Monetary Fragmentation, Exchange-Rate Volatility, and the Geoeconomics of Intra-African Trade under the AfCFTA

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Abstract

As the global economy fragments into rival trade and payment blocs, emerging markets with little monetary autonomy are doubly exposed: to external shocks, and to the currency frictions that raise the cost of trading with one another. The African Continental Free Trade Area (AfCFTA) aspires to weld 54 economies into a single market, yet those economies transact in more than forty national currencies organised into radically different regimes: the euro-pegged CFA franc zones (UEMOA and CEMAC), the rand-anchored Common Monetary Area, other hard euro pegs, and some 27 sovereign, mostly floating currencies. This paper argues that monetary fragmentation is a neglected barrier to African integration and quantifies its trade cost. **Research question.** Does the configuration of monetary regimes (external anchoring versus sovereignty), together with the exchange-rate volatility between African currency pairs, form a first-order barrier to intra-African trade, and what monetary architecture would best underpin the AfCFTA? **Methodology.** We assemble an original dyadic panel of Sub-Saharan African economies (2000–2020) that couples CEPII gravity data with a hand-built classification of monetary regimes, and estimate structural PPML gravity models with exporter-, importer- and pair-fixed effects, a control-function instrumental-variable Poisson, dynamic-timing and placebo tests, and Oster (2019) selection bounds. **Key findings.** Fragmentation mechanically generates bilateral exchange-rate volatility, near zero between currency-union or commonly-anchored partners but 0.18–0.24 between sovereign currencies. Common regional-community membership raises intra-African trade three- to six-fold; bilateral exchange-rate volatility robustly depresses it, with a credible but moderate causal magnitude (a Hansen-valid IV elasticity implying roughly −4% to −5% for the sovereign-versus-anchored gap), while the raw common-currency dummy is selection-driven and is not interpreted causally. **Policy relevance.** A partial-equilibrium counterfactual implies that removing the fragmentation-induced volatility friction would raise intra-African trade by about 2% (conservative estimate) to 16% (upper bound), on the order of USD 1.6–12 billion per year, reframing monetary coordination and the Pan-African Payment and Settlement System (PAPSS) as geoeconomic instruments of trade policy.

Keywords: AfCFTA; monetary sovereignty; currency fragmentation; intra-African trade; exchange-rate volatility; PAPSS; gravity model; optimum currency area.
JEL: F15; F33; F45; E42; O24; O55.

1. Introduction

The global economy is fragmenting. Trade wars, sanctions and the weaponization of cross-border payments have pushed the post-1990 consensus toward a more contested, multipolar order in which the currency a country trades and settles in has again become a strategic variable. Emerging and developing economies are the most exposed to this shift, and nowhere is the exposure sharper than in Africa. The African Continental Free Trade Area (AfCFTA) is the most ambitious integration project of the post-war developing world: a single market of 1.3 billion people and a combined output above USD 3 trillion, whose promise is to raise intra-African trade, industrialize the continent, and strengthen Africa's bargaining power in exactly this multipolar economy. Yet the project rests on a paradox. AfCFTA seeks one market, but Africa remains monetarily fragmented into more than forty currencies grouped in incompatible regimes. Intra-African trade has long stagnated near 15% of the continent's total, against roughly 60% in developing Asia and 65% within the European Union. Much of the policy debate attributes this gap to tariffs, infrastructure and non-tariff barriers. This paper turns to a margin that has drawn far less attention, and that speaks directly to how emerging markets navigate a fragmented global economy: the money in which African firms pay one another.

The mechanism is straightforward. Because most African currencies are not directly convertible into one another, a typical intra-African payment is still routed through the US dollar or the euro. A Nigerian importer paying a Kenyan supplier converts naira to dollars and dollars to shillings, bearing two conversion spreads, correspondent-banking fees, settlement delay, and the exchange-rate risk of two legs rather than one. These frictions are largest precisely where currencies are sovereign and floating, and smallest within the CFA and rand zones, where partners either share a money or track a common anchor. Monetary fragmentation is thus a dyadic trade cost, not merely a macroeconomic curiosity.

We make three contributions. First, we document and measure the mechanism: using an original classification of Sub-Saharan African monetary regimes merged onto bilateral data, we show that fragmentation mechanically translates into bilateral exchange-rate volatility. Second, we test the money–trade nexus with a modern gravity toolkit, Poisson pseudo-maximum-likelihood (PPML) with high-dimensional fixed effects, a control-function instrumental-variable Poisson, dynamic-timing and placebo tests, and Oster (2019) selection bounds, and are candid about what is causal and what is selection. Third, we translate the estimates into a policy counterfactual for the two live proposals on Africa's monetary agenda: the Pan-African Payment and Settlement System (PAPSS) and the ECOWAS single-currency ("ECO") project.

The timing of the question is not incidental. AfCFTA's trading regime became operational only in 2021, and the continent is now debating how to move from a legal market to a functioning one. That debate has so far privileged tariff schedules, rules of origin and trade facilitation, while the monetary architecture beneath every cross-border

payment has been treated as a separate, largely macroeconomic, file. Our central methodological point is that the two files are one: the currency regime is a determinant of trade costs at the level of the individual bilateral relationship, and it can therefore be studied with the same gravity apparatus economists use for distance, borders and trade agreements. Placing money inside the gravity equation lets us price fragmentation and assess the monetary reforms, PAPSS and the ECO, as trade-policy instruments rather than monetary curiosities.

Fragmentation translates directly into exchange-rate risk. Bilateral exchange-rate volatility is essentially zero (0.000–0.005) between partners sharing a currency or a common euro anchor, but 0.18–0.24 between sovereign currencies. Common membership in a regional economic community raises bilateral trade three- to six-fold. Bilateral volatility depresses trade within country pairs, though the credible causal magnitude is moderate. A Hansen-valid instrumental-variable elasticity implies about −4% to −5% of trade for the sovereign-versus-anchored volatility gap, smaller than the raw within-pair correlation. The common-currency dummy, by contrast, proves fragile and selection-driven, and we do not give it a causal reading. The counterfactual implies that neutralizing fragmentation-induced volatility would raise intra-African trade by roughly 2% (conservative) to 16% (upper bound), on the order of USD 1.6–12 billion annually. The remainder of the paper proceeds as follows. Section 2 sets out Africa's monetary geography and the geoeconomics of external anchoring. Section 3 develops the conceptual framework. Section 4 presents a structural-gravity model of monetary fragmentation. Sections 5–6 describe the data and empirical strategy. Section 7 presents the results, Section 8 the policy counterfactual, and Section 9 concludes.

2. Africa's monetary geography and the geoeconomics of anchoring

Sub-Saharan Africa offers a natural laboratory of monetary regimes. Of the 48 economies studied here, 21 have de facto ceded national monetary sovereignty through a hard external anchor, while 27 operate an autonomous currency. The anchored group comprises the fourteen CFA franc countries, eight in the West African union (UEMOA, issuing the XOF through the BCEAO) and six in the Central African union (CEMAC, issuing the XAF through the BEAC), the four members of the rand-based Common Monetary Area (CMA), and three further euro pegs (Cabo Verde, Comoros, São Tomé and Príncipe). An often-missed detail is that the CFA franc is not one currency but two: the XOF and XAF are not mutually convertible at par, so a UEMOA–CEMAC pair shares a common euro anchor without sharing a money.

Africa's monetary map is also a map of dependence. The CFA arrangement ties fourteen states to the euro under a convertibility guarantee historically operated through the French Treasury, an external dependence that sits uneasily with the AfCFTA discourse of strategic autonomy. External anchoring delivers price stability: average inflation over

2000–2020 is roughly 4% in the pegged bloc against about 14% under autonomous regimes. It does not, however, deliver a growth premium, and it coincides with an institutional paradox. The CFA countries, which possess no national monetary autonomy, exhibit the region's highest central-bank independence through their supranational central banks, while autonomous regimes carry markedly higher public debt (about 72% of GDP against roughly 50% in the CFA zone). Table 1 summarizes the typology.

Table 1. Monetary-regime typology of the 48 SSA economies, 2000–2020 (author's classification; WDI, IMF WEO, Garriga CBI).

Regime (issuer)	Countries	Anchor	Inflation	Public debt/GDP
UEMOA – CFA West (XOF)	8	Euro (hard)	≈2.4%	≈51%
CEMAC – CFA Central (XAF)	6	Euro (hard)	≈3.1%	≈48%
Common Monetary Area (rand)	4	ZAR (hard)	≈5.6%	≈39%
Other euro pegs (CPV/COM/STP)	3	Euro (hard)	≈6.1%	,
Autonomous currencies	27	None (mostly float)	≈14–17%	≈72%

Note. Inflation and debt are unweighted regime means. The CFA zone shows the highest central-bank independence (supranational BCEAO/BEAC) despite the absence of national monetary autonomy.

The CFA arrangement has itself become a live political question, and the 2019 agreement to reform the West African franc, renaming it, ending the requirement to hold half of foreign reserves with the French Treasury, and withdrawing French representatives from the union's governance bodies, signalled that the monetary status quo is negotiable rather than permanent. Critics of the zone have long argued that the euro peg delivers price stability at the cost of an overvalued real exchange rate, procyclical adjustment and weak private-credit growth, while defenders point to its low inflation and fiscal discipline. Our purpose is not to adjudicate that debate but to observe that any such reform, and any move toward a broader African currency, will reshape the pattern of bilateral exchange-rate volatility that our estimates price. The monetary map, in short, is not fixed, and the trade consequences of redrawing it are quantifiable.

Two reform agendas respond to this fragmentation. The first is monetary unification. The ECOWAS bloc has repeatedly announced, and repeatedly postponed, a single currency (the “ECO”), reflecting the familiar tension between the trade benefits of a shared money and the loss of stabilization policy in economies exposed to asymmetric commodity shocks. The second, and more immediately operational, is payments integration. The Pan-African Payment and Settlement System (PAPSS), launched by Afreximbank in 2022, allows intra-African transactions to be cleared and settled in local currencies through a central platform, bypassing the dollar/euro correspondent chain; Afreximbank estimates the mechanism could save the continent around USD 5 billion a year in transaction costs. PAPSS is attractive precisely because it is sovereignty-preserving: it lowers the friction of fragmentation without requiring states to surrender their currencies. Whether that friction

is quantitatively large enough to matter for trade is an empirical question, to which we now turn.

The payment mechanics are worth spelling out. When two African firms in different currency areas transact, the payment rarely moves directly between their banks. In the absence of a bilateral correspondent relationship, which is the norm outside the CFA and rand zones, the transaction is intermediated through a bank in New York or a European financial centre, converting the exporter's currency into dollars or euros and then into the importer's currency. Each conversion carries a bid–ask spread; each hop carries a fee and a delay of days during which the bilateral rate can move. Fragmentation therefore produces three distinct costs, the conversion spread, the correspondent-banking charge, and exchange-rate risk over the settlement window, of which our volatility measure captures the last and proxies for the whole. PAPSS attacks the first two directly by netting and clearing in local currencies through a central platform; we therefore model it as removing a fraction of the friction rather than eliminating the underlying nominal volatility that a floating currency retains.

3. Conceptual framework and related literature

The analysis sits at the intersection of optimum-currency-area (OCA) theory and the empirical gravity literature. Mundell's (1961) OCA framework weighs the microeconomic efficiency gains of a shared money, lower transaction costs and exchange-rate risk, against the loss of an independent stabilization instrument. Frankel and Rose (1998) show that these criteria are endogenous: trade integration and business-cycle synchronization respond to the monetary arrangement itself, so a currency area may be justified ex post even when it is not ex ante. The empirical counterpart is the “Rose effect” (Rose, 2000), the finding that currency unions are associated with dramatically higher bilateral trade. That literature also supplies its own caution: Persson (2001) argues the effect is contaminated by non-random selection into unions, and Baldwin (2006) documents its fragility. A parallel strand estimates the trade cost of exchange-rate volatility directly (Clark, Tamirisa and Wei, 2004), typically finding modest negative effects. We inherit both the hypotheses and the warnings.

Methodologically we follow the structural-gravity consensus (Anderson and van Wincoop, 2003; Head and Mayer, 2014; Yotov et al., 2016): estimate in levels by PPML to accommodate zero trade flows and heteroskedasticity (Santos Silva and Tenreyro, 2006), and absorb multilateral resistance and pair heterogeneity with exporter-time, importer-time and pair fixed effects. For the African case specifically, Masson and Pattillo (2005), Carrère (2004) and Tsangarides and Qureshi (2008) study regional monetary integration and its trade effects. The gap we fill is the systematic linkage of Africa's regime fragmentation, measured at the level of the currency pair, to AfCFTA's intra-African trade

potential, using contemporary identification tools (control-function IV, dynamic placebos, Oster bounds) rather than a single cross-sectional currency dummy.

The volatility-and-trade channel matters on its own, independently of the currency-union question. Even without a shared money, two economies whose bilateral rate is stable, because both anchor to the same external currency, face little of the settlement risk that deters trade; two sovereign floaters face it in full. Our design therefore separates a common-currency indicator from a common-anchor indicator and from a continuous volatility measure, rather than collapsing them into a single regime dummy. It also connects the paper to a growing literature on digital and mobile payments in Africa, which argues that the binding constraint on intra-African commerce is increasingly the payment rail rather than the tariff. PAPSS is the wholesale analogue of the retail mobile-money revolution, and a volatility-augmented gravity model is built to quantify its trade implications. Our treatment of selection, finally, follows the modern skepticism about the Rose effect: rather than report a single currency coefficient, we subject it to Oster (2019) bounds and show that it does not survive.

4. A structural-gravity model of monetary fragmentation

The empirical section estimates a Poisson gravity equation in which bilateral trade responds to common regional-community membership and to the volatility of the bilateral exchange rate. This section supplies the structure behind that regression: it micro-founds the gravity equation from CES preferences, embeds monetary fragmentation as a component of the bilateral trade cost, and derives the sign and the identifying variation that the estimator exploits. This turns the volatility coefficient into the elasticity of a specific trade friction, and clarifies why the common-currency indicator is not separately identified from selection.

4.1 Environment

There are Neconomies, each producing one nationally differentiated variety (Armington). Let $Y_i$be the value of country i's output, $E_j$destination j's expenditure, and $Y = \sum_i Y_i$world output. Shipping one unit from $i$to $j$requires dispatching $t_{ij} \geq 1$units (iceberg cost).

Assumption 1 (CES preferences). The representative consumer in each destination has CES preferences over origin varieties with elasticity of substitution $\sigma > 1$and positive weights, and minimizes expenditure for a given utility.

The restriction $\sigma > 1$is the gross-substitutes condition; it makes the trade-cost elasticity of trade negative and is maintained throughout.

Assumption 2 (Trade-cost decomposition). The bilateral trade cost separates multiplicatively into a conventional component and a monetary component,

$$\ln t_{ij} = \ln \tau_{ij} + \kappa_{ij} + \rho(v_{ij}), \qquad (1)$$

where τ_{ij} collects distance, contiguity, common language, colonial ties and trade-agreement effects; $\kappa_{ij} \geq 0$ is the resource cost of settling across two currencies (correspondent-banking fees, conversion spreads); and $\rho(v_{ij})$ is a risk premium in the bilateral exchange-rate volatility, v_{ij} with $\rho(0) = 0$ and $\rho' > 0$. A common currency or an integrated payment system (PAPSS) lowers κ_{ij}; a shared anchor lowers v_{ij}.

Assumption 3 (Monetary-regime map). Pair-level volatility v_{ij} and the wedge κ_{ij} are set by the bilateral monetary arrangement: a common currency implies $v_{ij} = 0$ and κ_{ij} at its floor; a shared euro or rand anchor implies $v_{ij} \approx 0$; two sovereign floats imply $v_{ij} > 0$. Exporters commit prices and quantities before the exchange rate realizes and are risk-averse.

Assumption 3 is the model's contact with the data: measured five-year bilateral volatility is 0.0003 for same-currency pairs and 0.005 for same-anchor pairs, against 0.18–0.24 for sovereign or mixed pairs. Fragmentation mechanically injects exchange-rate risk into intra-African trade; the timing and risk-aversion clauses turn that risk into the premium $\rho(v_{ij})$.

4.2 Demand and the risk-averse exporter

Lemma 1 (CES demand and the trade-cost elasticity). Under Assumption 1, destination j's expenditure on variety i is

$$X_{ij} = \frac{Y_i E_j}{Y} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma}, \qquad (2)$$

where Π_i and P_j are the outward and inward multilateral-resistance indices in (3). The elasticity of trade with respect to the trade cost is $1 - \sigma < 0$.

Proof. CES expenditure minimization gives relative demands with constant elasticity $-\sigma$: for any two origins, $\ln(X_{i'j}/X_{ij})$ has slope $-\sigma$ in the relative delivered price (verified symbolically). Aggregating with market clearing and the price indices below yields (2); the exponent $1 - \sigma$ combines the $-\sigma$ demand elasticity with the unit expenditure share of the delivered price (Anderson and van Wincoop, 2003; Head and Mayer, 2014). ▫

Lemma 2 (Volatility raises the effective trade cost). Under Assumption 3, a risk-averse exporter's optimal export volume is strictly decreasing in bilateral volatility; equivalently the certainty-equivalent trade cost rises in, v_{ij} so $\rho' > 0$.

Proof. Let the exporter ship q at foreign-currency price p_s and home marginal cost, c receiving uncertain home revenue $e\, p_s q$ with, $\mathbb{E}[e] = \mu$, $\mathrm{Var}(e) = ss$ increasing in volatility. A mean–variance exporter maximizes, $\mathrm{CE}(q) = (\mu p_s - c)q - \gamma/2\, p_s^2 s\, q^2$ which is strictly concave (second derivative $-\gamma p_s^2 s < 0$). The optimum is, $q^* = (\mu p_s - c)/(\gamma p_s^2 s)$ with $\partial q^* / \partial s = -(\mu p_s - c)/(\gamma p_s^2 s^2) < 0$ whenever exporting is profitable

($\mu p_s > c$). Lower volume at a constant demand elasticity is isomorphic to a higher iceberg cost, so $\rho' > 0$(Clark, Tamirisa and Wei, 2004). ▫

4.3 Trade equilibrium

Definition 1 (Trade equilibrium). A trade equilibrium is flows $\{X_{ij}\}$ and indices $\{\Pi_i, P_j\}$such that consumers minimize expenditure (Lemma 1), goods markets clear ($Y_i = \sum_j X_{ij}$), and

$$P_j^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{\Pi_i}\right)^{1-\sigma} \frac{Y_i}{Y}, \qquad \Pi_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{E_j}{Y}. \qquad (3)$$

Proposition 1 (Structural gravity). Under Assumptions 1–3, equilibrium flows satisfy (2), and the resistance system (3) has a solution $\{\Pi_i, P_j\}$unique up to the normalization of one index.

Proof. Substituting Lemma 1 into market clearing gives (3), the Anderson–van Wincoop system. With strictly positive costs, outputs and expenditures, the mapping it defines on the normalized positive resistance vector is a contraction, so a fixed point exists and is unique up to normalization (Anderson and van Wincoop, 2003; Head and Mayer, 2014). Only relative resistances are pinned down, which is immaterial for the comparative statics below, which hold the resistance system fixed. ▫

4.4 Monetary fragmentation and trade

Proposition 2 (Fragmentation reduces trade). Holding the resistance system fixed, bilateral trade strictly decreases in volatility,

$$\frac{\partial \ln X_{ij}}{\partial v_{ij}} = (1-\sigma)\,\rho'(v_{ij}) < 0, \qquad (4)$$

with absolute semi-elasticity $(\sigma - 1)\rho'$. Symmetrically, a lower conversion wedge raises trade, $\partial \ln X_{ij} / \partial \kappa_{ij} = 1 - \sigma < 0$.

Proof. Differentiate $\ln X_{ij}$from (2) using (1); the resistance terms and $Y_i E_j / Y$are fixed, so $\partial \ln X_{ij} / \partial v_{ij} = (1-\sigma)\rho'(v_{ij})$. With $\sigma > 1$and $\rho' > 0$the sign is negative; the κresult is identical (verified symbolically). ▫

Proposition 3 (Payment integration and coordination). Removing a fraction $\lambda \in (0,1]$of the monetary friction on a pair raises bilateral trade by

$$\frac{\Delta X_{ij}}{X_{ij}} = \exp\left[(\sigma-1)\,\lambda\,(\kappa_{ij} + \rho(v_{ij}))\right] - 1 > 0, \qquad (5)$$

increasing in v_{ij}. Full integration ($\lambda = 1$) removes the whole wedge; a payment system such as PAPSS corresponds to,$\lambda < 1$ capturing the conversion layer but not the entire risk premium.

Proof. Scaling the wedge $(\kappa_{ij} + \rho(v_{ij}))$by $(1 - \lambda)$multiplies $X_{ij}$by $\exp[(\sigma - 1)\lambda(\kappa_{ij} + \rho(v_{ij}))]$; subtracting one gives (5), whose derivative in $v_{ij}$is $(\sigma - 1)\lambda\rho'(v_{ij})\exp[\cdot] > 0$(verified symbolically). ▫

Corollary 1 (Why the common-currency effect is not separately identified). A common currency sets both $v_{ij} \approx 0$and κ_{ij}at its floor and is time-invariant within a pair. Its trade effect is therefore (i) absorbed by pair fixed effects, and (ii) in the cross-section confounded with the country attributes entering Π_i and P_j that also select which countries share a currency. The volatility channel,v_{ij} by contrast, varies within a pair over time and is identified from that variation.

Proof. Time-invariance makes the indicator collinear with the pair fixed effect, giving (i). For (ii), by Proposition 1 the resistances are functions of all bilateral costs and of $\{Y_i, E_j\}$; currency-sharing correlates with these primitives (Assumption 3), so without pair fixed effects the indicator loads on omitted resistance and selection components. Only within-pair variation in $v_{ij}$is orthogonal to the time-invariant pair component. ▫

Corollary 1 is the model's account of the empirical pattern: the common-currency coefficient is sign-unstable and fails an Oster selection-sensitivity test, whereas the within-pair volatility elasticity is the credible object, which is why inference rests on the volatility channel rather than the currency-union dummy (Persson, 2001).

4.5 Testable implications

Taking logs of (2) and appending a multiplicative error gives the Poisson gravity equation estimated below,

$$X_{ij,t} = \exp\left[\mu_{i,t} + \nu_{j,t} + (1 - \sigma)(\delta \ln\text{dist}_{ij} + \boldsymbol{x}'_{ij}\boldsymbol{\beta} + \rho_0\, v_{ij,t})\right]\eta_{ij,t}, \qquad (6)$$

where $\mu_{i,t}$(exporter–year) and $\nu_{j,t}$(importer–year) fixed effects absorb the outward and inward resistances together with $Y_{i,t}$and,$E_{j,t}$ and $\boldsymbol{x}_{ij}$collects contiguity, common language, colonial ties, regional-community membership and the trade agreement. Four implications follow, each mapped to an estimator:

1. **Sign and interpretation.** Proposition 2 predicts a negative coefficient on v_{ij}(the variable er_vol5), equal to $(1 - \sigma)\rho_0$; it estimates the semi-elasticity $(\sigma - 1)\rho_0$of trade to the monetary risk premium, not a free slope. A trade elasticity $\sigma - 1 \approx 5$with $\rho_0 \approx 0.15$implies a coefficient near,-0.75 within the range spanned by the within and instrumented estimates.
2. **Identification.** By Corollary 1, the clean test adds pair fixed effects so that $\rho_0$is identified from within-pair variation in volatility, purged of the time-invariant selection that contaminates the currency-union indicator.

3. **Estimator.** Because (6) is multiplicative with many zero flows, it is estimated by PPML rather than log-OLS, which is inconsistent under heteroskedasticity (Jensen's inequality) and undefined at zeros (Santos Silva and Tenreyro, 2006).
4. **Counterfactual.** Proposition 3 is the payment-system and coordination counterfactual: the proportional gain (5), with $\lambda$the share of the monetary wedge removed, is what the counterfactual computes, and its increase in $v_{ij}$is why gains concentrate on high-volatility pairs.

Estimation of (6) by PPML, the instrumented-Poisson treatment of volatility, and the selection-sensitivity checks are carried out in the following sections.

5. Data

The country layer is a balanced panel of the 48 Sub-Saharan African economies over 2000–2024, drawn from the World Bank's World Development Indicators, IMF World Economic Outlook fiscal series, the Ilzetzki–Reinhart–Rogoff (2019) de-facto exchange-regime classification, the Garriga (2016) central-bank-independence index, and IMF dollarization data. From it we retain the monetary-regime classifiers and the official exchange rate (local currency per US dollar).

The dyadic layer is built from the CEPII Gravity database (version 202211), which provides bilateral trade flows (BACI and IMF Direction of Trade), distance, contiguity, common language, colonial ties, and output for every country pair-year. We keep all pairs with at least one Sub-Saharan African leg over 2000–2020, deduplicate pair-years arising from CEPII's dual country identifiers (e.g. Ethiopia before and after the Eritrean secession), and obtain 441,504 directed pair-year observations, of which 48,384 are intra-African. Onto both the exporter and importer legs we merge the monetary classifiers and construct the dyadic variables of interest: an indicator for sharing the same currency (XOF, XAF or rand); an indicator for a common euro anchor; indicators for both partners being pegged, both sovereign, or of mixed regime; common regional-community membership; and, centrally, bilateral exchange-rate volatility, measured as the five-year rolling standard deviation of the annual change in the log bilateral rate (constructed from the two legs' rates against the dollar). As instruments for bilateral volatility we build leave-one-out measures of each partner's general monetary instability against all its other counterparts.

Three features of the data shape the empirical choices that follow. Intra-African trade is sparse: a large share of possible bilateral pairs record little or no trade in a given year, which is exactly why a Poisson estimator that admits zeros, rather than a log-linear regression that discards them, is essential; the extensive margin is where currency frictions plausibly bite hardest. The volatility measure, next, is constructed to be zero by definition for currency-union and commonly-anchored pairs, so the identifying contrast reflects genuine variation in exchange-rate behaviour rather than an artefact of the classification. The leave-one-out instruments, in turn, rest on a shift-share logic: a country whose currency is generally unstable against the rest of the world imports that instability into each of its

bilateral rates, yet its instability against third countries is plausibly unrelated to the idiosyncratic determinants of any single bilateral trade relationship, satisfying the exclusion restriction conditional on fixed effects. We verify instrument strength and over-identifying validity below.

6. Empirical strategy

The estimating equation is a structural gravity model of bilateral trade estimated by PPML,

$$X_{odt} = exp[\, \beta \cdot VOL_{odt} + \gamma \cdot CUR_{od} + \delta \cdot REC_{odt} + controls_{od} + \mu_{ot} + \nu_{dt} + \lambda_{od}\,] \cdot \varepsilon_{odt},$$

where X_{odt} is exports from o to d in year t, VOL is bilateral exchange-rate volatility, CUR the monetary dummies, REC common-community membership, μ and ν exporter-year and importer-year fixed effects (absorbing size and multilateral resistance), and λ pair fixed effects. Zero flows are retained so the extensive margin is identified. Because common-currency status is essentially time-invariant within a pair, it is absorbed by λ and is therefore identified only cross-sectionally; the time-varying volatility measure, by contrast, is identified within pairs. We confront three threats to a causal reading of β: reverse causality (trade may itself stabilize a bilateral rate), which we address with lagged and dynamic specifications and a control-function IV using leave-one-out instability instruments; selection into currency arrangements, which we probe with Oster (2019) bounds on the currency dummy; and functional-form and inference concerns, which we address with alternative volatility measures, manufactured-goods flows, two-way clustering, and a valid non-overlapping placebo.

7. Results

7.1 The mechanism: fragmentation generates bilateral volatility

Table 2 reports mean bilateral exchange-rate volatility by the monetary configuration of the pair. The pattern is stark and mechanical. Partners that share a currency face essentially no bilateral volatility (0.0003); partners that merely share a common euro anchor, including CFA West–Central pairs that use different monies, face almost as little (0.0049). Pairs of mixed regime average 0.179, and pairs of sovereign floating currencies 0.242, roughly four hundred to seven hundred times the anchored figure. This is the friction that fragmentation imposes on intra-African exchange.

Table 2. Bilateral exchange-rate volatility by monetary pairing, intra-African pairs, 2000–2020.

Pair configuration	Mean bilateral ER volatility
Same currency (XOF / XAF / rand)	0.0003
Common euro anchor (both CFA / euro-pegged)	0.0049
Mixed regime (one pegged, one sovereign)	0.179
Both sovereign (own floating currencies)	0.242

7.2 Structural gravity estimates

Table 3 presents the PPML gravity results. The standard forces behave exactly as theory predicts: contiguity multiplies trade roughly seven-fold, common language nearly triples it, and regional trade agreements enter positively. The most robust new result concerns regional integration blocs, common membership of a regional economic community raises intra-African trade by a factor of three to six (coefficients of 1.14 to 1.89), a large and clean effect. The monetary variables require a more careful reading. Across the intra-African specifications the raw common-currency dummy enters negative and the cross-sectional volatility coefficient positive, the opposite of the naive hypothesis. This is selection, not causation: the CFA countries that share a currency are small, peripheral economies that trade little with one another and much with Europe, whereas the pairs with high bilateral volatility are the large intra-African traders (Nigeria, Ghana, Angola, the DRC, South Africa) that run sovereign currencies. Exporter-time and importer-time fixed effects absorb country size but not this pair-level selection. The moment pair fixed effects are added (column 4), the volatility coefficient flips to the theoretically expected negative sign (−1.50).

Table 3. PPML gravity estimates. DV = bilateral trade. All columns: exporter-year and importer-year FE; column 4 adds pair FE. SE clustered by pair.

Variable	(1) SSA+world	(2) intra-Afr	(3) intra-Afr	(4) +pair FE	(5) DOTS
Log distance	−0.25***	0.24**	0.22**	,	0.36***
Contiguity	1.68***	1.83***	1.98***	,	2.05***
Common language	0.61***	0.88***	1.06***	,	1.22***
Colonial link	0.45***	0.24	0.47	,	0.20
Common currency	−0.25	−0.81**	−0.84**	(absorbed)	−1.16***
Common euro anchor	0.81**				
Common REC	0.75***	1.14***	1.89***	(collinear)	2.55***
RTA in force	0.36***	0.88***		−0.93	
Bilateral ER volatility			2.87**	−1.50*	3.36***
Observations	338,781	44,989	37,337	34,515	36,879

** p<0.10, ** p<0.05, *** p<0.01. Columns 2–5 restrict to intra-African pairs.*

7.3 Robustness and the causal magnitude of volatility

Table 4 collects the robustness and identification tests for the within-pair volatility effect. The negative association is stable in sign and magnitude: −1.49 in the baseline, −2.33 when volatility is lagged one year, −2.14 when the two dominant traders are excluded, and −1.09 with a three-year volatility window; it survives conservative two-way (exporter and importer) clustering. Dynamic timing is instructive: using clean single-year exchange-rate shocks, the lagged shock significantly depresses trade while the contemporaneous one does not, consistent with pre-arranged contracts, and future shocks are jointly insignificant, with a distant (t+3) placebo that is a precise null; the placebo

therefore passes. A control-function instrumental-variable Poisson, instrumenting bilateral volatility with each partner's leave-one-out instability (first-stage F ≈ 272; Hansen J p = 0.21, so the over-identifying restrictions are not rejected), returns a significant but moderate causal elasticity of −0.229, implying about a 4–5% trade reduction for the sovereign-versus-anchored volatility gap. Oster (2019) bounds, lastly, confirm that the common-currency dummy is fragile: the ratio of selection on unobservables to observables needed to nullify it is only 0.13, far below the conventional threshold of one, and its sign flips between estimators. We therefore treat bilateral volatility as a robust, if moderate, causal drag on trade, and the common-currency dummy as selection.

Table 4. Robustness and identification for the within-pair volatility effect (intra-African sample; see appendix log for full output).

Test	Coefficient / result
Baseline (pair + exp-yr + imp-yr FE)	−1.49* (≈ −26% for +0.2 vol)
Lagged volatility (t−1)	−2.33***
Three-year window	−1.09*
Exclude South Africa & Nigeria	−2.14**
Two-way cluster (exporter & importer)	−1.49 (coef. stable)
Dynamic: t−1 shock / future joint / t+3 placebo	−0.77** / ns (p=0.14) / −0.15 ns
IV-Poisson (Hansen J p=0.21; F≈272)	−0.229*** (≈ −4–5%)
Oster δ, common-currency dummy	0.13 (fragile)

7.4 Alternative outcomes, functional form, and heterogeneity

Three further checks support the reading. Restricting the dependent variable to manufactured goods, the differentiated products for which exchange-rate risk and payment frictions should matter most, yields a coefficient of similar sign and magnitude (about −1.4), though less precisely estimated on the thinner manufactures sample. A Santos Silva–Tenreyro RESET test flags mild functional-form misspecification in the two-way-fixed-effects specification, which is unsurprising given the parsimonious covariate set and is one motivation for the pair-fixed-effects design; it does not overturn the sign or robustness of the volatility result. Heterogeneity, lastly, is absent: interacting bilateral volatility with contiguity, with a post-2008 indicator, and with common-community membership produces uniformly insignificant interaction terms. The volatility drag is broad-based rather than concentrated in a particular subgroup or period, which is what one expects from a mechanism operating through the universal channel of payment and settlement costs.

8. Policy counterfactual: PAPSS and monetary coordination

What is the trade prize from removing the exchange-rate friction that fragmentation imposes? We answer with a partial-equilibrium counterfactual that applies the estimated semi-elasticities to the observed bilateral volatility of actual intra-African trade, winsorizing volatility at its 95th percentile so that a handful of hyperinflation episodes, which no payments reform can address, do not drive the linear extrapolation. Two policy levers are distinguished. Full monetary coordination (a shared currency or anchor, as under

the ECO) brings bilateral volatility down to the anchored benchmark; PAPSS, more modestly, removes the correspondent-banking and conversion layer, which we represent as eliminating a fraction (25–40%) of the friction.

Table 5. Counterfactual intra-African trade gains (intensive margin, trade-weighted).

Scenario	IV central (causal)	Within-pair (upper)
Monetary coordination / ECO (to anchor)	+2.3%	+16%
PAPSS payments integration (≈40%)	+0.9%	+6.1%
PAPSS partial (≈25%, conservative)	+0.6%	+3.7%

On the 2019 intra-African trade base in the sample (about USD 72 billion), full coordination implies a gain of USD 1.6 billion under the conservative causal elasticity and up to USD 11.8 billion under the upper bound, while a PAPSS-style 40% reduction yields USD 0.6–4.4 billion. Reassuringly, the upper-bound PAPSS figure brackets Afreximbank's own independent estimate of roughly USD 5 billion in annual transaction-cost savings, external corroboration of the order of magnitude. Figure 1 displays the full set of scenarios.

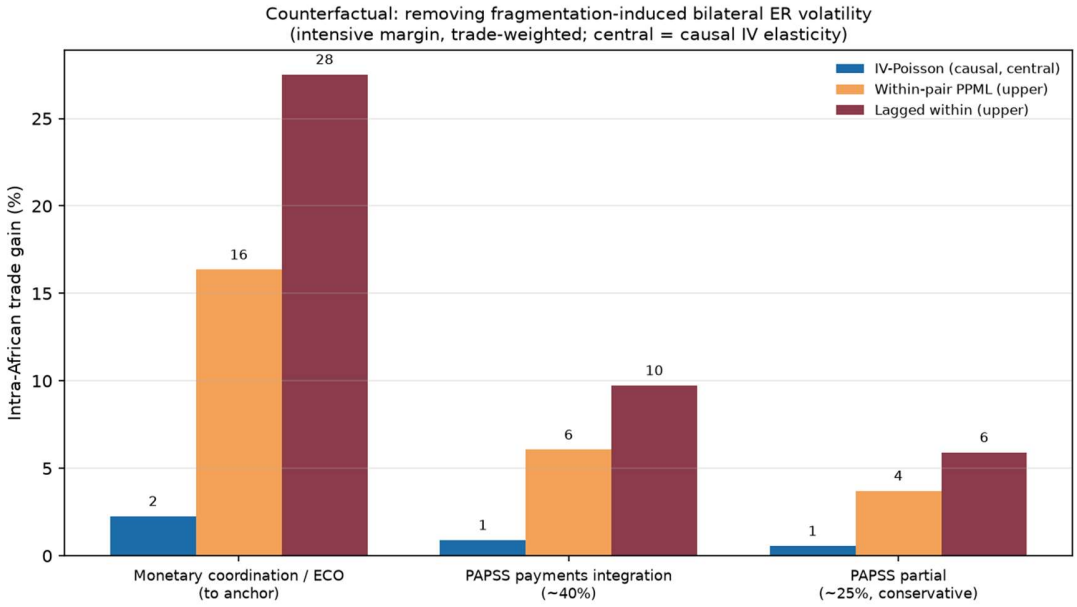


Figure 1. Counterfactual intra-African trade gains from removing fragmentation-induced bilateral exchange-rate volatility.

Three qualifications temper these numbers. The exercise is partial-equilibrium, a reduced-form elasticity applied ceteris paribus rather than a general-equilibrium or CGE simulation, a natural extension. It captures only the intensive margin, so new trading relationships would add more. And PAPSS is not full coordination, so its row is a deliberate fraction of the first. Even with these caveats, the policy reading holds: monetary fragmentation is a first-order, addressable barrier to AfCFTA's central objective, and a

sovereignty-preserving payments architecture captures a meaningful share of the prize without the political cost of currency union.

The counterfactual also bears on the sequencing debate that has long paralysed African monetary integration. The endogenous-OCA logic implies that trade integration and monetary coordination are complements whose optimal order is trade-first: as intra-African trade deepens under AfCFTA and PAPSS, business cycles synchronize and the cost of a shared stabilization policy falls, improving the conditions under which a currency union such as the ECO could eventually succeed. Attempting the reverse, locking in a single currency before trade has thickened, across economies still subject to asymmetric commodity shocks, risks importing the very "stability-without-development" critique long levelled at the CFA zone. The distributional reading reinforces the point. The economies that would gain most from lower bilateral volatility are the smaller, non-anchored traders on the periphery of intra-African commerce, for whom correspondent-banking access is thinnest and conversion costs proportionally largest; a continental payments utility is therefore as much inclusion-enhancing as efficiency-enhancing, aligning with AfCFTA's stated development objectives.

9. Conclusion and policy implications

AfCFTA sets out to build one market on top of many monies, and this paper has shown that the monetary seam matters. Fragmentation injects bilateral exchange-rate risk into intra-African trade; that risk is a robust, if moderate, causal drag on bilateral flows; and neutralizing it could raise intra-African trade by roughly 2% to 16%, worth on the order of USD 1.6–12 billion a year. The negative result matters as much: the headline currency-union effect familiar from the Rose literature is, in the African cross-section, an artifact of selection, and we decline to build policy on it.

For policymakers the implications are ordered. In the near term, accelerating PAPSS adoption is a low-political-cost, sovereignty-preserving way to strip out the correspondent-banking and conversion layer of the friction, with continental gains plausibly in the low billions of dollars annually. In the medium term, sequencing matters: the endogenous-OCA logic suggests that deepening trade first, through AfCFTA implementation and payments integration, improves the conditions under which any future monetary coordination (the ECO, and beyond) would deliver, rather than the reverse. Throughout, monetary policy should be read as an instrument of trade policy and of geoeconomic autonomy. For a bloc of emerging markets facing a fragmenting global economy, reducing reliance on the dollar and euro for its own internal commerce is simultaneously a trade-cost reduction and a hedge against external monetary and payment-system shocks, and it strengthens Africa's collective position in the governance of a contested global trading system.

Several limitations qualify the analysis and mark the research agenda. The counterfactual is partial-equilibrium and confined to the intensive margin; embedding the

estimated elasticities in a structural or computable-general-equilibrium model would capture the extensive margin, terms-of-trade and welfare effects, and the general-equilibrium reallocation of trade across partners. Our identification, though reinforced by instruments, dynamics and placebos, isolates a moderate causal effect whose precise magnitude remains specification-sensitive, and the volatility measure, a rolling standard deviation built from annual data, is a proxy for a settlement-window risk that higher-frequency data would measure better. The deepest limitation is temporal: because AfCFTA trading began only in 2021, our sample necessarily estimates the structural relationship over the pre-AfCFTA era and simulates the reform's monetary complement rather than observing it. As post-2021 bilateral data and PAPSS adoption accumulate, a direct evaluation of the payments reform, ideally exploiting the staggered onboarding of countries and banks, will become feasible and is the natural sequel to this paper.

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References

Anderson, J. E., & van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. American Economic Review, 93(1), 170–192. https://doi.org/10.1257/000282803321455214

Baldwin, R. (2006). The euro's trade effects. ECB Working Paper No. 594. European Central Bank.

Carrère, C. (2004). African regional agreements: Impact on trade with or without currency unions. Journal of African Economies, 13(2), 199–239. https://doi.org/10.1093/jae/ejh010

Clark, P., Tamirisa, N., & Wei, S.-J. (2004). Exchange rate volatility and trade flows, some new evidence. International Monetary Fund.

Frankel, J. A., & Rose, A. K. (1998). The endogeneity of the optimum currency area criteria. Economic Journal, 108(449), 1009–1025. https://doi.org/10.1111/1468-0297.00327

Garriga, A. C. (2016). Central bank independence in the world: A new data set. International Interactions, 42(5), 849–868. https://doi.org/10.1080/03050629.2016.1188813

Head, K., & Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In Handbook of International Economics (Vol. 4, pp. 131–195). Elsevier. https://doi.org/10.1016/B978-0-444-54314-1.00003-3

Ilzetzki, E., Reinhart, C. M., & Rogoff, K. S. (2019). Exchange arrangements entering the twenty-first century: Which anchor will hold? Quarterly Journal of Economics, 134(2), 599–646. https://doi.org/10.1093/qje/qjy033

Masson, P. R., & Pattillo, C. (2005). The Monetary Geography of Africa. Brookings Institution Press. ISBN 978-0-8157-5500-5

Mundell, R. A. (1961). A theory of optimum currency areas. American Economic Review, 51(4), 657–665.

Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. Journal of Business & Economic Statistics, 37(2), 187–204. https://doi.org/10.1080/07350015.2016.1227711

Persson, T. (2001). Currency unions and trade: How large is the treatment effect? Economic Policy, 16(33), 433–462. https://doi.org/10.1111/1468-0327.00081

Rose, A. K. (2000). One money, one market: The effect of common currencies on trade. Economic Policy, 15(30), 8–45. https://doi.org/10.1111/1468-0327.00056

Santos Silva, J. M. C., & Tenreyro, S. (2006). The log of gravity. Review of Economics and Statistics, 88(4), 641–658. https://doi.org/10.1162/rest.88.4.641

Tsangarides, C. G., & Qureshi, M. S. (2008). Monetary union membership in West Africa: A cluster analysis. World Development, 36(7), 1261–1279. https://doi.org/10.1016/j.worlddev.2007.06.019

Yotov, Y. V., Piermartini, R., Monteiro, J.-A., & Larch, M. (2016). An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model. World Trade Organization & UNCTAD. ISBN 978-92-870-4367-2