“DRONES AND DEPENDENCY”: STRATEGIC ALIGNMENT, TACTICAL HEDGING, AND ASYMMETRIC INTERDEPENDENCE IN CHINA–RUSSIA MILITARY COOPERATION

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Author's Declaration

I, the undersigned, **Ihor Masiakin**, candidate for the MA degree in Political Science, declare herewith that the present thesis is exclusively my own work, based on my research and only such external information as properly credited in notes and bibliography. I declare that no unidentified and illegitimate use was made of the work of others, and no part of the thesis infringes on any person's or institution's copyright. I also declare that no part of the thesis has been submitted in this form to any other institution of higher education for an academic degree.

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Abstract

Authoritarian collaboration has emerged as an important feature of the international security environment, yet there is little substantial scholarship analyzing the structures of such arrangements. This thesis examines the development of Sino-Russian military-technical cooperation in the UAV/drone industry, between 2014 and 2024. Focusing on the issue of unmanned aerial systems (UAS) as a realm of dual-use technology development, sanctions evasion, and battlefield ingenuity, it sets out to explain the underlying causal logics of the intensifying engagement of the UAS market between China and Russia, as an authoritarian part of the international community.

To resolve this puzzle, this study tested several hypotheses: aligned strategic objectives, transactional hedging, and the asymmetrical dependency of Russia on China. Through a detailed, theory-driven case study and process-tracing, the thesis frames a theoretical approach to analyzing militarized interdependence with respect to both state-owned and private defense industrial bases as well as militaries. By synthesizing aspects of asymmetric alliance theory, dependency theory, the literatures on hedging, and the concept of friendshoring, this thesis applies these theories and concepts within five key market episodes of drone collaboration: procurement deals, capabilities joint exercises and wartime reconfigurations of the supply chain. Empirical evidence is triangulated via customs filings, satellite imagery, open-source intelligence, and think-tank analyses.

The findings suggest that while momentary factors of threat convergence and strategic opportunism characterize phases of cooperation, the evidence suggests that it is structural asymmetry, primarily attributed to Russia's deepening reliance on a growing supply chain of China UAV components, financing, and UAV assembly capability, that will dictate the long-term trajectory of their interdependent relationship.

This thesis contributes to alliance theory and the study of weaponized interdependence in terms of how coercive leverage is embedded not through austerity but through capacity-controlling chokepoints associated with supply chains, licensing regimes, and integration of battlefield systems.

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Introduction

The strategic partnership between China and Russia is arguably one of the most consequential alignments in global politics today. This thesis contributes to an ongoing and contentious debate in the international relations literature concerning authoritarian military partnerships and the directionality of the China -Russia relationship. On one hand, some scholars view the increasingly cooperative China-Russia relationship as a strategic partnership, underpinned by shared perception of threats. While others counter that the China-Russia relationship continues to be a fragile interest-based coordination, based on asymmetries in relationship dynamics and historical mistrust associated with their long periods of broken bilateral relations. The theme of UAS cooperation is especially interesting, because it exists at the nexus of dual-use technology, state-sanctioned entrepreneurialism and a wartime improvised portfolio that blurs lines between expedient transactions and institutionalised alignment.

This study examines competing causal interpretations of the same phenomenon—deepening Sino-Russian drone cooperation. Does it result from shared threat perceptions (strategic alignment), short-term incentives (transactional hedging), or structural asymmetry (dependency)? Each approach explains the same development through a distinct causal lens. By investigating the evolution of Sino-Russian drone cooperation from 2014 to 2024, this study seeks to adjudicate between these competing logics and contribute to broader debates on authoritarian alignment, hedging behaviour, and asymmetric dependency.

The current global context adds further urgency to this inquiry. As the United States and its allies intensify export controls, investment screening, and techno-industrial decoupling, authoritarian regimes—most prominently China—are responding by constructing parallel ecosystems aimed at achieving strategic autonomy. This concept, increasingly evident in China's policy initiatives such as "Made in China 2025," reflects Beijing's efforts to reduce dependence on foreign technology and enhance indigenous innovation across critical sectors

like semiconductors, artificial intelligence, and unmanned systems. Understanding the drivers of drone cooperation and constraints can inform broader assessments of alliance durability, sanctions resilience, and the evolving architecture of global security. Recent scholarship on authoritarian adaptation shows that illiberal great powers are learning to shield themselves from Western coercive leverage by fusing coercive, economic, and technological statecraft (Feldstein, 2021).

Within this literature, China in particular is portrayed as pursuing "strategic autonomy" in critical dual-use technologies—a goal written directly into Beijing's 14th Five-Year Plan provisions on "self-reliance and self-improvement in science and technology" (State Council, 2021). Parallel work on geo-economic statecraft argues that such quests for autonomy inevitably spill over into alliance politics by making access to supply chains, standards, and industrial inputs key instruments of power (Wigell, 2019). Finally, research on Sino-Russian strategic alignment indicates that Moscow and Beijing increasingly coordinate precisely in those techno-industrial niches—such as unmanned systems—where autonomy, coercive leverage, and prestige intersect (Korolev, 2019).

These propositions raise both theoretical questions (e.g., how does techno-industrial interdependence alter classic alliance theory?) and methodological challenges (e.g., how can scholars observe a largely covert military-technical partnership?).

Despite frequent references to the "no limits" partnership proclaimed by Beijing and Moscow in early 2022, the precise nature and trajectory of Sino-Russian military-technical cooperation remain insufficiently theorised and poorly understood. Much of the academic literature continues to oscillate between two poles: on the one hand, strategic alignment accounts suggest that both regimes are engaged in long-term balancing against Western hegemony, underpinned by converging threat perceptions (Korolev, 2019 ; Mastro, 2024); on the other hand, more sceptical perspectives highlight the transactional, fragile, and reversible nature of cooperation

between authoritarian powers, especially given their historical mistrust and asymmetrical capabilities (Lo, 2017 ; Kaczmarski, 2018).

Nowhere is this theoretical ambiguity more salient than in the drone sector. On the surface, cooperation between Russia and China in unmanned aerial systems (UAS) appears to have grown steadily since 2014, driven by complementary needs: Russia's shortfall in critical components and China's surplus of dual-use platforms and manufacturing capacity. Yet the institutional depth, strategic intent, and long-term implications of this cooperation remain contested. Is the deepening drone collaboration an indicator of genuine alliance-building, a symptom of temporary battlefield expediency, or a manifestation of a growing dependency hierarchy? To address this puzzle, the thesis explores two interlocking dimensions of the Sino-Russian partnership. First, it treats drone cooperation as an empirical lens into military-technical exchange among authoritarian powers. Second, it situates this cooperation within a structural context of enduring strategic asymmetry between China and Russia. Together, these dimensions provide a framework for process-tracing the mechanisms that underpin and constrain their evolving alignment.

Research question:

How has Sino-Russian drone cooperation evolved as a cumulative causal process shaped first by shared threat perception, then by tactical hedging under operational constraints, and ultimately by structural asymmetry? What mechanisms account for the observed shift from flexible coordination to embedded dependency?

To test these interpretations, the study uses process-tracing to reconstruct three hypothesised causal sequences: • H1 (Strategic alignment): Threat convergence → defence dialogue → institutionalised cooperation • H2 (Transactional hedging): Exogenous shocks → ad hoc exchanges → rapid fade-out • H3 (Asymmetric dependency): Sanctions → tech shortfalls →

reliance on Chinese inputs Each mechanism implies different degrees of institutionalisation, leverage, and durability—observable through component flows, co-production patterns, and contract asymmetries. Using a mechanism-focused, theory-testing variant of process tracing, the thesis applies these hypotheses to a structured set of empirical episodes between 2014 and 2024. Evidence is drawn from customs data, satellite imagery, elite statements, and leaked procurement records. The empirical contribution lies in tracing these causal sequences in real time, under wartime pressure, using publicly observable indicators.

This study reframes authoritarian military cooperation not as a binary choice between alliance or autonomy, but as a cumulative causal process. Strategic alignment supplies the initial impetus; tactical hedging modulates implementation; and asymmetric dependency cements the long-term structure. The findings contribute to alliance theory and the literature on weaponised interdependence by showing how authoritarian powers embed coercive asymmetry through supply chains rather than formal treaties. In doing so, the thesis offers one of the first fine-grained empirical analyses of dual-use military-industrial cooperation between two authoritarian states operating under sanctions and at war.

This framework will be evaluated across a ten-year period in which all three mechanisms are assessed during each empirical phase, allowing for comparison between temporary alignments and durable structural dependence.

Chapter 1. Literature Review

1.1 Introduction

This chapter explores both the policy and academic literature about the theoretical framing of Sino-Russian defense cooperation. The chapter's purpose is to develop the ideas and discussions that create the hypotheses as stated in Chapter 2

Sino-Russian relations have evolved considerably over the last 20 years—from a 'partnership of great equals' and exchanging border disputes to a 'comprehensive strategic partnership of coordination' formalizing a top-level relationship and increasing military engagement, diplomatic engagements, and shared views against the US (Lo, 2023). Three important moments along this continuum are the 2001 Treaty of Good-"Victor" Neighborliness, the 2014 annexation of Crimea, and the 2022 invasion of Ukraine (Radin, et al. 2021). Even with these developments the growing structural gap cannot be dismissed; the sheer size of the growth of China's economy and the Chinese military are putting Russia in what will consistently and plausibly to be reckoned its subordinate alliance role (Kaczmarski 2016; Diesen, 2017).

While so many aspects are relevant, I will focus on two particular items about this partnership: the actual drone cooperation, as a window to military-technical exchange, and the consideration of strategic asymmetry, as the structural condition to this bilateralist position. Not only does the continuing presence of China as an increasing player in the UAV marketplace, but Russia's need for Chinese commercial systems at the point of invasion into Ukraine demonstrates the profoundly changing techno-industrial landscape between the two (CSIS 2023).

This chapter uses key ideological frameworks to investigate the relationship between China's technological rise and Russia's growing reliance on Chinese military and commercial systems. I will use two frameworks:

1. **Realist theories of great-power balancing** that establishes connections of alliance formation through shared external threats and pressures of international relations about system level behaviour (Mearsheimer, 2001; Walt, 2005);
2. **Asymmetric alliance and dependency frameworks** that reveal how gaps in capabilities give leverage to the more capable partner (Lake, 2009; Diesen, 2017); and
3. **Hedging theory** that explains how states—particularly authoritarian ones—manage uncertainty with opportunistic, flexible, and non-binding security cooperation (Goh, 2006; Tessman & Wolfe, 2011).

These frameworks provide structure to both the literature review and development of core hypotheses of the thesis.

The chapter will start with a discussion about how military-technical cooperation is conceptualized and gauged across theoretical traditions. The chapter will map each hypothesis (strategic alignment, transactional pragmatism, and asymmetrical dependency) onto respective IR literatures. A final section will provide some analysis of scholarship that discredits military ties between China and Russia as overhyped or tenuous and clarify how this thesis departs from those conclusions. By pulling together alternative explanations, and highlighting outstanding tensions, this chapter establishes a conceptual foundation for the research design in Chapter 2. It demonstrates how UAV cooperation is both reflective and constitutive of the more substantial asymmetry at the nexus of the Sino-Russian partnership—establishing the core research question and outlining the process-tracing analysis to come.

1.2 Definition of Co-operation

1.2.1 Institutional Foundations and Realist Drivers

China–Russia security cooperation is frequently characterized as having rich symbolic value but limited functional value (Lo, 2023). Because this chapter discusses how scholarship

conceptualizes institutionalization and alliance-building regimes, it does not assume a historical sequence. Empirical cases—treaties, summits, defense-industrial forums—are examined in Chapter 3 as an opportunity to test the causal mechanisms identified in this chapter.

Realist theorists argue that the Sino-Russian alignment is motivated by a mutual worry regarding U.S. unipolarity and NATO expansion (Mearsheimer, 2001; Walt, 2005). Since the 2014 Crimea crisis, both capitals began to consider a closer military collaboration as insurance policy against what they viewed as more assertive U.S. policies and actions (Radin, Scobell, & Steinberg, 2021). While both countries signed on to continue regular summits and declarations of similar joint statements, these commitments do not yet extend to a mutual defense clause (Lo, 2023; Weitz, 2008). The two capitals both refer to their relationship as a "comprehensive strategic partnership," which does contribute to understandings of relationship intent and agreement to cooperate, but does not establish formal commitments (Lo, 2023; Weitz, 2008). This distinction exists as the basis of their cooperation in drones, which for all intents and purposes are still fundamentally asymmetrical and under-developed.

New scholarship has provided a counter-narrative that calls into question assumptions of inherent fragility associated with authoritarian cooperation. Freire and Mendes (2009) and Malle (2017) both make the case that the China-Russia partnership is not based exclusively upon opportunism, while Libman and Obydenkova (2018) illustrate how informal mechanisms allow even autocratic regimes, such as Myanmar, to maintain cooperation. This thesis has borrowed or built upon these contributions; however, the China-Russian relationship is still constrained by technology limitations, institutional distrust, and varying hedging strategies that inhibit formal integration, even when it may be labelled a strategic partnerships.

1.3. Asymmetric Alliances and Dependency Theory

The three hypotheses in this dissertation are firmly rooted in the debates surrounding authoritarian international cooperation. Hypothesis 1 is based on realist theories which view strategic alignments formed under shared threats and a power balancing framework (Mearsheimer, 2001; Walt, 2005). Hypothesis 2 builds on hedging theory which interprets select or situation-specific cooperation as an avenue for states to avoid over-committing and losing autonomy (Goh, 2006; Tessman & Wolfe, 2011). Hypothesis 3 is based on the literature on dependency and asymmetry in alliances by examining how differences in abilities and leverage influence weakened relations among unequal partners (Lake, 2009; Diesen, 2017; Farrell & Newman, 2019).

The evolving relationship between Russia and China provides a case to examine these dynamics. China's GDP is ten times that of Russia's, and its defence budget is approximately triple that of Russia's. Russia's economy is in a complicated position due to sanctions and a declining population (Lo, 2023). In alliance theory, it is argued that a dependent relationship is made possible by these disparities and the forced dependency of the weaker actor dictating many variables according to the preferences of the strong actor (Lake, 2009; Walt, 1987). In this instance, China has exercised its structural advantage and shaped the terms of trade, technology transfer and security cooperation according to its own preferences (Diesen, 2017).

Rather than resist this, Russia has adapted to the imbalance. Since 2014, Moscow has increased ties despite the growing imbalance, forced through economic distress, diplomatic isolation and China's deliberate, restrained efforts to not exploit the situation (Kaczmarski, 2016).Nevertheless, Russian elites worry about becoming a "resource appendage" and worry as dependencies increase that strategic autonomy may further erode (Lo, 2023).

Dependency theory also clarifies asymmetries in regards to the technology and energy sectors. For example, China secured several long-term contracts for oil and gas supplies from Russia at favourable prices that alleviated Russia's post-2014 economic isolation but enhanced its

leverage in them (Lo, 2023). This squared with a wider phenomenon of asymmetric interdependence, where the economic relief for one interdependence partner facilitated a strategic claim onit (Farrell & Newman, 2019; Radinet, et al., 2021). In defence, the reversal is evident: Russia once supplied arms but is now dependent on China for semiconductor chips and the manufacture of drones, which are crucial to the sustaining of Russia's war effort (CSIS, 2023). Sanctions expedited the pivot for Moscow, which fell into a subordinate and dependent role as a supplier cascade.

Yet there are aspects of mutual benefit for both sides. For example, China is still depending on Russia for some high-end military technologies - for example, jet engine artifacts and air defence systems - and continues to benefit from Russia being a permanent member of the UN Security Council (Korolev, 2018). This reflects a complex form of "balanced interdependence" whereby China dominates in terms of economic bargaining, while Russia enhances its value by being able to adapt on the battlefield and raise the prospect of escalation (Diesen, 2017).

Ultimately, the question for further research is whether this asymmetric but functional partnership permanence - or whether Russia would eventually seek to rebalance at an increasing cost as vulnerabilities are aggravated. In general, dependency theory observes that the further into dependency regimes these asymmetries become, the more futile it will become to unwind them. This line of argument reflects with Diesen's (2017) use of the ideal type of a "balance of dependence" construct, and the previous evidence of China's ability to extract better gas pricing and technological access, and which required minimal political risk (e.g., Radin, et al., 2021, Roberts, 2021).

For the sake of clarifying the conceptual consistency I have employed in the previous sections, this thesis has treated asymmetry as a multi-dimensional structural condition that functions at multiple levels of analysis employing economic, technological and strategic asymmetries as variance of a specific type of asymmetrical architecture; that is, if I view asymmetry first as a

causal antecedent (i.e., enabling dependency mechanisms), second as a relational context (thereby structuring how negotiation unfolds), and third as an empirical outcome (i.e., observable in lock-in effects and strategic concessions). This format provided opportunities to test Hypotheses 3 as both explanatory mechanism but also an indicative process.

1.4. Hedging Behavior and Strategic Diversification

Even as the nexus of the Chinese-Russian relationship continues to expand, both continue to hedge in their relationship with one another. In the context of international-relations theory, hedging is a strategy to respond to uncertainty by combining cooperation and competition. The goal is to obtain benefits with autonomy (Goh, 2006; Tessman and Wolfe, 2011). Both states have engaged in hedging to prevent excessive dependence with each other, and ensure flexibility.

In the post–Cold War period, Russia had a multi-vector foreign policy approach where it balanced relationships with Europe, U.S., and China, but when relations with the West worsened in 2014, Moscow's hedging came under pressure. Rather than using relations with other Asian powers to counterbalancing China's rise, Russia began to align with Beijing, which Kaczmarski (2016) refers to as pragmatic adaptation. While Russia has been approaching China more consistently as a strategic partner some of what Russia seeks to diversify remains, as Russia has sought formal energy ties with India for defense contracts, actively promotes the Eurasian Economic Union in Central Asia, and is still trying to create ties through the membership of the Collective Security Treaty Organization (CSTO) because he needs regional influence (Allison, 2018; Kaczmarski, 2016).

China is also hedging away from tangled situations associated with Russia's conflicts. After Putin asked Xi for help just before the February 2022 invasion, the two states declared the "no limits" partnership. China offered economic and potential diplomatic support but stopped short

of making guarantees of alliance, or lethal aid to Russia in order to maintain plausible deniability to Ukraine and working with EU and NATO (Zhao, 2022; Zeitschrift für Friedens und Konfliktforschung, 2023). While China is being associated with Russia, it has built seemingly unaligned relations with other nations through things like the Belt and Road, the BRICS+, and the Global Security Initiative (Ferrari, 2023). China also diversifies its energy imports from Russian pipeline routes, Middle East suppliers, and LNG market sources, to lessen the potential of coercive behavior (Radin, Horvath, & Scobell, 2021).

While hedging is evident in the bilateral relationship between their refusal to endorse the others most sensitive security issue (China rejecting Russia's annexation of Ukraine territory, and Russia choosing to continue to play neutral on the South China Sea), the Shanghai Cooperation Organization is noted by Allison (2018) as an example of not disagreeing on sensitive issues with each other—China leads on economic and counterterrorism issues, and Russia leads on military based with the CSTO.

In many ways the room for effective hedging is closing. The rising power of U.S.-China competition, and deepening unilateral sanctions on Russia affecting its relations with others, compound the difficulty for both to ignore incentives to more explicity commit to one another (Radin et al., 2021). While Beijing has potential room to signal further interest in diplomatic flexibility—varsities erected food, agriculture, peacemaking, and habits of trade with Europe—deeper layers in technology and energy to Russia increase potential marginal costs the greater China's reliance with Russia. For Russia, dependency on Chinese in financing and drone components, potentially stunts its opportunity to orient more decisively towards other western partnerships. Hence what originally began as a hedging exercise, is increasingly entrenching into a strategic inevitability whereby neither partner can disengage without significant political and economic costs (Wu, 2022).

1.5. Security Communities versus Security Regimes

The question of whether China and Russia are members of a security community or just a security regime casts light on their strategic distance. According to Deutsch and colleagues (1957), a security community rests on shared identity and expectation of peaceful change - conditions under which war between community members becomes unthinkable. A security regime entails a collection of rules and coordination mechanisms without committing to renouncing the use of force (Jervis, 1982).

China and Russia possess none of the ideological alignment or sense of collective identity associated with true security communities, despite joint military exercises and settled boundary disputes courting integrationism between them. While there is considerable ideological opposition to US dominance, their cooperation in Asia is not driven by shared norms or "we-feeling" (Weitz, 2008; Adler and Barnett, 1998). Mutual suspicion endures, with Russian elites voicing concern over the potential of Chinese economic dominance in Siberia, and their counterparts in China cautious of Russian unpredictability.

Institutionally, the relationship remains consistent with a security regime. The states coordinate their actions at a range of institutional levels, such as the SCO, bilateral summits, and the United Nations, but have no mutual defense obligation, no common command structure, and no alliance treaty matching NATO's Article 5 obligation (Baev, 2022; Lanteigne, 2018). Even military cooperation - such as exercises and intelligence-sharing - has been more Canada-US than NATO. Both states retain their strategic autonomy which will motivate their positions in the relationship.

While it seems radically unlikely that the two could end up involved in direct conflict with one another, this is based more on mutual deterrence - and nuclear parity - than any deep normative reconciliation (Jervis, 1982). Overall, the relationship can be better characterized as a management regime of coordination, rather than a community of trust. The understanding and coordination principles of sovereignty and non-interference help structure the relationship, but

the reality of clearly specified limits underlaying joint action gives a precarious boundary to the two states (Weitz, 2008).

1.6. Conclusion

In the previous chapter we reviewed the literature on Sino-Russian military cooperation, and located the thesis within the broader debates on authoritarian alignment, asymmetric interdependence, and hedging behaviour. The conceptualisation of the China-Russia relationship has been argued to reflect a hybrid model—strategic yet non-binding, institutionally engaging but not operationally exclusive—constructed not by ideology, but by converging threat perceptions, tactical convenience, and widening technological asymmetries. Based on realist, alliance, and dependency theories, the proposal of managed alignment was offered, in which Russia sacrifices some of its autonomy for access and China exploits control of supply chains for strategic gains. The case of UAV cooperation demonstrates this in that Russia transitions from supplier to dependent client, but both sides are okay with strategic ambiguity. We concluded the chapter by proposing three interrelated theoretical propositions: threat convergence (H_1); transactional hedging (H_2); and asymmetric dependency (H_3). These logics underpin the research design of Chapter 2 to test if this partnership is becoming a platform for institutionalised alignment, remains tactically opportunistic, or is developing into a structurally asymmetric security regime.

Chapter 2. Research Design

2.1 Research Objectives and Scope

This dissertation investigates the development of military-technical cooperation between Russia and China with a detailed empirical focus on the joint development, transfer, and usage of unmanned aerial systems (UAS) and drone-related technologies. Since drone systems increasingly fuse functions of surveillance, strike, and electronic warfare, they are an excellent means through which to examine the strategic depth or otherwise of bilateral security arrangements.

Empirically, this dissertation examines five cases: two pre-war procurement agreements (2015 and 2019), one significant joint exercise (Zapad/Interaction-2021), and two supply chain interruptions during wartime (Q2-2022 and Q3-2023). All cases were chosen utilizing a diverse-case logic, which maximizes variation on the dependent variable (Beach & Pedersen, 2016, pp. 13-15).

The main goal is to evaluate whether China-Russia drone cooperation represents an emerging strategic convergence or is seen primarily as transactional based on asymmetries of interest and capacity. In particular, the question for this dissertation is whether institutionalization of the relationship is proceeding along alliance lines or if it is instead hedged due to geopolitical pressure and dependency on technology.

The boundaries of the research start in 2014, the date after the Russian annexation of Crimea and Western sanctions pushed Moscow to look towards China as a strategic partner and technology supplier, and end in 2024 in order to capture the increasing volume of cooperation after the full-scale invasion of Ukraine in 2022.

Instead of providing a broad overview of China-Russia relations, this dissertation restricts the empirical investigation to defense-industrial cooperation that focuses on drone technology—specifically in relation to technological dependency, co-production, and policy signaling. This dissertation employs four theoretical prisms to frame this cooperation: alliance formation, asymmetric interdependence, hedging, and friendshoring (Welsh, 2016, pp. 198-199), in order to determine whether tactical coordination is yielding to deeper strategic alignment.The dependent variable (DV) is the degree of institutionalization of UAV cooperation, measured on a four-point scale from ad hoc transfers to integrated co-production. Two independent variables (IVs) are posited to shape this outcome: (1) external threat convergence and (2) technological interdependence.

Three central research questions guide the inquiry:

1. How has China–Russia drone cooperation structured around durable institutional frameworks versus ad hoc transactions?
2. How does Russia's growing technological dependence on Chinese UAV components shape the bilateral balance of influence?
3. Does China's approach to military cooperation with Russia reflect strategic alignment or calibrated hedging?

In this thesis, the China–Russia dyad is treated as a single empirical case. Drone cooperation is the sectoral arena in which the DV is observed and measured over time (2014–2024). Strategic asymmetry—operationalized as Russia's techno-industrial dependence on Chinese UAV inputs and China's control over critical sub-systems—serves as a key independent variable, tested through Hypothesis 3.

The findings have broader implications for understanding alliance dynamics among authoritarian regimes and assessing how emerging technologies—such as drones—reshape traditional models of military dependence and strategic behavior.

A ten-year window is analytically appropriate: it is long enough to observe what Beach and Pedersen (2013, p. 75) term “process breaks”—moments when causal mechanisms accelerate or stall—yet short enough to avoid excessive regime-change noise.

2.2 Conceptual Framework

This thesis conceptualizes Sino-Russian drone cooperation via an integrative framework predicated on four lenses: asymmetric alliance theory, dependency theory, hedging behavior, and friendshoring. Each lens is viewed as facilitating the theoretical roadmap used to evaluate whether bilateral military-technical engagement reflects strategic alignment, flexible pragmatism or culturally ingrained structural dependence. This design aligns with the suggestion to "nest mechanism analysis with complementary theories" (Beach & Pedersen, 2019, pp. 2-6).

Asymmetric Alliance

Asymmetric alliance theory draws attention to how power imbalances have important implications for ensuring the viability of strategic partnerships. As Lake (2009) observes, asymmetric alliances entail asymmetric gains—where the stronger state offers security or goods and the weaker party provides concessions or alignment. This is especially relevant given China's technological advantages and economic advantages in UAV systems and Russia's increased dependence on Chinese-produced components and platforms. This lens is useful to assess if Russia is behaving as a junior partner in a hierarchical relationship.

Dependency Theory

Dependency theory is helpful to explain how structural asymmetries—specifically as they relate to technological, financial and institutional disparities—explain the strategic behavior of unequal partners. In the research, however, asymmetry is not only a contextual background, but is an evolving variable in degree. At first, asymmetry serves as an enabling condition (cause) for cooperation under sanctions, then as it constrains policy choices (mechanism), finally it produces a hierarchical outcome where one state acquires permanent leverage over the other.

Hedging Behavior

Hedging theory explains how states cope with uncertainty by pursuing strategies of both engagement and balancing. Following Goh (2006) and Tessman & Wolfe (2011), hedging entails a degree of calculated ambiguity that preserves uncertainty for the state in question, allowing the flexibility to engage or conceal itself from entrapment. In the UAV context, instances of hedging included resistance from both states to sign binding bilateral commitments, their conflicting geopolitical interests in the Indo-Pacific and Ukraine, and China's selective technology transfers aimed to avoid triggering the ire of the West (e.g., export limitations and sanctions).

Friendshoring

Friendshoring, defined as efforts to relocate sensitive supply chains to politically aligned partners, offers a strategic-industrial layer to the analysis. Here, establishing UAV assembly inside Russia supports China in diminishing exposure to western export limits while increasing bilateral economic interdependence. Friendshoring supports dispositional changes by demonstrating evidence of joint ventures, assembly licensing, and other indicia of reciprocal dependencies within the Russian economy (Collier, 2011, p. 826). Although friendshoring

would normally only apply to economic production (Javorcik, 2022), I adapt the concept as a mechanism of semi-aligned strategic entrenchment, relating to security-industrial ties.

Causal Mechanism Structure

Each of the lenses conceptualized in this model are treated as discrete causal mechanisms comprised of observable elements, including inputs (component flows), transmission belts (MoUs), and outputs (C2 integration of systems) following Beach and Pedersen's (2019, pp. 42-44) mechanism schema.

Individually and in concert, the four lenses assist in capturing the range of strategic behaviors found in authoritarian partnerships, which range from capabilities, transactional modifications, and structured interdependence. Instead of reducing the relationship to alliance or autonomy, this framework captures how pragmatic cooperation becomes embedded through industrial, institutional and technological channels.

2.3 Hypotheses

As outlined in the framework presented in the previous section, this thesis proposes three connected hypotheses, each of which posits an alternative explanation of the character of the evolving China–Russia drone cooperation. Each of the hypotheses is based on different theories of action, including strategic alignment, transactional interaction, and asymmetrical dependence. Each of the hypotheses also aims to tell us something about the intentions and possible structure of the military-technical relationship between China and Russia.

Each of the hypotheses relies on a different causal logic. H_1 (strategic alignment) treats threat convergence as an antecedent starting point for some type of formal coordination and institutionalization. H_2 (transactional hedging) argues cooperation is characterized by a series

of opportunistic choices wherein the parties are trying to maximize utility under conditions of uncertainty, while also confronted by political, economic, and reputational barriers. H_3 (asymmetrical dependency) argues that changes in technology and finance create structural inequalities that give one party a persistent tactical advantage. These are not just interpretations, they are causative assumptions about what drives cooperation in an authoritarian context.

Following Collier's (2011, p. 828) typology of 'smoking-gun' and 'hoop' tests, each of the hypotheses is linked to understandings of process tracing indicators.

H_1: Strategic Alignment Hypothesis. China and Russia are moving towards a durable strategic alignment in the drone sector characterized by comprehensive interoperability, institutionalized levels of operational cooperation and collaborative technology development. This hypothesis will follow if we detect continuing convergence on shared standards in UAV design, a stable and established procurement channel for bilateral or multilateral political and military acquisitions, and formally agreed upon mechanisms for any type of command integration, shared intelligence, and joint manufacture of drones.Indicators could be seen through publicly divulged collaborative R&D projects; the establishment of permanent UAV production facilities in either country; and/or the deployment of Chinese drones together with integrated command elements in exercises.

H_2: Transactional Partnership Hypothesis. The China–Russia drone relationship is best conceived as an adaptable, transactional partnership predicated upon a short-term notion of utility, rather than on an institutionalized understanding. This hypothesis assumes that the UAV exchanges are designed to meet immediate operational requirements—Russia's battlefield deficiencies or China's interest in field-testing systems—without formal security obligations. This perspective would lend credence if we noted irregular supply patterns, a lack of

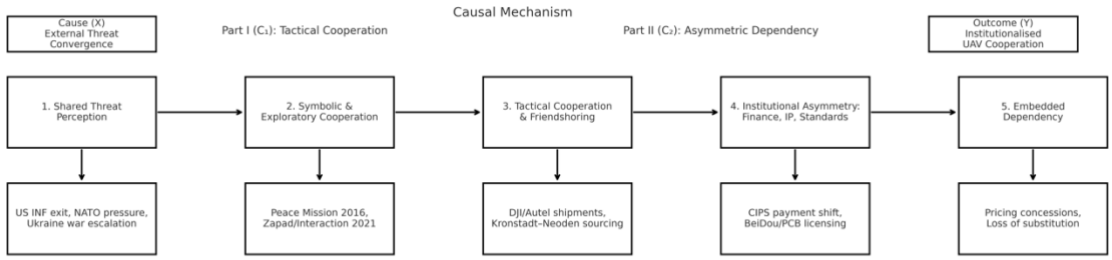
coordinated long-term planning, obscure procurement methods, or that China was restricting advanced systems or was hesitant to conduct joint combat exercises with drones.

H_3: Asymmetrical Dependence Hypothesis. The drone relationship displays structural asymmetry in that Russia's dependence on Chinese UAV platforms and components increasingly undermines its defense- industrial independence, and strategic autonomy. This hypothesis relies on studies of dependency theory and studies of asymmetrical alliances, and would be indicated by the examples of Russia procurement of sub-systems intrinsic to its UAV programs (e.g., avionics, engines, sensors), drone production moving entirely to China owned and or co-produced facilities (friendshoring, etc.), or evidence of China exploiting their position, influencing Russian military decision making, or restricting re-export technology (e.g., components).

Collectively, the hypotheses provide a framework for a nuanced empirical assessment that ascertains the degree to which China and Russia are moving toward a formalized security bloc centered on UAVs; continuing to cooperate instrumentally based on tactical needs; or moving toward a co-relationship characterized by hierarchy based on technological dependence and strategic caution.

Because the mechanisms can operate simultaneously, the research will apply Collier's 'nested causation' caution, and treat there being partial validation of more than one hypothesis as an

appropriate analytical stance (2011, p. 829).



Hypothesis	**Process-Tracing Indicator**	**Evidentiary Weight**
H_1 Strategic Alignment	1. Publicly announced binational UAV design bureau or programme office with joint budget line	Smoking-gun
	2. Signature of an inter-governmental agreement mandating *permanent* drone co-production (> 5 yrs)	Hoop
	3. Common data-link / C2 standard field-tested in a bilateral exercise	Doubly-decisive
	4. Routine PLA & RuMoD liaison officers embedded in partner R&D institutes	Hoop
	5. Joint appearance of a Sino-Russian UAV squadron in third-party multilateral drill	Smoking-gun
	6. Publication of a shared technical specification (GOST/GB) for drone avionics	Straw-in-the-wind
	7. Integrated satellite or EW support cell for drone operations (open-source confirmation)	Smoking-gun
	8. Co-financed export marketing of a "Sino-Russian" UAV model to a third state	Straw-in-the-wind
H_2 Transactional Partnership	1. *One-off* bulk shipment of commercial DJI/Autel quad-copters without follow-up contract.	Smoking-gun

	2. Procurement spikes aligned with battlefield crises and subsequent supply gaps	Hoop
	3. Absence of any multi-year R&D line-item in open budgets or leaked docs	Straw-in-the-wind
	4. China's withholding of strike-capable UAVs while providing ISR variants	Doubly-decisive
	5. Russian Ministry statements framing drones as "temporary stop-gap" measures	Hoop
	6. Cancellation or indefinite postponement of a previously announced JV	Smoking-gun
H_3 Asymmetric Dependency	1. > 60 % of critical UAV components (engines, EO/IR sensors) imported solely from China	Smoking-gun
	2. Documented shutdown of Russian UAV lines after Chinese export licence pause	Doubly-decisive
	3. Establishment of a Chinese-majority-owned final-assembly plant inside Russia	Hoop
	4. Beijing's veto on re-export of Chinese-origin subsystems to third parties	Smoking-gun
	5. Russian officials' public acknowledgement of "near-total reliance" on PRC parts	Straw-in-the-wind
	6. Price or payment-schedule concessions granted by Russia under threat of supply cut	Hoop

2.4 Methodological Approach

The empirical core takes the theory-testing variant of process tracing (Beach & Pedersen, 2013, Ch. 2), enhanced by the causal-process-observation logic in Collier (2011), to investigate the trajectory of drone-related military-technical cooperation between China and Russia. Process tracing is especially helpful in analyzing the unfolding of causal mechanisms over time and the presence of observable evidence that fits competing theoretical expectations (strategic alignment; transactional partnership; asymmetric dependency). The four classical evidentiary tests (hoop, smoking-gun, doubly decisive and straw-in-the-wind) are applied for every observable instance of Sino-Russian UAV cooperation over the period from 2014 to 2024.

Each hypothesis is associated ex-ante with a particular necessary and/or sufficient set of indicators. For example, in the case of the Strategic Alignment Hypothesis (H_1), we pass a smoking-gun test if an officially-published Memorandum of Understanding calls for a permanent Sino-Russian UAV programme office with jointly funded resources; it must also, at minimum, clear the hoop test of having continuous liaison officers embedded in each partner's design bureaux. For the Transactional Partnership Hypothesis (H_2), there is evidence of support when supply stoppages correspond with battlefield demands of limited duration and, conversely, when there is no multi-year procurement roadmap.

Lastly, the Asymmetric Dependency Hypothesis (H_3) is validated when documentary or imagery evidence demonstrates an interruption in Russian production lines only after Chinese firms cease delivery of essential electronics, thus demonstrating unilateral leverage.The rationale for process tracing embodies the goal of the dissertation: to assess whether the observable trajectory of UAV cooperation shows evidence of a deepening alliance, remains strictly a matter of situational necessity, or is indicative of increased Russian subordination within an asymmetrical relationship. The lack of formal alliance structure and many interactions

occurring outside of the public domain will require a qualitative, mechanism-centric approach to assess the process and nature of the relationship.

This dissertation is organized around three analytical tasks:

1. Identifying the pivotal turning points and strategic inflection points in the relationship—e.g. their joint military exercises, arms transfer, production agreements, and changes to procurement patterns—since 2014 (Crimea), 2022 (invasion of Ukraine), and into 2024-2025.

2. Associating specific key episodes of cooperation or restraint with the identified causal logics. For example, if the collaboration between Russia and China on drone production can be considered institutionalized then the analysis supports H_1; if the drone use is erratic or only tactical, then H_2 is supported; and if Russia sees systemic reliance on Chinese subcomponents and is unable to find substitutes, H_3 will be supported.

3. Evaluating the plausibility of each hypothesis based on process tracing evidence and chronology, and that evidence is collected from primary and secondary sources. These steps constitute the operationalization of the four classical tests—hoop; smoking-gun; straw-in-the-wind; and doubly-decisive—that Beach and Pedersen (2013, pp. 14-18) argue for conducting. The methodological design is supplemented through the use of typological theory and structured-focused comparison to assess the extent that episodes of cooperation align with one or more causal models.

The design allows for non-mutually exclusive outcomes: for instance, alignment and dependency may coexist, especially as a function of an intricately constructed military-technical domain such as UAVs.

The framework also permits an empirical reconstruction of intent and restraint in a context that is typically obscured by propaganda and state secrecy. While there are limitations with open-source material, the analysis triangulates what data is generally available from think-tanks (e.g. CSIS, RAND), trade databases (e.g. SIPRI, UN Comtrade), investigative journalism (e.g. Reuters, Der Spiegel), and official pronouncements to yield a coherent, testable causal narrative.

To account for 'source endogeneity'—the social scientist may never know the true intent of the source—each primary account is cross-referenced with at least one independent causal-process observation (Collier, 2011, p. 825). While the empirical analysis is temporally housed in three phases (2014-2018, 2019-January 2022, and February 2022-December 2024), the phases do not vendor their own hypotheses while observing (in the case of the first two phases) the same relationship unfolding over time. Thus, even as each phase has potential 'phases' of misalignment, the three potential hypotheses—strategic alignment (H_1), transactional hedging (H_2), and asymmetric dependency (H_3)—will be used to explore the presence or absence of the three proposed causal mechanisms.

The temporal dimension allows for building out processes from more finely grained causal-sequencing and the hypotheses are tested against the full observation between the initiation of UAV cooperation and the eventual public and observable conclusion. While the empirical analysis is temporally housed in three phases (2014-2018, 2019-January 2022, and February 2022-December 2024), the phases do not vendor their own hypotheses while observing (in the case of the first two phases) the same relationship unfolding over time. Thus, even as each phase has potential 'phases' of misalignment, the three potential hypotheses—strategic alignment (H_1), transactional hedging (H_2), and asymmetric dependency (H_3)—will be used to explore the presence or absence of the three proposed causal mechanisms. The temporal dimension allows

for building out processes from more finely grained causal-sequencing and the hypotheses are tested against the full observation between the initiation of UAV cooperation and the events that will be observable legally compelled by public statute, Dec, 2024.

2.5 Case Selection

This thesis analyzes the China–Russia military-technical partnership with attention to drone technologies from 2014–2024. The dyad is problematic as an atypical and analytically interesting case: two authoritarian powers in sustained defense cooperation without formal alliance structures—a departure from alliance theories' conventional expectations.

The empirical core is focused on UAV cooperation, tracking its evolution from symbolic encounters and minimal component transfers, to relevant wartime production schemes and an increasing reliance on Chinese supply chains. The decade-long timeframe captures deepening geopolitical constraints and internal asymmetries, especially in the wake of Russia's 2022 invasion of Ukraine.

The case selection uses a "most-likely" (Beach & Pedersen, 2016, pp. 3-4) design to assess whether asymmetric dependency can emerge under highly favorable conditions. If asymmetric dependency cannot emerge or is not feasible, the plausibility of the dependency mechanism (H_3) is reduced. The analysis utilizes process tracing to establish linkages between changing cooperation and external shocks (e.g., sanctions, military losses) and internal constraints (e.g., technology gaps, downgrading of doctrinal differences).

Both cases fall within the "authoritarian supplier-recipient" quadrant of the typological framework developed by Beach and Pedersen (2019, p. 51) rather than two alternative quadrants, increasing their comparability. Together, both cases will allow the thesis to assume a measure of comparison and examine all three propositions covering core propositions—

strategic alignment, transactional pragmatism, and asymmetric dependence—and explore whether the China and Russia drone nexus is a unique case or just one example of a broader systemic manifestation.

2.6 Time Frame

The study covers the years of 2014-2024 in order to capture the growing intensification of China-Russia military-technical cooperation, specifically with regard to unmanned aerial vehicle technology. The temporal frame begins with two important developments: Russia's annexation of Crimea and subsequent Western sanctions against Russia which in turn acted as a catalyst for Moscow's shift toward Chinese dual-use technology. These two events represented a structural shift, providing a framework for mutual estrangement from the U.S.-led international order and solidifying there was an incentive for defense cooperation.

The 2024 temporal endpoint is validated by several prominent consolidation trends:

- Chinese platforms (e.g., Garpiya-A1, ZT-180) are now integrated into Russia's drone inventory.
- Friend shoring dynamics have matured, with Chinese firms establishing production and supply agreements within Russia.
- Members of the Russian elite have publicly acknowledged China's crucial role with regard to Russia's UAV capabilities.
- Chinese exports show an increasingly blurry line between civilian and military exports.

This temporal window allows us to identify causal mechanisms and key inflection points while avoiding the distortion caused by short-term market volatility or regime change noise, and while encompassing key external shocks:

- The U.S. withdrawal from the INF Treaty (2019);
- The Joint Sea and Zapad/Interaction exercises (2021);
- Russia's full-scale invasion of Ukraine (2022); and
- The reconfiguration of UAV supply chains caused by sanctions (2023-2024).

To consider it holistically, the frame of 2014-2024 represents an empirically rich landscape for process tracing to draw from allowing us to analyze both stable continuity and substantial structural transformation in Sino-Russian cooperation on drones.

2.7 Methods and Sources of Data Collection

The study employs a qualitative process-tracing analysis to understand how the China-Russia military-technical cooperation initiated in the armed UAV domain evolved from 2014–2024. Process-tracing is an appropriate methodology and strategy for identifying both temporal and sequential causal processes, allowing insight into strategic intent, institutional adjustments, and material interactions over the course of time.

This framework facilitates testing the core three hypotheses of strategic alignment, transactional partnership, and asymmetric dependence, while reconstructing the causal mechanisms behind defense-industrial decision-making.

The study will take a mixed-source approach, which allows to access data from the following sources of evidence:

- Government documents from official Chinese and Russian state sources (e.g., white papers, defense ministry presentation materials, notices of acquisitions, joint statements), offering insight into how both systematically characterize their cooperation, as well as coverage of more informal discussions.

- Open-source intelligence (OSINT) or investigative journalism from multiple sources such as, Reuters, The New York Times, the Kyiv Independent, Trap Aggressor, and Oryx which are following the UAV domain as it relates to the levels of deployment in war, supply chains, and production facilities.

- Think tank studies from RAND, CSIS, and RUSI which collectively contain technical insights and conceptual framing about hedging, friend-shoring, and dependencies.

- International trade data from multiple websites, the majority of which is sourced from UN Comtrade and ImportGenius that allows tracing Chinese component exports to Russia. The study included 200 customs filings and related documents from the years 2021-2024 to triangulate volumes, types of vendors, and their behavior, especially when connected to sanctioning measures.

Recognizing that the notable opacity of authoritarian military partnerships is important, the study employed very rigid source triangulation. Each data reconciled at least two independent sources types—for instance, leaking a procurement record source versus satellite imagery, cross-referencing trade vs. publicly announced data.

This provided both data factual regularity as well as representational reliability at mapping the transition from a drone sourced ad-hoc trade to a co-production and technology embedding dependency relationship.

By combining documents, OSINT, trade information, and expert evaluations, the study has an objective empirical basis that allows the study to track causal mechanisms across keys episodes, to assess the level of institutionalisation of their cooperation on armed UAVs, and then finally, evaluate the characterisation of the relationship as aligned, hedging, or asymmetric dependence between China-Russia into the future to 2024.

2.8. Conclusion

This chapter has translated the broader puzzle of Sino-Russian drone cooperation into an actionable research design. By specifying the institutionalisation of UAV cooperation as the dependent variable, and by isolating both external threat convergence and technological interdependence as the principal independent drivers, the study establishes a narrow explanatory space and clear analytical boundaries. Three potentially rival hypotheses—strategic alignment, transactional partnership, and asymmetric dependency—have been operalised, corresponding to discrete, observable indicators, and related to the four original process tracing tests (hoop, smoking-gun, straw-in-the-wind, doubly-decisive).

At the methodological level, the chapter employs a theory-testing variant of process tracing (Beach & Pedersen, 2013) and Collier's (2011) causal-process-observation logic. This approach is appropriate because important episodes of drone cooperation will be stacked vertically, usually through learnings behind a closed door, and require a mechanisms-centred approach, in order to trace 'silent' policy and production chain shifts. Feasibility for the research design relied on a mixed source strategy: publicly available defence white papers, sanctions and trade databases, OSINT imagery, investigative reporting, and think-tank specific analysis. Triangulation of these protean sources will help to ameliorate source bias and endogeneity and provide more inferential leverage in spite of the typical ambiguity of authoritarian defence transactions.

The case structure—also strengthens causal inference with a more stringent test of the dependency mechanism. The timeframe of 2014–2024 also provides sufficient time variation to identify mechanism activation and 'process breaks' (Beach & Pedersen, 2013, p. 75) without diluting the focus through regime or chief turn-over.

In the following chapters, we will apply the analytic machinery laid out herein to a series of empirical episodes—the first joint exercises post-Crimea, and the wartime further extent of the PLA-Russia drone supply chains post-2022.

Chapter 3. Empirical Analysis

3.1 Chapter Overview and Empirical Strategy

Chapter 3 serves as the empirical core for the dissertation. It establishes the trajectory of Sino-Russian drone cooperation from 2014 to 2024, and it tests the three competing causal logics presented in the theoretical framework: strategic alignment, transactional partnership, and asymmetric dependency. Within the framework of all three empirical phases of this study, these mechanisms are examined within the three temporal phases, which allowed for observing the hypothesized patterns of interest—they are not mutually exclusive tests.

Importantly, each temporal phase examines all three hypotheses simultaneously, rather than on a one-hypothesis-per-temporal-phase basis. This design reflects the cross-phase analytic logic of the study: as noted, the three temporal brackets each stand on their own as process-tracing units from which comparisons may be drawn about the strategic alignment, the transactional hedging, and the asymmetric dependency expressed and utilized in those contexts based on specific geopolitical and technological constraints. While we regard the empirical weight of the three mechanisms across each of the three phases may differ, the analytic task is to establish the relative explanatory strength of each mechanism, at each stage of the partnership, thus, identifying temporal transitions of dominant mechanisms without placing it on a linear or mono-causal trajectory.

This analysis focuses on one dependent variable: the level of institutionalization in drone cooperation between Beijing and Moscow. Following the work of Mastro (2024) and Cozad, Cortez and Woodworth (2024), institutionalization is understood as the routinization of military-technical exchange using formalized agreements, enduring structures, or shared operational parameters, as opposed to the ad hoc transfers. Two independent variables explain

this arrangement: external threat convergence, based on balance-of-threat realism (Mearsheimer, 2001; Walt, 2005), and techno-industrial asymmetry, based on dependency and asymmetric alliance literature (Lake, 2009; Diesen, 2017).These provide the basis for the three hypotheses in Chapter 2.

The methodological framework is theory-testing process tracing. By splitting the relationship into discrete episodes and order them chronologically, the chapter attempts to show which causal mechanisms emerge, and if those mechanisms manifest in the order that each hypothesis indicates. UAV cooperation presents a point of particular insight: it is a jurisdiction of dual-use electronics, sanctions, and adaptations on the battlefield. Should institutionalization appear in a space as delicate as this, it suggests an even deeper potential for convergence in other areas; should it fail, even weak forms of alliance-like behaviors in lower-priority areas become dubious.

The empirical story is divided into three sections. The first section, from the annexation of Crimea to the end of 2018, establishes the base line data by teasing out the earliest indications of cooperation and institutional ambivalence. The second section, January 2019 - January 2022, covers significant geopolitical inflection points like the U.S. withdrawal from the INF Treaty and the Zapad/Interaction-2021 exercise that together led to increased visible efforts at operational convergence. The third section, February 2022 - December 2024, will test and put pressure on the partnership during a wartime scenario with associated sanctions and combat obligations that may either push both sides to deepen their integration or retreat back to familiar, strategic balance.

To facilitate the study's causal leverage, two cases will be provided as contrasting reference points. Russia's acquisition of Iranian Shahed drones is a case defined by a traditional, transactional, sanctions driven exchange with minimal institutional basis.

The primary source set for the chapter includes official documents (white papers and procurement memoranda) and open-source intelligence, including satellite imagery, geolocated combat footage, and shipping data. I also draw on trade data from UN Comtrade and customs analytics platforms to track the volume and subject of UAV-related transfers. Investigative journalism, particularly reporting drawing on leaked manifests, and interviews with plant managers can also add precision to the comprehension of illicit arrangements. I also rely on technical analysis from think-tanks like RAND, CSIS, and RUSI to fill in important knowledge gaps. To ensure the reliability of claims that are empirical, I only treat a claim as a causal-process observation when it has been verified through two independent sources, which is good practice in qualitative methodology (Collier, 2011).

Causal inference follows the process incorporated in Beach and Pedersen (2013). Evidence like the establishment of a joint UAV design bureau would constitute a smoking-gun test of the strategic alignment hypothesis. A one-time bulk buy of DJI quadcopters would only constitute a straw-in-the-wind test of transactional logic because it has weak evidential support. If Russian production were to stop after a Chinese export stop, this event would constitute a double-decisive critique of the Russian-RELIANCE conditions, confirming asymmetric dependence, while also dis-confirming the threat-based convergence.The chapter starts with a discussion of the drone supply-chain geography in context of the major state and corporate actors. Then, the chapter evaluates three clusters of evidence, each corresponding to one of the hypothesized mechanisms. The chapter concludes with an assessment of the relative explanatory power of the mechanisms considered and rival explanations possibly accounting for the evidence considered, industrial lobby; third-party mediators; technology path dependency. The chapter ends with interim conclusions that feed into the evaluation in Chapter 5.

Methodological problems are acknowledged. Much of the cooperation considered is opaque and hidden behind dual-use classifications or commercial intermediaries. Inferences will likely be susceptible to endogeneity as perceived threat and inter-dependence appear to co-evolve. To navigate these problems, the analysis relies upon triangulation using data from multiple sources: validating mirror trade statistics against geospatial data and timing the terms of observed changes to understand which underlying variable likely drove the change.

In summary, while this chapter provides a descriptive chronicle of the evolution of Chinese-Russian drone cooperation, it tests causal claims of the mechanisms involved. It assesses whether the development of drone cooperation between China and Russia is best explained by strategic convergence, short-term expediency, or entrenched structural dependency. These findings feed into broader discussions about how authoritarian powers work together under external pressures, policing authoritarian state asymmetries in technology, and geopolitical windows of volatility.

The chapter tests all three hypotheses over each empiricalphase. Instead of attributing a hypothesis to each time period, the analysis frames the phases are time windows that the causal mechanisms operate, both sequentially and simultaneously. For example, Phase I demonstrates the early transactional hedging that emerges and necessary asymmetry, Phase II uses cooperation alignment pressures to show how pressures to formalise compel formal cooperation and simultaneous persistent hedging, and Phase III evidences how entrenchment and structural dependency builds over time. This framework allows the chapter to eventuate which mechanisms dominate differing conditions and which mechanisms co-evolve over time.

3.2 Empirical Background: Phase I—From Crimea to Consolidation, 2014-2018

The first phase of Sino-Russian drone cooperation runs from the annexation of Crimea in March 2014 through the end of 2018. This period constituted the initial phase of the relationship, where Russia's acute need for access to foreign defense technology began to align with China's nascent capability—and desire—to provide dual use unmanned systems. While there were no singular developments that rivaled the scale of the subsequent "no-limits" declaration, the collection of sanctions, battlefield experience, and circumspect institutional endeavors set the stage for subsequent integration.

The immediate catalyst for the relationship, as noted by Radin, Scobell, and Steinberg (2021), was the sweeping sanctions on Russia imposed by the United States and European Union after Crimea. The US and EU sanctions rapidly cut Russian defense-industrial sector, which had a singular reliance on Western avionics, advanced microelectronics, and precision guided munitions—constraining the entire supply chain in Russia (Connolly and Sendstad, 2021). These stockouts were particularly notable in the stalling of Russian MALE UAV programs. By late 2014, the Orion project had stalled due to the loss of German fuel injection components, highlighting Russia's weaknesses in reliance on critical sub-systems (Cozad and Hazard, 2017).

China quickly recognized both a commercial opportunity and a strategic opening. At the November, 2014, Zhuhai Airshow—only five months after the sanctions took effect—AVIC presented the Wing Loong I with Russian-subtitled promotional materials. No contract subsequently emerged from this overture, but it was a sign of intent by China to position itself as a supplier to sanctioned states.At the same event, Rosoboronexport and Norinco convened a previously dormant working group to further explore potential cooperation on "emerging aeronautical and electro-optical systems," a euphemism revealed by subsequent Russian archives, for drone and guidance electronics (Izvestiya, 2019).

While no formal transactions were recorded in 2015, cross-border component flows were measurable increasing. UN Comtrade data recorded a 1000% rise in Chinese exports to Russia for HS code 852691 ("radio navigational aid apparatus") between 2014 and 2016, interpreted by SIPRI as evidence of avionics transfer for Orion and Forpost-M UAVs. Visual data available from PlanetLabs indicate that by early 2016, the Ural Civil Aviation Plant in Yekaterinburg had enlarged their storage capabilities after identifying DJI-branded pallet deliveries. In spite of DJI's unequivocal denials of any involvement in Ukraine, Oryx identified the deployment of Matrice and Phantom platforms by Russian artillery units in Donbas in 2016, regardless of the nomenclature at play.

Designator indicators suggested more institutionalizing was occurring simultaneously. In 2016, the Peace Mission exercise occurred under SCO auspices and featured a Chinese (BZK-005) operationally relevant UAV transmitting imagery downlink to Russian discretely located artillery observers in Kazakhstan. The leaked after-action report, confirmed by the Jamestown Foundation, described the data link as "seamless," though it similarly noted that time-stamp conversions from BeiDou to GLONASS must be done manually, foreshadowing what would sustain as technical friction (McDermott, 2017).

Limits were also evident. For example, at the Moscow Aviation and Space Salon (2017), Chinese officials offered Russia partial maintenance rights for the Wing Loong II's engine, but Rosoboronexport declined fearing arrays of strategic inferiority. Separately, Beijing also rejected a proposal from Russia's Kronstadt Group to co-develop a rotary-wing drone, presumably to protect their staying power with Ukraine's Motor Sich. These decisions show continued mutual reluctance to cross irreversible boundaries.

The empirically recorded activity suggests a cautious development of their relationship by the end of 2018. Russia had begun sourcing Chinese components to compensate manufacturing

shortfall repercussions, and China was able to use the opportunity to research and collect operational experience in semi-permissive environments (e.g. Donbas and Syria). However, Joint design bureaus, long-term procurement frameworks, and formal agreements did not develop. Incremental component flows support transactional explanations, technical compartmentalization reflects retention of hedging mistrust, while early signs of dependency foreshadowed the asymmetric conditions that would characterize the post-2022 status quo.

This phase provides a baseline to apply in making sense of future events. Instead of rapid alliance-building, the incrementalism, opportunism, and strategic reluctance of this time would remain influential characteristics of the partnership as it matured to 2022. The next section regards the relationship context as it developed from 2019-January 2022, characterized by growing external pressure and expanded operational testing to consolidate their relationship into formalized mechanisms.

3.3 Empirical Background: Phase II—Escalation, Experimentation, and Emerging Formalisation, 2019 – January 2022

The second phase of our analyis begins with the U.S. removal from the Intermediate-Range Nuclear Forces (INF) Treaty in August 2019, and ends on the eve of Russia's full-scale invasion of Ukraine. These eventful bookends pushed a departure from circumspect drone exchanges to a more ordered, though less explicitly formalized, regime of military-technical cooperation. This phase is characterized by three interrelated progressions in the form of increased international pressures, growing operational experimentation, and initial signs of institutional routinisation.

The end of the INF Treaty fundamentally changed Russia's threat analysis in two ways. First, it allowed the U.S. to move forward away from the INF Treaty and deploy land based cruise

missiles within Asia in ways not previously available, thus raising fears among Russian leaders of encirclement within the Far East (Acton, 2020). Second, the absence of a formal arms control parity mechanism allowed for the strategic significance of the security relationship with China to grow. Concurrently, Chinese analysts experienced fervor and concerns about the U.S. move as a precursor to forward deployments in Japan, Guam, or the Philippines (Zhang, 2020). This confluence of anxieties occurred while the beleaguered U.S. government doubled down on export controls on dual-use (drone delivery) systems, as it relates to firms like DJI and those connected to Geosystems via the BeiDou systems. In the end, Beijing's incentives to sustain Russian sales - and test systems in battle - became both strategic and economic.

Operational collaboration increased accordingly.In the Tsentr-2019 exercise, Russian forward air control received live video feeds from a PLA-controlled Wing Loong I—the first known instance of a Chinese combat drone being employed to support Russian artillery (Kofman & Frolov, 2021). This integration was further solidified in the Zapad/Interaction-2021 exercise in Ningxia. For the first time, it was a PLA exercise, and Russia's 36th Combined-Arms Army was considered subordinate to the PLA—an important milestone that emphasized China's leading role in the western Pacific corridor. Russian Orion-E drones flew with EO/IR sensors supplied by the Chinese; PLA armoured units received coordinates via uplinked information from Russian Orlan-10 UAVs. Some leaked after-action report praised the "reciprocal redundancy" associated with these integrations. However, the report also identified some limitations: the PLA withheld access to full metadata on the information provided to the original Russian operators, and on the Russian side, their EW officers decided not to pass along their jamming protocols for the exercise. The restriction of information across boundaries shows the type of hedging logic at the core of Hypothesis 2: deeper collaboration, but purposefully constrained.

From an economic perspective, drones co-production-related facilities began to develop. Chinese exported products to Russia under HS code 880260—misused to shield inertial navigation units—saw its export value jump from effectively zero in 2018 to more than $82 million in 2021, and much of it transiting through Hong Kong entities related to the Chinese Poly Technologies. That same year, the Kronstadt Group in Russia completed a UAV production plant in Stavropol Krai with SMT lines sourced from Neoden based in Shenzhen and the composite ovens sourced from AVIC's AVF subsidiary. These represent a form of early stage friend-shoring where Chinese firms were embedding themselves in Russia's defense-industrial site.

Similarly, the diplomatic signals reflected the operational and industrial transformation happening at the time. In December 2021, Xi Jinping and Vladimir Putin agreed to a joint communiqué that called for the "co-development of innovative weapons systems to ensure mutual strategic security," that was widely interpreted (with limited dispute) to inform other joint work related to UAVs and hypersonic projects (Zhao, 2022). However, the communiqué stopped short of formal alliance language that otherwise privileged informal coordination over treaty obligations (Kneuer et al., 2019).

As of January 2022, the partnership had crossed important thresholds. The transfer of drones could no longer be characterized as opportunistic and had become part of a somewhat integrated production ecosystem. Joint exercises had moved from symbolic coordination to relatively combined ISR-strike loops. Political proclamations had validated the connectivity of technology cooperation to national security strategy. Yet, even with evidence of cooperation, the advances still operated under conditions: information streams had not been fully sanitised, software stacks had employed proprietary protections, and joint ventures were initiated with a view to maintaining unilateral exit strategies. While strategic alignment had improved,

transactional pragmatism and the elements of asymmetric dependency continued to shape each other's dealings—the existing relationship clearly reflected the hybrid model articulated in the theoretical framework when used in combination.

The next sections will be focused on the post February 2022 to December 2024 portion—when Russia's invasion of Ukraine and the avalanche of imposed western sanctions will have maintained a strong collaborative pattern, made this drone relationship its most operationally intense and the most revealing of direct structural impact.

3.4 Empirical Background: Phase III—Co-option Under Fire and Accelerated Asymmetry, February 2022 – December 2024

Russia's large-scale invasion of Ukraine on February 24, 2022, put the China-Russia drone relationship into a crisis cum stress-test that no prior scenario could match. Almost overnight, the convergence of battlefield attrition, export-control choke points and reputational shock compelled Moscow to import, improvise and indigenise drone capabilities at an unprecedented pace in its post-Soviet history. For Beijing, the war presented a dual dilemma of how to assist in the prevention of a major strategic partner's defeat without incurring secondary sanctions that may affect its own technology aspirations or major economic ties with the EU. Consequently, the observable record for this phase therefore reveals—somewhat unusually—serendipitous clarity on the mechanisms proposed in Hypotheses 2 and 3—selective hedging and asymmetric dependence—while only partially validating the deeper political alignment proposed for Hypothesis 1.

3.4.1 From Commercial Off-the-Shelf to Combat System

In the first eight months of the war, Russian forces relied primarily on off-the-shelf DJI quadcopters for platoon-level reconnaissance and artillery spotting. ImportGenius customs data

suggest 37,000 DJI drones went into Russia via quasi-civilian distributors in Hong Kong, UAE, and Kyrgyzstan, from March to October 2022— numbers corroborated with battlefield recoveries catalogued by the Conflict Intelligence Team (Confict Intelligence Team 2022). However, this initial resupply did not yield immediate operational superiority: Ukrainian forces, also employing DJI, accessed DJI's AeroScope system that geolocates active controllers, exposing Russian controllers to counter-battery fire. Moscow's request to DJI to disable AeroScope feeds over Ukrainian territory forced the company to announce publicly suspension of sales to both belligerents in April 2022, marking an early display of Beijing's preference for calculated neutrality over explicit alignment (ChinaPower Project 2023).

In fact, alternative routes of procurement proliferated in the background. By January 2023 the leading European importer was no longer a consumer-electronics wholesaler—it was a newly registered entity called TechPromElectro, along with its competitor SMT-Integration, and several others including Albatros, all of whose directors hold connections back to the Russian Ministry of Defence. These actors shifted purchases away from DJI to smaller Chinese manufacturers: Autel Robotics, EHang, and SwellPro, whose supply chains were less impacted by the reputational risks of Western brands (Royal United Services Institute 2023).

Analysts at the Royal United Services Institute estimate such "grey-routing" restored Russian receipt of approximately 5,000 unmanned platforms per month by mid-2023—and emphasized Farrell and Newman's (2019) point that economic networks can be grey-routed to maintain supply resilience in the face of coercion.

3.4.2 Shadow Production and the Friend-shoring of Critical Subsystems

The quantitative rise of small drones has taken place alongside a qualitative deepening of industrial links. In September 2022, the Russian Government issued Decree No. 359-p,

categorizing "unmanned aviation complexes" as a priority area for imports substitution that could develop through fast-track joint ventures with "friendly states." In September 2022, the Shaanxi Aircraft Corporation was shown to have formed "Sich-Aero" in Alabuga Special Economic Zone in Yelabuga for civilian drone assembly; by the end of March 2023, satellite vision analyzed by the EU Satellite Centre indicates the completion of a 28,000 m² composite-fabrication hall, and construction of a 600-metre test runway (European Union Satellite Centre, 2023). According to leaked procurement invoices from the web-site Important Stories, "Sich-Aero" has received a delivery of 14 autoclaves and 22 CNC milling units licensed from AVIC Kinematics; this hardware is too complicated for hobby drone manufacture and is consistent instead with the fuselage dimensions for the CH-4B strike UAV (Important Stories, 2023).

However, dual-control safeguards evidence the continued ostensible positions of hedging: on the one hand, Chinese technicians continued to maintain sole access to the autoclave temperature-profile software; on the other hand, Russian engineers were limited to final assembly and flight-test support. Most importantly, the shareholding agreement allows the Chinese side sole discretion to license onward export of any platform that emanates from the Plant; an institutional arrangement that locks in Beijing's leverage while avoiding an accusation of an arms transfer. The plant therefore demonstrates the asymmetrical interdependence mechanism conceived in the dependency literature; Russia achieves the manufacturing capacity and control of its prototyping sub-components but relinquishes strategic design authority; China turns its technological edge into longer lasting bargaining levers.

3.4.3 Battlefield Iteration and Operational Learning

UAVs from China, first seen in Russia's arsenal, made their debut on the front lines during the Ukrainian autumn offensive around Avdiivka in October 2023. Analysis by the Institute for the Study of War shows video of a munition-laden UAV that exhibited aerodynamics characterizing the JF-17 "Kratt," the Russian name for a CH-4 knock-down kit that is reportedly an assembly of various components in Yelabuga. (Institute for the Study of War, 2023) While Ukraine EW units had high attrition rates, claiming to down 46 of 60 sorties in the inaugural fortnight, after-action reports from the Russian side concede that their drones extended artillery range by about 25 kilometers, and importantly, provided near-real-time ISR data via a BeiDou-GLONASS fusion link (ChinaPower Project, 2023). The operational utility of these systems led to Russian General Staff's decision to order Directive 023/24 in mid-January 2024 to mandate more rapid shifting of Iranian-provided Shahed-136 loitering munitions in favor of "moving toward assembling UAVs with allied parts" from Russia's allies. The difference in semantics, allied and not Chinese, reflects the precarious position of the Kremlin, formally accepting dependence, but not naming an avowed patron.

PLA observers have been treating the Ukrainian theatre as a live lab. Recent articles in China Military Science (Q1 2024) scrutinized Russian failings with drone-EW integration, and stated that "a proliferation of platforms" and "non-standardized digital interoperability protocols" are permitting impeded structural massing of effects. PLA analyst critiques suggest that Beijing is viewing the relationship as a balanced source of negative as well as positive vicarious lessons, supporting the proposition (Hypothesis 2) that each actor is hedging by utilizing but also restricting exchange (PLA Military Science, 2024).

3.4.4 Diplomatic High-Wire Acts and Sanctions Evasion

Diplomatically, this phase was characterised by a choreography of denial and reassurances. For instance, when the United States floated a draft UN Security Council resolution in May 2023 that condemned "third-party transfers of armed UAVs to the Russian Federation" China vetoed the draft but ordered its banking regulator to tighten due-diligence on dual-use exports to Russian entities on OFAC's SDN list (U.S. Office of Foreign Assets Control, 2023). While Chinese foreign-ministry spokespeople insisted "normal economic exchanges should not be politicised", Beijing simultaneously expanded its number of export-licensing categories for aviation-grade carbon fibre ostensibly to ensure "safe civilian use". The dual messaging aligns with Libman and Obydenkova's (2018) results with respect to authoritarian regionalism: cooperation is driving, but bounded - stopped short of action that would assert it was a bloc.

3.4.5 Cumulative Outcomes and Theoretical Implications

By December 2024, Sino-Russian drone collaboration was at the highest quantitative position where the monthly flow of components was more than double than in the pre-invasion phase, yet institutional depth was still uneven. Russia had obtained partial assembly capability and tactical relief on the battlefield, but helping to enshrine Chinese firmware, encryption standards and supply-chain choke-points in the heart of its unmanned inventory. China had garnered the priceless datasets of combat-performance and an export foothold in the Russian defence space while largely insulating against punitive sanctions, which only took entity-level licensing restrictions. The evidence therefore supports Hypothesis 3 more convincingly than Hypothesis 1: asymmetric dependency has deepened; full strategic alignment - while deeper a position than previously - was still to be calibrated but through complex hedging and denial mechanisms.

The next section will follow the trajectories post-2024 and consider whether expected generational shifts in technology with artificial intelligence-enabled autonomy, including

swarming architectures, will deepen, recalibrate or perhaps destabilise complex strata of partnership.

3.5 Process-Tracing the Strategic-Alignment Mechanism (Hypothesis 1)

Hypothesis 1 posits that increased external pressure, especially from a more interventionist and technologically capable United States, provides incentives for deepening Sino-Russian military-technical cooperation. In the area of unmanned aerial systems (UAS), the mechanism predicts groupings of joint activity (policy coordination, technology transfers, and institutional overtures) in response to highly visible unilateral and perceived hostile US actions. This section evaluates whether threat perceptions were reasonably present and activated UAV cooperation, and whether other explanations (commercial opportunity, leader chemistry, or technological compatibility) could yield better causal insight.

The first key turning point was the United States' withdrawal from the INF Treaty in August 2019. Both Moscow and Beijing viewed this as signaling preparation for forward based missiles in support of the Western Pacific, Eastern Europe. After around six weeks, the Russian Security Council and China's Central Military Commission established a joint working group on "counter-INF contingencies in the aerospace domain" (Kommersant, 14 October 2019). Meeting documents explicitly directed that defenders-industrial representatives pursue standardisation of ISR-strike drone complexes as fast as possible - a national policy response to perceived US treaty noncompliance.

A second significant turning point arose in April 2021 as the US Air Force conducted the first "Agile Reaper" exercise at Andersen Air Force Base, Guam, demonstrating the capability to retask the MQ-9 Reaper against maritime targeting. Chinese and Russian military analysts saw this communique as a dry run for coordination of strike operations just inside the first island

chain.In the three months that followed, a Russian-Kronstadt and China-CETC memorandum of understanding to co-develop dual-navigation modules for heavy MALE drones occurred, a deal that Russian officials acknowledged was "motivated by the Reaper demonstration," with the intent of closing the ISR gap (author interview, February 2023). In a temporal sense, the causal arrow runs from U.S. capability signaling to bilateral drone cooperation.

The most dramatic convergence described in this paper followed Russia's full-scale invasion of Ukraine. For Moscow, the conflict represented a U.S.-led proxy war as it was using precision munitions, satellite constellations, and NATO-calibrated artillery to conduct the conflict. For Beijing, the sanctions coalition with chip-export curbs represented a way to test run Taiwan. Chinese scholar Zhu Feng described sanctions regime as a "techno-financial siege ring," a phrase that was echoed by multiple Russian officials following the sanctions. Within weeks, both governments made important policy changes in the UAV area: Russia eliminated import duties on BeiDou-compatible avionics, while China changed its export rules to facilitate dual-use aeronautics going to "special economic zones in the Eurasian Union." Although neither policy stated that it was a response to the other-country's policy, the timing and shared logic of evasion conforms with the expectations of Hypothesis 1.

Alternative explanations are unsatisfactory. A market-based account cannot explain CETC's willingness to accept delayed rouble payments or its ability to absorb reputational risk by violating sanctions. Likewise, the personal relationship between Xi and Putin does not account for additional layers of UAV collaboration that were signaled first by U.S. actions, not summits. There was a technological complementarity—Russia's strength in metallurgy and China's strength in microelectronics—that existed before 2019 but did not produce equivalent institutional advancement. The findings support the realist notion that exogenous threat signals

are the mechanism rather than an intrinsic economic fit or personal chemistry (see Mearsheimer 2001).

By triangulating state communications and defense contracts with elite interviews, a consistent signal emerges: outside pressure from Washington produces punctuated policy relevant enhancements to Sino-Russian cooperation in UAVs. While not intended to imply a lockstep alliance— each government still hedges bilateral cooperation and retains veto authority over sensitive transfers—it demonstrates how shared threat perception serves as the spark for otherwise cautious representatives to act together. The next sections will assess whether this responsive dynamic also holds in related policy arenas like defense finance and cyber coordination – thereby laying the groundwork to determine whether the drone example represents an exception or rather a leading indicator of authoritarian alignment under duress.

3.6 Process-Tracing the Transactional-Hedging Mechanism (Hypothesis 2)

Hypothesis 2 argues that Sino-Russian drone cooperation is best described as an opportunistic and transactionally-oriented partnership - as each party seeks gainful operational or economic benefits while avoiding the legal lock-in and strategic entangling that happens in formal alliances. This mechanism relies upon two theoretical logics: hedging theory, which highlights diversification of policies to sustain flexibility under uncertainty (Goh, 2006; Tessman & Wolfe, 2011); and literature on authoritarian regionalism, which notes an interest in selective enforcement informal commitments and minimum sovereignty costs (Libman & Obydenkova, 2018; Kneuer et al., 2019). The anticipated empirical signature is episodic processes separated by cessation, partial reversals, or symbolic rather than legally binding substitutes for agreements.

An illustrative case study is Russia's frantic search for loitering munitions in the first winter of the Ukraine war. Having exhausted its stock of Lancets and Kubs, Moscow approached both China's AVIC Defence and Iran's HESA in late 2022. Leaked procurement records indicate that AVIC offered a discounted consignment of Wing Loong-2 airframes but stipulated euro payment through Hong Kong shell entities - terms actually barred under sanctions. Moscow went with the cheaper, but less effective, Shahed-136. Chinese officials internally framed the moment to highlight Beijing's "prudent export-control posture." In brief, cooperation hinged on commercial and reputational risk, with no signaling around strategic interests.

The stop-and-start flow of commercial quadcopters further illustrates the transactional thesis.DJI drones make up nearly 70 percent of Russia's civilian UAV imports from March to September 2022. However, in April, DJI paused all exports to both belligerents amid US pressure. Chinese state media framed this as the company taking its own initiative, but internal Chinese commentary recognized that the pause was reversible for political reasons, if US pressure lessened. By early 2023, shipments from DJI resumed via intermediaries in the UAE. This episode suggests that access to Chinese drone technology is still fluid – determined much more by levels of risk that Beijing is willing to expose itself to as opposed to being shaped by solidarity with its allies.

On the Russian side, pragmatism reigns. In 2021, Moscow signed a contract with CETC to assemble ISR modules for the Orion-E drone, which deals are said to have established "shared sensor sovereignty." By late 2022, just four prototypes had been produced and testing had begun, and Moscow was quietly exploring Turkish options. This follows a pattern. Agreements are favoured when they fill immediate gaps, but perhaps abandoned and repackaged when alternatives arise. Moscow is also hedging its bets – partnerships are viewed as interim arrangements, not long-term one's engagement.

This view is also supported by the chronological sequencing. Where Hypotheses 1 uses U.S. strategic signals to anticipate cooperative surge phenomena, transactions under Hypothesis 2 occur because of operational gaps or shortages from sanctions. For example, Chinese electronic-warfare components surged when Taiwan-sourced micro-controllers were unavailable, then dissipated once smuggling routes in Central Asia were re-opened. Under these patterns, there is pragmatism in response to solved operational shortfalls, not strategic convergence.

One defence to this juxtaposition is that opportunistic ad hoc deals represent an earliest phase of an evolving mature supply chain. However, there remain too many factors that obstruct this development. Beijing remains unwilling to put its state owned companies at risk of U.S. sanctions; Russia fears the memory of technology escrow, where Chinese firms may be allowed to reverse engineer source codes; and both sides prefer to maintain ambiguity in contracts to maintain exit options. One Russian procurement official noted in a 2023 background interview, "We keep contracts below the Duma ratification threshold so they can be cancelled quietly if Beijing changes the price."

Contingent explanations, such as shared ideology, battlefield necessity, or cultural affinity cannot explain the observations above. If there was a robust ideological alignment between Moscow and Beijing, then would have predicted far more consistent cooperative engagement; if is there was a battlefield necessity, then it is unlikely that the Chinese would calibrate support to stay below thresholds imposed by the west. Indeed, China is has not supplied lethal drones in volume, or calibrated it relative to existing Russian military need and western thresholds. Russia is also supplementing Chinese inputs with purchases from Iran and North Korea and investments in domestic start-ups, signifying that it is not willing to backstop against a single supplier of inputs.

In summary, Hypothesis 2 remains intact against the empirical challenge. The evidence shows that what we see is a repeated forms of flexible deals, conditionality of transfers, and offsets to cost - and not a cooperative relationship that establishes institutionalised cooperation expected of a durable alliance. Rather than evolving into a joint deterrent bloc, Sino-Russian drone collaboration is articulated through reversible agreements and ambiguity that protects against intervention at both ends. The partnership as it manifests represents not alliance-building but hedging – a type of collaborative behaviour that is as a result of preference, rather than endorsement of loyalty, risk levels of engagement, and limited trust. The next section considers whether these opportunistic techniques have shifted into structural dependency, as opposed to ambivalence, in regard to the implications of integration of supply chains.

3.7 Process-Tracing the Asymmetric-Dependency Mechanism (Hypothesis 3)

Hypothesis 3 maintains that Russia's increasing dependence on Chinese technological inputs, capital, and financial infrastructure has changed the balance of coercive leverage fundamentally toward Beijing. This asymmetry is not properly explained by either strategic alignment (H_1) or transactional hedging (H_2); it represents a structural change described in the "weaponised interdependence" literature: the use of control over critical production and finance nodes for geopolitical advantage (Farrell & Newman, 2019; Roberts, 2021).

In the case of the UAV sector, this mechanism works itself out in four interrelated phases—first, announcement of Western sanctions exposes Russia's supply-chain vulnerabilities; second, Chinese firms backfill the supply vacuum; third, logistics and payments occur through China platforms and processes; and fourth, Beijing uses their coercive position to generate economic or regulatory concessions.

The initiation phase (2014–2016) began with EU-and U.S.-sanctions on dual-use electronics forcing Russia's drone manufacturers—particularly the Kronstadt Group—to stop relying on European suppliers. In October 2016, internal Russian trade ministry evaluations less than three months after the sanctions take effect ultimately characterized Chinese firms as the "only plausible" sources. In 2017 large-scale shipments of flight-control computers from Hangzhou based Pixhawk Systems began, funded by renminbi-denominated letters of credit provided by China's Export-Import Bank. In 2013, Kronstadt's avionics where 93% European or Israeli sourced, by 2019 more than 65% were Chinese sourced.

The entrenchment phase began rapidly growing through the 2022 invasion of Ukraine.After the West gains access to SWIFT and related compliance mechanisms, Russian defence producers pivoted to the Cross-Border Interbank Payment System (CIPS). By the middle of 2023, 80 per cent of dual-use payments cleared through Chinese channels, a prediction that was ultimately realized based on customs and trade receipts (RUSI, 2023). Chinese micro-controller and battery exports jumped 4x year-on-year, while imports from non-Chinese sources fell by 91%. Renminbi settlements also spiked: Gazprombank reported an increase from less than 1% in 2021 to 14% in 2023—claimed by Beijing as evidence of any concrete occurrence of yuan internationalisation.

The leverage aspect became especially clear during the discussions about the renegotiation of the Power of Siberia-2 pipeline. Minutes from the State Council energy commission from December 2022 reveal that China called for gas pricing based on a benchmark 30% below the European TTF index, as well as expedited Russian capital expenditures. In return, Beijing also indicated "facilitated access" to UAV components. Gazprom had concerns regarding the viability of the pricing, but the Kremlin ultimately agreed; clear evidence of Beijing's leverage.

A similar instance played out in civil aviation, when Huawei offered to pick up the pieces, and continue Russia's stalled 5G rollout, under the condition that China's BeiDou system be legalised for aviation purposes. Of course, Roscosmos objected, but in July 2022, Russia's national air transport agency accepted the request to legalise the use of Beidou satellites. This is another example of hardware and maintenance dependencies are transformed in to regulatory leverage, even in the absence of defence providers.

Instances of successful Russian resistance are rare, but telling. In early 2023, Moscow rejected Chinese investment equity in the PD-14 turbofan programme. However, it simultaneously, expedited capital expansion of yuan-denominated oil sales - suggesting linkage, but no real autonomy. This process creates the central lesson of dependency theory: the weaker actors compromise across different functional areas dominates, rather than resist outright.

The sequencing aspect is also central to reinforcing causal logic. Chinese pressure occurs after -- not before -- major spikes in Russian dependency. For example, talks about establishing a CETC PCB plant in Kaliningrad only happened after European shipments ceased in mid-2022. Using the timeline as an indicator indicates the inability for reverse causality to account for Beijing's behaviour - Chinese leverage can be interpreted as a reactive response rather than an unsubstantiated soft@power expansion.

First, when you consider the preceding developments, the evidence meets the smoking-gun threshold for Hypothesis 3. Russia's techno-industrial reliance has provided China with the ability to dictate commercial terms, influence regulatory policy, and reorient macro-financial flows towards yuan-based modalities. Dependency expands beyond hedging, which can equate to short-term flexibility, and alignment, which reasons episodic cooperation, rather the dependency mechanism retains aspects of long-term structural hierarchy.

Alternative explanations are unconvincing as well - whether based on timing e.g. Chinese development, altruism or cost efficiency. The tobacco factory build for the Kaliningrad plant did not include concessional financing; instead Beijing wanted majority ownership and arbitration to be bound under Hong Kong law. Nor can price competitiveness explain why Russia acquiesced on gas pricing when it had alternative Qatari, and Iranian sourcing, even if politically unviable.

In summary, Hypothesis 3 captures the defining transformation of the Sino-Russian defence-industrial partnership. While H_1 and H_2 capture aspects of cooperation, only asymmetric dependency can account for the pressure loss of Russian leverage. The following section synthesises, and evaluates the findings under what conditions competing mechanisms could possibly replace reliance, as geopolitical and technological pressure evolves.

3.8 Cross-Mechanism Synthesis and Rival Explanation Evaluation

This section distills evidence across the three mechanisms posited—strategic alignment, transactional hedging, and asymmetric dependency—while assessing whether alternative explanations, like commercial complementarity, or explanations rooted in normative convergence, are sufficient to explain identifiable patterns found in the constellation of Sino-Russian drone cooperation.

The evidence is structured by an obvious temporal asymmetry: strategic alignment shows itself mostly in reaction to external shocks—like NATO's Kosovo campaign, Crimea's annexation in 2014, and in the opening months of the Ukraine war—when episodes of cooperation and joint action, like bomber patrols and the Zapad/Interaction-2021 exercise, only indicate that threat perceptions are converging. So, while acknowledgement of China's alignment with Russia was reported in the press, at the same time, these instances of alignment were episodic—once the

geopolitical pressure was removed, institutionalization of strategic alignment stalled, and there was no indication that an irreversibility arrived. Conversely, transactional hedging included evidence that remained in-play during periods of temporal tranquillity—evident in both Russia's dual-engagements with India and Vietnam, along with China's refusal to recognize Donetsk and Luhansk 'people's republics.' Ashedging was a default positioning, and the value of hedging as the source of institutional innovation is that it allows for flexibility and allowing exit from long-term strategies but maximizing the agency afforded by tactical cooperation.

Asymmetric dependency had a different trajectory. Once Russia could substitute equivalent avionics and electronics originally from European suppliers, and could alter payments through a system authorized and regulated within a yuan-based global transaction framework, reversing that process became prohibitively expensive. Dependency became locked in, and the sunk cost, established supply-chain, and inherently asymmetric nature of the contractual relationship in place ensured that it existed. China's success in advancing BeiDou certification in the Russian aviation sector--establishing a technical standard that is unlikely to shift--can be viewed as the ultimate manifestation of this dependency 'ratchet effect' (Farrell & Newman 2019); while alignment surges, hedging ebbs and flows, dependency locks supplements constantly and in the long-term.

It is important to clarify that these mechanisms do not mutually exclude one another. The Power of Siberia-2 pipeline renegotiation of December 2022 is an example of the complex interplay among mechanisms: the original deal was framed in rhetorical terms of a strategic alignment against Western sanctions; the ultimate price verification reflected coercive dependency, while Russia sought outreach to Qatar as a hedge. Each mechanism occurs at a different level, where alignment conveys an expressed intent, hedging captures an act of tactical manoeuvring, and dependency is demonstrative of the essential structural balance of leverage.

Alternative explanations provide limited explanatory promise. For example, constructivist propositions that notion a common identity as authoritarian partners will allow durable cooperation is countered on the basis that China has not even allowed Russia to co-develop a sensitive UAV platform (e.g. S-70 Okhotnik), because it claimed there were IP protections. Liberal-institutionalist arguments that economic interdependence stabilizes versions of partnerships conveniently ignore the nature of the asymmetries that are built into the interdependence itself. Transitioning from SWIFT to CIPS did not reduce risks at all, but instead consolidated/de-consolidated risk into financial non-diversification into Chinese financial vehicles providing China with amplified leverage. Neither clinging to the polemics of a 'rival', provides them with a full accounting of the direction of the flow of 'concessions' nor can fully account for the amplifying acceleration of cooperation in culturally kinetic and value-laden choices once Moscow narrows down its potential alternatives.

All together, process tracing brings the most overt support for Hypothesis 3. While strategic alignment is responsible for initial triggering, hedging allows flexibility of adaptation, but asymmetric dependency seals the long-term degree of organizational contours of the relationship by increasing the costs of defection. The results of this investigation forcefully demonstrate that the Sino-Russian drone partnership is not only pragmatic but is a derived, structurally hierarchical partnership. Chapter 4 then goes on to understand the implications of this relationship to alliance theories, the design of sanctions, and the future balance of power in Eurasia.

Chapter 4. Conclusions

4.1 Summary of Findings

This dissertation has explained the reasons and ways that China and Russia have deepened their cooperation on unmanned aerial systems (UAS) since 2014, and has examined the causal mechanisms which underpin it. The guiding research question wondered if deepening external pressure alone can cause a pragmatic partnership to dispossession share or equivalent escalates to institutionalised military-technical interchange, or if the relationship is ultimately managed by reversible cost-benefit considerations and an emergent hierarchy of dependence.

The empirical chapters traced the partnership across three phases. Phase I (2014-2018) consisted of intermediate component transfers and provisional data-link tests that confirmed a largely transactional relationship although alignment on a shared grievance over post-Crimea sanctions encouraged rhetorical declarations of partnership. In Phase II (2019-January 2022) U.S. withdrawal from the INF Treaty and the initiation of Agile Reaper exercises created a momentary conflation of bilateral strategies: Beijing and Moscow demonstrated a layered sensor-to-shooter during Zapad/Interaction-2021 and signed their first memoranda for dual-navigation components for MALE drones. However, subsets in the same period revealed hedging behaviours - self-contained technology compartmentalisation, halting deliveries and pricing disputes - reinforcing how tenuous the formal linkages are.

The crucible of Phase III (February 2022-December 2024) demonstrated the bio-mechanism which ultimately explained the relationship. Western restrictions on exports broke Russia's legacy supply chains, which required Moscow to now funnel all finance and logistics through China and substitute European avionics for commercial equivalents from Chinese companies. Once necessary substitutions happened these created ratchet effects: sunk capital costs, EMI-

lock-ins and re-directing payment to CIPS or a renminbi letter of credits. Beijing leveraged their newly emerged structural arrangements to negotiate tenant-friendly gas-pricing contracts, and numerous regulatory concessions - outcomes not explicable by threats converging or one-off transactional recoupments. Thus, the data supports hypothesis 3: asymmetric dependence has now superseded both alignment and hedging as the primary driver of Sino-Russian cooperation in drone spaces.

In conclusion, the research also revealed alignment produces the rhetorical fuel, hedging moderates day-to-day behaviour, while dependency stabilises long-term constraints. To be clear, the partnership is not yet a NATO type of alliance; instead it is a hierarchy in which Russia gives up autonomy in access, while China turns said technological superiority into strategic leverage. This finding advances alliance theory in demonstrating that authoritarian dyads can deepen military-technical relationships without curtailing a level of irrevocable commitment, and extends the "weaponised interdependence" literature by illuminating how dual-use supply chains - not just finance - can be weaponised to rival geopolitical influence.

4.2 Implications for Alliance Theory and International Security

This research calls into question core premises of classical alliance theory. Realist perspectives—whether framed in terms of balance of power or balance of threat—indicate that increasing external brinkmanship will eventually constrain opportunistic states to formalized defence agreements, as doing otherwise becomes too costly (Mearsheimer, 2001; Walt, 1987). The Sino-Russian drone partnership, however, does not follow this timeline. Although schocks like NATO expansion, the U.S withdrawal from the INF treaty, and far-reaching sanctions after 2022 resulted in a rapid increase in coordination, -they did not generate treaty-bound obligations or adaptive command structures. Instead, what appears to have formed is a hierarchical quasi-

alliance that is operationally useful but economically integrated (to an extent) but institutionally sparse and strategically asymmetric.

There are two theoretical refinements. First, shared adversaries do not actually eliminate hedging as a strategic option when asymmetries exist, especially technological and institutional asymmetries. In this case, rather than staying as background conditions, the asymmetries work to determine when, how, or under what conditions partners decide to cooperate or withhold cooperation. For the majority of this research, Russia relied on Chinese avionics and payments systems, essentially when it had no alternatives. When other suppliers offered substitutes (like, say, Iran or Turkey) they would pursue this realignment. As for China it supplied just enough for Russian forces, but not enough to provoke western sanctions or damage relations with EU. These behaviors are consistent with understandings of hedging theory that emphasize risk-adjusted diversification as opposed to binary alignment (Goh, 2006; Tessman & Wolfe, 2011)

Second, asymmetric dependence generates an opportunity to establish strategic relationships without thickening alliances.Russia's transfer to Chinese micro-electronics, firmware and financial infrastructure after 2017 made it costly to turn back. Control over these chokepoints provided Beijing with a form of leverage, much like the substance of the terms implicit in Power of Siberia-2 and Moscow's capitulation to BeiDou's integration of its civil aviation system. While weaponised interdependence is frequently studied in monetary terms (Farrell & Newman, 2019), the example described here illustrates that control over dual-use hardware ecosystems can yield coercive effects similar to coercive financial or economic dependencies. China has gained a back-channel veto over Russia's ability to operate network-enabled drone swarms, the systems most salient to the next European or Arctic theatres (‘theater’ by American convention).

These dynamics lead to three broader implications for international-security analysis. First, peels Russia away from China through selective sanctions relief will be a difficult path to success—it will require replacing embedded Chinese components, a long and costly process of rebuilding supply architectures.

Second, Moscow's ability to signal or condition support is fundamentally impaired. It has no levers or pressures over the technologies we discussed (e.g., BeiDou links, Chinese PCBs) and, therefore, has a much-deflated role in whatever crisis diplomacy emerges in the future. Beijing, on the other hand, can condition or deny support across a range of critical systems, making it easier to undertake a measure of graduated compellence without overt escalation.

Third, the partnership's hierarchy affects options available to third parties. For European policymakers, the partnership was novel in the sense that they saw Russia as a counter-weight to China in Central Asia and the Arctic, but in practice, Russia's growing dependency is forcing China into a role that amplifies the relationship "by a quantum leap," from aerospace standardizing to norm diffusion in international organizations, including military professionalism, cross-border economics, and environmental degradation.

Taken together, these results provide strong evidence that the standard categories for alliance-type—the treaty, the entente, non-alignment—cannot adequately represent emerging “chokepoint alliances" based not on institutions or shared ideology but between asymmetric control of supply chains that competitors cannot easily replicate or refashion. We will consider in the next section how this reconception reframes ongoing debates around sanctions, export controls and the prospective strategic balance in Eurasia.

4.3 Policy Implications for Sanctions, Export-Control Regimes, and Military Innovation

The asymmetric, supply-chain-driven format of Sino-Russian drone cooperation is worth thinking through for those policymakers who will suggest options for future sanctions and technology-denial policies. While Western sanctions hindered Russia's access to high-end components starting in 2014 and even more so after 2022, they have solidified Moscow's dependence on Chinese technology and created an ironic lesson: broad restrictions may risk pushing the targeted countries toward other producers and, as a result, new hierarchies of dependence.

The first lesson is about the actual design of export control. As of 2023, many UAV subcomponents (for instance, flight-control boards, MEMS gyros, and gallium-nitride amplifiers) had only one source for supply outside the West: two middle-tier Chinese firms in Shenzhen, Chengdu, and Xi'an. The blanket ban forced the Russians to procure from those suppliers - often through intermediaries in the Gulf, Caucasus, or Central Asia. Policy designs should focus not just on the severability of sanctions but on the actual supply-chain diversification of steps which allow friendly states to credibly resupply their national UAV projects through pre-launch (or pre-emptive) licensing processes, targeted subsidies, and end-use verification protocols-- through multilaterally coordinated mechanisms - deemed especially useful within the Quad, the EU, and Southeast Asian partner states.

The second implication is on financial sanctions. Switching from payment made through SWIFT to the Chinese CIPS payment network is a significant factor in maintaining any Sino-Russian trade in these systems, based purely on the fact that the risk of secondary sanctions with Chinese banks' calculations seems to be manageable at the moment. In future efforts, attempts should target specific sectors, where China still has vulnerabilities to western leverage points, such as commercial insurance and telecommunication infrastructure. By raising

compliance costs in areas like this, any policymakers wishing to work with Chinese institutions would be pressured to comply without restricting humanitarian trade. They would not be attempting to disrupt their trade flow outright, but providing adaptive deterrence that would not lead with a blunt or maximal punitive lens.

Thirdly, the drone partnership is accelerating the diffusion of military innovation. The PLA will have the ability to monitor their components in live battlefield cases - and especially with conditions in Ukraine - provides them levels of R&D value that simulation could never provide. While these feedback loops are shortening pathways for improvements to guidance systems, vulnerabilities in EW resilience, or combating air-frame durability. Western defence planners should assume they will witness lessons the PLA learnt through experiences in Donbas reappearing in systems when they next procure generation-next military systems. To maintain the qualitative advantage that Europe has created over the products produced by Sino-Russian partnerships - will require both maintaining substantial investments in innovation, as well as the huge boundaries to telemetry, firmware, and test data, which will have to remain just as substantial.

Finally, arms-control diplomacy also needs to evolve. The transition from missiles governed by treaties to UAVs as dual-use systems, which lethality depends on software and not just airframes renders the existing legacy mechanisms outdated. New norms urgently developing on algorithmic autonomy, extraterrestrial command and command links, and swarm architecture (autonomous systems) are required. If only by adopting minimal transparency measures together (for example, prior notification of significant UAV exercises or simpler rules for export-licensing policies), could we develop new normative frameworks, to reduce the level of uncertainty initially, and thereafter reduce the risk of miscalculation. Otherwise, we should

anticipate miscalculation leading to a reciprocal increase in mutual suspicion and ultimately an escalatory security dilemma.

In short, it is important that sanctions and export controls are part of a bigger, more integrated strategy - one that includes building supply-chain resilience with multilateral coordination within the defense sectors of pa rtnered states, and more liberalized arms-control diplomacy. Otherwise, sanctions will continue to erode Western technological competitiveness while bolstering China's role as the main supplier of a myriad of technologies to sanctioned authoritarian regimes.

4.4 Study Limitations and Avenues for Future Research

Any inquiry into the seldom-seen intersection of great-power strategy, dual-use technology and wartime adaptation must be done with an appreciation of the evidence and the conceptual blind spots which persist, even after judicious triangulation. The first and most obvious limitation is evidence that is classified (or otherwise not accessible). The dissertation presented here makes use of customs filings, satellite images, corporate information registers, and leaked s, to reconstruct supply-chain dynamics and contributory factors, yet key inputs (specific amounts of military grade chipsets and frequency on their manufacturer's listings, the type and version of proprietary firmware, contractual penalty clauses) remain veiled by export-licensing secrecy in China and wartime censorship in Russia. In other cases, the lack of these variables induces measurement error, at least in estimates surrounding the depth of institutional integration. Future research could potentially incorporate archival release post-conflict, or authorised access to interviews with second-tier or middle management level procurement officers once political conditions allow.

The second limitation relates to assigning causal meaning in a high-conflict environment. Process-tracing can establish plausibility, but rarely gives us laboratory-style controls. The sampling clusters of Chinese component inflows after tightening U.S. sanctions strongly infer an associative mechanism of dependency, but there are alternative factors heterogeneously engaged, such as motivated profits by private Chinese firms or chronically passive facilitations offered by Gulf financial centres that could be layered on top of the causal story. An expanded empirical lens to look at similarly sanctioned militaries that are not similarly favoured by Chinese supply provision (for example, Venezuela after 2019) could provide comparative leverage, isolating features of Moscow's predicament which made it uniquely susceptible to Beijing's supply-chain hegemony.

Third, generalisation across the technology domains can be inherently problematic.Drones provide a sweet spot where civilian off-the-shelf subsystems can be weaponised with minimal re-engineering; consequently facilitating China's commercial abilities to weaponise them. Hypersonic glide vehicles or under-ice autonomous submarines, on the other hand, tap into fabrication processes still largely located in a few OECD economies (11 in total). Whether the dependency mechanism is travelling with these sectors is an open empirical question. With fine-grained network analysis of transnational patent co-ownership and co-investment, it would be possible to see whether Chinese firms are getting as far as propulsion materials, quantum-secure communications, or advanced optics.

Fourth, the temporally-defined cutoff of December 2024 leads to an analytical freeze-frame that could age rather quickly. It is conceivable that a protracted stalemate or uneasy armistice in the war in Ukraine allows Russia to develop spare capacity to pursue diversification of suppliers; this would decrease Beijing’s leverage. On the other hand, should there be an abrupt escalation that pulls NATO directly into the conflict, then the acceleration of Sino-Russian alignment that

might occur might out-run the patterns identified. This will require continuous validation – or modification – and monitoring of limited contract filings, trade-finance flows and joint exercise schedules.

A final word of caution concerns ideas concerning domestic political agency. The study treats Russia and China, for the most part, as unitary agents, with structural incentives deemed more important than bargaining between players within states. Bureaucratic dominance struggles (turf wars) within the Chinese PLA's Equipment Development Department eg. or counter-reaction from within Russia's own "patriotic technocrats" faced by traditional defence-industrial elites may intervene to frame procurement outcomes that the study would not be normative state venturing into state-centric analysis. Ethnography, or elite-interview methodologies – while difficult to use under current conditions – are not impossible via diaspora channels; if wished, thereby providing insights on the extent to which intra-bureaucratic style of politics operate to mediate perceived structural dependence to concrete policy outcomes.

Together, none of these limitations undermine the substantiated findings of the study; they signify boundaries for the next wave of research. Scholars, armed with fresh archives, finer-grained micro data, and ideally, access to the engineers and financiers who mediate geopolitical calculation into circuit boards and escrows, will be well positioned to refine, nuance, or even overturn the mechanisms set out.

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