Estimating the magnitude and flow of the proceeds of corruption in Nigeria

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1   Introduction

Nigeria presents a development paradox. As Africa's largest oil producer, endowed with vast natural resources and substantial human capital, conventional development theory predicts sustained growth and broad-based welfare improvements (e.g., Rosser, 2009; Rostow, 1961). Instead, Nigeria continues to experience persistent poverty, high unemployment, widening inequality, and deteriorating infrastructure (National Bureau of Statistics, 2022), while consistently ranking poorly on international corruption indices. A substantial body of empirical research links natural resource dependence to elevated corruption risks (e.g., David, 2024; David *et al.*, 2025a, 2024; Leite and Weidmann, 1999), and documents the adverse effects of corruption on investment, growth, fiscal performance, and broader developmental outcomes in Nigeria (e.g., Abu *et al.*, 2022a,b; David *et al.*, 2025a). Despite this extensive literature, three critical gaps remain.

First, the monetary magnitude of corruption-generated proceeds remains largely unquantified. Existing figures are often speculative or embedded within broader illicit financial flow estimates that do not isolate political corruption specifically (see Kar and Cartwright-Smith, 2010; Kar and LeBlanc, 2013). Consequently, the scale of corruption-related financial extraction remains uncertain. Second, the international allocation of these proceeds is insufficiently understood. While illicit funds are known to gravitate toward jurisdictions characterised by financial secrecy, regulatory weaknesses, or deep capital markets, systematic quantification of destination patterns is absent for Nigeria. Third, while partisan alignment between subnational and national government is known to influence corruption and fiscal transfers elsewhere (see Arulampalam *et al.*, 2009; Brollo and Nannicini, 2012; Solé-Ollé and Sorribas-Navarro, 2008; Stoecker, 2022), its role in shaping the economic consequences of corruption at the Nigerian state level remains unexamined.

In light of these gaps, this study pursues the following specific objectives:

i. To estimate the monetary proceeds of political corruption in Nigeria between 1970 and 2025 using a recalibrated Tanzi (1983)-type currency demand approach framework.
ii. To simulate the global allocation of estimated corruption proceeds using a gravity-based allocation model.
iii. To test whether partisan alignment between state governors and the national government shapes the impact of subnational corruption on state-level economic activity.

The study's significance is threefold. Methodologically, it is the first to adapts indirect monetary estimation techniques from the shadow economy literature to political corruption, providing a transparent and replicable framework for quantification. Empirically, it generates the first systematic estimates of both the magnitude and international allocation of corruption proceeds originating from Nigeria. Analytically, it contributes to the fiscal federalism literature by testing whether partisan alignment moderates the economic impact of corruption within a federal system. The findings contribute to debates on illicit financial flows, institutional accountability, and fiscal federalism, and have direct relevance for asset recovery, enforcement prioritisation, and oversight design.

2   Review of Relevant Literature

2.1   Corruption, growth, and direct measurement limitations

The covert nature of corruption renders direct measurement inherently difficult. Observable indicators such as prosecution rates or reported bribery cases often reflect enforcement capacity rather than the underlying prevalence of corrupt transactions (Abu *et al.*, 2015). Consequently, empirical research relies predominantly on perception-based measures, including Transparency International's Corruption Perceptions Index, the World Bank's Control of Corruption Index, and

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Crombach and Smits's (2024) subnational corruption index. While these indicators facilitate cross-country and intertemporal comparisons, they capture perceived institutional quality rather than the monetary value of corruption-related extraction.

Systemic empirical analysis using such measures gained prominence with Mauro (1996, 1995), who document a negative association between corruption and investment and growth. Subsequent studies have also used perception-based measures to link corruption to natural resource dependence (Leite and Weidmann, 1999), fiscal instability, declining public investment efficiency, and institutional deterioration. In Nigeria, existing evidence documents relationships between corruption and poverty, fiscal volatility, foreign direct investment instability, and growth fluctuations (e.g., Abu, 2025; Abu et al., 2022a,b, 2024; David et al., 2025a; Olayungbo and Adediran, 2017). However, this literature does not estimate the monetary proceeds generated by corruption.

2.2 Indirect estimation of illicit financial activity

The clandestine nature of illicit transactions makes direct observation of their monetary proceeds infeasible. To address this limitation, researchers have developed indirect approaches to estimate hidden economic activities, particularly the shadow or underground economy. Prominent approaches include structural equation models such as the dynamic multiple-indicators multiple-causes (DYMIMIC) framework, calibrated dynamic general equilibrium (DGE) models, overlapping-generations (OLG) growth models, and the currency demand approach (CDA) (see David et al., 2025b; Elgin et al., 2021; Medina and Schneider, 2019, for comprehensive review).

Structural models infer latent activity from observable causes and indicators but depend on strong identifying assumptions and typically yield relative indices. Calibrated equilibrium models provide micro-founded representations of illicit sectors, yet estimates are sensitive to parameter calibration and functional form assumptions. The currency demand approach, originally developed by Cagan (1958) and extended by Tanzi (1980, 1983), is based on the premise that illicit transactions rely disproportionately on cash to avoid detection and reduce traceability. By modelling excess currency holdings relative to macroeconomic fundamentals, the CDA yields monetary estimates of hidden activity using observable macroeconomic aggregates. Its relative transparency and replicability make it particularly suitable for long-run time-series analysis.

In recent years, these approaches have been extended beyond shadow economy estimation to quantify other illicit activities, including money laundering and organised crime. For example, Ardizzi et al. (2014), Ardizzi et al. (2018), and Aljassmi et al. (2024) apply the CDA framework to estimate money laundering activity in Italy and the UAE. Similarly, Schneider (2010) employs a DYMIMIC framework to estimate organised crime turnover and laundering volumes across OECD countries. DGE and OLG models have also been calibrated to estimate money laundering and illicit financial activities in the United States, EU countries, and Colombia (e.g., Argentiero et al., 2008; Bagella et al., 2009; Loayza et al., 2019; Villa et al., 2016). Despite these methodological advances, the CDA has not been applied to estimate corruption-generated proceeds, particularly in a cash-based economy such as Nigeria. Existing applications focus predominantly on tax evasion, shadow production, or money laundering, leaving corruption-specific monetary extraction unquantified. This omission motivates the present study's adaptation of the CDA framework to the direct estimation of corruption proceeds.

2.3 Gravity-based modelling of illicit financial flows

Beyond aggregate magnitude, the allocation of illicit proceeds across jurisdictions is analytically relevant. The cross-border distribution of such funds reflects strategic considerations, including asset protection, secrecy, financial depth, and regulatory risk. Gravity-based frameworks provide a tractable method for modelling these allocation patterns. Drawing from international trade theory, gravity models posit that bilateral flows increase with economic size and destination attractiveness, and decrease with distance-related and institutional frictions.

Walker (1999) pioneered the application of gravity logic to illicit financial flows, proposing a simulation-based allocation model in which estimated global proceeds are distributed across jurisdictions according to indicators of financial attractiveness, secrecy, regulatory quality, probability of detection, and transaction costs. Subsequent studies refined this framework by incorporating more systematic measures of institutional quality and financial sector characteristics. For example, Unger et al. (2006) further operationalised the gravity allocation structure, while Ferwerda et al. (2020) estimated destination-choice elasticities using suspicious transaction reports, thereby strengthening the empirical grounding of the gravity approach.

Despite its simplifying assumptions, the gravity framework offers a tractable structure for modelling destination patterns when direct bilateral data are unavailable. However, existing applications focus primarily on money laundering and aggregate illicit financial flows. No study has systematically applies a gravity-based allocation model to corruption-generated proceeds originating from Nigeria. As a result, the destination patterns of corruption-specific capital outflows remain unquantified. This study extends the gravity framework to model the international allocation of corruption proceeds estimated from a structural monetary approach.

2.4 Political alignment and economic consequences

The fiscal federalism literature highlights the political economy dimension of intergovernmental relations. Partisan alignment between subnational and national governments has been shown to influence intergovernmental transfers, oversight intensity, policy outcomes, and corruption incentives. For example, Brollo and Nannicini (2012) shows that alignment between Brazilian municipalities and the federal government increases transfers and affects local policy decisions. Arulampalam *et al.* (2009) and Solé-Ollé and Sorribas-Navarro (2008) find comparable patterns in India and Spain, respectively. In Ghana, Stoecker (2022) finds that partisan alignment reduces corruption levels by approximately 1.9 percentage points, suggesting that partisan connections may alter incentives or enforcement conditions.

Existing studies examine the effect of alignment on transfers or corruption incidence but do not assess whether alignment moderates the economic consequences of corruption. Through mechanisms such as differential enforcement intensity, discretionary fiscal transfers, and political protection, alignment may influence not only the level of corruption but also its economic impact. This interaction remains empirically unexplored in Nigeria.

2.5 Gaps in the Literature

Three gaps motivate this research. First, the existing measurement literature provides no model-based monetary estimate of corruption-generated proceeds for Nigeria. Second, illicit financial flows literature has not formally modelled the destination allocation of such proceeds from a Nigerian origin. Third, while political alignment influences transfers and corruption incidence, its moderating role in shaping the economic consequences of corruption remains unexamined in Nigeria. Addressing these gaps contributes to a more comprehensive understanding of corruption's scale, transmission mechanisms, and political determinants, and provides an empirical basis for policy interventions aimed at curbing illicit financial flows and strengthening institutional accountability.

3 Theoretical Model

This study adopts an integrated three-stage sequential framework linking corruption to excess currency demand, cross-border allocation of illicit proceeds, and subnational economic outcomes. The framework synthesises insights from the corruption literature, the CDA, gravity-based modelling, and the fiscal federalism tradition on political alignment.

3.1 Theoretical Relationships

Corruption and monetary distortions

Weak institutions and large oil windfalls create opportunities for political corruption, including bribery and embezzlement. Because corrupt transactions seek anonymity and avoidance of formal audit trails, they are disproportionately conducted in cash, inflating currency holdings relative to formal monetary aggregates. Following (Tanzi, 1983), (Ardizzi *et al.*, 2014), and Aljassmi *et al.* (2024), real money demand is modelled as:

$$\ln\left(\frac{C}{M_1}\right)_t = \alpha_0 + \alpha_1 x1_t + \alpha_2 x2_t + \alpha_3 x3_t + \alpha_4 Z_t + \varepsilon_t \tag{1}$$

where C/M_1 is currency to M1 ratio; $x1_t$ capture structural determinants of currency demand (income, interest rate, inflation, financial innovation); $x2_t$ represent underground economy drivers (tax burden, regulation, public expenditure), and $x3_t$ capture corruption-related distortions (perception-based corruption measures and objective conviction rates); Z_t includes additional controls such as oil price shocks and election-year dummy. Corruption-induced excess currency demand is computed as the difference between fitted values from equation 1 and counterfactual predictions with $x3_t = 0$. Corruption monetary proceeds (CP_t) are then derived by scaling this excess ratio by M1 relative to GDP.

Hypothesis 1 *Higher levels of political corruption in Nigeria are associated with greater excess currency demand, after controlling for structural and underground economy factors.*

Gravity-based allocation of corruption proceeds

Corrupt actors face a portfolio decision: retaining funds domestically raises detection risk, while foreign transfers offer asset protection and currency diversification. Consistent with gravity-model logic (Ferwerda *et al.*, 2020; Walker, 1999), bilateral illicit outflows are modelled as:

$$IFF_{ij,t} = \beta_0 \times \frac{PC_t \times A_{j,t}}{D_{ij}^{\beta_1}} \tag{2}$$

where $IFF_{ij,t}$ denotes illicit financial flows from Nigeria to destination j; CP_t is stage 1 corruption proceeds; $A_{j,t}$ captures destination attractiveness (financial secrecy, economic size, regulatory quality, financial depth), and D_{ij} reflects bilateral frictions (geographic distance, common language, colonial ties, trade linkages). Destination-choice elasticities β_1 are sourced from Ferwerda et al. (2020) or estimated directly where bilateral suspicious-transaction data are available.

Hypothesis 2 *Illicit fund flows from Nigeria to destination country j are positively related to destination attractiveness and negatively related to bilateral transfer frictions.*

Partisan alignment and subnational economic consequences

At the state level, corruption diverts public resources toward rent extraction, reducing productive economic activity. Partisan alignment between a state governor and the president may condition this effect through differential enforcement intensity, discretionary fiscal transfers, or political protection. State-level economic activity is specified as:

$$EA_{s,t} = \gamma_0 + \gamma_1 CO_{s,t} + \gamma_2 PPA_{s,t} + \gamma_3 (CO_{s,t} \times PPA_{s,t}) + \gamma_4 X_{s,t} + \delta_s + \lambda_t + u_{s,t} \tag{3}$$

where $EA_{s,t}$ is log night-light intensity as a proxy for state GDP; $CO_{s,t}$ is subnational corruption, $PPA_{s,t}$ is a partisan alignment dummy (1 if the governor and president share a party); and $X_{s,t}$ is a vector of state-level controls (population, federal transfers, urbanisation, oil-state indicator, human development index). δ_s and λ_t are state and year fixed effects. The interaction coefficient γ_3 tests whether alignment amplifies or attenuates the economic cost of corruption.

Hypothesis 3 *Partisan alignment between the state governor and the federal executive moderates the relationship between subnational corruption and state-level economic activity.*

Figure A1 presents the integrated conceptual diagram linking oil rent and institutional weakness through the three analytical stages to state economic outcomes.

4   Methodology

4.1   Data

The study will use annual data from 1970 to 2025, subject to availability. To operationalise the modified currency demand framework, both subjective and objective measures of corruption are employed. Subjective indicators include corruption perception measures from Transparency International, the World Bank, and the V-Dem Institute. For robustness, objective measures such as convictions and prosecution rates for corruption-related offences are incorporated where available. For the gravity model component, efforts will be made to obtain bilateral suspicious transaction reports to estimate destination-choice elasticities. Given the sensitivity of such data, access may be restricted. In that case, the destination-choice elasticities estimated by Ferwerda *et al.* (2020) will be adopted. These elasticities capture relative destination attractiveness under a gravity structure, abstracting from origin-specific enforcement regimes, and will be combined with country-specific corruption proceeds estimated from the currency demand approach to simulate bilateral corruption-related flows.

Subnational corruption data are drawn from the Crombach and Smits (2024) subnational corruption database. In the absence of consistent state-level GDP data, subnational economic activity is proxied using NOAA DMSP and NASA VI-IRS night-light data, which are widely used where official output statistics are unavailable or unreliable (Henderson *et al.*, 2012). Partisan alignment is constructed using official electoral records on the party affiliation of state governors by year, matched to that of the federal executive. All data are sourced from established national and international institutions, including the World Bank, IMF, TI, Central Bank of Nigeria, National Bureau of Statistics (Nigeria), NOAA, Global Data Lab, AidData, and UN Comtrade.

Table 1 summarises key variables, definition, sources, and frequency.

4.2   Empirical Strategy

The empirical analysis follows three steps:

1. **Estimation of corruption-related funds:** Equation (1) will be estimated by OLS as the baseline specification. Unit root tests will be conducted using both conventional procedures (ADF and Phillips-Perron) and tests that allow for structural breaks (Zivot-Andrews and Lee-Strazicich with two breaks) to determine stationarity properties and guide the choice of an appropriate long-run estimator. Bootstrap ARDL bounds testing (McNown *et al.*, 2018) and, where appropriate, a Fourier-augmented ARDL approach (David *et al.*, 2025a) will be employed as the primary cointegration frameworks, while FMOLS, DOLS, and CCR estimators will serve as consistency checks. Following Ardizzi *et al.* (2014), corruption proceeds will be computed by contrasting predicted currency holdings under observed corruption with counterfactual zero- or minimal-corruption conditions, scaled by M1/GDP. Alternative corruption indicators and monetary aggregates will be used to assess robustness.

2. **Allocation of corruption proceeds (gravity-based simulation):** Corruption proceeds (CP_t) from Stage 1 serve as the origin mass in equation (2). Where bilateral Nigerian STR data are accessible, equation (2) will be estimated in panel form using Poisson Pseudo-Maximum Likelihood (PPML) to accommodate zero flows and the multiplicative structure of the gravity specification. Where such data remain restricted, destination-choice elasticities from Ferwerda *et al.* (2020) will be adopted, and this stage will be treated as a structural simulation rather than an estimated

Table 1: Summary of key variables, sources, and frequency

Variable	Definition	Source	Freq.
Corruption (subjective)	TI-CPI, WB Control of Corruption, V-Dem PCI	TI; World Bank; V-Dem	Annual
Corruption (objective)	Corruption-related convictions	EFCC and ICPC	Annual
Currency (C/M_1)	Currency in circulation to M_1 (%)	CBN	Annual
Real income	Log real GDP per capita (constant 2015 USD)	World Bank WDI	Annual
Interest rate; Inflation	Deposit interest rate (%); CPI-based inflation (%)	CBN	Annual
IMF financial development	Financial development index	IMF	Annual
Oil revenue; tax burden; public spending	Oil revenue, total tax revenue, and total public spending (% GDP)	CBN	Annual
Suspicious transaction reports	Suspicious bilateral transactions (USD)	NFIU	Annual
Destination attractiveness	Financial Secrecy Index; dest. GDP; regulatory quality; banking depth	TJN; WB WGI	Annual/ Biennial
Bilateral frictions	Log great-circle distance; common language; colonial tie; bilateral trade	CEPII GeoDis; UN Comtrade	Fixed/ Annual
State economic activity	Log sum-of-radiance (night-light intensity)	NOAA DMSP; NASA VIIRS	Annual
Subnational corruption	State-level grand corruption index	Crombach and Smits (2024)	Annual
Partyisan alignment	=1 if state governor and president share party affiliation, 0 otherwise	INEC; party records	Annual

model, transparently disclosed as a limitation. Sensitivity analyses will be performed using alternative elasticity parameterisations and by excluding extreme outlier destinations.

3. **Partisan alignment and subnational economic outcomes:** Equation (3) will be estimated as the baseline specification using fixed- and random-effects estimators, with the Hausman test guiding model selection. Pre-estimation diagnostics, including cross-sectional dependence tests, unit root tests, and slope homogeneity tests, will guide estimator choice. Depending on the data properties, dynamic estimators such as mean group, pooled mean group, cross-sectionally augmented ARDL (CS-ARDL), or system GMM may be employed. Lagged corruption measures will be included in dynamic specifications to mitigate simultaneity concerns. Robustness checks will incorporate alternative estimators, including instrumental variables, DOLS, and FMOLS.

4.3 Identification assumptions and validation

The modified CDA, adapted to estimate corruption proceeds, relies on the identifying assumption that corruption-related transactions are more likely to be conducted in cash to reduce traceability. Consequently, corruption increases the demand for cash relative to formal monetary aggregates. After controlling for standard macroeconomic determinants and shadow-economy drivers, any residual excess currency demand is attributed to political corruption. This identifying assumption is standard in the CDA literature and will be examined by replacing subjective corruption measures with objective conviction-rate data. The gravity-based allocation stage assumes that the destination-choice elasticities estimated by Ferwerda *et al.* (2020) for global money laundering approximate the allocation preferences of Nigerian corrupt actors. This maintained assumption is treated as a scenario boundary condition rather than a structural causal estimate and will be validated against documented case evidence and available financial intelligence reports. In the subnational analysis stage, it is assumed that, conditional on state and year fixed effects, staggered changes in governor-president partisan alignment are not systematically correlated with unobserved determinants of economic activity. Lagged corruption measures will be included to mitigate simultaneity concerns, and subsample analyses by oil-producing status and region will be conducted to assess treatment heterogeneity.

5 Time Frame of Study

The research is planned over two and a half years (five semesters), with thesis submission in the first semester of the third year. Key milestones include proposal defence, candidature confirmation, submission of at least two papers to reputable economics journals, conference presentation, and final thesis submission. Year 1 focuses on completing the literature review, refining the theoretical framework and econometric design, drafting the proposal (first three chapters), and collecting and organising datasets. Year 2 involves data cleaning, estimation of the currency demand model, calibration of the gravity model, and completion of the subnational political alignment analysis. Robustness checks and manuscript drafting proceed concurrently, with journal submissions targeted by the end of Year 2. In the first semester of Year 3, the remaining chapters are finalised, findings integrated, and the full thesis submitted for review and revision prior to formal submission.

Table 2 summarises the proposed activity schedule.

Table 2: Proposed timeline of research activities

Activity	Year 1		Year 2		Year 3	
	S1	S2	S1	S2	S1	S2
Literature review	■					
Theoretical framework & model specification		■				
Proposal writing & defence		■				
Candidature confirmation	■					
Data collection & organisation	■					
Data cleaning & preprocessing			■			
CDA model recalibration for estimates of corruption proceeds, estimation			■			
Robustness checks & validation of estimates			■			
Develop and refine gravity model for simulation of allocation patterns of illicit funds				■		
Robustness tests and validation of allocation patterns				■		
Subnational political alignment model development & analysis			■	■		
Journal paper drafting & submission			■			
Conference presentation					■	
Refine and finalise chapters			■			
Supervisor review & revisions			h			
Thesis submission for examination						■

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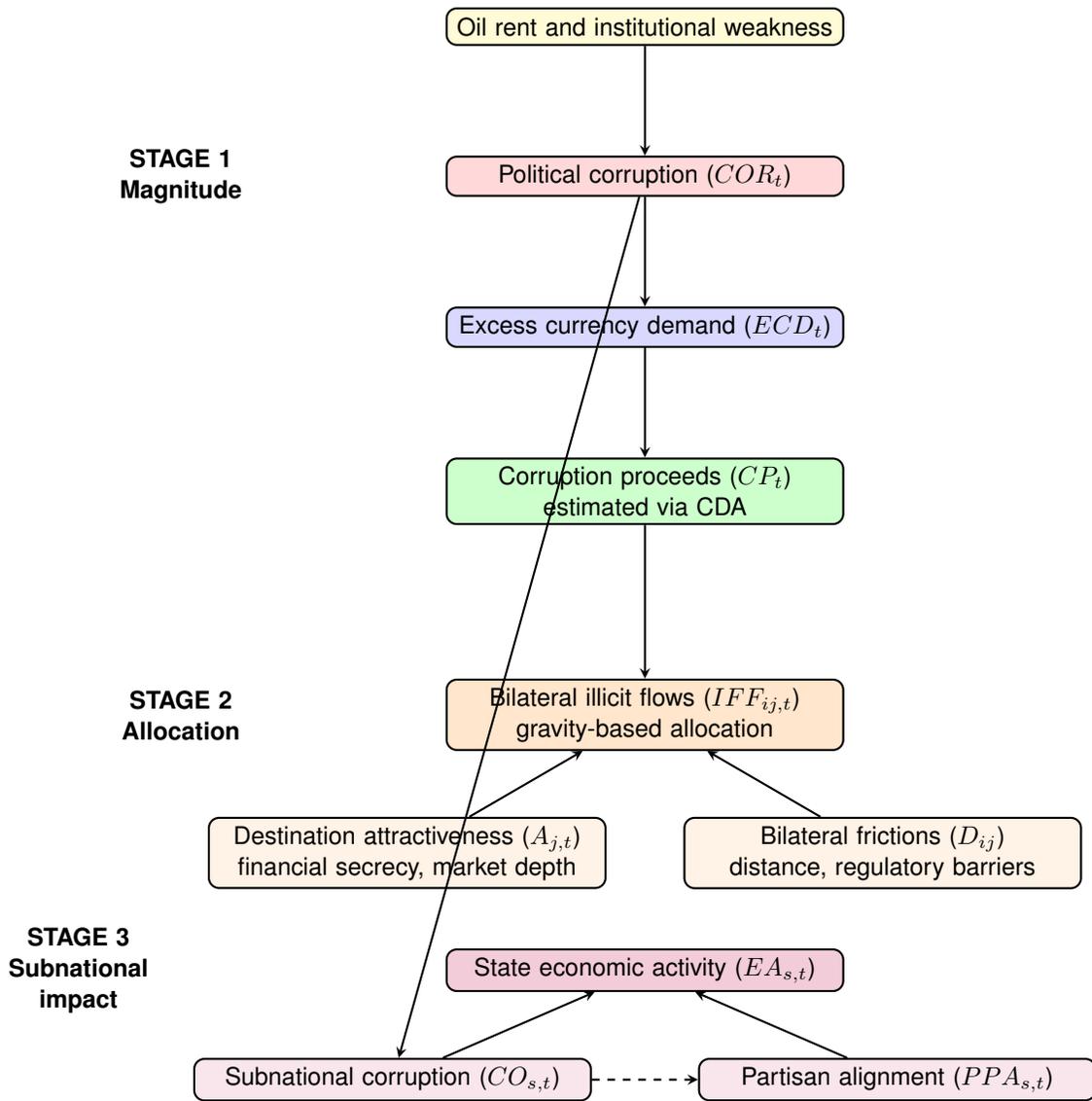
A Appendix

Appendix Figure A1: Integrated theoretical framework

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