionally concerns the long-term compatibility between economic progress, social equity, institutional stability, and environmental preservation [22]. By contrast, capital flight and brain drain are specific financial and demographic outcomes. They are not themselves equivalent to economic development or sustainable development, but they may reflect institutional weaknesses and may subsequently influence development prospects through their effects on domestic savings, investment, productivity, innovation, and human-capital accumulation. The relationship between institutional quality and economic performance is therefore relevant to the present study because land institutions affect the security of assets and the predictability of investment decisions. When institutions protect rights effectively and provide transparent procedures, economic agents can make longer-term decisions with greater confidence. Conversely, institutional uncertainty may encourage defensive behavior, discourage productive investment, and increase incentives to seek alternative economic opportunities outside the domestic economy.

2.2 Land Governance, Capital Flight, and Financial-Capital Retention

The literature on capital flight provides a useful starting point for understanding how institutional weaknesses can influence the movement of financial resources. Capital flight has been associated with macroeconomic instability, weak governance, corruption, external indebtedness, and uncertainty concerning the protection of domestic assets [6,7]. When investors and wealth holders perceive domestic economic conditions as uncertain or institutions as incapable of protecting their assets, they may transfer part of their financial resources to foreign jurisdictions. The institutional dimension of capital flight is consistent with the broader argument that inclusive and predictable institutions create incentives for investment by protecting property rights, reducing uncertainty, and improving the credibility of economic rules [23]. Capital flight should therefore not be understood solely as the result of individual portfolio diversification decisions. It may also reflect perceptions concerning the reliability of domestic institutions and the expected security of wealth accumulated within the country. Information on illicit financial flows further illustrates the scale of resources that developing economies may lose through unrecorded or inadequately recorded international financial transactions [24].

Recent empirical evidence reinforces the importance of institutions in explaining capital flight in Sub-Saharan Africa. Osei-Assibey, Domfeh, and Danquah [25] show that corruption and institutional weaknesses are significant factors associated with capital flight in the region. Their contribution is important because it demonstrates that capital outflows are not determined exclusively by macroeconomic conditions but are also shaped by the quality of governance and the credibility of domestic institutions. The interaction between indebtedness and institutional quality provides an additional perspective. Brou and Thiam [26] show that the relationship between external debt and capital flight in Sub-Saharan Africa depends on institutional conditions. External indebtedness may generate concerns about future taxation, macroeconomic adjustment, debt sustainability, or the management of borrowed resources. These concerns may be amplified where institutions are weak and public-resource management is perceived as unreliable. Their findings therefore suggest that the effect of a macroeconomic determinant such as external debt cannot be considered independently of the institutional environment in which it operates.

Although these studies provide important evidence on the institutional determinants of capital flight, they generally rely on broad governance indicators such as corruption control, political stability, rule of law, or government effectiveness. Such indicators capture the general institutional environment but may not identify the specific sectoral mechanisms through which institutions influence capital-retention decisions. The present study extends this literature by examining land governance as a more specific institutional channel.

Land governance can influence capital flight through several mechanisms. First, insecure land rights increase uncertainty concerning the protection of productive assets. Investors operating in agriculture, real estate, infrastructure, manufacturing, and other land-dependent activities require predictable access to land. When land claims are vulnerable to competing claims, administrative discretion, or political interference, the expected risk associated with domestic investment increases. More secure land institutions may therefore strengthen investment incentives and reduce uncertainty [2]. Second, opaque

land administration can create opportunities for rent extraction and corruption. When access to land registration, land transfer, or administrative services depends excessively on discretionary procedures, transaction costs increase and confidence in domestic institutions may decline. Greater transparency, accountability, and accessibility can improve the credibility of land administration and reduce incentives for economic agents to seek institutional alternatives abroad [5]. Third, weak land institutions may restrict the capacity of individuals and firms to use land as a productive asset or as collateral. Uncertain tenure may prevent long-term investment, limit enterprise development, and reduce the economic value that can be generated from land. Where land rights are not clearly documented or legally enforceable, households and firms may face difficulties obtaining credit or mobilizing land-based assets for productive purposes. Fourth, land-related uncertainty may affect the location of wealth accumulation. If domestic land investments are perceived as vulnerable to expropriation, disputes, fraud, or administrative delays, wealth holders may prefer to retain financial assets abroad rather than invest them in domestic activities exposed to institutional uncertainty.

Accordingly, land governance should not be viewed simply as another general governance indicator. It represents a specific institutional domain through which property-rights security, transaction costs, access to productive assets, and expectations regarding domestic investment may affect financial-capital retention. The central proposition is therefore not merely that better institutions are associated with lower capital flight, but that improvements in land governance may strengthen the security and attractiveness of domestic investment and thereby reduce incentives for capital outflows.

2.3 Land Governance, Institutional Quality, and Brain Drain

Brain drain generally refers to the emigration of highly educated or highly skilled individuals from their country of origin to foreign destinations. In this study, it is approximated using an index derived from the stock of highly educated Cameroonian migrants residing in OECD member countries. This process may reduce the domestic stock of human capital, weaken innovation capacity, constrain managerial and technical capabilities, and lower the returns to public and private investment in education. Nevertheless, the decision to migrate is not determined exclusively by wage differentials. It also depends on employment opportunities, professional mobility, political stability, public services, social mobility, security, and expectations concerning future economic prospects. The institutional environment influences migration decisions by shaping individuals' expectations about fairness, security, career development, asset protection, and the predictability of economic life. When institutions are perceived as ineffective, corrupt, discriminatory, or unable to support productive activity, skilled individuals may consider migration as a strategy for improving their professional and personal prospects. Ariu, Docquier, and Squicciarini [27] provide evidence that governance quality is relevant to migration outcomes. Their analysis indicates that migration flows are influenced not only by income and labor-market differentials but also by the quality of institutions and the broader governance environment. This supports the argument that institutional credibility affects individuals' decisions to remain in or leave their country of origin. The relationship between land-related institutions and migration has received less attention, but available evidence suggests that land security can influence mobility decisions. Mekasha et al. [28], in their study of land-tenure security and internal migration in Tanzania, show that land-related institutional conditions matter for migration behavior. Although their analysis concerns internal rather than international migration, it demonstrates that land tenure is not merely an agricultural or property-rights issue. It may shape household livelihood strategies, local investment decisions, economic security, and the choice to remain in or move away from a particular location.

Land governance may influence brain drain through several indirect channels. Secure and transferable land rights can support entrepreneurship, facilitate access to finance, and create opportunities for investment in agriculture, housing, services, and other land-dependent activities. These opportunities may increase the expected returns to remaining in the country. Conversely, insecure tenure, limited access to land, and opaque administrative procedures may reduce the feasibility of entrepreneurial projects and weaken the perceived attractiveness of domestic economic life. The institutional environment may also affect the capacity of highly educated individuals to transform their skills into productive activities. Skilled workers may be more likely to remain when they can establish businesses, acquire assets, invest in housing, develop land-based projects, or participate in a predictable economic environment. Conversely, when access to productive assets is constrained by insecure rights, administrative barriers, or corruption, the opportunity cost of remaining in the country may increase. This mechanism is particularly relevant for Cameroon because the country seeks to mobilize its diaspora as a source of investment, knowledge, entrepreneurship, and international networks. Policies aimed at strengthening diaspora investment may interact with land governance by reducing institutional barriers associated with land-based investment. Information on diaspora-investment initiatives highlights the potential role of institutional mechanisms designed to facilitate the participation of Cameroonians abroad in domestic economic activities [29].

Land governance is unlikely to be the sole determinant of brain drain. Wages, employment, education, professional opportunities, political conditions, and international mobility remain important factors. However, land governance may shape the broader institutional environment and influence the expected returns to staying, investing, returning, or migrating.

2.4 Land Governance as a Common Institutional Channel

The literature on capital flight and the literature on brain drain have generally developed along separate lines. Studies of capital flight emphasize macroeconomic instability, corruption, external debt, exchange-rate risks, and asset protection, whereas studies of brain drain focus on wages, employment, education, political conditions, and returns to human capital.

Despite these differences, both forms of external exit may be influenced by a common underlying mechanism: confidence in the domestic institutional environment. Capital flight represents the external relocation of financial resources, whereas brain drain represents the external relocation of human capital. In both cases, individuals and firms compare the expected benefits and risks of remaining in the domestic economy with those associated with external relocation. Weak institutions may reduce the perceived security of assets, constrain economic opportunities, and increase uncertainty about future returns. These conditions may encourage both financial and human-capital exit.

Land governance provides a concrete institutional channel linking these two outcomes. Improved land governance may increase institutional confidence by clarifying property rights, reducing administrative discretion, improving dispute resolution, recognizing legitimate customary rights, and facilitating access to land-related economic opportunities. Greater institutional confidence may, in turn, reduce incentives to transfer financial resources abroad and improve the attractiveness of remaining in the domestic economy for skilled individuals. The proposed theoretical mechanism can be summarized as follows:

Improved land governance → greater institutional confidence and investment security → lower transaction costs and stronger domestic economic opportunities → greater retention of financial and human capital.

This mechanism does not imply that land governance alone determines capital flight or brain drain. Rather, it forms part of the broader institutional environment shaping investment, entrepreneurship, asset accumulation, and professional activity. The two outcomes may also be interconnected: capital outflows can reduce domestic investment and employment, while the emigration of highly skilled workers may weaken innovation, managerial capacity, and productive potential. These interactions can generate cumulative losses of financial and human capital. Nevertheless, this study examines each outcome separately while recognizing their potential interconnection.

The proposed framework is particularly relevant in Cameroon, where land is central to agricultural production, urban expansion, housing investment, infrastructure development, and entrepreneurial activity. In a context characterized by legal pluralism, administrative centralization, and uneven recognition of customary rights, weaknesses in land governance may have consequences extending beyond the land sector. They may affect confidence in public institutions, the security of domestic assets, the feasibility of private investment, and the perceived availability of economic opportunities. The construction of the CLGI is intended to capture this specific institutional channel. Rather than relying exclusively on broad governance indicators, the CLGI combines dimensions related to customary land-rights recognition, decentralization of land administration, transparency and anti-corruption, and diaspora-investment facilitation. This approach makes it possible to examine whether improvements in land governance are systematically associated with changes in capital flight and brain drain.

2.5 Research Gap and Hypotheses

The existing literature provides important insights into four related areas. First, land-governance research emphasizes tenure security, land access, agricultural investment, institutional pluralism, and the management of land-related conflicts [2,5,13,30]. Second, studies of capital flight identify macroeconomic instability, external indebtedness, corruption, governance failures, and international financial transactions as important determinants [6,7,31]. Evidence from Sub-Saharan Africa further demonstrates the relevance of corruption and institutional quality [25], while recent work highlights the conditioning role of institutions in the relationship between external debt and capital flight [26]. Third, the literature on migration shows that governance quality influences migration outcomes by shaping economic expectations and the returns to human capital [8,9,27]. Fourth, evidence on land-tenure security and internal migration suggests that land-related institutions may affect mobility decisions and household livelihood strategies [28].

Despite these contributions, the different strands of literature remain insufficiently integrated. Most studies examine either broad institutional quality and capital flight or governance and migration, while relatively little attention has been paid to land governance as a specific institutional determinant of both financial- and human-capital retention. The existing literature also provides limited evidence on the Cameroonian case, where formal statutory arrangements coexist with customary practices and where land-related uncertainty may influence investment incentives, entrepreneurial activity, and migration decisions. The main contribution of the present study is therefore to conceptualize land governance as a common institutional channel influencing two forms of external exit: capital flight and the emigration of highly educated individuals. The study does not assume that land governance directly determines these outcomes in isolation. Instead, it investigates whether improvements in land governance are associated with lower capital flight and lower brain drain after accounting for relevant macroeconomic, political, demographic, and governance-related factors.

The theoretical framework assumes that improvements in land governance may increase institutional confidence by strengthening property-rights security, improving administrative transparency, reducing opportunities for rent extraction, facilitating access to productive land, and enhancing the credibility of land-related public institutions. Greater institutional confidence may improve the expected returns to domestic investment and entrepreneurship and thereby reduce incentives for both financial and human capital to leave the country. The theoretical relationship can be summarized as follows:

Better land governance → greater institutional confidence → improved investment security and economic opportunities → lower capital flight and lower brain drain.

The framework also recognizes the possibility of reverse causality. Capital flight may reduce domestic investment and fiscal resources, while brain drain may weaken the stock of human capital available for institutional development and economic transformation. These feedback mechanisms imply that the observed relationship between land governance and capital or human-capital retention may be endogenous. This concern provides a justification for the instrumental-variable strategy adopted in the empirical analysis. Based on the preceding theoretical arguments, the study tests the following hypotheses:

Hypothesis 1 (H1): Improvements in land governance are associated with lower capital flight in Cameroon by strengthening investment security, reducing institutional uncertainty, and enhancing incentives for domestic capital retention.

Hypothesis 2 (H2): Improvements in land governance are associated with lower brain drain in Cameroon by improving economic opportunities, strengthening institutional confidence, and enhancing incentives for highly skilled individuals to remain in the domestic economy.

These hypotheses are examined using the CLGI and an instrumental-variable estimation strategy designed to address potential endogeneity arising from reverse causality, omitted institutional factors, and measurement concerns. Given the limitations associated with the small annual sample and the identification strategy, the empirical findings are interpreted cautiously as evidence of relationships consistent with the proposed institutional mechanism rather than as definitive proof of a fully identified causal effect.

3. Empirical Methodology

3.1 Data and Variables

This study examines the relationship between land governance, capital flight, and brain drain in Cameroon over 2000-2023. The period is determined by data availability and captures major institutional and economic changes affecting land administration, investment, and financial and human-capital mobility.

The empirical analysis combines national and international sources. Information on land administration, land registration, cadastral procedures, and land-related reforms is obtained from the Ministry of State Property, Surveys and Land Tenure (MINDCAF) [32]. Macroeconomic and structural indicators are drawn primarily from the World Development Indicators [11], while broader governance indicators are obtained from the Worldwide Governance Indicators and Transparency International [5,12]. Information on capital flight is based on estimates provided by Ndikumana and Boyce [6]. Data on migration and the educational characteristics of migrants are obtained from the OECD Database on Immigrants in OECD Countries [10]. Information on decentralization and local governance is collected from Annual Performance Reports and reports on the state of decentralization produced by the Ministry of Decentralization and Local Development (MINDDEVEL) and the Ministry of Territorial Administration (MINAT) [18-21], while information on diaspora investment and diaspora-engagement initiatives is drawn from relevant reports of the International Organization for Migration (IOM) [29]. Additional data on education and human-capital indicators are obtained from the UNESCO Institute for Statistics [33].

The empirical framework includes two dependent variables, one principal explanatory variable, and a set of control variables. The first dependent variable is capital flight, measured as a percentage of GDP. It captures the estimated externalization of domestic financial resources and is relevant because persistent capital outflows may reduce the resources available for domestic investment, productive transformation, and public-resource mobilization [6,7].

The second dependent variable is brain drain, measured using an index derived from the stock of highly educated Cameroonian migrants residing in OECD member countries. More specifically, the indicator refers to Cameroonian migrants with tertiary education or equivalent qualifications and is expressed as an index constructed from the OECD migrant-stock information. The indicator therefore captures the accumulated externalization of highly skilled human capital rather than annual migration flows. This distinction is important because migrant stocks reflect the cumulative outcome of past migration decisions, return migration, mortality, and changes in the educational composition of the migrant population. The OECD Database on Immigrants in OECD Countries provides harmonized information on migrants' countries of origin and educational attainment and constitutes the principal source for this measure [10]. The indicator is complemented, where relevant, by broader evidence on African migration and human-capital mobility [8]. Brain drain is not interpreted exclusively as a demographic outcome. The international mobility of highly educated individuals may also reflect perceptions concerning domestic employment opportunities, institutional quality, entrepreneurship, asset accumulation, professional mobility, and long-term economic security. Land governance may affect these perceptions by influencing the security and predictability of access to land and other land-dependent productive opportunities.

The main explanatory variable is the CLGI, which is constructed specifically for this study. The index is designed to capture the multidimensional quality of land governance rather than a single dimension of tenure security. It incorporates four dimensions:

(1) recognition and protection of customary land rights;

- (2) decentralization of land administration;
- (3) transparency and anti-corruption mechanisms in land administration;
- (4) facilitation of diaspora investment in land-dependent activities.

The control variables are selected to account for other factors that may influence capital flight and brain drain. In the capital-flight equation, the controls include corruption, political instability, GDP per capita growth, inflation, and trade openness. Interest-rate conditions were initially considered as a potential determinant of capital movements but are not retained in the preferred specification where their inclusion creates substantial loss of degrees of freedom or multicollinearity concerns.

In the brain-drain equation, the controls include income differentials, unemployment, education, political instability, and relevant governance indicators. These variables reflect the conventional economic and institutional determinants of brain drain, including expected income, labor-market conditions, human-capital accumulation, and perceptions of political and institutional stability. The selection of macroeconomic and governance controls is consistent with the literature emphasizing the role of economic incentives and institutional quality in explaining financial and human-capital mobility [7,8,25,28].

Table 1 reports the descriptive statistics of the variables used in the empirical analysis.

Table 1. Descriptive Statistics (2000-2023).

Variable	Obs.	Mean	Std. Dev.	Min	Max	Source
Capital flight (% GDP)	24	5.84	1.72	3.10	9.40	[6,11,31]
Brain drain index (0-100, based on OECD highly educated migrant stock)	24	62.35	8.91	47.20	78.60	[10]
CLGI	24	0.51	0.14	0.29	0.76	[5,12,18-21,29,32]
Corruption index	24	2.35	0.42	1.70	3.10	[5,12]
Political instability index	24	2.18	0.46	1.35	3.05	[5,12]
GDP per capita growth (%)	24	1.82	1.34	-2.10	4.60	[11]
Inflation (%)	24	3.15	2.01	0.60	8.20	[11]
Trade openness (% GDP)	24	28.70	4.80	20.10	37.90	[11]
Education attainment (%)	24	21.40	5.30	13.20	31.60	[33,11]
Income differential	24	2.84	0.67	1.72	4.15	Author's calculation based on [10,11]
Unemployment (%)	24	4.83	1.18	2.90	7.20	[11]
Governance index	24	2.41	0.38	1.72	3.05	[5,12]
Historical land-administration indicator (HLAI)	24	0.792	0.410	0	1	Author's construction based on [32]
Land-registration and cadastral indicator (LRCI)	24	0.583	0.504	0	1	Author's construction based on [32]
Land-policy reform indicator (LPRI)	24	0.542	0.509	0	1	Author's construction based on [18-21,32]

Note: Obs. = observations; Std. Dev. = standard deviation; CLGI = Cameroon Land Governance Index.

Source: Author's compilation based on the sources indicated in the table.

The descriptive statistics reveal substantial variation in the main variables over the study period. Capital flight averages 5.84% of GDP, underscoring the importance of financial-resource retention as a macroeconomic and development concern. The brain-drain index has a mean of 62.35 and ranges from 47.20 to 78.60, indicating considerable variation in the stock of highly educated Cameroonian migrants residing in OECD countries. The CLGI has a mean of 0.51, with values ranging from 0.29 to 0.76. This variation suggests changes in land-governance conditions over the study period, although the CLGI should be interpreted as a composite institutional measure rather than a direct annual count of completed land reforms. The binary instruments also vary over time, reflecting the implementation dates of documented institutional changes. The analysis covers 24 annual observations for a single country. This small sample limits the number of variables that can be included simultaneously, reduces the reliability of conventional asymptotic inference, and

increases sensitivity to individual observations and structural changes. The empirical results are therefore interpreted cautiously and complemented by parsimonious specifications, diagnostic tests, alternative instrument combinations, and sensitivity analyses where feasible.

Because the variables are annual time series and several may exhibit persistence or deterministic trends, the empirical analysis also considers their time-series properties. Unit-root tests and residual serial-correlation diagnostics are used to assess whether the estimated relationships may be affected by non-stationarity, common trends, or serial dependence. Given the small sample size, these diagnostics are interpreted cautiously, and the empirical findings are considered in conjunction with the institutional framework and the temporal characteristics of the data.

3.2 Construction of the CLGI

The central explanatory variable is the CLGI. The index is designed to provide a context-specific measure of land governance that captures institutional arrangements governing access to, administration of, protection of, and investment in land. The conceptualization of the CLGI follows the broader understanding of responsible land governance, according to which effective land institutions should protect legitimate tenure rights, improve transparency and accountability, facilitate equitable access, recognize different forms of tenure, and provide accessible mechanisms for resolving disputes [3,14,16]. The index also reflects the institutional characteristics of Cameroon's land system, including customary tenure, centralized administration, decentralization reforms, transparency challenges, and initiatives intended to facilitate diaspora investment [4,5,14,18-21,29]. Four dimensions are used to construct the index.

The first dimension is recognition of customary land rights. This dimension reflects the importance of customary tenure in Cameroon and the extent to which customary rights are recognized and protected within the broader land-governance system. Four indicators are considered: (i) the degree of formal recognition of customary tenure arrangements, (ii) the legal protection afforded to customary land rights, (iii) the effectiveness of customary land dispute-resolution mechanisms, and (iv) the protection of vulnerable groups, particularly women and rural communities, in accessing and securing land rights. Information for this dimension is compiled from land-governance assessments, national land information, and the literature on legal pluralism in Cameroon [3,4,32].

The second dimension concerns the decentralization of land administration. Decentralization may improve administrative responsiveness by bringing decisions closer to local communities and increasing the role of local authorities in land management. Three indicators are considered: (i) the involvement of local authorities in land-related decision-making, (ii) the extent to which administrative responsibilities for land management are decentralized, and (iii) the financial and institutional resources available to local authorities for carrying out land-related responsibilities. Information is obtained from reports on decentralization and local governance [18-21]. The institutional rationale for this dimension is also consistent with international assessments of the business and administrative environment, which emphasize the importance of predictable and efficient administrative procedures for economic activity [30]. In this study, such information is used only as contextual evidence concerning the administrative environment and is not treated as a direct measure of the CLGI.

The third dimension captures transparency and anti-corruption mechanisms in land administration. Transparency is important because limited access to information and discretionary procedures can increase transaction costs and create opportunities for rent-seeking. Four indicators are considered: (i) accessibility of land registries, (ii) the level of digitalization of land administration services, (iii) the average time required to obtain a land title, and (iv) reported corruption cases related to land administration. Information is compiled from land-sector governance assessments, governance indicators, and national administrative sources [5,14,32].

The fourth dimension captures diaspora investment facilitation insofar as it relates directly to land-dependent investment. It measures documented mechanisms that facilitate the acquisition, registration, protection, and productive use of land by Cameroonians living abroad. Three indicators are considered: (i) diaspora investment projects involving land-related activities; (ii) institutional or fiscal mechanisms facilitating such investment; and (iii) diaspora investment in agriculture and agro-industry. Information is obtained from reports on Cameroonian diaspora engagement and investment [29]. General diaspora programmes unrelated to land governance are excluded. As a robustness check, an alternative CLGI excluding this dimension is also estimated.

The CLGI is constructed through a two-stage aggregation procedure. First, individual indicators are standardized and aggregated within their respective conceptual categories to generate four dimension scores: customary land rights recognition, decentralization of land administration, transparency and anti-corruption mechanisms, and diaspora investment facilitation. Second, Principal Component Analysis (PCA) is applied to these four standardized dimension scores, and the first principal component is retained as the final composite measure of land governance. The construction therefore follows the sequence: individual indicators → dimension scores → PCA-based CLGI. Taken together, these four dimensions provide a multidimensional representation of land governance in Cameroon. The CLGI therefore goes beyond a narrow conception of land governance based exclusively on land titling. It incorporates legal security, administrative organization, transparency, accountability, and the capacity of land institutions to support productive investment. Because the underlying indicators are measured using different units and scales, they are first standardized according to:

$$Z_{it} = \frac{X_{it} - \bar{X}_i}{\sigma_i} \quad (1)$$

Where X_{it} denotes the value of indicator i in year t , $\bar{X}_i$ represents its sample mean, and σ_i denotes its standard deviation.

PCA is then applied to the standardized indicators. The CLGI is constructed using the first principal component:

$$CLGI_t = \sum_{i=1}^n w_i Z_{it} \quad (2)$$

where w_i represents the weight assigned to indicator i by the first principal component. Higher values of the resulting index indicate better land governance.

Table 2 reports the PCA results used to assess the structure of the CLGI.

Table 2. Principal component analysis results.

Component	Eigenvalue	Proportion Explained	Cumulative Variance
PC1	2.74	68.5%	68.5%
PC2	0.81	20.3%	88.8%
PC3	0.31	7.8%	96.6%
PC4	0.14	3.4%	100%

Note: PC = principal component.

Source: Author's calculation based on the four standardized land-governance dimension scores.

As shown in Table 2, the first principal component explains 68.5% of the total variance in the underlying indicators. This relatively high proportion suggests that the selected dimensions provide a coherent composite representation of land-governance conditions in Cameroon. Details of the CLGI construction and aggregation are provided in Appendix A.

3.3 Econometric Strategy and Identification

The empirical strategy estimates two separate structural equations using an IV-2SLS approach to examine the relationship between land governance, capital flight, and brain drain while addressing the potential endogeneity of the CLGI. The first structural equation is specified as:

$$CF_t = \alpha_0 + \alpha_1 CLGI_t + \alpha_2 X_t + \varepsilon_t \quad (3)$$

The second structural equation is specified as:

$$BD_t = \beta_0 + \beta_1 CLGI_t + \beta_2 Z_t + \mu_t \quad (4)$$

where CF_t denotes capital flight, BD_t represents brain drain, $CLGI_t$ is the Cameroon Land Governance Index, X_t and Z_t denote vectors of control variables, and ε_t and μ_t are the respective error terms.

For the capital-flight equation, the control variables include corruption, political instability, GDP per capita growth, inflation, and trade openness. For the brain-drain equation, the controls include education, income differentials, unemployment, political instability, and relevant governance indicators. The expected coefficient on the CLGI is negative in both equations. A negative estimate of α_1 would indicate that stronger land governance is associated with lower capital flight, whereas a negative estimate of β_1 would indicate that stronger land governance is associated with lower brain drain. A major econometric concern is the potential endogeneity of land governance. Although the theoretical framework predicts that improvements in land governance may reduce capital flight and brain drain, the direction of causality may also run in the opposite direction. Countries with greater economic resources and stronger institutional capacity may be better positioned to implement land reforms. At the same time, persistent capital flight can reduce domestic resources available for institutional development, while the emigration of highly skilled workers can reduce the human capital required to design and implement institutional reforms. Estimating equations (3) and (4) using OLS could consequently generate biased and inconsistent estimates because of reverse causality, simultaneity, and omitted institutional factors.

To address the potential endogeneity of the CLGI, the study employs an IV-2SLS approach based on three institutional instruments. The first instrument is a HLAI that captures major changes in the institutional organization of land administration during the study period. It is constructed as a time-varying indicator coded according to the implementation of significant institutional changes affecting the organization and administration of land. The second instrument is a LPRI, coded to reflect the timing of major land-related reforms and administrative initiatives implemented during the period under review. The third instrument captures changes in land-registration and cadastral arrangements and reflects institutional improvements in land registration, cadastral administration, and related administrative capacity. Information used to construct these instruments is derived from national land-administration statistics and institutional reports [17–21].

The instruments are expected to be relevant because changes in land administration, land-policy reforms, and cadastral arrangements directly affect the institutional dimensions captured by the CLGI, including administrative organization, tenure security, and transparency. The exclusion restriction is treated as an identification assumption rather than an established fact. The identification strategy assumes that, conditional on the included controls, the institutional changes captured by the instruments affect capital flight and brain drain primarily through their effect on land governance. Although direct effects of administrative and cadastral reforms on investment conditions cannot be entirely ruled out, their plausibility is assessed through first-stage relevance tests, overidentification tests where applicable, and robustness checks using alternative CLGI specifications. The use of several institutional instruments also makes it possible to assess whether the estimated relationship remains robust across alternative sources of institutional variation in land governance. Table 3 presents the definition and coding of the instrumental variables used in the IV-2SLS estimation.

Table 3. Definition and coding of the instrumental variables.

Instrument	Definition and coding	Period/annual variation	Source
HLAI	Binary indicator of the major institutional reorganization of land administration and reform of land-title acquisition procedures. It equals 0 before 2005 and 1 from 2005 onward.	2000-2004: 0; 2005-2023: 1	[32]; Decrees No. 2005/178 and 2005/481
LRCI	Binary indicator capturing the introduction of an institutional mechanism specifically designed to facilitate land and State-property transactions through one-stop services. It equals 0 before 2010 and 1 from 2010 onward.	2000-2009: 0; 2010-2023: 1	[32]; Order No. 000109/MINDAF/S030 of 8 April 2010
LPRI	Binary indicator capturing the adoption of a formal national policy framework for spatial planning and sustainable territorial development with implications for land governance. It equals 0 before 2011 and 1 from 2011 onward.	2000-2010: 0; 2011-2023: 1	[18-21,32]; Law No. 2011/008 of 6 May 2011

Note: The three instruments are constructed as time-varying institutional indicators based on the effective dates of documented institutional changes. They are used to predict variation in the CLGI in the first-stage estimation. The identification strategy assumes that, conditional on the included controls, these institutional changes affect capital flight and brain drain primarily through their effect on land governance. HLAI = Historical Land-Administration Indicator; LRCI = Land-Registration and Cadastral Indicator; LPRI = Land-Policy Reform Indicator.

Source: Author's construction based on national legal and administrative sources.

The three excluded instruments are binary step indicators that mark documented institutional changes in land administration and territorial planning. Because their activation dates coincide with broader institutional and macroeconomic changes, it is important to assess whether the instruments may capture variation beyond land governance. Table 4 summarizes the main institutional changes associated with the three reform dates, together with potentially concurrent developments relevant to the identification strategy.

Table 4. Institutional and macroeconomic events around the reform dates.

Reform date	Instrument	Main institutional change	Potential concurrent changes	Implication for the exclusion restriction
2005	HLAI	Reorganization of land administration and changes to procedures governing land-title acquisition. Decree No. 2005/178 reorganized the Ministry responsible for state property and land affairs, while Decree No. 2005/481 amended the procedures for obtaining land certificates.	The year also coincided with strengthened fiscal and structural reform under the IMF-supported programme, including improvements in tax and customs administration, public financial management, governance, and the business environment. The decentralization process was also being advanced through the implementation of the 2004 decentralization framework and the 2005 orientation strategy.	The institutional land reforms provide a clear relevance channel for CLGI, but the coincidence with broader administrative, fiscal, governance, and decentralization reforms means that a direct effect on capital flight or brain drain cannot be completely ruled out.
2010	LRCI	Establishment of one-stop services intended to facilitate land and state-property transactions for commercial enterprises through Order No. 000109/MINDAF/S030 of 8 April 2010.	The period was also characterized by a new medium-term policy programme emphasizing infrastructure, rural and mining development, human resources, governance, and improvements in the business environment. Cameroon was also implementing its 2010–2020 Growth and Employment Strategy.	The reform is directly related to land-transaction administration and therefore provides a plausible relevance channel. However, its timing overlaps with broader economic and institutional reforms that could independently affect investment, capital mobility, or migration decisions.
2011	LPRI	Adoption of Law No. 2011/008 of 6 May 2011 establishing guidelines for territorial planning and sustainable development, including a general framework for territorial planning and land-use allocation.	The reform occurred during a period of continuing administrative and decentralization reforms and around the 2011 presidential election. The broader institutional environment therefore included changes that were not confined to land governance.	The law provides a direct institutional link to territorial and land-use governance, but its timing cannot be regarded as exogenous to all other institutional and macroeconomic developments. The exclusion restriction is therefore maintained as an identification assumption rather than treated as empirically established.

Note: HLAI = Historical Land-Administration Indicator; LRCI = Land-Registration and Cadastral Indicator; LPRI = Land-Policy Reform Indicator.

Source: Author's construction based on national legal and administrative sources.

The timing structure of the instruments is an important limitation of the identification strategy. Because each binary instrument switches on at a single reform date and remains active thereafter, it may be correlated with broader changes occurring around that date, particularly given the small sample of 24 annual observations. Accordingly, the first-stage results are interpreted as evidence of instrument relevance rather than proof of exogeneity. The analysis controls for the main macroeconomic and institutional factors in the structural equations, while the exclusion restriction is maintained as an identification assumption. Robustness tests using alternative instrument combinations and specifications further assess the sensitivity of the estimated relationship between CLGI and the two outcomes.

The first stage of the 2SLS procedure is specified as:

$$CLGI_t = \gamma_0 + \gamma_1 IV_t + \gamma_2 W_t + v_t \quad (5)$$

where IV_t denotes the vector of instrumental variables, W_t represents the vector of exogenous control variables, and v_t is the first-stage error term. The estimation generates fitted values of the $CLGI$ that capture the component of land governance predicted by the instruments and exogenous controls.

In the second stage, the fitted values replace the observed $CLGI$ in the structural equations:

$$CF_t = \alpha_0 + \alpha_1 \widehat{CLGI}_t + \alpha_2 X_t + \varepsilon_t \quad (6)$$

$$BD_t = \beta_0 + \beta_1 \widehat{CLGI}_t + \beta_2 Z_t + \mu_t \quad (7)$$

where $\widehat{CLGI}_t$ represents the predicted value of land governance generated in the first stage.

Given the time-series nature of the data and the small sample of 24 annual observations, unit-root tests are conducted before estimating the structural equations. Table 5 reports Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit-root tests in levels and first differences. The results indicate mixed integration orders: CLGI, capital flight, brain drain, and some controls are I(1), while corruption, GDP per capita growth, inflation, and unemployment are stationary

in levels. None of the variables appears to be I(2). Given the limited sample size and the sensitivity of unit-root tests to specification, these results are interpreted cautiously and used primarily to characterize integration properties and rule out I(2) behavior. The presence of I(1) variables also motivates the robustness and sensitivity analyses reported below.

Table 5. Time-series diagnostics.

Variable	ADF Level	p-value	ADF First Difference	p-value	PP Level	p-value	PP First Difference	p-value	Conclusion
CLGI	-2.91	0.058	-4.27	0.004	-2.84	0.067	-4.19	0.005	I(1)
Capital flight	-2.18	0.218	-4.63	0.002	-2.24	0.198	-4.55	0.002	I(1)
Brain drain	-1.96	0.301	-4.12	0.006	-2.01	0.277	-4.06	0.007	I(1)
Corruption	-3.14	0.038	/	/	-3.09	0.043	/	/	I(0)
Political instability	-2.73	0.082	-4.38	0.003	-2.69	0.091	-4.31	0.004	I(1)
GDP per capita growth	-3.87	0.011	/	/	-3.79	0.014	/	/	I(0)
Inflation	-4.21	0.004	/	/	-4.16	0.005	/	/	I(0)
Trade openness	-2.36	0.154	-4.71	0.001	-2.42	0.137	-4.64	0.002	I(1)
Education	-2.11	0.246	-4.02	0.008	-2.17	0.225	-3.95	0.010	I(1)
Income differential	-2.48	0.128	-4.46	0.002	-2.53	0.113	-4.39	0.003	I(1)
Unemployment	-3.52	0.021	/	/	-3.47	0.024	/	/	I(0)
Governance	-2.29	0.176	-4.25	0.004	-2.34	0.159	-4.18	0.005	I(1)

Note: ADF = Augmented Dickey-Fuller; PP = Phillips-Perron. The null hypothesis is the presence of a unit root. Given the small sample size (T=24), the results should be interpreted cautiously.

Source: Author's compilation based on the data described in Table 1.

The presence of I(1) variables does not by itself establish a long-run relationship or invalidate the level-IV specification. The structural equations are therefore estimated in levels to identify the structural association between land governance, capital flight, and brain drain, rather than to estimate cointegration. This modeling choice is assessed through robustness checks using alternative specifications and instrument combinations. The absence of I(2) variables rules out one particularly problematic form of non-stationarity, but it does not by itself establish that the level relationships are free from common-trend or spurious-correlation concerns.

3.4 Diagnostic Tests and Robustness Procedures

The unit-root results reported in Table 5 indicate mixed integration orders: CLGI, capital flight, brain drain, political instability, trade openness, education, income differentials, and governance are I(1), while the remaining variables are stationary in levels. None appears to be I(2). Given the small sample and the IV-2SLS framework with endogenous CLGI, conventional cointegration tests are not used as the primary identification strategy. The structural equations are therefore estimated in levels but are not interpreted as stable long-run equilibrium relationships. The coefficients are interpreted as conditional associations under the stated IV identification assumptions. The possibility that level relationships are affected by common trends is addressed through the robustness and sensitivity analyses.

Several diagnostics are used to assess the econometric specification. Instrument relevance is evaluated using first-stage F-statistics and individual coefficients, while the Hansen J-test is interpreted cautiously given the small sample. The Durbin-Wu-Hausman test assesses the treatment of CLGI as endogenous; an insignificant result is interpreted as failure to reject exogeneity, not as proof of exogeneity. Heteroskedasticity-robust standard errors are reported, and residual serial correlation is assessed using the Breusch-Godfrey LM test. The test indicates no evidence of serial correlation in either the capital flight equation (LM = 1.84, p = 0.175) or the brain drain equation (LM = 1.62, p = 0.203).

Robustness checks consider alternative CLGI constructions, including the exclusion of the diaspora-investment and transparency dimensions and equal weighting instead of PCA weights. As a sensitivity check, the IV-2SLS models are re-estimated using each instrument separately and each two-instrument combination. These specifications assess whether the estimated effect of CLGI depends materially on a particular source of instrumental variation. Sensitivity to potentially influential reform years, particularly 2005, 2010, and 2011, is assessed given the stepwise structure of the instruments.

The correlation between the structural-equation residuals is $r = 0.55$ ($p = 0.005$), indicating moderate cross-equation dependence. Given $T = 24$ and the number of parameters, the main analysis retains the separate-equation IV-2SLS framework rather than a joint 3SLS specification.

Overall, the empirical strategy combines the multidimensional CLGI, IV-2SLS estimation, identification diagnostics, residual tests, and robustness analyses. The results are interpreted as evidence on conditional relationships between land governance and capital flight and brain drain, rather than as definitive evidence of long-run causal effects.

4. Empirical Results and Discussion

The empirical analysis covers 2000-2023 and assesses the relevance of the instruments used to identify the effect of land governance on capital flight and brain drain in Cameroon. Consistent with Section 3, the first-stage regressions relate the CLGI to the excluded instruments and exogenous controls in the respective structural equations. This section reports the first-stage estimates and instrument-relevance diagnostics, followed by the structural IV-2SLS results and robustness checks. Given the small sample, the findings are interpreted cautiously and in light of the underlying IV identification assumptions.

4.1 First-Stage Estimation and Instrument Relevance

Because CLGI is treated as endogenous in the structural equations, the IV-2SLS procedure first estimates its reduced-form relationship with the excluded instruments and the exogenous controls. Specifically, HLAI, LRCI, and LPRI are included as excluded instruments, together with the exogenous controls specified in the corresponding structural equations.

Table 6 reports the complete first-stage IV-2SLS regressions. The three excluded instruments (HLAI, LRCI, and LPRI) enter positively and are statistically significant at the 1% level in both equations. The excluded-instruments F-statistics are 18.70 for capital flight and 19.40 for brain drain, with partial R^2 values of 0.789 and 0.795, respectively. These results indicate strong instrument relevance, although they are interpreted cautiously given the small sample and considered alongside the other identification diagnostics and robustness checks.

Table 6. First-stage IV estimates and instrument relevance.

Variables	Capital Flight Equation	Brain Drain Equation	Variables	Capital Flight Equation	Brain Drain Equation
HLAI	0.214*** (0.057)	0.226*** (0.059)	Income differential		-0.061* (0.034)
LRCI	0.173*** (0.051)	0.181*** (0.053)	Unemployment		-0.047* (0.026)
LPRI	0.196*** (0.054)	0.207*** (0.056)	Governance	0.083* (0.046)	0.091** (0.044)
Corruption	-0.118* (0.064)		Constant	0.287** (0.126)	0.264** (0.119)
Political instability	-0.094* (0.052)	-0.087* (0.050)	Observations	24	24
GDP per capita growth	0.041 (0.032)		Residual degrees of freedom	15	15
Inflation	-0.028 (0.024)		Excluded instruments	3	3
Trade openness	0.036* (0.020)		Excluded-instruments F-statistic	18.70	19.40
Education		0.072** (0.031)	Partial R^2	0.789	0.795

Note: The dependent variable in both first-stage regressions is the CLGI. HLAI, LRCI, and LPRI are the excluded instruments. Exogenous controls correspond to those included in the respective structural equations. Standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. HLAI = Historical Land-Administration Indicator; LRCI = Land-Registration and Cadastral Indicator; LPRI = Land-Policy Reform Indicator; CLGI = Cameroon Land Governance Index.

Source: Author's estimation based on the data and IV strategy described in Section 3.

4.2 Land Governance and Capital Flight

The first objective is to examine whether land governance is negatively associated with capital flight. Table 7 reports the IV-2SLS estimates for the capital-flight equation under two specifications.

Table 7. IV Estimation results: Capital flight equation (2000-2023).

Variables	Model 1	Model 2
CLGI (instrumented)	-2.41*** (0.72)	-2.18*** (0.69)
Corruption	0.84** (0.34)	0.71** (0.31)
Political instability	0.56** (0.27)	0.49* (0.26)
GDP per capita growth	-0.32* (0.18)	-0.29* (0.16)
Inflation	0.21 (0.14)	0.18 (0.13)
Trade openness	-0.15* (0.08)	-0.13* (0.07)
Constant	7.91*** (1.83)	7.42*** (1.73)

Note: Dependent variable: Capital flight (% GDP). CLGI = Cameroon Land Governance Index. Observations: 24 First-stage F-statistic: 18.7 Hansen J-test p-value: 0.34 Durbin-Wu-Hausman test p-value: 0.091 Breusch-Godfrey LM test p-value: 0.175 Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Source: Author's estimation based on the data and IV strategy described in Section 3.

The estimated coefficient of the instrumented CLGI is negative and statistically significant in both specifications. In the preferred Model 2, the coefficient is -2.18 and is statistically significant at the 1% level. This result is consistent with Hypothesis 1, which predicts a negative relationship between the quality of land governance and capital flight. Given the composite nature of the CLGI, the coefficient should not be interpreted as the effect of a single land-policy measure. Rather, it captures the estimated association between improvements in the broader institutional environment governing land rights, land administration, transparency, decentralization, and land-related investment opportunities and the capital-flight indicator. The coefficient remains relatively stable across the two specifications, declining from -2.41 in Model 1 to -2.18 in Model 2 after the inclusion of additional controls. The persistence of the negative coefficient and its statistical significance suggest that the estimated relationship is not entirely explained by the exclusion of the principal macroeconomic and institutional covariates. Nevertheless, because the CLGI is instrumented using institutional reform indicators that may coincide with broader changes in the economic and administrative environment, the coefficient should be interpreted as evidence consistent with the proposed mechanism rather than as definitive proof of a fully causal effect.

The control variables generally display signs that are consistent with the institutional interpretation of capital flight. Corruption is positively associated with capital flight and is statistically significant in both specifications. This finding is consistent with the literature emphasizing the role of weak institutions, corruption, and limited confidence in domestic asset protection in encouraging the transfer of financial resources abroad [6,14,26,27]. Political instability also has a positive coefficient, suggesting that greater uncertainty concerning the political environment is associated with higher capital outflows. By contrast, GDP per capita growth and trade openness display negative coefficients, although their estimated magnitudes are comparatively modest. Inflation is positive but statistically insignificant in both models, indicating that its independent contribution is not precisely estimated within the present specification.

The first-stage F-statistic is 18.7, indicating a relatively strong statistical association between the excluded instruments and the endogenous CLGI variable in the capital-flight equation. This result provides evidence of instrument relevance under the identification strategy described in Section 3. The Hansen J-test has a p-value of 0.34 and therefore does not reject the over-identifying restrictions. However, this result should not be interpreted as definitive confirmation of instrument exogeneity, particularly given the small number of observations and the fact that the instruments are reform-related step indicators. The Durbin-Wu-Hausman test yields a p-value of 0.091, providing limited evidence of endogeneity at the 10% level and offering some support for the use of an IV specification rather than relying exclusively on ordinary least squares.

Taken together, the results indicate a robust negative statistical relationship between land governance and capital flight. One plausible interpretation is that secure land rights, more transparent administrative procedures, and greater predictability in land-related transactions may strengthen confidence in domestic asset protection. Where land ownership is uncertain, administrative decisions are discretionary, or land transactions are perceived as opaque, investors may regard domestic asset holding as riskier and may have stronger incentives to transfer financial resources abroad. Conversely, improvements in land institutions may reduce such incentives by increasing the credibility of domestic property-rights protection.

This interpretation extends the conventional capital-flight literature, which has primarily emphasized macroeconomic instability, corruption, external debt, exchange-rate uncertainty, and general institutional quality [6,12,25,27]. The present results suggest that sector-specific institutions, particularly those governing access to and protection of land, may constitute an additional institutional channel through which confidence in the domestic economy is formed. The finding should nevertheless be understood as suggestive evidence of this channel rather than as evidence that land governance alone determines capital-flight dynamics.

4.3 Land Governance and Brain Drain

The second objective is to examine whether land governance is associated with lower brain drain. Table 8 reports the IV–2SLS estimates for the brain-drain equation. The dependent variable is the brain-drain index constructed from the stock of highly educated Cameroonian migrants in OECD destination countries, as described in Section 3. It should therefore be interpreted as an index of skilled-migration intensity rather than as a percentage of the population or as a raw migrant count.

Table 8. IV estimation results: Brain drain equation (2000-2023).

Variables	Model 1	Model 2
CLGI (instrumented)	-15.62*** (4.21)	-14.87*** (4.05)
Income differential	8.34*** (2.11)	7.91*** (2.04)
Unemployment	2.46** (1.04)	2.21** (1.01)
Political instability	3.12** (1.31)	2.86** (1.25)
Education level	0.54* (0.29)	0.48* (0.27)
Constant	71.45*** (8.37)	69.82*** (8.11)

Note: Dependent variable: Brain drain. CLGI = Cameroon Land Governance Index. Observations: 24 First-stage F-statistic: 19.4 Hansen J-test p-value: 0.41 Durbin-Wu-Hausman test p-value: 0.104 Breusch-Godfrey LM test p-value: 0.203 Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Source: Author's estimation based on the data and IV strategy described in Section 3.

The coefficient of the instrumented CLGI is negative and statistically significant in both specifications. In Model 2, the estimated coefficient is -14.87 and is significant at the 1% level. This result is consistent with Hypothesis 2 and indicates that stronger land governance is associated with a lower value of the brain-drain index. Since the dependent variable is a composite index, the coefficient should be interpreted as an estimated association between the quality of land governance and the intensity of brain drain, conditional on the other determinants included in the model. As in the capital-flight equation, the coefficient remains relatively stable when additional controls are introduced. It changes from -15.62 in Model 1 to -14.87 in Model 2, while retaining its statistical significance. This stability suggests that the negative relationship is not exclusively attributable to the omission of the principal labor-market and macroeconomic variables. However, the magnitude of the coefficient should be interpreted cautiously because the CLGI and the brain-drain index may both exhibit persistence and common time-related movements over the study period. The result therefore provides evidence consistent with the proposed institutional mechanism, but it does not by itself establish that land-governance improvements causally reduce international brain drain.

The coefficients on the control variables are broadly consistent with the expected determinants of brain drain. The positive coefficient on the income differential indicates that larger differences between domestic and international income opportunities are associated with higher brain drain. This result is consistent with the migration literature, which emphasizes the role of relative expected returns in shaping international migration decisions. Unemployment is also positively associated with the brain-drain index, suggesting that limited domestic labor-market opportunities may increase

incentives for skilled individuals to seek employment abroad. Political instability has a positive and statistically significant coefficient, indicating that uncertainty and insecurity may encourage skilled individuals to relocate internationally. Finally, the positive coefficient on education attainment is consistent with the argument that an expansion in the supply of highly educated individuals increases the pool of persons with the qualifications and resources required for international migration.

The first-stage F-statistic of 19.4 indicates a meaningful relationship between the instruments and the endogenous CLGI variable in the brain-drain specification. The Hansen J-test produces a p-value of 0.41 and does not reject the over-identifying restrictions. As noted above, however, failure to reject the null hypothesis should be interpreted cautiously because the test has limited power in small samples and does not directly establish that the instruments satisfy the exclusion restriction. The Durbin-Wu-Hausman test yields a p-value of 0.104, which does not provide strong evidence of endogeneity at conventional significance levels. This result suggests that the difference between the IV and non-IV estimates may not be precisely identified in this equation, although it does not eliminate the conceptual concern that land governance may be endogenous to broader institutional and economic conditions.

The negative association between land governance and brain drain can be interpreted through the institutional-confidence mechanism developed in Section 2. Migration decisions among highly educated individuals are shaped not only by wages and employment opportunities but also by expectations concerning long-term economic security, entrepreneurship, asset accumulation, and the protection of property rights. Secure access to productive assets and predictable administrative procedures may increase the expected returns to remaining in, investing in, or eventually returning to Cameroon. Conversely, uncertainty surrounding land acquisition, property registration, and administrative treatment may reduce the attractiveness of domestic economic engagement and reinforce the perceived benefits of migration.

This interpretation is consistent with the broader literature linking governance quality to migration outcomes [27,28]. It also complements research showing that insecure land tenure can influence mobility decisions by weakening the economic foundations of local livelihoods and investment opportunities [28]. The contribution of the present analysis is to suggest that land governance may operate as a common institutional channel affecting both the retention of financial resources and the retention of highly educated human capital.

4.4 Robustness Checks

The robustness analysis examines whether the negative relationship between the CLGI and the two outcome variables depends on a particular index construction, weighting procedure, or control-variable specification. Table 9 reports the estimated coefficients of the CLGI under alternative specifications.

Table 9. Robustness tests.

Specification	CLGI coefficient - Capital Flight	CLGI coefficient - Brain Drain
Baseline IV model	-2.18***	-14.87***
Alternative CLGI (excluding diaspora dimension)	-2.41**	-15.73**
Excluding transparency dimension	-1.94***	-13.62***
Alternative CLGI weighting (PCA vs. equal weights)	-2.07***	-14.21***
Additional governance controls	-1.89**	-13.74***

Note: The alternative CLGI excluding the diaspora dimension is constructed using only land-governance components directly related to land rights, decentralization, transparency, and land administration. General diaspora programmes unrelated to land governance are excluded. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. CLGI = Cameroon Land Governance Index.

Source: Author's robustness estimations based on the same dataset and alternative specifications described in Section 3.

Across all specifications, the CLGI coefficient remains negative and statistically significant for both capital flight and brain drain. For capital flight, the estimates range from -1.89 to -2.41, while those for brain drain range from -13.62 to -15.73. The consistency in sign and the relatively limited variation in magnitude indicate that the main findings are not dependent on a particular index construction or weighting procedure. Excluding the diaspora dimension yields coefficients of -2.41 for capital flight and -15.73 for brain drain, suggesting that the results are not driven solely by the diaspora-related component. This is relevant because that dimension may capture broader channels, including investment promotion or migration-related policies, in addition to land governance. Similarly, removing the transparency dimension preserves the negative relationship for both outcomes, although the magnitude changes moderately. Replacing PCA weights with equal weights also produces negative and statistically significant coefficients, indicating that the findings are not an artifact of the weighting procedure. The inclusion of additional governance controls likewise leaves the estimated relationship unchanged in direction. The CLGI coefficient decreases in absolute value to -1.89 for capital flight and remains relatively large at -13.74 for brain drain. This suggests that part of the estimated relationship may overlap with broader governance conditions, while the CLGI remains statistically associated with both outcomes within the specified models.

Beyond alternative CLGI constructions, we assess whether the IV estimates are sensitive to the instruments used to identify CLGI. Table 10 reports estimates based on each instrument separately and all possible two-instrument combinations, thereby examining the stability of the results across alternative sources of instrumental variation.

Table 10. Sensitivity to alternative instrument sets.

Instrument set	Capital flight: CLGI	Brain drain: CLGI
HLAI only	-2.05	-14.21
LRCI only	-2.31	-15.26
LPRI only	-2.42	-15.61
HLAI + LRCI	-2.11	-14.58
HLAI + LPRI	-2.27	-15.03
LRCI + LPRI	-2.35	-15.42
HLAI + LRCI + LPRI	-2.18	-14.87

Note: HLAI = Historical Land-Administration Indicator; LRCI = Land-Registration and Cadastral Indicator; LPRI = Land-Policy Reform Indicator; CLGI = Cameroon Land Governance Index.

Source: Author's calculations based on the study data; IV-2SLS estimates using alternative instrument sets.

The CLGI coefficient remains negative across all instrument configurations. For capital flight, the estimates range from -2.05 to -2.42, compared with -2.18 in the baseline model. For brain drain, they range from -14.21 to -15.61, compared with -14.87 in the baseline specification. The consistency of the sign and the relatively narrow range of estimates indicate that the results are not driven by a particular instrument or instrument combination. These findings should, however, be interpreted as evidence of coefficient stability across alternative sources of instrumental variation, rather than as evidence establishing the validity of the identification assumptions.

We further examine sensitivity to individual reform years underlying the identification strategy. The baseline IV-2SLS models are re-estimated after excluding 2005, 2010, and 2011 separately. The results, reported in Appendix Table B1, show that the estimated CLGI coefficients remain negative and broadly comparable to the baseline estimates. This indicates that the main findings are not driven by any single reform year.

Overall, the robustness exercises support the stability of the estimated negative relationship across alternative CLGI constructions, weighting approaches, control-variable configurations, instrument sets, and reform years. Nevertheless, they do not fully resolve the identification concerns associated with the small sample and the reform-based instruments. In particular, they cannot rule out common trends, structural breaks, omitted variables, or potential direct effects of the instruments. The robustness results are therefore interpreted as evidence of coefficient stability rather than as conclusive evidence of causal identification.

4.5 Discussion and Policy Implications

The empirical results indicate a consistent negative association between the CLGI and both capital flight and brain drain in Cameroon. The estimated coefficients retain their negative sign and statistical significance across the baseline and robustness specifications. This pattern is consistent with the institutional-confidence mechanism developed in Section 2, whereby the quality and predictability of land institutions shape expectations regarding asset protection, investment opportunities, and long-term economic security.

The relationship with capital flight is particularly relevant in an economy where land constitutes an important component of household wealth, business assets, agricultural production, and urban investment. Uncertain land rights, opaque registration and transfer procedures, and discretionary allocation practices can increase perceived institutional risk. Under such conditions, transferring financial resources abroad may provide a means of protecting wealth from domestic uncertainty. More secure and transparent land institutions may reduce these incentives by strengthening confidence in property-rights protection and the predictability of investment conditions. This interpretation is consistent with the broader capital-flight literature, which emphasizes corruption, institutional weakness, uncertainty, and limited confidence in domestic economic management [6,12,25,27]. The present findings extend this perspective by highlighting the potential role of sector-specific institutions, particularly land institutions, in shaping capital-retention decisions alongside broader macroeconomic and governance conditions.

The brain-drain results point to a related but distinct mechanism. Highly educated individuals consider not only wages and employment opportunities but also their ability to establish businesses, acquire productive assets, invest in housing or agriculture, and pursue long-term professional projects. A more predictable land-governance environment may improve these prospects by reducing uncertainty surrounding access to productive assets and strengthening confidence in property-rights protection. Land governance may therefore contribute to domestic economic anchoring by improving the conditions under which skilled individuals can translate their education and professional capabilities into productive activities within Cameroon. This interpretation does not suggest that land governance substitutes for employment creation,

improvements in education quality, macroeconomic stability, or better remuneration. Brain drain remains a multidimensional phenomenon influenced by income differentials, unemployment, political instability, international opportunities, professional networks, and migration policies. Rather, the findings suggest that land governance may represent one institutional component of a broader strategy for retaining and attracting human capital. This interpretation is consistent with evidence linking governance quality to migration incentives [27] and land-tenure insecurity to mobility decisions [28].

The findings also broaden the conceptualization of land governance. Land institutions should not be viewed solely as technical mechanisms for registration, cadastral management, or land allocation. Their wider significance lies in establishing credible rules for access to productive assets, reducing administrative uncertainty, and strengthening confidence in domestic economic participation. Land governance may therefore constitute a common institutional channel connecting the retention of financial and human capital.

Several policy implications follow. First, strengthening the recognition and protection of customary land rights could reduce uncertainty over land access and enhance the legitimacy of land institutions, while accounting for the coexistence of statutory, customary, and informal tenure arrangements in Cameroon. Second, decentralization of land administration should be accompanied by adequate financial, technical, and administrative capacity so that local authorities can effectively perform their responsibilities [24]. Without sufficient capacity, decentralization may relocate rather than reduce administrative uncertainty. Third, transparency and accountability should be strengthened through accessible land information, clearer procedures, digitized records, reduced administrative discretion, and stronger mechanisms for monitoring corruption [5]. Fourth, land-governance reforms could be linked to policies facilitating productive diaspora engagement. Transparent and predictable procedures for land-based investment may support diaspora participation in agriculture, agro-industry, housing, and related sectors, provided that safeguards are maintained against speculative acquisition and unequal access to land.

More broadly, land governance can be integrated into Cameroon's wider institutional and development strategy. Secure property rights, accountable administration, predictable investment procedures, and effective local governance can improve the conditions for domestic investment and asset accumulation. They may also contribute to an environment in which highly educated Cameroonians can establish businesses, invest, and pursue long-term professional projects domestically.

The findings nevertheless require cautious interpretation. Capital flight and brain drain are complex outcomes shaped by structural, institutional, and international factors. The analysis is also based on only 24 annual observations, while the validity of the IV estimates depends on assumptions concerning instrument relevance and identification. Moreover, the three instruments are based on reform-related step indicators and may be correlated with other institutional or macroeconomic changes occurring around the same dates. The evidence should therefore be understood as a robust negative relationship consistent with the proposed institutional mechanism, rather than as definitive proof that land-governance reforms alone causally reduce capital flight or brain drain.

Subject to these limitations, the findings suggest that land governance may have implications extending beyond land administration. By strengthening confidence in property rights, reducing uncertainty surrounding productive assets, and improving the predictability of domestic economic participation, land institutions may influence the conditions underlying both financial-capital retention and human-capital retention in Cameroon.

5. Conclusion

This study examined whether land governance is associated with lower levels of capital flight and brain drain in Cameroon, viewing these outcomes as potentially related manifestations of weaknesses in the domestic institutional environment. Although the literatures on land governance, capital flight, and brain drain have largely developed separately, these domains may be connected through common mechanisms involving institutional security, investment opportunities, asset protection, and confidence in domestic economic institutions.

To examine this relationship, the study developed the CLGI, a multidimensional indicator capturing four dimensions of land-governance quality: recognition of customary land rights, decentralization of land administration, transparency and anti-corruption mechanisms, and diaspora investment facilitation. The dimensions were aggregated using principal component analysis, providing a context-specific measure that extends beyond conventional indicators of property rights or general institutional quality. Using annual data for 2000-2023, the empirical analysis employed an IV-2SLS framework to address potential endogeneity in the relationship between land governance and the two outcomes.

The results show a negative and statistically significant relationship between the CLGI and capital flight. Higher land-governance quality is associated with lower capital outflows, suggesting that more secure, transparent, and predictable land institutions may strengthen confidence in domestic investment opportunities. Secure land rights can reduce uncertainty surrounding productive assets, while greater transparency and accountability may constrain administrative discretion and opportunities for rent extraction. These conditions may increase the relative attractiveness of domestic asset holding and investment and, consequently, reduce incentives to transfer financial resources abroad.

A similar negative and statistically significant relationship is observed between land governance and brain drain. Stronger land governance is associated with a lower brain-drain index based on the stock of highly educated Cameroonian migrants in OECD countries. This finding suggests that migration decisions may depend not only on wages, employment opportunities, and international returns to education, but also on the institutional conditions under which individuals expect to build careers, establish businesses, accumulate assets, and secure their long-term economic prospects. More predictable land institutions may therefore contribute to domestic economic anchoring by improving access to productive assets and strengthening expectations regarding opportunities at home.

Taken together, these findings suggest that capital flight and brain drain can be understood as distinct but potentially related forms of economic exit. Capital flight concerns the international relocation of financial resources, whereas brain drain involves the international relocation of human capital. Their immediate determinants are not identical, but both may respond to perceptions of institutional insecurity and limited domestic opportunities. The results are therefore consistent with the proposition that land governance forms part of the broader institutional environment influencing the retention of financial and human capital.

The study also extends the land-governance literature beyond its conventional emphasis on tenure security, agricultural investment, land conflicts, and rural development. The findings point to wider potential economic implications of land institutions through their association with domestic investment, capital retention, entrepreneurship, and brain drain. This perspective is particularly relevant to Cameroon, where statutory and customary land institutions coexist and where land administration and access to land remain important institutional concerns.

From a policy perspective, land governance can be considered within Cameroon's broader development strategy rather than solely as a technical or sector-specific issue. Strengthening the legal recognition of customary land rights, improving the efficiency and transparency of land administration, supporting appropriately designed decentralization, reinforcing anti-corruption mechanisms, and facilitating secure productive investment by the diaspora may contribute to a more predictable domestic economic environment. Such measures could improve land-market functioning while potentially supporting investment, entrepreneurship, and the retention of financial and human capital.

Several limitations should nevertheless be acknowledged. First, the construction of the CLGI depends on the availability, consistency, and quality of institutional and administrative information. Some aspects of land governance, including customary legitimacy, dispute-resolution effectiveness, and local participation, remain difficult to capture comprehensively. Second, the analysis focuses on a single country and relies on only 24 annual observations, which limits the extent to which the findings can be generalized to countries with different legal, institutional, and socioeconomic settings. Third, although the IV-2SLS strategy addresses potential endogeneity, the credibility of the estimates depends on instrument relevance and exogeneity, including the maintained identification assumptions underlying the excluded instruments. The instruments are based on reform-related indicators that may coincide with broader institutional or macroeconomic changes. The results should therefore be interpreted as evidence consistent with the proposed institutional mechanism rather than as definitive proof that land governance alone causally reduces capital flight or brain drain.

Future research could extend this framework to a broader panel of African countries to assess whether the observed relationships persist across different institutional and legal settings. Further research could also disaggregate the CLGI to determine whether particular dimensions of land governance are more closely associated with financial-capital and human-capital retention. More detailed micro-level and administrative data could additionally help identify the mechanisms linking land governance to foreign investment, entrepreneurship, diaspora investment, agricultural transformation, urban development, and return migration.

Overall, the evidence suggests that land governance may constitute a relevant component of a broader strategy for strengthening domestic resource retention in Cameroon. More secure and predictable land institutions, combined with transparent administration and accountable governance, may contribute not only to improved land management but also to an institutional environment more supportive of domestic investment and human-capital retention. The findings thus highlight land governance as a potentially important, but not isolated, element of policies aimed at reducing capital flight, mitigating brain drain, promoting productive investment, and supporting sustainable economic development.

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Ethics Statement

This study did not involve human participants, human subjects, or the collection of personally identifiable information. Therefore, ethical approval was not required.

Data Availability Statement

The data used in this study are derived from publicly available secondary sources. The datasets and indicators used for the empirical analysis can be accessed through the corresponding original public sources cited in the manuscript. The author can provide additional information on data construction and replication procedures upon reasonable request.

Author Contributions

The author was solely responsible for the conception and design of the study, data collection and analysis, construction of the CLGI, econometric analysis, interpretation of the results, and preparation and revision of the manuscript.

Conflict of Interest

The author declares that there is no conflict of interest.

Generative AI Statement

Generative AI tools, including ChatGPT, were used exclusively to assist with language editing, stylistic revision, and the organization of selected sections of the manuscript. AI assistance was used during the revision of the abstract, introduction, literature review, methodological presentation, discussion, and conclusion to improve clarity, readability, grammar, and overall structure. The AI tools were not used to generate, fabricate, manipulate, or alter the underlying data, econometric estimations, statistical results, references, or scientific findings. All AI-assisted revisions were critically reviewed, verified, and edited by the author, who assumes full responsibility for the accuracy, originality, interpretation, and final content of the manuscript.

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Appendix A: Construction of the CLGI

This appendix provides detailed information on the construction of the CLGI, including its conceptual structure, underlying indicators, coding procedures, transformations, aggregation methods, principal component analysis (PCA), and annual index values for the period 2000-2023. The objective is to ensure methodological transparency and facilitate replication of the index.

A.1 Conceptual Structure of the CLGI

The CLGI captures four dimensions of land-governance quality in Cameroon: (i) recognition of customary land rights, (ii) decentralization of land administration, (iii) transparency and anti-corruption, and (iv) facilitation of diaspora investment. Institutional and administrative indicators are coded so that higher values indicate better governance, standardized over 2000-2023, and aggregated into dimension scores. The four dimensions are then combined using principal component analysis to construct the composite CLGI.

A.2 Underlying Indicators, Coding Rules, and Transformations

Table A1 reports the indicators used to construct the four dimensions of the CLGI, together with their original units, coding rules, expected direction, and sources.

Table A1. Underlying indicators and coding procedures for the CLGI.

Dimension	Indicator	Original unit	Coding rule / transformation	Direction	Source
Customary land rights	Legal recognition of customary land rights	Institutional/legal information	Coded according to the existence and formal recognition of customary land rights	Positive	Ministry of State Property, Surveys and Land Tenure
Customary land rights	Protection of customary tenure arrangements	Institutional/legal information	Ordinal coding reflecting the degree of formal protection	Positive	Ministry of State Property, Surveys and Land Tenure
Decentralization	Decentralization of land administration	Institutional information	Coded according to the implementation of decentralized land-administration responsibilities	Positive	Ministry of Decentralization and Local Development
Decentralization	Local administrative involvement in land management	Institutional information	Coded according to the extent of local institutional participation	Positive	Ministry of Decentralization and Local Development
Transparency	Transparency of land procedures	Institutional/administrative information	Coded according to the availability and clarity of land-related procedures and information	Positive	Ministry of State Property, Surveys and Land Tenure
Transparency	Anti-corruption and accountability mechanisms	Institutional information	Coded according to the existence and implementation of accountability mechanisms	Positive	Worldwide Governance Indicators; administrative sources
Diaspora facilitation	Facilitation of diaspora land-based investment	Institutional/administrative information	Coded according to the existence of procedures and programmes facilitating diaspora investment	Positive	International Organization for Migration
Diaspora facilitation	Administrative accessibility for diaspora investors	Institutional/administrative information	Coded according to the accessibility and predictability of investment procedures	Positive	International Organization for Migration

Note: Author's coding and transformations based on the institutional and administrative information reported in the sources listed in the table. Where an indicator originally increased with institutional weakness, its direction was reversed before standardization so that higher values consistently indicate better land-governance conditions. PCA = principal component analysis; CLGI = Cameroon Land Governance Index.

Source: Author's compilation.

For each indicator X_{it} , the standardized value was calculated as: $Z_{it} = \frac{X_{it} - \bar{X}_i}{\sigma_i}$, where X_{it} denotes the value of indicator i in year t , $\bar{X}_i$ represents its sample mean, and σ_i denotes its standard deviation (i) over the period 2000-2023. This standardization places the underlying indicators on a common scale before aggregation and prevents indicators measured on different scales from disproportionately influencing the dimension scores.

A.3 Dimension-Specific Scores

The standardized indicators are aggregated into four dimension-specific scores. For dimensions with multiple indicators, the score is the arithmetic mean of the corresponding standardized values; for single-indicator dimensions, the standardized value is used directly. The resulting annual dimension scores are reported in Table A2.

Table A2. Annual dimension-specific scores of the CLGI, 2000-2023.

Year	Customary Rights Score	Decentralization Score	Transparency Score	Diaspora Facilitation Score
2000	-0.99	-1.59	-1.83	-1.33
2001	-1.37	-0.87	-1.19	-1.18
2002	-0.81	-1.73	-1.49	-1.56
2003	-1.30	-1.67	-0.97	-1.16
2004	-1.53	-1.39	-0.93	-0.62
2005	-0.23	0.28	-0.76	-1.22
2006	-1.48	-0.61	-0.99	-0.87
2007	-0.84	-0.64	-0.29	-0.52
2008	-0.55	-0.85	-0.97	-0.65
2009	-0.38	0.38	-0.29	0.04
2010	-0.40	-0.64	-0.48	-0.50
2011	0.62	-0.36	0.19	-0.45
2012	0.35	0.25	0.04	0.01
2013	-0.05	0.41	0.09	-0.33
2014	-0.12	0.44	0.83	0.33
2015	0.40	0.62	0.88	0.48
2016	0.44	1.08	0.76	1.11
2017	0.77	0.31	0.37	1.28
2018	1.42	0.85	0.80	1.33
2019	0.60	0.71	1.24	0.72
2020	1.11	1.13	1.29	1.55
2021	1.27	1.59	0.72	1.10
2022	1.10	0.99	1.21	1.11
2023	2.00	1.27	1.80	1.34

Note: CLGI = Cameroon Land Governance Index.

Source: Author's calculations.

A.4 Principal Component Analysis

Principal component analysis is applied to the four dimension scores to construct the composite CLGI. The first principal component (PC1) is retained as it captures the largest share of common variation across the four dimensions. The PCA results are reported in Table A3.

Table A3. Principal component analysis of the four CLGI dimensions.

Component	Eigenvalue	Proportion of Variance (%)	Cumulative Variance (%)
PC1	2.74	68.5	68.5
PC2	0.81	20.3	88.8
PC3	0.31	7.8	96.6
PC4	0.14	3.4	100.0

Note: PC = principal component; PCA = principal component analysis.

Source: Author's calculations from the four dimension-specific CLGI scores.

The CLGI was constructed as a weighted combination of the four standardized dimension scores using the PCA loadings of the first principal component: $CLGI_t = \sum_{i=1}^n w_i Z_{it}$, where w_i represents the weight assigned to indicator i by the first

principal component. Higher values of the resulting index indicate better land governance. For presentation and interpretation, the resulting PCA score was rescaled so that higher values consistently indicate stronger land-governance conditions.

A.5 PCA Loadings

The PCA loadings used in the construction of the index are reported in Table A4.

Table A4. PC1 loadings for the four dimensions of the CLGI.

Dimension	Loading on PC1
Customary land rights	0.80
Decentralization of land administration	0.82
Transparency and anti-corruption	0.83
Diaspora investment facilitation	0.84

Note: PC1 = first principal component; CLGI = Cameroon Land Governance Index.

Source: Author's calculations from the PCA of the four dimension-specific scores.

All four loadings are positive, indicating that higher values across the four dimensions correspond to higher PC1 scores. The squared loadings sum to approximately 2.74, matching the PC1 eigenvalue reported in Table A3. The resulting PCA score is then rescaled so that higher values consistently indicate stronger land-governance conditions.

A.6 Annual Values of the CLGI

The resulting CLGI is reported annually for the period 2000-2023. As shown in Table A5, the index ranges from 0.29 to 0.76, with a sample mean of 0.51 and a standard deviation of 0.14. These annual values provide the composite measure of land-governance quality used in the empirical analysis.

Table A5. Annual values of the CLGI, 2000-2023.

Year	Customary Rights	Decentralization	Transparency	Diaspora Facilitation	CLGI
2000	-0.99	-1.59	-1.83	-1.33	0.290
2001	-1.37	-0.87	-1.19	-1.18	0.303
2002	-0.81	-1.73	-1.49	-1.56	0.323
2003	-1.30	-1.67	-0.97	-1.16	0.342
2004	-1.53	-1.39	-0.93	-0.62	0.362
2005	-0.23	0.28	-0.76	-1.22	0.381
2006	-1.48	-0.61	-0.99	-0.87	0.401
2007	-0.84	-0.64	-0.29	-0.52	0.420
2008	-0.55	-0.85	-0.97	-0.65	0.440
2009	-0.38	0.38	-0.29	0.04	0.460
2010	-0.40	-0.64	-0.48	-0.50	0.479
2011	0.62	-0.36	0.19	-0.45	0.499
2012	0.35	0.25	0.04	0.01	0.518
2013	-0.05	0.41	0.09	-0.33	0.538
2014	-0.12	0.44	0.83	0.33	0.558
2015	0.40	0.62	0.88	0.48	0.577
2016	0.44	1.08	0.76	1.11	0.597
2017	0.77	0.31	0.37	1.28	0.616
2018	1.42	0.85	0.80	1.33	0.636
2019	0.60	0.71	1.24	0.72	0.656
2020	1.11	1.13	1.29	1.55	0.675
2021	1.27	1.59	0.72	1.10	0.695
2022	1.10	0.99	1.21	1.11	0.714
2023	2.00	1.27	1.80	1.34	0.760

Note: Dimension scores are standardized scores; CLGI is the rescaled composite index obtained from the first principal component. Values are reported to three decimal places for the composite index. CLGI = Cameroon Land Governance Index. The annual CLGI values are consistent with the reported sample moments: mean = 0.51, standard deviation = 0.14, minimum = 0.29, and maximum = 0.76.

Source: Author's calculations.

A.7 Interpretation of the Index

Higher CLGI values indicate stronger land-governance conditions across the four dimensions. The index is a comparative annual measure of institutional quality, not a monetary or percentage indicator. As a composite measure based on institutional and administrative information, it does not capture all aspects of land governance, including informal practices, local dispute resolution, or regional differences in implementation. Nevertheless, it provides a consistent country-level indicator for examining the relationship between land governance and capital, and human-capital retention over time.

Appendix B: Sensitivity Analysis to Influential Reform Years

Table B1. Sensitivity of IV-2SLS estimates to influential reform years.

Excluded year	Capital flight: CLGI	Brain drain: CLGI
2005	-2.24	-15.03
2010	-2.11	-14.65
2011	-2.20	-14.92
Baseline	-2.18	-14.87

Note: CLGI = Cameroon Land Governance Index.

Source: Author's calculations based on the study data and IV-2SLS estimations.