

MINORITY UPSTREAM OWNERSHIP AS AN OPERATIONAL HEDGE: A BRAZIL–INDONESIA CASE OF LOOSE COUPLING UNDER COMMODITY VOLATILITY

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ABSTRACT

This paper examines a third way to manage commodity risk: an Upstream Equity Hedge (UEH), i.e., a minority upstream stake that offsets input-price shocks while keeping market-based procurement. Using Indofood's stake in Brazil's Companhia Mineira de Açúcar e Alcool (CMAA) as a single embedded case, we link ICE #11 sugar futures to Indofood's equity-method results and carrying amount. After analyzing 11 years (2013–2024) of context, with a focus on results from 2020–2024, evidence centers on the 2023 sugar-price spike and its 2024 normalization: the carrying amount increases materially in 2023 and partially retraces in 2024, consistent with directional cushioning in high-price regimes. An Offset Ratio that relates changes in associate income and carrying amount to a modeled sugar-attributable cost shock is formalized, providing an auditable, direction-of-change metric rather than a one-for-one hedge claim. Managerially, the UEH offers a portable design that stabilizes internal funds during stress while maintaining competitive sourcing and supplier optionality.

Keywords: Hedge; loose coupling; operational hedging; commodity price risk; cross-border management

INTRODUCTION

Commodity price swings normally stress food manufacturers, especially when input markets and consumer markets sit in different countries. Firms typically respond with financial hedges or full vertical integration. This paper presents a third path: a minority upstream equity stake that acts as an operational hedge - an Upstream Equity Hedge (UEH) - implemented in a loosely coupled (Orton & Weick, 1990; Weick, 2001) cross-border structure. The idea is simple: let upstream earnings move with the commodity that needs to be hedged, pass part of that movement to the parent through equity-method accounting and dividends, but keep downstream procurement market-based and flexible (Weick, 1976; Baldwin & Clark, 2000).

The main research setting is Indofood's stake in Companhia Mineira de Açúcar e Alcool (CMAA), a Brazilian sugar/ethanol group. The surge in global sugar prices in 2023 offers a useful case study for evaluating the effectiveness of the method. Some questions are presented: (i) Does a UEH co-move with benchmark prices in a way that cushions input-cost shocks? (ii) Which organizational features enable cushioning without forcing internal offtake? (iii) How visible is the hedge in financial statements, specifically the carrying amount of the associate under IAS 28/21 and the “share of results of associates”? (iv) What are the boundary conditions (FX translation, dividends, OCI) that make the hedge stronger or weaker in a given year? The stance follows the risk-management view that firms hedge to stabilize internal

funds and avoid bad states, not to engineer one-for-one price offsets (Froot, Scharfstein, & Stein, 1993; Stulz, 1996).

Empirically, the paper utilizes a single embedded case with a longitudinal design. The identification window is 2020–2024, but a longer annual panel (2013–2024) provides context. International sugar futures (ICE #11 sugar prices in US\$ cents/lb) are tracked and analyzed in conjunction with Indofood’s carrying amount for CMAA, and respective payouts. The analysis is complemented with process evidence on coordination and procurement. Methodologically, the work follows theoretical sampling and process tracing to explain how the design works under stress (Eisenhardt, 1989; Pettigrew, 1990; Langley, 1999; Yin, 2018), treating the Indofood–CMAA link as an extreme/critical case (Flyvbjerg, 2006). Conceptually, UEH is formalized as an operational hedge under loose coupling: economically linked through ownership returns, but commercially separable in procurement, which allows companies to remain flexible when operationalizing their commercial strategies. This connects risk-management theory (Froot et al., 1993; Stulz, 1996) with organizational modularity (Weick, 1976; Baldwin & Clark, 2000) and integration choice (Williamson, 1985; Kogut & Kulatilaka, 1994).

Empirically, by using closing carrying balances (2020–2024), it is shown that directional co-movement - a step-up during a 2023 sugar price shock (the largest in more than a decade) and a retrace in 2024 - is consistent with cushioning during price spikes while preserving sourcing flexibility. To measure the UEH effect, an offset ratio that pairs P&L and balance-sheet lenses is proposed. It consists in the sum of i) variation of equity participation (Δ “share of results of associates”), and ii) variation of equity carrying amount (Δ “carrying amount”). This ratio can be scaled by the value of the cost that is being hedged, in this particular case it is scaled by a modeled sugar-attributable variation on Cost of Goods Sold (Δ “COGS”).

Lastly, a practical playbook for emerging-market manufacturers is offered: build a cost-leading upstream pole; keep cross-pole links loose; monitor hedge strength with an auditable metric; use derivatives for short-horizon gaps. Given the international connectivity of this case, validated by an event study, results can be generalized as it is portable to other commodity poles when the input has a transparent benchmark (e.g., a futures contract), there exists an investable upstream asset, procurement can remain market-based, and FX/dividend repatriation frictions are manageable. The rest of the paper reviews related work and the UEH construct (Section 2), describes the setting, data, and design (Section 3), presents results (Section 4), discusses implications and limits (Section 5), and concludes (Section 6).

LITERATURE REVIEW

The transnational solution proposed by Bartlett & Ghoshal (1989) enables organizations to be simultaneously efficient on a global scale, highly responsive to local markets, and capable of rapidly sharing knowledge and innovation across borders, which are essential capabilities in today’s complex and competitive international environment. Where the transnational assumes one integrated network with rich lateral flows, Luo and Tung (2025) argue that the retreat from hyper-globalization makes one global strategy untenable, proposing a multipolar geo-strategy in which multinationals operate with tight coupling within geopolitical poles (to capture scale and speed) and loose coupling across poles (to buffer spillovers and comply with divergent regimes). Their framework integrates loose-coupling theory with the new internalization logic, showing how firms decide what to internalize by pole while using connector countries to preserve optionality under decoupling. This is especially relevant when globalization of trade is not equally disseminated among countries (Vamberg, 2018).

Through the lens of loose-coupling theory (Orton & Weick, 1990; Weick, 2001), I treat today’s external fragmentation (divergent trade, data, and industrial policies across blocs) and firms’ internal fragmentation (subsidiary differentiation, governance variance, localized systems) as design inputs for a

dual-tier architecture: loose at the global level to prevent shock contagion, tighter within specific geopolitical zones to capture scale under a single rule set. While analyzing decoupling at a global level, Qiu et al. (2024) find that geopolitical alignment is a major factor shaping global trade flows, with countries experiencing significantly slower growth in trade volumes when trading with geopolitically distant partners. The study also finds that countries most dependent on geopolitically distant partners are especially vulnerable to escalating tensions because they have fewer options for trade diversion, underscoring the challenges in managing geopolitical trade risks in today's fragmented world, where countries show very different risk profiles (Girard, 2018).

Related work on the intersection of geopolitics and global trade includes extensive research on trade fragmentation and the reorientation of trade along geopolitical lines. Blanga-Gubbay & Rubínová (2023) provide evidence that trade between East and West blocs has grown slower than intra-bloc trade since the onset of the Russia-Ukraine war (2022). Fernández-Villaverde et al. (2024) developed a geopolitical fragmentation index, showing significant fragmentation increases since the 2007-2008 financial crisis. Gopinath et al. (2024) and related ECB research also highlight emerging evidence for both trade and investment flows fragmenting along geopolitical bloc lines, especially after major recent geopolitical shocks. Policy-focused studies (e.g., the WTO 2023 World Trade Report) show that higher tariffs and barriers reinforce regionalization but do not necessarily signal outright deglobalization; instead, global supply chains become more complex and regional, which creates challenges, but also policy opportunities (Mashaphu et al., 2024).

Trade disruptions trigger immediate shifts in the volume and direction of cross-border flows, forcing firms to adapt sourcing and market strategies (Semeniak, 2025). Supply chains therefore need to combine resilience with flexibility, as shocks propagate rapidly through logistics networks and create cascading operational bottlenecks (Moradlou et al., 2025). In commodity markets, such shocks translate into sharp price fluctuations in spot and futures benchmarks along the value chain. Recent work shows that commodity and supply-chain disturbances - especially around major geopolitical crises - have been key drivers of persistent inflation in advanced and emerging economies, with outsized effects in energy and food (Díaz et al., 2024; Aizenman, 2024).

This is particularly consequential for food manufacturers whose input costs depend on geographically concentrated upstream sources, for example, an Indonesian producer reliant on imported sugar from a small set of large exporters. Sugar price risk has been a persistent vulnerability for Indonesia's food manufacturers because the country relies heavily on imported raw sugar. Empirical work documents a tight co-movement between domestic and international benchmarks (Jati, 2013; Ekananda, 2023; Agustin et al., 2022), consistent with import-parity pricing once freight, tariffs, distribution costs, and the exchange rate are layered onto global quotes. Several studies also highlight asymmetric transmission: domestic prices adjust more quickly when world prices rise than when they fall, implying faster pass-through of cost shocks than cost relief (Ekananda, 2023). These frictions (regulation, market power along the distribution chain, and inventory/contract rigidities) can magnify upside volatility at the factory gate even when average exposures appear hedged.

For listed consumer-goods firms, this pricing dynamic has clear corporate-finance implications. Input-cost spikes compress gross margins and stress working capital, while downturns in sugar costs expand margins and cash flow; brokerage evidence on Indofood's earnings sensitivity to sugar costs illustrates this channel (Ciptadana Sekuritas Asia, 2019). The literature therefore motivates active risk management, combining procurement strategies (timing, supplier diversification), financial hedges on sugar and FX, and pricing policies, to dampen the convex downside from price surges and preserve operating resilience (Jati, 2013; Agustin et al., 2022; Ekananda, 2023).

Indofood (PT Indofood Sukses Makmur Tbk) is Indonesia's flagship "total food solutions" company, founded in 1990 (as PT Panganjaya Intikusuma) and now operating across the full chain—from upstream agribusiness to branded staples and last-mile distribution—through four strategic business groups: Consumer Branded Products (CBP), Bogasari (flour and pasta), Agribusiness, and Distribution (Indofood, 2025a, 2025b). Its network is described as the most extensive Fast-Moving Consumer Goods (FMCG) distribution platform in the country, while CBP's noodles arm is among the world's largest, with ~34 billion packs of annual capacity across 31 factories spanning Indonesia, Malaysia, Africa, the Middle East, and Southeastern Europe (Indofood, 2025a, 2025c). Regionally, Indomie is a pan-Asian anchor brand with availability in 100+ countries, reinforcing Indofood's role as a node in the Asian packaged-food ecosystem (Indomie, n.d.). Scale is reflected financially: Indofood CBP reported Rp 67.91 trillion in net sales for 2023 (Indofood CBP, 2024). Upstream, Bogasari—part of Indofood since 1995—has long been cited as operating the world's largest flour-milling facility, underlining the group's centrality to Indonesia's food staples (Donley, 2019).

Vertical integration theory suggests that firms pursue backward integration to secure critical inputs, reduce transaction costs, and mitigate supply chain risks, particularly when dealing with commoditized inputs subject to price volatility (Williamson, 1985). Indofood's acquisition of Companhia Mineira de Açúcar e Alcool (CMAA) in Brazil back in 2013 represents a sophisticated application of this theoretical framework, where the company sought to hedge against sugar price fluctuations while securing supply chain control for its extensive food manufacturing operations. As one of Indonesia's largest food conglomerates, Indofood operates across multiple consumer product segments that require substantial sugar inputs, making commodity price volatility a significant operational risk factor. The strategic decision to pursue sugar production assets in Brazil, rather than expanding domestic Indonesian capacity, reflects careful analysis of global supply chain dynamics and cost optimization opportunities.

CMAA - Companhia Mineira de Açúcar e Alcool - is a Brazilian sugar-ethanol group founded in 2006 by the JF Citrus family, headquartered in the Triângulo Mineiro cane belt, with three operating mills: Vale do Tijucu (Uberaba), Vale do Pontal (Limeira do Oeste), and Canápolis - and an administrative center in Uberlândia (EMIS, n.d.; CMAA, n.d.-a). Capacity has expanded via greenfield and acquisition, with circa 9.7 million tonnes of annual crushing reported in recent disclosures (Indofood Agri Resources Ltd., 2024). Shareholding combines the founding JF interests with international capital: Indofood Agri Resources acquired an initial 50% in 2013 as private-equity investors exited, and today reports a 36.21% equity-method interest in CMAA (Indofood Agri Resources Ltd., 2013, 2024). Together, the ownership structure, mill footprint, and expansion pipeline position CMAA as a scale, logistics-advantaged upstream platform in Brazil's Center-South, and a natural anchor for downstream manufacturers seeking upstream equity hedging exposure.

Indofood's consumer branded products division demonstrates extensive sugar dependency across its diverse manufacturing operations, creating substantial exposure to commodity price volatility. The company's flagship Indomie instant noodles, which represent the world's largest instant noodle manufacturing operation, incorporate sugar as the second-listed ingredient in seasoning powders and as the primary component in sweet soy sauce packets (Indomie, 2021; Scientific Research Publishing, 2017). Beyond instant noodles, Indofood's dairy division produces sweetened condensed milk, flavored beverages, and dairy products that require significant sugar inputs for both taste enhancement and preservation functions (DBS Vickers Securities, 2025). The company's snack foods, confectionery items, and beverage products further amplify sugar consumption requirements, with analysts noting that sugar price fluctuations materially impact profit margins across these product categories (Ciptadana Sekuritas Asia, 2019). This extensive sugar utilization creates natural hedging opportunities through backward integration, where controlled production capacity can offset input cost volatility.

Indofood's US\$71.7 million acquisition of a 50% stake in CMAA's 3.0-million-ton crushing platform is best understood as an Upstream Equity Hedge (UEH) rather than merely backward integration. Under UEH, the firm holds an equity-method stake in an upstream producer whose earnings and carrying value co-move with the input benchmark (here, ICE #11 sugar futures). This creates an ownership-based offset to downstream cost shocks without requiring captive offtake or internal transfer pricing. When sugar prices are elevated, CMAA's profitability and Indofood's recognized share of results rise, cushioning pressure on Indofood's COGS and margins; when prices normalize, the hedge leg moderates accordingly. The all-cash deal further avoided financing frictions, allowing the hedge to operate through operating cash flows and the equity-method line rather than through short-dated financial derivatives.

Two core ideas guide how we interpret the upstream-equity hedge (UEH). First, firms should hedge the risks that threaten internal cash flow and investment, not chase variance reductions for their own sake (Froot, Scharfstein, & Stein, 1993). When external finance is costly or slow, stabilizing operating cash flows helps the firm keep funding positive-NPV projects and routine working capital. In our setting, the UEH channels part of a sugar price upswing into associate earnings and the carrying amount, while dividends provide cash. That cushions the downstream business when input costs rise, coordinating risk management with investment and financing rather than treating hedging as a standalone activity (Froot et al., 1993).

Second, the goal of risk management is to avoid bad states - the left tail where liquidity is tight, strategy is disrupted, or distress costs mount - rather than to engineer one-for-one price offsets (Stulz, 1996). The UEH fits that logic: it is a directional hedge that strengthens in price spikes (as in 2023) and eases when prices normalize (2024). Because accounting and FX can mute or amplify the reported effect in any single year, we judge success by whether the structure reduces the likelihood and severity of costly states while preserving procurement flexibility. In short, UEH protects capacity to operate and invest when it matters most, consistent with both the investment-smoothing view of Froot et al. (1993) and the downside-protection view of Stulz (1996). Seen through an international alliance portfolio network lens (van Aduard et al., 2016), a UEH is a minority, loosely coupled equity tie that adds diversity to the firm's alliance set while keeping procurement market based. The portfolio view suggests it creates value when diversity is high but manageable and alliance-management capabilities (information rights, dividend alignment, simple monitoring) keep coordination costs in check - so UEH acts as a network-level hedge that complements derivatives without forcing captive offtake.

Indofood's 2013 acquisition of a 50% stake in Brazil's CMAA was timed to leverage the country's dominance in global sugar exports and its position as the lowest-cost producer, while also preparing for ASEAN Economic Integration in 2015. Chairman Edward Lee emphasized Brazil's strategic importance and tariff advantages, while CEO Mark Wakeford highlighted the move as Indofood's first overseas agribusiness investment, providing both market access and operational learning in mechanized cane harvesting that could be adapted in Indonesia. Structured as a joint venture, the deal was negotiated at arm's length and reflected Indofood's broader diversification strategy to reduce single-crop risks and optimize plantation resources².

METHODOLOGY

This paper uses embedded case study (Yin, 2018) to examine how multinational enterprises deploy loose-coupling as a commodity-risk tool. A single case is preferable here because the aim is theory elaboration about mechanisms - not hypothesis testing across many units (Eisenhardt, 1989). The focal case

² Indofood Agri Resources Ltd. (2013, June 26). Completion of acquisition of a 50% interest in CMAA Group [Press Release].

is Indofood's Upstream Equity Hedge (UEH) via CMAA. This structure yields within-case variation across organizational levels, functions, and geographies, depth that multi-case designs often trade away for breadth (Scholz & Tietje, 2002).

Our design is longitudinal. Following Pettigrew (1990), process evolution is traced from design to stress-test over 2020–2024, bracketing periods (Langley, 1999) to show not just whether the arrangement works, but how it works under changing conditions. A longer annual panel (2013–2024) is also assembled to contextualize the 2020–2024 analysis.

The 2023 sugar shock (prices above ~24 US\$ cents/lb) - driven by El Niño-related drought in Asia with documented production losses in India, Thailand, and China (Indian Sugar Mills Association, 2023; U.S. Department of Agriculture, 2023) - provides a natural experiment for stress-testing UEH effectiveness. Consistent with critical/extreme case logic (Flyvbjerg, 2006), this setting maximizes learning and clarifies boundary conditions; if loose-coupling works here, its mechanisms should generalize to milder contexts. The goal is analytical (not statistical) generalization to theory (Yin, 2018).

The method links the annual ICE #11 sugar futures benchmark (US\$ cents/lb) to Indofood's consolidated investment in its associate CMAA (accounted for under IAS 28 with translation under IAS 21) over 2013–2024. Under the equity method, the carrying amount rolls forward from the prior year by (i) adding Indofood's share of CMAA profit or loss (also reported in "share of results of associates"), (ii) adding Other Comprehensive Income (OCI) items (e.g., cash-flow hedge reserves, biological-asset fair-value changes), (iii) subtracting dividends (which reduce the asset and bypass Indofood's P&L), and (iv) capturing other movements (capital injections, dilution, reclassifications, impairment). The resulting balance is then translated at the local currency (IDR) FX rate, with translation effects recognized in equity. Because this stock measure blends operating co-movement with FX and accounting remeasurement, the tests emphasize level co-movement and event-year directionality rather than fine attribution of each component.

The empirical strategy combines pattern matching between theoretical predictions and observed outcomes with an event-study of the 2023 shock. Firstly, a co-movement between sugar benchmarks and CMAA's carrying value is established. Secondly, such linkage is connected to organizational mechanisms that preserve operational independence, i.e., loose-coupling rather than vertical integration. Lastly, the hedge performance is validated under stress (2023) and partial reversal (2024).

To address a quantification caveat on how much the upstream equity stake cushions sugar-driven cost shocks, an annual Offset Ratio is proposed:

$$Offset_t = \frac{\Delta(\text{share of associates from CMAA})_t + \Delta(\text{CMAA carrying})_t}{\Delta(\text{sugar} - \text{attributable COGS})_t} \quad (1)$$

All terms are in a common currency. The numerator is observable (equity-method P&L plus change in carrying, which already nets dividends); the denominator requires a modeled sugar COGS shock, which is not publicly available. Rather than impose strong pass-through assumptions, the construction is presented theoretically. The directional protection aligns with the view that firms hedge to stabilize internal funds and avoid bad states, not to engineer perfect offsets (Froot, Scharfstein, & Stein, 1993; Stulz, 1996). The 2023 spike shows a clear step-up in the carrying amount, with a retracement in 2024 as prices eased, which highlights a directional cushion that is strongest in stress and moderates in normalization.

RESULTS

CMAA's dividend payments and equity-method carrying value co-moves with international sugar prices, with a marked step-up in 2023 and retrace in 2024, while day-to-day procurement remains unconstrained - evidence that minority stakes can hedge commodity shocks without forcing internal offtake. Two frictions matter: (i) FX translation (IDR/BRL) amplifies or dampens the reported asset; (ii) accounting noise (hedge accounting, biological-asset fair value, other OCI) obscures high-frequency tracking. Accordingly, UEH should be read as a directional hedge: it smooths exposure across the cycle rather than delivering one-for-one offsets each period.

Table 1: International Sugar Price and Indofood's Upstream Equity Hedge Value

Sugar is ICE #11 (US\$ cents/lb, annual average). CMAA carrying amount is IDR millions under the equity method (Indofood consolidated statements; year-end closing balances). CMAA financials follow a Apr–Mar fiscal cycle, while Indofood reports Jan–Dec; to align currencies, all FX translations use calendar-year average rates (R\$/US\$). “Indofood Dividends Share (US\$ mm)” is Indofood's proportionate share of CMAA profit. “Dividends Declared (R\$ mm)” are CMAA gross dividends from CMAA's financial statements; Indofood's dividend share is estimated as (CMAA dividends × Indofood Share %) and converted to USD using the BRL/USD calendar-year average. Carrying amounts already net out dividends and include OCI and translation effects; read movements as directional, not one-for-one with sugar prices.

Year	Sugar Price (US\$ cents/lb)	CMAA Net Profit (R\$ mm)	CMAA Dividends Declared (R\$ mm)	Indofood Share (%)	Indofood Dividends Share (US\$ mm)	CMAA Carrying (IDR mm)
2013	17,34	9	0	50,0%	0	na
2014	16,21	6	0	50,0%	0	na
2015	13,04	-87	0	50,0%	0	na
2016	18,28	-9	0	50,0%	0	na
2017	15,74	90	0	50,0%	0	na
2018	12,07	19	8	35,0%	1	na
2019	12,37	58	57	36,2%	4	na
2020	12,94	176	103	36,2%	7	587,432
2021	17,90	195	60	36,2%	4	286,600
2022	18,73	79	115	36,2%	8	774,802
2023	24,18	104	60	36,2%	4	992,355
2024	20,83	34	80	36,2%	5	886,916

Indofood–CMAA data support the pattern and clarify the frictions. Across 2020–2024, sugar price and CMAA's carrying value co-move positively in levels (with a strong step-up in 2023 and a retrace in 2024). CMAA's own financials show profit rising in high-price regimes and healthy dividend distributions; Indofood's equity-method line picks up its proportional share, while the carrying amount reflects the cumulative result net of dividends. Two frictions matter: (a) FX translation - the IDR/BRL FX rate amplifies or dampens the reported carrying value; and (b) accounting noise - hedge accounting, biological-asset fair value, and other OCI can mask operating co-movement at high frequency. This is why UEH is framed as a directional hedge: it smooths the firm's economic exposure across the cycle, but it is not one-for-one in every reporting period.

The hypothesis yields testable, with an event-year validation: in sugar up-swings (e.g., 2023), we should observe higher CMAA profit, higher Indofood share of results, and a step-up in the carrying amount

(subject to dividends/FX), with the inverse in down-swings (2024). Because UEH does not force internal offtake, Indofood can still optimize procurement across suppliers and grades; the hedge operates in the background through equity-method economics. UEH turns minority upstream ownership into a structural, balance-sheet-visible buffer against commodity shocks, complementary to - not a substitute for - operational and financial hedging.

Some caveats are necessary. First, FX matters: the exchange rate can alter the recognized hedge. Second, the balance-sheet lens should be paired with the P&L lens - “share of results of associates” - and, ideally, a modeled sugar-driven COGS to compute the Offset Ratio. Third, 2020–2021 behavior reflects non-sugar factors (translation, remeasurement, mix), reminding us that UEH is partial and state-contingent, not a perfect hedge. With those qualifications, the 2023–2024 pattern supports the core claim: Indofood’s stake in CMAA behaves like an Upstream Equity Hedge, appreciating in high-price regimes and easing as prices normalize, precisely the balance-sheet smoothing you want in a multipolar, loosely coupled design.

DISCUSSION

The historical evidence is consistent with the idea that a minority upstream stake can act as an operational hedge. The carrying amount for CMAA rises into the 2023 sugar spike and gives back part of that gain in 2024; dividends add cash relief when prices are high. This fits the risk-management view that firms hedge to stabilize internal funds and investment capacity rather than to chase perfect price offsets (Froot, Scharfstein, & Stein, 1993; Stulz, 1996). The hedge is directional, not mechanical, because the balance is in local currency (IDR) and reflects dividends, other comprehensive income, and currency translation (IAS 28/21).

Organizationally, the Indonesia–Brazil link behaves as a loosely coupled system: economically connected but commercially separable. That structure limits shock transmission through physical flows while still passing useful co-movement through ownership returns (Weick, 1976). The design is also modular: Brazil specializes in low-cost cane and milling, while Indonesia keeps procurement flexible. Modularity preserves option value under uncertainty and supports reconfiguration when freight, policies, or prices change (Baldwin & Clark, 2000).

On the integration choice, the results line up with classic transaction-cost and real-options arguments. Full vertical integration can insure supply but reduces flexibility and raises coordination costs (Williamson, 1985). A minority stake captures many integration benefits—learning, process discipline, and the option to scale—without locking the buyer into fixed internal offtake (Kogut & Kulatilaka, 1994). Our case shows those benefits in practice: knowledge transfer and capacity expansion options co-exist with market-based sourcing.

Because accounting and FX can mask the hedge in some years, evaluation should use both P&L and balance-sheet lenses. A simple offset ratio - the change in “share of results of associates” plus the change in carrying amount, divided by a modeled sugar-driven change in COGS - keeps the test tied to operating exposure, as suggested by risk-management work that links hedging to cash-flow sensitivity and investment needs (Froot et al., 1993). This metric will be strongest in price upswings and weaker when normalization, heavy dividends, or adverse FX dominate reported movements.

The equity strategy complements financial derivatives. Commodity futures and options can certainly introduce more direct cash flow and fair value hedges, specially as far as short-term price shocks are concerned. UEH and financial derivatives are not mutually exclusive: managers should assess effectiveness over multi-year windows, monitor both the associate P&L and carrying amounts, and combine equity participation with market derivatives to handle multi-horizon gaps.

The setting functions as a demanding critical case: high volatility, long distance, multiple institutions, and translation effects. If loose coupling delivers cushioning here, theory suggests it should work in milder contexts as well (Flyvbjerg, 2006). Taken together, the evidence and design choices support a practical message: build a cost-leading upstream pole, keep cross-pole links loose, and measure the hedge explicitly, so the upstream equity stake complements operational and financial hedges without sacrificing flexibility.

While evidence rests on a single critical case, the UEH design is portable to other commodity poles when four conditions hold: (i) the input has a transparent, liquid benchmark (e.g., ICE cocoa futures, CBOT wheat futures, NYMEX crude oil futures) to anchor price shocks; (ii) there exists an investable upstream asset with minority-friendly governance and dividend visibility; (iii) downstream procurement can remain market-based (no captive offtake), preserving price discovery; and (iv) FX/dividend repatriation frictions are manageable. Under these conditions, a UEH should transmit partial upside during price spikes to the downstream P&L, analogous to our setting. For example, a food manufacturer exposed to cocoa could acquire a small stake in a West African grinder/processor; in tight markets, higher cocoa margins would lift associate earnings and carrying amounts, cushioning chocolate COGS without locking volumes. Boundary conditions include shallow or state-managed upstream markets, unstable dividend regimes, or strong basis risk between the firm's input grade and the traded benchmark, which can weaken the hedge's effectiveness. This portability logic invites comparative tests across other commodity markets, and a head-to-head evaluation versus alternatives such as long-dated supply/tolling or majority vertical integration.

MANAGERIAL IMPLICATIONS

For firms exposed to volatile input prices, a minority upstream equity hedge offers a scalable design that transmits part of upstream margin spikes to consolidated accounts while preserving procurement discipline. Because the stake is non-controlling and does not mandate volumes, managers retain competitive sourcing and price discovery ("loose coupling"), yet still benefit from upside in tight markets through the associate's earnings and carrying-amount dynamics. This configuration is attractive when long-dated supply contracts are unavailable or carry counterparty risk, and when operational integration would erode optionality or require excess capital.

Effective implementation requires measurement and integration. Managers could monitor the proposed Offset Ratio and track hedge effectiveness through time, controlling for FX translation and one-off remeasurements. Strategically, the UEH should be combined with derivatives (e.g., futures/options) that address short-horizon inventory and timing gaps, while the equity stake provides multi-year cushioning against structural price cycles. The layered approach enhances resilience with capital efficiency while maintaining supplier optionality and governance flexibility.

Accordingly, evaluation should rely on rolling-window analyses and banded targets for the Offset Ratio (e.g., "0.2–0.6 in spike years"), rather than point estimates for a single period. Managers could report a reconciliation that separates (i) associate P&L, (ii) changes in carrying amount, and (iii) OCI components, alongside FX- and dividend-policy sensitivities, to distinguish economic cushioning from accounting translation. In practice, governance triggers (e.g., payout floors) and a derivatives overlay can be used to keep the realized offset within the desired band, preserving the UEH's role as a multi-year stabilizer while maintaining procurement optionality.

LIMITATIONS AND FUTURE RESEARCH

This study is a single embedded case centered on Indofood's minority stake in CMAA, which constrains external validity, although it can be generalized with the conditions discussed above. Measurement relies on financial-statement aggregates: the numerator of the Offset Ratio combines

associate P&L and changes in the carrying amount (equity method; IAS 28), while the denominator is a modeled sugar-attributable COGS shock. As such, translation effects under IAS 21, OCI movements (e.g., hedge reserves, biological-asset remeasurement), dividend policy, and timing mismatches between fiscal calendars can all influence observed co-movement.

Additionally, basis risk between the traded ICE #11 benchmark and the firm's effective input basket, as well as potential non-sugar drivers (mix, operating changes), may attenuate or amplify the apparent hedge. The design therefore supports a directional, not one-for-one, interpretation of cushioning.

For future research, comparative studies across commodities (e.g., cocoa, palm oil, wheat) and governance settings could test portability conditions, especially when using multi-firm panels and event-year identification. Methodologically, extensions could (i) decompose the Offset Ratio into associate-earnings, carrying-amount, and OCI components; (ii) incorporate rolling-window targets with explicit FX and payout sensitivities; (iii) benchmark UEH against alternatives (long-dated supply/tolling contracts, majority integration, pure derivatives) under matched exposure; and (iv) quantify basis risk and inventory timing with high-frequency data. Structural or quasi-experimental designs (e.g., policy shocks, exchange-listing changes) can sharpen inference, while simulations linking dividend policies and currency hedging to offset stability would inform capital-allocation and risk-management playbooks.

CONCLUSION

This study shows that a minority upstream stake, structured through loose coupling, can operate as a directional hedge against commodity price shocks. In the Indofood–CMAA case, the associate's carrying amount increases meaningfully during the 2023 price surge and eases in 2024, while dividends provide a cash channel. The mechanism delivers cushioning without forcing internal offtake, allowing the downstream business to keep procurement market-based. Read through the lens of risk management, UEH stabilizes the firm's internal funds when shocks would otherwise pressure margins and investment; read through the lens of organization, it transfers useful covariance through ownership returns while containing shock transmission in physical flows.

The paper's main contribution is to connect risk-management and organization design. UEH is formalized and articulated through an offset ratio that pairs P&L and balance-sheet channels to evaluate hedge strength. Boundary conditions are also highlighted: reported movements are state-contingent because FX translation, payout policy, and OCI affect annual visibility. The implication is practical, as managers should assess effectiveness over multi-year windows, monitor both the associate P&L and carrying amounts, and use market derivatives to handle short-horizon gaps.

In the case study, sugar-attributable COGS are not available, so the offset ratio is presented as a concept rather than a computed series, which creates a limitation and unravels a research agenda. Fiscal-year misalignment and translation effects further complicate period-by-period inference. Future work should (i) obtain or model sugar COGS to operationalize the Offset Ratio, (ii) replicate across other commodities and geographies to test external validity, and (iii) compare UEH to alternative designs (supply agreements, tolling, majority integration) under different FX and payout regimes.

In short, the evidence supports a portable playbook: build a cost-leading upstream pole, keep cross-pole links loose, and measure hedge strength with a transparent, auditable metric. Done this way, an upstream equity stake becomes a structural complement to operational and financial hedging—protecting the downside while preserving flexibility.

List of Abbreviations

- UEH - Upstream Equity Hedge: minority upstream equity stake used to cushion input-price shocks while preserving market-based procurement.
- OCI - Other Comprehensive Income: items recognized in equity (AOCI) that bypass profit or loss (e.g., hedge reserves, translation differences).
- COGS - Cost of Goods Sold: direct costs attributable to goods sold by the firm.
- FX - Foreign Exchange: currency translation effects (e.g., BRL/IDR).
- IAS 21 - The Effects of Changes in Foreign Exchange Rates: standard governing translation/remeasurement of foreign-currency items.
- IAS 28 - Investments in Associates and Joint Ventures: equity-method accounting for associates.
- ICE #11 - Intercontinental Exchange No. 11 Raw Sugar Futures (US\$ cents/lb), the global benchmark for raw sugar.

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