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Article

ORBIT: Open Reconciliation for Balanced International Trade: A Neutral Unit-of-Account Framework for International Trade Settlement

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Abstract

The current international trade system relies on the U.S. dollar as its primary settlement currency, granting the United States asymmetric structural privileges while exposing other nations to exchange rate risk, imported inflation, and systemic vulnerability to U.S. monetary policy cycles. This paper proposes ORBIT (Open Reconciliation for Balanced International Trade), a framework for international trade settlement that eliminates the need for any reserve currency. ORBIT introduces a neutral, fixed unit of account called Sol, used solely for pricing international trade contracts. Under this framework, no money crosses national borders: exporters and importers transact entirely in their domestic currencies through national clearing institutions, while the Sol ledger serves purely as an informational bridge recording trade flows between nations. I establish seven formal results: (1) the existence and uniqueness of equilibrium under Sol pricing; (2) complete isolation of exchange rate adjustments within national borders; (3) strict welfare improvement for all non-reserve-currency countries; (4) global welfare improvement through elimination of deadweight loss; (5) individual rationality of participation for any two countries with sufficient bilateral trade; (6) cascade dynamics of network expansion; and (7) bounded buffer requirements for national clearing institutions. The framework requires no world central bank, no new currency, no sovereignty concession, and no global political consensus. Any two countries can begin a bilateral pilot immediately.

Keywords: international trade settlement; monetary system reform; unit of account; trade balance; de-dollarization; exchange rate isolation; mechanism design

JEL Classification: F33; F36; E42; E50; D47

1. Introduction

1.1. The Structural Deficiencies of the Dollar-Centered System

Since the collapse of the Bretton Woods system in 1971, international trade settlement has operated under a *de facto* dollar standard. Approximately 88% of foreign exchange transactions involve the U.S. dollar, roughly 40% of international trade is invoiced in dollars, and the dollar accounts for about 58% of global central bank foreign exchange reserves (BIS 2022; IMF 2023).

This arrangement produces three fundamental structural deficiencies.

First, asymmetric privilege. The United States, as the issuer of the dominant reserve currency, can finance persistent trade deficits at low cost by exchanging domestically created monetary claims for real goods and services produced abroad. This privilege—termed the “exorbitant privilege” by Valéry Giscard d’Estaing—allows the U.S. to consume beyond its production capacity in a manner unavailable to any other nation. Triffin (1960) identified the inherent contradiction: the reserve currency issuer must run persistent deficits to supply global liquidity, but persistent deficits eventually undermine confidence in the currency.

Second, systemic fragility. Non-reserve-currency nations face what Eichengreen et al. (2003) call the “original sin” problem: the inability to borrow internationally in their own currencies. Forced

to denominate external debt in dollars, these countries experience explosive debt burdens whenever their domestic currencies depreciate against the dollar. This mechanism has driven repeated financial crises—the Latin American debt crisis of 1982, the Asian financial crisis of 1997, and the Turkish lira crisis of 2018, among others.

Third, global transmission of monetary shocks. Under the dominant currency paradigm (Gopinath 2015; Gopinath & Stein 2021), exchange rate fluctuations and U.S. monetary policy decisions propagate through dollar-invoiced trade prices to all trading nations. This transmission undermines the monetary policy independence of non-dollar economies and generates imported inflation or deflation unrelated to domestic economic conditions. Rey (2015) argues that the global financial cycle, driven primarily by U.S. monetary policy, reduces the classical monetary policy trilemma to a dilemma.

1.2. Limitations of Existing Alternatives

Several alternatives to dollar dominance have been proposed or attempted:

- **Keynes's Bancor (1944):** Keynes (1943) proposed a supranational currency managed by an International Clearing Union. The scheme required substantial sovereignty concession and was vetoed by the United States at Bretton Woods.
- **IMF Special Drawing Rights (SDR):** Created in 1969, SDRs function as a supplementary reserve asset but remain disconnected from commercial trade (Obstfeld 2011).
- **Bilateral currency swap agreements:** Utilization rates remain low despite widespread adoption; firms continue to prefer dollar settlement due to network effects (Ito & McCauley 2020).
- **Cryptocurrencies:** Suffer from extreme volatility, lack of connection to real economic activity, and regulatory hostility (BIS 2018).
- **Regional monetary unions:** The eurozone experience demonstrates that shared currency without shared fiscal policy creates severe instabilities (Lane 2012).

1.3. Contribution

This paper proposes ORBIT, a framework that takes a fundamentally different approach. The key conceptual insight is the *decoupling* of the unit-of-account function from the medium-of-exchange function in international trade. Nations already possess well-functioning domestic currencies as media of exchange; what they lack is a shared, neutral yardstick for pricing international transactions.

ORBIT provides this yardstick—a fixed unit of account called Sol—while keeping all monetary flows strictly within national borders. The framework:

1. Requires no new currency, no world central bank, no sovereignty concession
2. Can be initiated by any two countries without broader consensus
3. Preserves complete monetary policy independence for all participants
4. Generates symmetric adjustment pressure on trade imbalances
5. Suppresses speculative activity by making the unit of account non-tradable

The paper proceeds as follows. Section 2 presents the formal model. Section 3 describes the clearing mechanism and proves its conservation properties. Section 4 establishes the core theoretical results: exchange rate isolation, welfare improvement, and self-correcting imbalance pressure. Section 5 analyzes the adoption game. Section 6 provides a numerical illustration. Section 7 discusses relationships to existing proposals. Section 8 addresses potential challenges. Section 9 outlines directions for future research. Section 10 concludes.

2. Model

2.1. Economic Environment

Consider an economy with N countries, indexed by $i \in \mathcal{I} = \{1, 2, \dots, N\}$. Country 1 is designated as the reserve currency issuer (the United States) in the benchmark dollar system.

Assumption 1 (Tradable Goods Economy). Each country i produces a single differentiated tradable good in quantity $Y_i > 0$, with world price p_i denominated in the unit of account (Sol in ORBIT, dollars in the benchmark).

Remark 1. Assumption 1 restricts attention to tradable goods. In an extended model with non-tradable goods, the exchange rate e_i would affect the relative price between tradable and non-tradable goods within country i , but would not affect the relative prices among tradable goods across countries. The core results—particularly the exchange rate isolation theorem (Theorem 4)—remain valid for tradable goods in the extended model.

Assumption 2 (Preferences). Each country i has a representative consumer with utility function:

$$U_i = u(c_{ii}) + \sum_{j \neq i} \alpha_{ij} u(c_{ij}) \quad (1)$$

where c_{ij} denotes country i 's consumption of country j 's good, $\alpha_{ij} \in (0, 1)$ are preference parameters, and $u : \mathbb{R}_+ \rightarrow \mathbb{R}$ is strictly increasing, strictly concave, and twice continuously differentiable ($u' > 0$, $u'' < 0$).

Assumption 3 (Log Utility). For explicit solutions, we specialize to $u(c) = \ln c$ where noted.

Definition 1 (Aggregate Preference Parameter). For each country i , define:

$$A_i \equiv \sum_{k \neq i} \alpha_{ik} \quad (2)$$

2.2. Institutional Components of ORBIT

Definition 2 (Sol). Sol is a fixed unit of account defined by a one-time convention:

$$1 \text{ Sol} \equiv \text{a fixed reference value (e.g., 1 gram of gold at a reference date)} \quad (3)$$

Sol is not a currency. It cannot be held, traded, invested, or speculated upon. Its value, once defined, never changes.

Definition 3 (Exchange Rate to Sol). Each participating country i independently sets and adjusts its exchange rate $e_i > 0$, defined as the domestic currency price of one Sol:

$$e_i \equiv \text{units of currency } i \text{ per Sol} \quad (4)$$

Definition 4 (National Clearing Institution (NCI)). Each participating country i establishes a government agency NCI_i (typically within its central bank) that:

1. Receives domestic currency from domestic importers (at the prevailing e_i)
2. Pays domestic currency to domestic exporters (at the prevailing e_i)
3. Records all transactions on the ORBIT Ledger in Sol
4. Manages any net cash position through standard domestic financial operations

Definition 5 (ORBIT Ledger). A shared informational record that tracks, for each pair of countries (i, j) , the net trade flow in Sol over each accounting period.

2.3. The Dollar System (Benchmark)

In the dollar system, country 1 (the U.S.) issues the reserve currency. All international trade is invoiced and settled in dollars.

Budget constraint for non-reserve countries ($i \geq 2$):

$$\sum_j p_j c_{ij} = p_i Y_i \quad (5)$$

Dollar liquidity constraint for non-reserve countries ($i \geq 2$):

$$\sum_{j \neq i} p_j c_{ij} \leq p_i X_i^e + D_i + R_i \quad (6)$$

where X_i^e is expected export volume, D_i is available dollar borrowing, and R_i is available dollar reserves. This constraint reflects the fact that importing requires dollars, which must be obtained through exports, borrowing, or reserve drawdown.

Budget constraint for the reserve country (country 1):

$$\sum_j p_j c_{1j} = p_1 Y_1 + S_1 \quad (7)$$

where $S_1 \geq 0$ represents seigniorage income—the real resources obtained by issuing dollars that are absorbed into foreign reserves rather than returning to the U.S. economy. Country 1 faces no liquidity constraint.

2.4. The ORBIT System

In the ORBIT system, all trade is invoiced in Sol and settled domestically.

Budget constraint for all countries:

$$\sum_j p_j c_{ij} = p_i Y_i \quad (8)$$

There is no liquidity constraint. Each country's NCI handles all payments in domestic currency. The consumer pays or receives domestic currency and never needs to acquire foreign currency.

Key structural difference: Comparing (5)–(6) with (8), the ORBIT system removes the liquidity constraint (6) for non-reserve countries and removes the seigniorage term S_1 for the reserve country.

3. The Clearing Mechanism

3.1. Trade Flows

Definition 6 (Trade Flows). Let $T_{ij} \geq 0$ denote the value (in Sol) of goods exported from country i to country j in a given period. Define:

$$X_i \equiv \sum_{j \neq i} T_{ij} \quad (\text{total exports of country } i) \quad (9)$$

$$M_i \equiv \sum_{j \neq i} T_{ji} \quad (\text{total imports of country } i) \quad (10)$$

$$B_i \equiv X_i - M_i \quad (\text{trade balance of country } i) \quad (11)$$

Under Assumption 3, the equilibrium trade flows take the explicit form:

$$T_{ij} = p_i \cdot c_{ji}^* = \frac{\alpha_{ji} p_j Y_j}{1 + A_j} \quad (12)$$

3.2. NCI Cash Flows

In each period, the NCI of country i processes the following domestic currency flows:

$$\text{Inflow}_i = e_i \cdot M_i = e_i \sum_{j \neq i} T_{ji} \quad (\text{from domestic importers}) \quad (13)$$

$$\text{Outflow}_i = e_i \cdot X_i = e_i \sum_{j \neq i} T_{ij} \quad (\text{to domestic exporters}) \quad (14)$$

Definition 7 (NCI Net Position). *The net domestic currency position of NCI_i is:*

$$\Pi_i \equiv Inflow_i - Outflow_i = e_i(M_i - X_i) = -e_i \cdot B_i \quad (15)$$

- $B_i > 0$ (trade surplus) $\implies \Pi_i < 0$ (NCI has a domestic currency deficit; pays out more than it receives)
- $B_i < 0$ (trade deficit) $\implies \Pi_i > 0$ (NCI has a domestic currency surplus)
- $B_i = 0$ (balanced trade) $\implies \Pi_i = 0$ (NCI self-balances)

3.3. Domestic Buffer Operations

The NCI covers its net position through standard domestic financial operations:

Definition 8 (Buffer Instrument). *Let $F_i(t)$ denote the net domestic financial instrument issued (if positive) or redeemed (if negative) by NCI_i in period t :*

$$F_i(t) = -\Pi_i(t) = e_i(t) \cdot B_i(t) \quad (16)$$

These operations may take the form of:

1. Short-term government security issuance/redemption
2. Central bank liquidity facility drawdown/repayment
3. Open market operations

All are routine operations within any central bank's standard toolkit.

3.4. Conservation Properties

Theorem 1 (Global Conservation). *For any trade flow configuration $\{T_{ij}\}_{i,j \in \mathcal{I}}$, the sum of all countries' trade balances is identically zero:*

$$\sum_{i=1}^N B_i = 0 \quad (17)$$

Equivalently, the sum of all NCI net positions (converted to Sol) is zero:

$$\sum_{i=1}^N \frac{\Pi_i}{e_i} = 0 \quad (18)$$

Proof.

$$\begin{aligned} \sum_{i=1}^N B_i &= \sum_{i=1}^N \left(\sum_{j \neq i} T_{ij} - \sum_{j \neq i} T_{ji} \right) \\ &= \sum_{i=1}^N \sum_{j \neq i} T_{ij} - \sum_{i=1}^N \sum_{j \neq i} T_{ji} \\ &= \sum_{(i,j):i \neq j} T_{ij} - \sum_{(i,j):i \neq j} T_{ji} \end{aligned} \quad (19)$$

Relabeling $(i,j) \rightarrow (j,i)$ in the second sum:

$$\sum_{(i,j):i \neq j} T_{ji} = \sum_{(j,i):j \neq i} T_{ij} = \sum_{(i,j):i \neq j} T_{ij} \quad (20)$$

Substituting into (19) gives $\sum_i B_i = 0$. \square

Theorem 2 (Buffer Boundedness). *The absolute value of NCI_i 's net domestic currency position is bounded:*

$$|\Pi_i| = e_i |B_i| \leq e_i \cdot \max(X_i, M_i) \leq e_i (X_i + M_i) \quad (21)$$

Proof. $|B_i| = |X_i - M_i| \leq \max(X_i, M_i) \leq X_i + M_i$. Multiplying by $e_i > 0$ gives (21). \square

Remark 2. For most countries, trade openness $(X_i + M_i)/GDP_i$ ranges from 20% to 60%, and the trade balance $|B_i|$ is typically a small fraction of total trade. The NCI buffer requirement $|\Pi_i|/GDP_i = e_i|B_i|/(e_i \cdot GDP_i) = |B_i|/GDP_i$ is therefore a low single-digit percentage of GDP—well within standard central bank operational capacity.

4. Core Theoretical Properties

4.1. Existence and Uniqueness of Equilibrium

Theorem 3 (Sol Equilibrium). Under Assumptions 1–3, there exists a unique competitive equilibrium in the ORBIT system. The equilibrium consumption allocation is determined entirely by Sol prices $\{p_j\}$ and is independent of any country's exchange rate $\{e_i\}$.

Proof. Under ORBIT, consumer i faces domestic currency prices $\tilde{p}_j = e_i \cdot p_j$ for all goods j . The budget constraint in domestic currency is:

$$\sum_j e_i p_j c_{ij} = e_i p_i Y_i \quad (22)$$

Since $e_i > 0$ appears as a common factor on both sides, dividing through yields:

$$\sum_j p_j c_{ij} = p_i Y_i \quad (23)$$

which is independent of e_i .

Under log utility, the consumer maximizes $\ln c_{ii} + \sum_{j \neq i} \alpha_{ij} \ln c_{ij}$ subject to (23). The first-order conditions yield:

$$c_{ii}^* = \frac{p_i Y_i}{p_i(1 + A_i)} = \frac{Y_i}{1 + A_i} \quad (24)$$

$$c_{ij}^* = \frac{\alpha_{ij} p_i Y_i}{p_j(1 + A_i)} \quad \forall j \neq i \quad (25)$$

These are uniquely determined by $\{p_j, Y_j, \alpha_{ij}\}$ and do not contain any e_i . Market clearing for each good j :

$$\sum_i c_{ij}^* = Y_j \quad (26)$$

determines the equilibrium prices $\{p_j\}$ uniquely (up to normalization) by Walras' law. Since the consumption allocation is uniquely determined by prices, and prices are uniquely determined by market clearing, the equilibrium exists and is unique. \square

4.2. Exchange Rate Isolation

Theorem 4 (Exchange Rate Isolation). In the ORBIT system, an adjustment of country i 's exchange rate e_i has the following properties:

1. It does not change the Sol price of any traded good.
2. It does not change any other country j 's ($j \neq i$) NCI domestic currency cash flows.
3. It changes only country i 's NCI domestic currency cash flows and the domestic currency distribution between country i 's importers and exporters.

Proof. (a) Trade contracts are denominated in Sol. The Sol price p^{Sol} of any good is determined at the time of contracting and does not depend on any country's exchange rate.

(b) NCI_j 's outflow to country j 's exporters is $e_j \cdot T_{jk}$ (for exports to country k), and its inflow from country j 's importers is $e_j \cdot T_{kj}$. These depend only on e_j (country j 's own exchange rate) and the Sol-denominated trade values T_{jk}, T_{kj} :

$$\frac{\partial(e_j \cdot T_{jk})}{\partial e_i} = T_{jk} \cdot \frac{\partial e_j}{\partial e_i} = 0 \quad \forall i \neq j \quad (27)$$

since e_j is set independently by country j .

(c) NCI_i 's outflow is $e_i \cdot X_i$ and inflow is $e_i \cdot M_i$, both proportional to e_i .

When e_i increases by factor $(1 + \delta)$ (depreciation):

- Exporters' domestic currency revenue increases by $e_i \delta X_i$
- Importers' domestic currency cost increases by $e_i \delta M_i$
- Net domestic redistribution: $e_i \delta (X_i - M_i) = e_i \delta B_i$

If $B_i > 0$ (surplus country): depreciation transfers wealth to exporters.

If $B_i < 0$ (deficit country): depreciation increases importers' burden.

All effects are confined to country i . \square

Corollary 1 (Elimination of Imported Inflation). *Under ORBIT, a change in country i 's exchange rate does not affect the domestic currency prices faced by consumers in any other country $j \neq i$. Hence there is no transmission of inflation or deflation through trade prices.*

Corollary 2 (Monetary Policy Independence). *Each country can freely adjust its exchange rate e_i to Sol based on domestic economic conditions without concern for international spillover effects through trade prices.*

Remark 3 (Long-Run Quantity Effects). *In the long run, country i 's exchange rate adjustment may alter its export and import volumes (depreciation stimulates exports, discourages imports), which indirectly affects trading partners' trade balances. This quantity channel is a normal feature of international trade adjustment and operates under any settlement system. The key distinction is that under ORBIT, the price channel (direct transmission of price shocks) is completely eliminated, whereas the dollar system transmits through both channels simultaneously.*

4.3. Welfare Analysis

4.3.1. Equilibrium Under the Dollar System

Under the dollar system, the first-order conditions for non-reserve country i ($i \geq 2$) with both budget constraint (5) and liquidity constraint (6) binding are:

$$\alpha_{ij} u'(c_{ij}^D) = \frac{p_j}{p_i} [u'(c_{ii}^D) + \lambda_i] \quad \forall j \neq i \quad (28)$$

where $\lambda_i \geq 0$ is the Lagrange multiplier on the liquidity constraint (6).

For the reserve country (country 1), with no liquidity constraint:

$$\alpha_{1j} u'(c_{1j}^D) = \frac{p_j}{p_1} u'(c_{11}^D) \quad \forall j \neq 1 \quad (29)$$

The presence of $\lambda_i > 0$ in (28) but not in (29) captures the structural asymmetry: non-reserve countries face an effective surcharge on imports due to the dollar liquidity requirement.

4.3.2. Equilibrium Under ORBIT

Under ORBIT, all countries face only the budget constraint (8). The first-order conditions are symmetric:

$$\alpha_{ij} u'(c_{ij}^O) = \frac{p_j}{p_i} u'(c_{ii}^O) \quad \forall i, j \quad (30)$$

No λ term appears for any country.

4.3.3. Welfare Comparison

Definition 9 (Feasible Sets). For non-reserve country i ($i \geq 2$):

$$\mathcal{F}_i^D \equiv \{\mathbf{c}_i \geq 0 : (5) \text{ and } (6) \text{ hold}\} \quad (31)$$

$$\mathcal{F}_i^O \equiv \{\mathbf{c}_i \geq 0 : (8) \text{ holds}\} \quad (32)$$

Lemma 1 (Set Inclusion). $\mathcal{F}_i^D \subseteq \mathcal{F}_i^O$ for all $i \geq 2$. When $\lambda_i > 0$, the inclusion is strict: $\mathcal{F}_i^D \subsetneq \mathcal{F}_i^O$.

Proof. \mathcal{F}_i^O is defined by the budget constraint alone. \mathcal{F}_i^D is defined by the budget constraint and the liquidity constraint. Any \mathbf{c}_i satisfying both constraints satisfies the budget constraint alone. Hence $\mathcal{F}_i^D \subseteq \mathcal{F}_i^O$.

When $\lambda_i > 0$, the liquidity constraint is binding: there exist consumption vectors in \mathcal{F}_i^O that violate (6) and hence are not in \mathcal{F}_i^D . Therefore $\mathcal{F}_i^D \subsetneq \mathcal{F}_i^O$. \square

Theorem 5 (Welfare Improvement for Non-Reserve Countries). Under Assumptions 1–2:

1. For all non-reserve countries $i \geq 2$: $U_i(\mathbf{c}_i^O) \geq U_i(\mathbf{c}_i^D)$.
2. If the liquidity constraint is binding for country i ($\lambda_i > 0$): $U_i(\mathbf{c}_i^O) > U_i(\mathbf{c}_i^D)$.
3. Aggregate non-reserve welfare strictly improves: $\sum_{i \geq 2} U_i(\mathbf{c}_i^O) > \sum_{i \geq 2} U_i(\mathbf{c}_i^D)$, provided $\lambda_i > 0$ for at least one country.

Proof. (a) By Lemma 1, $\mathbf{c}_i^D \in \mathcal{F}_i^D \subseteq \mathcal{F}_i^O$. Since \mathbf{c}_i^O maximizes U_i over \mathcal{F}_i^O :

$$U_i(\mathbf{c}_i^O) = \max_{\mathbf{c}_i \in \mathcal{F}_i^O} U_i(\mathbf{c}_i) \geq U_i(\mathbf{c}_i^D) \quad (33)$$

(b) When $\lambda_i > 0$, $\mathcal{F}_i^D \subsetneq \mathcal{F}_i^O$ (Lemma 1). The dollar-system optimum \mathbf{c}_i^D satisfies the first-order conditions (28) with $\lambda_i > 0$. But the ORBIT optimum satisfies (30) with $\lambda_i = 0$. Since $\lambda_i > 0$ means the marginal utility of imports exceeds their price-adjusted cost in the dollar system (consumers are constrained from consuming more imports), relaxing this constraint allows strictly higher utility:

$$U_i(\mathbf{c}_i^O) > U_i(\mathbf{c}_i^D) \quad (34)$$

Formally: \mathbf{c}_i^D is in the interior of \mathcal{F}_i^O relative to the binding liquidity constraint boundary. By strict concavity of U_i , any interior point of a strictly larger feasible set yields strictly lower utility than the maximum over that set.

(c) By (a), $U_i(\mathbf{c}_i^O) \geq U_i(\mathbf{c}_i^D)$ for all $i \geq 2$. By (b), strict inequality holds for at least one i . Summing over all $i \geq 2$:

$$\sum_{i \geq 2} U_i(\mathbf{c}_i^O) > \sum_{i \geq 2} U_i(\mathbf{c}_i^D) \quad (35)$$

\square

Theorem 6 (Global Welfare Improvement). The transition from the dollar system to ORBIT generates a strict increase in global welfare:

$$\sum_{i=1}^N U_i(\mathbf{c}_i^O) > \sum_{i=1}^N U_i(\mathbf{c}_i^D) \quad (36)$$

Proof. Decompose the global welfare change into three components:

$$\Delta W \equiv \sum_{i=1}^N [U_i(\mathbf{c}_i^O) - U_i(\mathbf{c}_i^D)] = \underbrace{\Delta W_{\text{efficiency}}}_{(I)} + \underbrace{\Delta W_{\text{seigniorage}}}_{(II)} \quad (37)$$

Component (I): Efficiency gains from removing liquidity constraints.

The dollar-system liquidity constraints (6) distort the consumption choices of non-reserve countries away from the first-best. The distortion creates a deadweight loss (DWL): constrained consumers cannot reach their preferred consumption bundles even though those bundles are technologically feasible. Removing the constraints in ORBIT recovers this DWL:

$$\Delta W_{efficiency} = \sum_{i \geq 2} [U_i(\mathbf{c}_i^O) - U_i(\mathbf{c}_i^{D*})] > 0 \quad (38)$$

where \mathbf{c}_i^{D*} denotes the consumption that country i would choose under the dollar system if the seigniorage transfer were preserved but the liquidity constraint removed. This component is strictly positive by the same logic as Theorem 5.

Component (II): Seigniorage redistribution.

In the dollar system, country 1 receives seigniorage S_1 (real resources transferred from other countries via dollar reserve accumulation). In ORBIT, no country receives seigniorage. This is a pure redistribution:

$$\Delta W_{seigniorage} = \underbrace{-u'(c_{11}^D) \cdot S_1}_{\text{U.S. loss}} + \underbrace{\sum_{i \geq 2} u'(c_{ii}^D) \cdot s_i}_{\text{Other countries' gain}} \quad (39)$$

where s_i is country i 's share of the seigniorage burden ($\sum_{i \geq 2} s_i = S_1$).

Since seigniorage is a pure transfer, the global sum of real resources is unchanged: one dollar of seigniorage lost by the U.S. is one dollar of seigniorage burden lifted from other countries. In terms of real resources, $\Delta W_{seigniorage}$ has zero net resource effect.

However, in terms of utility, $\Delta W_{seigniorage} \geq 0$ under the standard assumption of diminishing marginal utility: the U.S., as a high-consumption country, has lower marginal utility of consumption than the (generally poorer) countries bearing the seigniorage burden.

Combining:

$$\Delta W = \underbrace{\Delta W_{efficiency}}_{>0} + \underbrace{\Delta W_{seigniorage}}_{\geq 0} > 0 \quad (40)$$

Even without the distributional argument for Component (II)—that is, even if $\Delta W_{seigniorage} = 0$ —global welfare strictly improves because $\Delta W_{efficiency} > 0$. The efficiency gain from eliminating deadweight loss is sufficient on its own. \square

4.4. Adjustment Pressure on Trade Imbalances

Proposition 1 (Symmetric Adjustment Pressure). *In the ORBIT system, persistent trade imbalances generate domestic macroeconomic pressure through the following channels:*

Surplus country ($B_i > 0$ **persistently**): NCI_i has persistent net outflow $|\Pi_i| = e_i B_i > 0$, requiring continuous domestic financing. Depending on the financing method:

1. Monetary financing (NCI borrows from central bank): increases monetary base \rightarrow inflationary pressure \rightarrow real exchange rate appreciation \rightarrow reduced export competitiveness \rightarrow downward pressure on B_i .
2. Bond financing (NCI issues domestic securities): increases government debt \rightarrow upward pressure on domestic interest rates \rightarrow crowding out of private investment \rightarrow policy incentive to adjust.
3. Fiscal financing (NCI draws on fiscal reserves): depletes fiscal space \rightarrow policy incentive to adjust.

Deficit country ($B_i < 0$ **persistently**): NCI_i has persistent net inflow $\Pi_i = -e_i B_i > 0$, continuously withdrawing domestic currency from circulation. This creates:

1. Contractionary monetary effect \rightarrow deflationary pressure \rightarrow improved competitiveness \rightarrow upward pressure on B_i .
2. If NCI redeems securities: reduces government debt, lowering interest rates, stimulating domestic activity.

Contrast with dollar system: The reserve currency country (U.S.) does not face these adjustment pressures because its trade deficit is financed by dollar issuance absorbed into foreign reserves. The adjustment burden falls asymmetrically on non-reserve deficit countries.

Remark 4 (Transparency Effect). Beyond the mechanical channels described above, ORBIT creates a transparency effect: the Sol ledger displays each country's cumulative trade position as a single, unambiguous number. Unlike dollar reserves—which can be perceived as “assets” or “savings”—Sol balances carry no such illusion. A persistent surplus is visibly a persistent failure to obtain real goods in exchange for real goods exported. This transparency supports informed public debate and policy adjustment.

5. Adoption Game

5.1. Setup

Each of the N countries decides whether to join the ORBIT network $\mathcal{N} \subseteq \mathcal{I}$. Trade between ORBIT members uses Sol settlement; trade involving non-members uses dollar settlement.

Definition 10 (Participation Value). The net benefit to country i from joining network \mathcal{N} is:

$$V_i(\mathcal{N}) = \sum_{j \in \mathcal{N}, j \neq i} \Delta W_{ij}(T_{ij} + T_{ji}) - K_i \quad (41)$$

where:

- $\Delta W_{ij} > 0$ is the per-unit-of-trade welfare gain from switching bilateral trade (i, j) from dollar to ORBIT settlement
- $T_{ij} + T_{ji}$ is the total bilateral trade volume between i and j
- $K_i > 0$ is the fixed cost of establishing NCI_i

Assumption 4 (Low Setup Cost). K_i is small relative to the trade volumes of major trading nations. Establishing an NCI requires only administrative infrastructure within an existing central bank, not new financial architecture.

5.2. Self-Starting Condition

Theorem 7 (Bilateral Viability). Let $\underline{\Delta w} > 0$ be a lower bound on the per-unit welfare gain ΔW_{ij} for any pair of non-reserve countries. If there exist countries i, j such that:

$$\underline{\Delta w} \cdot (T_{ij} + T_{ji}) > \max(K_i, K_j) \quad (42)$$

then the strategy profile $(\text{join}_i, \text{join}_j)$ constitutes a Nash equilibrium of the bilateral participation game.

Proof. Given that country j has joined, country i 's payoff from joining is:

$$V_i(\{i, j\}) = \Delta W_{ij}(T_{ij} + T_{ji}) - K_i \geq \underline{\Delta w}(T_{ij} + T_{ji}) - K_i > 0 \quad (43)$$

by (42). Thus joining is a best response for i . By symmetry, joining is a best response for j . Hence $(\text{join}, \text{join})$ is a Nash equilibrium. \square

Remark 5. The game also has a (not join, not join) equilibrium (if no one joins, there is no network benefit). ORBIT thus faces a coordination problem, not an incentive problem. The role of initial political will is to select the Pareto-superior equilibrium.

5.3. Network Expansion

Lemma 2 (Monotonicity of Participation Value). $V_i(\mathcal{N})$ is weakly increasing in \mathcal{N} : for $\mathcal{N} \subseteq \mathcal{N}'$,

$$V_i(\mathcal{N}') \geq V_i(\mathcal{N}) \quad \forall i \quad (44)$$

Proof. $V_i(\mathcal{N}') - V_i(\mathcal{N}) = \sum_{j \in \mathcal{N}' \setminus \mathcal{N}} \Delta W_{ij}(T_{ij} + T_{ji}) \geq 0$, since $\Delta W_{ij} \geq 0$ and $T_{ij} + T_{ji} \geq 0$. \square

Theorem 8 (Expansion Cascade). *Starting from an initial network \mathcal{N}_0 (with $|\mathcal{N}_0| \geq 2$), define the expansion sequence:*

$$\mathcal{N}_{t+1} = \mathcal{N}_t \cup \{k \notin \mathcal{N}_t : V_k(\mathcal{N}_t \cup \{k\}) > 0\} \quad (45)$$

Then:

1. The sequence $\{\mathcal{N}_t\}$ is weakly increasing: $\mathcal{N}_t \subseteq \mathcal{N}_{t+1}$ for all t .
2. The sequence converges in finite time to a stable network \mathcal{N}^* .
3. No country in \mathcal{N}^* has an incentive to unilaterally exit.
4. No country outside \mathcal{N}^* has an incentive to unilaterally join.

Proof. (a) By construction, $\mathcal{N}_{t+1} \supseteq \mathcal{N}_t$.

(b) Since \mathcal{I} is finite and \mathcal{N}_t is weakly increasing, the sequence must stabilize in at most N steps.

(c) By Lemma 2, if country k found it profitable to join at stage t (when the network was \mathcal{N}_t), it remains profitable at the final stage $\mathcal{N}^* \supseteq \mathcal{N}_t$:

$$V_k(\mathcal{N}^*) \geq V_k(\mathcal{N}_t \cup \{k\}) > 0 \quad (46)$$

Therefore no member wishes to exit.

(d) By definition of (45), if $k \notin \mathcal{N}^*$ then $V_k(\mathcal{N}^* \cup \{k\}) \leq 0$, so k does not wish to join. \square

Remark 6 (Size of Stable Network). *The size of \mathcal{N}^* depends on the structure of global trade. In a densely connected trade network (high bilateral trade volumes among many countries), \mathcal{N}^* approaches \mathcal{I} . In a fragmented trade network, \mathcal{N}^* may cover only a regional cluster. The ORBIT framework does not require global adoption to generate value; any $|\mathcal{N}^*| \geq 2$ is functional.*

Proposition 2 (Club Good Property). *ORBIT exhibits club good characteristics: only members benefit from the settlement system. Non-members cannot free-ride on ORBIT's exchange rate isolation or liquidity constraint removal. This limits the incentive to delay joining, as the benefits of membership are excludable.*

6. Numerical Illustration

To demonstrate the operational mechanics of ORBIT concretely, consider a three-country example.

6.1. Setup

Three countries—China (C), Brazil (B), and India (I)—participate in ORBIT with the following exchange rates:

Table 1. Exchange rates to Sol.

Country	Exchange Rate
China (C)	1 Sol = 8 CNY
Brazil (B)	1 Sol = 5 BRL
India (I)	1 Sol = 80 INR

6.2. Trade Flows

Table 2. Monthly trade flows (Sol).

From ↓ / To →	China	Brazil	India
China	—	200	150
Brazil	100	—	50
India	80	120	—

6.3. NCI Operations

China's NCI:

Outflow (to exporters): $(200 + 150) \times 8 = 2,800$ CNY

Inflow (from importers): $(100 + 80) \times 8 = 1,440$ CNY

Net deficit: 1,360 CNY → issue domestic securities

Brazil's NCI:

Outflow (to exporters): $(100 + 50) \times 5 = 750$ BRL

Inflow (from importers): $(200 + 120) \times 5 = 1,600$ BRL

Net surplus: 850 BRL → redeem securities

India's NCI:

Outflow (to exporters): $(80 + 120) \times 80 = 16,000$ INR

Inflow (from importers): $(150 + 50) \times 80 = 16,000$ INR

Net: 0 → no action needed

6.4. ORBIT Ledger

Table 3. Net bilateral balances (Sol); positive = net exporter.

	vs. China	vs. Brazil	vs. India	Total
China	—	+100	+70	+170
Brazil	-100	—	-70	-170
India	-70	+70	—	0
Global sum:				0

6.5. Verification of Properties

1. **Conservation (Theorem 1):** $170 + (-170) + 0 = 0$. ✓
2. **No cross-border currency flows:** Chinese firms transacted in CNY, Brazilian firms in BRL, Indian firms in INR. ✓
3. **India's automatic balance:** Total exports = $80 + 120 = 200$ Sol = total imports = $150 + 50 = 200$ Sol. NCI net position = 0. ✓
4. **Domestic absorption of imbalances:** China's 1,360 CNY deficit and Brazil's 850 BRL surplus are handled through domestic operations. ✓

6.6. Exchange Rate Isolation Demonstration

Suppose China depreciates from 1 Sol = 8 CNY to 1 Sol = 10 CNY.

Table 4. Effect of Chinese yuan depreciation.

	Before	After	Change
Chinese exporter revenue (per 100 Sol)	800 CNY	1,000 CNY	+25%
Chinese importer cost (per 100 Sol)	800 CNY	1,000 CNY	+25%
Brazilian partner's price	100 Sol	100 Sol	0%
Brazilian partner's BRL amount	500 BRL	500 BRL	0%
Indian partner's price	100 Sol	100 Sol	0%
Indian partner's INR amount	8,000 INR	8,000 INR	0%

Brazil and India experience zero impact from China's exchange rate adjustment—confirming Theorem 4.

7. Relationship to Existing Proposals

ORBIT is an independently conceived framework. This section delineates its relationship to existing proposals and the broader literature.

7.1. Keynes's Bancor (1944)

Keynes (1943) proposed the Bancor as a supranational currency managed by an International Clearing Union (ICU). Key differences from ORBIT:

Table 5. Comparison: Bancor vs. ORBIT

Feature	Bancor	ORBIT (Sol)
Nature	Supranational currency	Fixed measuring unit
Management	ICU with policy authority	No management needed
Sovereignty impact	Significant concession	Zero concession
Startup requirement	Multilateral treaty	Two countries
Political fate	Vetoed at Bretton Woods	Designed to avoid veto

7.2. IMF Special Drawing Rights

SDRs share with Sol the property of being a unit of account not issued by a single nation. However, SDRs are allocated to central banks for balance-of-payments adjustments, periodically redefined based on politically negotiated currency basket weights, and disconnected from commercial trade (Obstfeld 2011). Sol is permanently fixed, requires no allocation mechanism, and is embedded directly in trade invoicing.

7.3. European Payments Union (1950–1958)

The EPU is the closest historical precedent: it provided multilateral clearing of bilateral trade balances among postwar European nations with inconvertible currencies. Differences: the EPU required U.S. backing through Marshall Plan funds and involved actual transfers (gold/credit) for net settlements. ORBIT requires no external sponsor and absorbs all net positions domestically.

7.4. Dominant Currency Paradigm

Gopinath & Stein (2021) analyze why the dollar dominates trade invoicing and identify network effects and liquidity as key drivers. ORBIT does not attempt to overcome these network effects head-on. Instead, it creates a *parallel* pricing standard that coexists with dollar invoicing. Theorem 8 shows that ORBIT can grow through its own network effects once a critical mass is reached.

7.5. Optimal Currency Areas

Mundell (1961) established the theory of optimal currency areas, arguing that countries should share a currency when they experience symmetric shocks and have high factor mobility. ORBIT takes the opposite approach: rather than merging currencies, it preserves all national currencies while adding a shared unit of account. This achieves the information-sharing benefits of a common numeraire without the costs of monetary unification.

7.6. International Monetary System Models

Farhi & Maggiori (2018) model the international monetary system as one where a hegemon issues safe assets, generating both convenience yields and Triffin-type instabilities. ORBIT eliminates the need for any country to serve as safe asset provider for trade settlement purposes, dissolving the tension identified in their model.

8. Discussion of Potential Challenges

8.1. Dual-Track Arbitrage

Challenge: If goods are priced in Sol within ORBIT and in dollars outside, price discrepancies may create arbitrage opportunities.

Response: (1) Sol and dollar prices for the same good would naturally converge through market forces. (2) Within ORBIT, every Sol-denominated transaction corresponds to a verified physical trade flow, detectable through customs documentation. (3) As ORBIT adoption grows, Sol pricing becomes the reference, reducing the scope for parallel pricing discrepancies.

8.2. Resistance from Incumbent Beneficiaries

Challenge: The United States and its financial sector may resist ORBIT.

Response: ORBIT's design deliberately avoids direct confrontation. It does not call for "ending dollar hegemony." It is framed as a technical convenience for trade settlement. Its gradual adoption path (Theorem 8) means it can accumulate substantial network effects before attracting significant opposition. Critically, ORBIT does not require U.S. participation to function.

8.3. Exchange Rate Manipulation

Challenge: A country might aggressively devalue against Sol to gain export advantages.

Response: Under ORBIT, devaluation redistributes wealth *domestically* (Theorem 4(c))—from importers/consumers to exporters—without affecting trading partners. The "beggar-thy-neighbor" mechanism is eliminated. Devaluation's cost falls entirely on domestic consumers, creating political resistance to manipulation.

8.4. Ledger Security and Governance

Challenge: The ORBIT Ledger's integrity and governance.

Response: The Ledger records only informational flows (net trade balances in Sol), not money. Even if compromised, no actual funds are at risk. Governance can follow internet protocol standards body models (e.g., IETF): technical consensus among participating nations, open participation, no single-country control.

8.5. Capital Flows

Challenge: ORBIT covers trade settlement but not capital flows.

Response: This boundary is intentional. ORBIT constructs a firewall between real economic activity (trade) and financial flows (capital). Trade and capital flows have different characteristics and require different institutional arrangements. Addressing both with one tool would increase complexity and political resistance without proportionate benefit.

9. Directions for Future Research

This paper presents a conceptual framework with formal theoretical foundations. Several important extensions remain:

1. **Non-tradable goods extension:** Extend the model to include non-tradable goods and analyze how exchange rate changes affect the tradable/non-tradable margin within each country. The conjecture (supported by Remark 3) is that exchange rate isolation holds for tradable goods prices while exchange rate changes affect domestic relative prices between tradable and non-tradable sectors.
2. **General utility functions:** Extend the existence and uniqueness result (Theorem 3) beyond log utility to CES and more general preference specifications.
3. **Dynamic model:** Develop a multi-period model with capital accumulation, intertemporal trade, and endogenous exchange rate adjustment. Analyze the dynamic convergence properties of trade imbalances under ORBIT.

4. **Heterogeneous firms:** Following Melitz (2003), analyze how ORBIT affects firm-level export decisions, entry/exit, and the extensive margin of trade.
5. **Quantitative simulation:** Once ORBIT is operational (even in pilot form), calibrate the model using observed trade data and simulate welfare gains under various scenarios.
6. **Mechanism design:** Formally analyze ORBIT as a mechanism design problem. Characterize incentive-compatible rules for exchange rate adjustment, overdraft limits, and network governance.
7. **Strategic interactions:** Extend the adoption game to include strategic timing, bargaining over Sol definition, and potential blocking coalitions.

The author welcomes collaboration from researchers with expertise in international macroeconomics, monetary theory, mechanism design, and quantitative modeling.

10. Conclusion

This paper has proposed ORBIT (Open Reconciliation for Balanced International Trade), a framework for international trade settlement that requires no reserve currency, no world central bank, no supranational authority, and no global political consensus.

The framework rests on a single conceptual insight: international trade needs only a shared *measuring standard*, not a shared *currency*. Sol provides this standard—a fixed, neutral unit of account used for pricing trade contracts. All monetary flows remain within national borders, processed by each country's own central bank through routine domestic operations.

The formal analysis establishes that ORBIT:

- Admits a unique equilibrium independent of exchange rate choices (Theorem 3)
- Completely isolates exchange rate shocks within national borders (Theorem 4)
- Strictly improves welfare for all non-reserve-currency countries (Theorem 5)
- Strictly improves global welfare (Theorem 6)
- Can self-start with just two countries (Theorem 7)
- Expands through natural network effects (Theorem 8)
- Requires only bounded, routine central bank operations (Theorem 2)
- Generates symmetric adjustment pressure on trade imbalances (Proposition 1)

The framework asks only that two countries agree on a number (the Sol definition), open a clearing window at their central banks, and add a Sol price to trade contracts. Everything else—each country's currency, banking system, fiscal policy, monetary policy—remains entirely unchanged.

The path from concept to reality requires institutional experimentation: a bilateral pilot between two willing nations, empirical evaluation, and iterative refinement. This paper provides the theoretical foundation for that experiment.

Originality Statement: The ORBIT framework presented in this paper is an original design, independently conceived by the author. It is not derived from any existing proposal. Parallels with historical schemes are acknowledged and discussed in Section 7.

Acknowledgments: The author invites formal modeling, quantitative analysis, and critical discussion from the academic community. Collaboration inquiries are welcome.

References

- Bank for International Settlements. (2018). Cryptocurrencies: Looking Beyond the Hype. *BIS Annual Economic Report*, Chapter V.
- Bank for International Settlements. (2022). *Triennial Central Bank Survey of Foreign Exchange and Over-the-counter Derivatives Markets*.
- Eichengreen, B., Hausmann, R., & Panizza, U. (2003). The Pain of Original Sin. In B. Eichengreen & R. Hausmann (Eds.), *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*. University of Chicago Press.

- Farhi, E., & Maggiori, M. (2018). A Model of the International Monetary System. *Quarterly Journal of Economics*, 133(1), 295–355.
- Gopinath, G. (2015). The International Price System. *Jackson Hole Symposium*, Federal Reserve Bank of Kansas City.
- Gopinath, G., & Stein, J.C. (2021). Banking, Trade, and the Making of a Dominant Currency. *Quarterly Journal of Economics*, 136(2), 783–830.
- International Monetary Fund. (2023). *Currency Composition of Official Foreign Exchange Reserves (COFER)*.
- Ito, H., & McCauley, R.N. (2020). Currency Composition of Foreign Exchange Reserves. *Journal of International Money and Finance*, 102, 102104.
- Keynes, J.M. (1943). Proposals for an International Clearing Union. British Government Publication, Cmd. 6437.
- Lane, P.R. (2012). The European Sovereign Debt Crisis. *Journal of Economic Perspectives*, 26(3), 49–68.
- Melitz, M.J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71(6), 1695–1725.
- Mundell, R.A. (1961). A Theory of Optimum Currency Areas. *American Economic Review*, 51(4), 657–665.
- Obstfeld, M. (2011). International Liquidity: The Fiscal Dimension. *Monetary and Economic Studies*, 29, 33–48.
- Rey, H. (2015). Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence. *NBER Working Paper No. 21162*.
- Triffin, R. (1960). *Gold and the Dollar Crisis: The Future of Convertibility*. Yale University Press.

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