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RESEARCH ARTICLE

Diplomatic drones? How states exploit drone exports for leverage

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Abstract
How do states use drone exports to build their leverage with buyers? The scholarly literature acknowledges that states use arms exports to cement alliances, improve the capacities of allies and support their domestic arms industry. But there has been no examination of how suppliers of unmanned aerial vehicles (UAVs) tailor their export strategies to develop leverage with their buyers. This paper deploys SIPRI's classification of arms exporters (hegemonic, industrial, and restrictive) and describes how each uses a varying combination of inducements (bundling, lock-ins, and predatory pricing) and risk-mitigation strategies to build leverage while avoiding reputational damage from being drawn into external conflicts. Examining new data on seven types of follow-on sales or defence cooperation agreements after drone sales, this paper finds that of the three of the five major drone suppliers – China, Turkey, and to a lesser extent Iran – operate like hegemonic exporters. To test the proposed mechanisms, it explores how China and Turkey have exploited their drone exports to build leverage with Pakistan. It offers conclusions about how drone diplomacy will evolve as the export market diversifies.

Keywords: defense economics; drones; exports; leverage; technology; war

Introduction

In November 2019, as the civil war in Libya raged, the Government of National Accord (GNA) forces looked for outside suppliers of drones to reverse the territorial losses imposed by their rival, the Libyan National Army (LNA) forces commanded by General Khalifa Haftar. The GNA found a ready seller in Turkey, which had developed a medium altitude, long endurance (MALE) drone – the TB2 Bayraktar drone – used in conflicts worldwide. With LNA forces on the march, the GNA cut a deal with Turkey offering concessions on oil and gas deposits off the coast of Libya in return for these drones.[1] Turkey rushed TB2 Bayraktars to GNA forces, along with Turkish pilots, training, and electronic warfare packages. The result was a rapid reversal in fortunes for the GNA. Armed with Turkish drones, GNA forces repelled the LNA's assault on Tripoli and forced them to sign a ceasefire.[2] While the GNA was able to turn the tide of the war, Turkey became the GNA's chief military benefactor, extending its reach in Libya and deepening the GNA's dependence upon its assets, training, and concepts of operation.

[1]International Crisis Group, *Turkey Wades into Libya's Troubled Waters*, Europe Report no. 257 2020, available at: {https://www.crisisgroup.org/europe-central-asia/western-europemediterranean/turkey/257-turkey-wades-libyas-troubled-waters}, accessed 24 October 2025.

[2]Jason Pack and Wolfgang Pusztai, *Turning the Tide: How Turkey Won the War for Tripoli*, Policy Paper (Middle East Institute, n.d.).

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This case raises an important question: how do states use drone exports to extend their leverage with buyers? There is no reason to assume that Turkey's exploitation of its drone export capacity is unique. Other drone producers, such as the United States, Israel, China, and Iran, have attached conditions to drone sales and tailored their export strategies to build leverage with their buyers. But they have not sought the same things. With different partners, drone exporters have sought different goals: to boost the capabilities of allies, to lure non-allies into their orbit, to achieve regional influence, or to achieve a foothold in a military and commercial market. All of this constitutes a form of what may be described as drone diplomacy.[3] As drones are increasingly important as military assets and symbols of a state's power, drone producers have an extraordinary opportunity to develop an export strategy that extends their military influence with buyers.[4] While this is acknowledged as a fact in the literature, there is no theoretical work explaining how drone exporters develop strategies to offer follow-on sales of related military technology or agreements for training, joint operations, and joint ventures to build leverage with a buyer.

This paper explains how drone exporters use follow-on sales and cooperation agreements to build leverage. It develops the theoretical classification of different types of exporters originally developed by SIPRI (hegemonic, industrial, and restrictive) to articulate different drone export strategies.[5] Specifically, it describes how each type of exporter crafts varying combinations of inducements (bundling, lock-ins, and predatory pricing) and risk-mitigation strategies to build leverage. It argues that hegemonic exporters will offer a series of inducements, including technology like manned aircraft and radars but also training packages, to gain leverage with their buyer. At the same time, they have greater ambitions to seek influence regionally so they will take steps to limit the principal-agent risks that yield reputational damage or drag them into new conflicts. Industrial drone exporters will be narrowly oriented to commercial gains and focus on price and inducements that entrench their foothold in the domestic drone market of the buyer while paying little, if any, attention to political risk. Restrictive exporters will limit their sales to close allies and condition them on making sure that they preserve regional stability. Their caution and their narrow pool of trusted buyers means that restrictive suppliers will offer few inducements to buy their drones and have little need for explicit risk-mitigation strategies. However, restrictive exporters will offer cooperative measures such as joint operations to improve the fighting capacities of their allies.

The empirical section of the paper uses newly collected data on the sale or export of drone-related technology, training, joint operations, and joint investment packages to classify the position of the five main drone suppliers worldwide (United States, China, Israel, Turkey, and Iran). It finds that three suppliers – China, Turkey, and to a lesser extent Iran – act as regional hegemonic exporters, competing across the Middle East, Asia, and Africa for market dominance while offering training, joint operation, and joint ventures to build leverage with their buyers. It finds that Israel has acted consistently as an industrial exporter, deploying joint venture agreements to strengthen its commercial position. Finally, despite its superior technology and market position in the export market, the United States has consistently acted as a restrictive exporter, selling only to close allies and placing safeguards on its use to reduce the risk of accidental escalation.

This paper makes three contributions to security studies. First, it calls attention to the variation in sales strategies among drone (and, by extension, other arms) exporters, showing how different combinations of inducements and follow-on sales may reveal their ambitions – or lack thereof – to build leverage with the buyer. Second, it highlights the importance of principal-agent problems in

[3]Erik Lin-Greenberg, 'The Dawn of Drone Diplomacy', Center for a New American Security (En-US), 20 December 2022, available at: {https://www.cnas.org/publications/commentary/the-dawn-of-drone-diplomacy}, accessed 11 November 2025.

[4]Michael J. Boyle, *The Drone Age: How Drone Technology Will Change War and Peace* (Oxford University Press, 2020).

[5]Stockholm International Peace Research Institute, *The Arms Trade and the Third World: Revised and Abridged Edition* (Holmes and Meier, 1975).

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these transactions, illustrating how concerns over risk-mitigation affect some exporters' calculations and shape their willingness to build leverage with buyers through mechanisms like predatory pricing, bundling, and lock-ins. Third, it provides the first dataset to date on sales of electronic warfare and C-UAS systems, showing how many drone exporters are capitalising on their sales to also offer these technologies.

It will proceed in seven sections. First, it will review the literature on arms transfers, highlighting three main categories of explanations for seeking them (security, economic, and prestige). Second, it will situate the literature on drone proliferation within the wider literature on arms transfers and ask why drone sales might be different than other types of arms transfers. Third, it will develop the SIPRI classification as it applies to drone exporters, describing each type of exporter's strategy and identifying the predictions for which exporters will bundle drone sales with that of other military technology and elements of defence cooperation agreements. Fourth, it will describe the data collected and the research design. Fifth, it will present the results of models. Sixth, it will present a focused, paired comparison of China's and Turkey's exports to Pakistan, showing how both sought to leverage their exports for closer ties while offsetting the security risks associated with arming Pakistan. Finally, it will analyse how drone diplomacy will evolve as the export market diversifies.

Literature review

Why do states transfer or sell arms to other states? The scholarly literature that addresses this question can be broken down to three main explanations: security, economic, and prestige-based. Drawn largely from realist work, security explanations focus on the degree to which arms transfers are designed to improve the capabilities of allies who may be called upon in a future conflict.[6] In many cases, arming allies has a clear logic, as the cumulative power of states is measured by not just its own material capabilities but also the capabilities of allies who may come to their aid.[7] A straightforward implication of this is that states should be willing to arm allies to ensure that they are ready to fight. Arms transfers may also serve as a side payment to get these allies on side in the first place, though it is important to recognise that this is not always the case. As Walt notes, 'aid in a relationship may be more the result of a political alignment than a cause of it'.[8]

The consensus within the security literature is that sellers will use arms exports for leverage with buyers. According to Wheelock, 'leverage is defined as manipulation of the arms transfer relationship in order to coerce or induce a recipient-state to conform its policy or actions to the desires of the supplier-state.'[9] Gelb notes that arms sales and transfers are useful as a tool of leverage in foreign policy, drawing allies in closer and building their capacity.[10] Pierre notes that arms sales are useful for leverage but also carry risks, notably of principal-agent problems where the buyer uses the arms in a way not intended by the seller.[11] Kinsella found that this tendency for buyers to engage in conflict-seeking behaviour once they have arms can be mitigated if the seller uses leverage to foster dependence.[12] Krause notes that the idea that arms transfers are tools of power and influence is a leitmotif in the literature and that arms sales can be understood as a form of

[6]Glenn H. Snyder, *Alliance Politics* (Cornell University Press, 1998); Glenn H. Snyder, 'The security dilemma in alliance politics', *World Politics*, 36:4 (1984), pp. 461–95, https://doi.org/10.2307/2010183; Barry Buzan and Eric Herring, *The Arms Dynamic in World Politics* (Lynne Reiner, 1998); Stephen Walt, *The Origins of Alliances* (Cornell University Press, 1987).

[7]James D. Morrow, 'Arms versus allies: Trade-offs in the search for security', *International Organization*, 47:2 (1993), pp. 207–33, https://doi.org/10.1017/S0020818300027922.

[8]Walt, *The Origins of Alliances*, 42.

[9]Thomas R. Wheelock, 'Arms for Israel: The limit of leverage', *International Security*, 3:2 (1978), pp. 123.

[10]Leslie H. Gelb, 'Arms sales', *Foreign Policy* 25 (1976), pp. 3–23, https://doi.org/10.2307/1148021.

[11]Andrew J. Pierre, 'Arms sales: The new diplomacy', *Foreign Affairs*, 60:2 (1981), pp. 266–86, https://doi.org/10.2307/20041080; Andrew J. Pierre, *The Global Politics of Arms Sales* (Princeton University Press, 2014).

[12]David Kinsella, 'Arms transfer dependence and foreign policy conflict', *Journal of Peace Research*, 35:1 (1998), pp. 7–23.

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bargaining power, where the seller offers threats and rewards as part of the sale.[13] Paul describes the leverage that sellers with a highly desired asset (like drones) have as 'structural influence', which they can wield over a recipient.[14]

Yet scholars agree that the calculation of leverage is not straightforward for three reasons.[15] First, the more important that the ally is, the more leverage they have with their patron, suggesting that the seller does not always call the shots.[16] For example, while it is commonly assumed that the seller has leverage in the relationship, Spindel found that junior partners in alliances can sometimes find ways to restrain great powers who offer them security assistance.[17] Second, states must confront what Yarhi-Milo, Lanozska, and Cooper describe as the 'patron's dilemma', which requires them to offer a strong enough commitment to reassure their allies but a flexible enough one to avoid entrapment by their allies in future conflicts.[18] Arms transfers can be a way of reassuring nervous allies but can also feature conditions designed to constrain their buyers from using them in risky ways. Third, the arms trade can be done to improve the capabilities of allies but can also foster dependency that undercuts the freedom of action of the buyer.[19] For this reason, some buyers will refuse to throw their lot in with a single supplier, and rather move between multiple suppliers to maintain their freedom of action.

A second explanation for arms exports focuses on their economic value. Krause noted that only a few states can sustain their domestic arms industry without an aggressive export posture. Outside of superpowers like the United States and the Soviet Union, most middle ranking powers will need to seek out other markets to export their arms in order to remain competitive in this market.[20] These states will then seek to export arms to a wide number of states for commercial gain. This is not always successful: in some cases, the economic returns to arms sales are overstated and represent only a small part of the overall balance of payments for most states.[21] Relative to other elements of international trade, the total size of the arms trade is small.[22] However, some states – and arms companies – can exploit both the black and so-called grey market for weapons sales and deliver profits for companies based at home. Developing a niche capacity in the arms trade, as Czechoslovakia did during the Cold War, can sustain domestic production of arms and return profits to powerful stakeholders in the state. This can be to the advantage of powerful lobbies in the state who will work to convince government leaders to adopt an aggressive export strategy.[23]

A third explanation for arms transfers concerns prestige: some states seek to acquire weapons less because of an intention to use them and more because it is a powerful symbol of their

[13]Keith Krause, 'Military statecraft: Power and influence in Soviet and American arms transfer relationships', *International Studies Quarterly*, 35:3 (1991), pp. 313–36, https://doi.org/10.2307/2600702.

[14]T. V. Paul, 'Influence through arms transfers: Lessons from the U.S.–Pakistani relationship', *Asian Survey*, 32:12 (1992), p. 1079, https://doi.org/10.2307/2645039.

[15]Patricia L. Sullivan et al., 'US military aid and recipient state cooperation', *Foreign Policy Analysis*, 7:3 (2011), pp. 275–94; Wheelock, 'Arms for Israel'.

[16]Walt, *The Origins of Alliances*.

[17]Jennifer Spindel, 'Arms for influence? The limits of great power leverage', *European Journal of International Security*, 8:3 (2023), pp. 395–412, https://doi.org/10.1017/eis.2023.3.

[18]Keren Yarhi-Milo et al., 'To arm or to ally? The patron's dilemma and the strategic logic of arms transfers and alliances', *International Security*, 41:2 (2016), pp. 90–139, https://doi.org/10.1162/ISEC_a_00250.

[19]Christian Catrina, *Arms Transfers and Dependence* (Routledge, 1988).

[20]Spencer L. Willardson and Richard A. I. Johnson, 'Arms Transfers and International Relations Theory: Situating Military Aircraft Sales in the Broader IR Context', *Conflict Management and Peace Science*, 39:2 (2022), pp. 191–213.

[21]Willardson and Johnson, 'Arms transfers and international relations theory'.

[22]Rachel Stohl and Suzette Grillot, *The International Arms Trade* (Polity, 2009), p. 4.

[23]Ron Smith et al., 'The economics of exporting arms', *Journal of Peace Research*, 22:3 (1985), pp. 239–47, https://doi.org/10.1177/002234338502200305.

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international standing.[24] Nuclear weapons are the most studied example of a weapon that delivers prestige, but most nuclear powers have developed their programme through domestic sources rather than the export market.[25] Not all weapons bear prestige benefits: small arms are considered to have a negligible prestige value, while higher value items like manned aircraft convey some prestige to the buyer. Aspiring great powers will seek to possess and sell weapons that convey their international standing.[26] At the same time, aspiring buyers will seek to buy prestige-bearing weapons to signal their standing to their rivals and neighbours.

Drone exports

Scholarship on drone proliferation has focused on the question of whether drones will spread widely across the international system and, if so, why states will acquire them.[27] Most of this literature has focused on the perspective of the buyer, emphasising security and prestige-based explanations for the acquisition. Boyle argues that states in conflict zones or those contesting borders with rivals seek drones and that they are also a status symbol for aspiring regional powers.[28] While acknowledging that states had security-related reasons to purchase drones, Joshi, Gilli and Gilli, and Horowitz, Kreps, and Fuhrmann offer a more sceptical account of drone proliferation, suggesting that industrial and technological constraints would limit the natural proliferation of drones.[29] Empirical work on drone proliferation focused more on the logic of buyers than of sellers. Fuhrmann and Horowitz found that the decision to seek drones is a function of a state's threat environment and that a state's technological capacity influences the types of drones it acquires.[30] Horowitz, Schwartz, and Fuhrmann also found that non-democracies are growing more likely to buy drones, especially as suppliers like China and Turkey have played a greater role in the export market.[31]

The literature on drone proliferation has paid comparatively less attention to the strategic decisions of exporters, often implying that they wish to sell to anyone willing to buy. Yet many scholars have noted that the United States has been a reluctant supplier of drones, in part due to its strict compliance with the Military Technology Control Regime (MTCR).[32] This literature has focused mainly on security and prestige-based explanations for selling drones, treating the economic aspect of the transaction – specifically, the commercial value from sales – as secondary. It has also not explored the possibility that drone exports will yield a relationship of dependence, treating the

[24]David Kinsella, 'The global arms trade and the diffusion of militarism', Anna Stavrianakis and Jan Selby (eds), *Militarism and international relations in the twenty-first century,* (London: Routledge, 2012); Pierre, *The Global Politics of Arms Sales*.

[25]Scott D. Sagan, 'Why do states build nuclear weapons?: Three models in search of a bomb', *International Security*, 21:3 (1996), pp. 54–86; Scott D. Sagan, 'The causes of nuclear weapons proliferation', *Annual Review of Political Science*, 14 (2011), pp. 225–44, https://doi.org/10.1146/annurev-polisci-052209-131042.

[26]Yuen Foong Khong, 'Power as prestige in world politics', *International Affairs*, 95:1 (2019), pp. 119–42, https://doi.org/10.1093/ia/iiy245.

[27]Michael J. Boyle, 'The race for drones', *Orbis*, 59:1 (2015), pp. 76–94, https://doi.org/10.1016/j.orbis.2014.11.007; Shashank Joshi and Aaron Stein, 'Emerging drone nations', *Survival*, 55:5 (2013), pp. 53–78, https://doi.org/10.1080/00396338.2013.841805; Michael C. Horowitz et al., 'Separating fact from fiction in the debate over drone proliferation', *International Security*, 41:2 (2016), pp. 7–42, https://doi.org/10.1162/ISEC_a_00257.

[28]Boyle, 'The race for drones'.

[29]Joshi and Stein, 'Emerging drone nations'; Horowitz et al., 'Separating fact from fiction in the debate over drone proliferation'; Andrea Gilli and Mauro Gilli, 'The diffusion of drone warfare? Industrial, organizational, and infrastructural constraints', *Security Studies*, 25:1 (2016), pp. 50–84, https://doi.org/10.1080/09636412.2016.1134189.

[30]Matthew Fuhrmann and Michael C. Horowitz, 'Droning on: Explaining the proliferation of unmanned aerial vehicles', *International Organization*, 71:2 (2017), pp. 397–418, https://doi.org/10.1017/S0020818317000121.

[31]Boyle, 'The race for drones'; Michael Horowitz et al., 'Who's prone to drone? A global time-series analysis of armed Uninhabited Aerial Vehicle Proliferation', *Conflict Management and Peace Science*, 39:2 (2020), pp. 119–42, https://doi.org/10.1177/0738894220966572.

[32]Department of Defense, *Unmanned Aircraft Systems Airspace Integration Plan* (2011), availble at: {https://info.publicintelligence.net/DoD-UAS-AirspaceIntegration.pdf}, accessed 30 January 2026.

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transactions as standalone events rather than a piece of a growing relationship of leverage between a seller and a buyer.

The literature on drone proliferation situates them within the scholarship on arms transfers and sales, but there are three reasons to suspect that drones may operate differently than other arms sales. First, drones represent an unusual conjunction of being both low cost (like small arms) but also increasingly necessary in modern competitions around deterrence and coercion.[33] This is different than other exports (like small arms, mines, and so on) that are low cost but play a less significant role in how states calculate credibility or bargain. Second, drones operate like a catalyst for other elements of military power, including ground and sea forces, and therefore may be of greater value for buyers for that effect. Third, while drone sales are increasing worldwide, the military export market is dominated by five countries – the United States, China, Israel, Turkey, and Iran – that gives each of them an unusual amount of leverage over buyers. Between 2001 and 2023, the SIPRI database records 294 UAV sales or transfers of military drones, with 275 (93.54 per cent) of these exports coming from one of five countries: United States (27.89 per cent), Israel (34.35 per cent), China (13.27 per cent), Turkey (14.29 per cent), and Iran (3.74 per cent).[34] Their dominance in the market allows them to develop export strategies that are tailored to expanding their leverage with buyers.

Supplier strategies

The literature on arms sales has developed theories explaining why countries sell arms. Krause drew a distinction between those countries that create technology, those that adapt it, and those that imitate it, suggesting each has reasons to adopt different export strategies to maximise their market position.[35] The parallel with drones is obvious, with some of the major suppliers creating the technology (notably, the United States and Israel), some adapting it (Turkey), and others offering models that largely replicate more popular models produced by other states (China and Iran). Bitzinger argues that the costs of developing modern technologies is so high that states are forced into an export orientation, even if the results of more states flooding the market is worse for international security writ large.[36]

A widely used classification scheme for suppliers was introduced by SIPRI in its analysis of Third World arms suppliers.[37] Unlike other works on arms exports, SIPRI introduces a categorisation of seller's orientation towards exports, identifying three types: hegemonic, industrial, and restrictive. This is obviously a simplification: all states selling arms have multiple motives (strategic, economic, and so on) at one time, and rarely can any sale be fully reduced to a single motive.[38] But the SIPRI classification system is useful because it helps explain the broad patterns of why sellers sell in the way they do, as well as distinctive features and anomalies in the ways that sales are constructed. The SIPRI categorisation has been broadly influential, with subsequent scholars such as Brzsoka and Pearson echoing its formulation in their classification of power-oriented, commercialised, and restrictive sellers.[39]

[33] Boyle, *The Drone Age*.

[34] These percentages are calculated out of total 294 sales. Austria technically has more drone sales than Iran – fourteen sales during this period, constituting 4.76 per cent of all sales – but it sells only one model – a Camcopter S-100 drone, used exclusively for maritime safety – and does not offer a wide range of military models.

[35] Keith Krause, *Arms and the State: Patterns of Military Production and Trade*, Cambridge Studies in International Relations (Cambridge University Press, 1992), https://doi.org/10.1017/CBO9780511521744.

[36] Richard A. Bitzinger, 'The globalization of the arms industry: The next proliferation challenge', *International Security*, 19:2 (1994), pp. 170–98, https://doi.org/10.2307/2539199.

[37] Stockholm International Peace Research Institute, *The Arms Trade and the Third World: Revised and Abridged Edition* (New York: Holmes and Meier, 1975).

[38] Gregory S. Sanjian, 'Great power arms transfers: Modeling the decision-making processes of hegemonic, industrial, and restrictive exporters', *International Studies Quarterly*, 35:2 (1991), pp. 180, https://doi.org/10.2307/2600469.

[39] Michael Brzoska and Frederic S. Pearson, 'Developments in the global supply of arms: Opportunity and motivation', *The Annals of the American Academy of Political Science*, 535:1 (1994), pp. 58–72, https://doi.org/10.1177/0002716294535001005.

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Empirical work on the motives of suppliers has been relatively scarce, in part due to limited data availability on the reasons for arms sales and transfers. Because of their sensitive nature, some arms sales are not public. Even when they are, states rarely confess their motives in clear, precise ways. Since motives vary and are hard to empirically assess from the outside, research on exporter strategies must focus on overarching patterns of how states act rather than why they do so. One empirical test of the SIPRI framework by Sanjian did this by deploying fuzzy-set multi-criteria models to predict the annual arms trade strategies of the United States, France, and West Germany between 1950 and 1976.[40] He found that this approach could make accurate predictions for arms strategies conforming to these broad types even in the absence of direct empirical evidence of what decision-makers are thinking. A more recent empirical examination by Kim and Sheikh used a topic-modelling test the validity of the SIPRI categories and explain the interaction between buyer and seller.[41]

One of the problems with empirical tests of this classification is that the strategies for each seller have not been fully articulated. The SIPRI classification describes what they are rather than how they behave; in other words, it leaves the strategy of each type of seller underdeveloped. In this section, we expand on this framework to describe each of their strategies and apply it to drones, drawing insights on the literature on the motivations for sales (security, economic, and prestige) and the marketing and finance literature on how private companies extend their leverage in similar oligopolistic markets (i.e., those with a few powerful sellers).

Hegemonic exporters

According to SIPRI, *hegemonic exporters* focus on building or maintaining their geopolitical dominance and deploy exports as part of a strategy to build leverage with buyers. They are security-focused but their scope can be either global (as it was with the United States and USSR during the Cold War) or regional. Hegemonic exporters seek to build capacity among allies and to project power through sales in real or aspirational spheres of influence. Their efforts to export drones are directed towards expanding their geopolitical reach, coupling an effort to advertise the technological prowess of their drones with a promise of a beneficial future relationship with the exporter.

Hegemonic exporters seek to capitalise on their position in oligopolistic markets to build leverage when there are few powerful suppliers. In similarly structured markets, private companies often use three lures to extend their leverage and apply pressure to buyers: bundling, lock-ins, and predatory pricing. Bundling products, a common practice in the commercial world with phones and tablets, occurs when a product is sold with a heavily discounted related technology to deepen the buyer's commitment to a particular seller.[42] With drones, hegemonic sellers use bundling with exclusive, often high-end military sales (for example, manned aircraft and radar) and lower cost, more accessible products like electronic warfare packages and C-UAS products. Hegemonic sellers emphasise the interoperability of drones and related equipment, which offers more capabilities to budget-conscious buyers than the drones alone. Buyers are then drawn into the ecosystem of a seller's repertoire, raising the costs associated with switching to a new seller. Turkey is particularly aggressive in bundling in its electronic warfare packages with its drones, advertising the interoperability of its Koral electronic warfare system with its popular drone systems.[43]

[40]Sanjian, 'Great power arms transfers',

[41]Sung Jin Kim and Nasir Jamil Sheikh, 'Behavior patterns of three archetypal arms suppliers based on empirical media analysis of the first Korean fighter jet program', *International Journal of Business*, 27:3 (2022), pp. 1–18, https://doi.org/10.55802/IJB.027(3).004.

[42]Stefan Stremersch and Gerard J. Tellis, 'Strategic bundling of products and prices: A new synthesis for marketing', *Journal of Marketing*, 66:1 (2002), pp. 55–72, https://doi.org/10.1509/jmkg.66.1.55.18455; Joseph P. Guiltinan, 'The price bundling of services: A normative framework', *Journal of Marketing*, 51:2 (1987), pp. 74–85, https://doi.org/10.1177/002224298705100206.

[43]Ali Bakir, 'Turkey's Electronic Warfare Capabilities: The Invisible Power Behind Its UACVs', Royal United Services Institute (27 September 2021), available at: {https://rusi.orghttps://rusi.org}, accessed 12 October 2024.

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Another mechanism for hegemonic suppliers is what is known as a lock-in, where a seller ties the hands of a buyer by imposing high costs for switching to another buyer through multi-year contracts.[44] On balance, many buyers are reluctant to accept lock-ins, especially if they have any leverage with the exporter. But drone exporters can offer lock-ins in the form of long-term training, maintenance contracts, investment, and production agreements with the buyer. These agreements – sometimes formalised as defence cooperation agreements and cast as a multi-year commitment – are a way for an exporter to leverage their offerings and prevent a switch to an alternative provider. In some cases, this comes with clear commercial benefits, such as an attempt to boost the commercial drone productive capacity of the buyer.

A final lure deployed by hegemonic suppliers is predatory pricing, where the costs of drones and related equipment are heavily discounted as a way of rendering the products of other suppliers non-competitive and forcing them out of the market.[45] In effect, the exporter is sacrificing profit today for leverage at a later point with predatory pricing. With drones, the commercial market is rife with accusations of predatory pricing, focusing particularly on how the Chinese company DJI uses predatory pricing to control 70 per cent of the drone market.[46] In the military sphere, the actual pricing (including operating costs) of drones is opaque, but there is evidence that both China and Turkey have adopted strategies that are price-focused, building drones that are 'good enough' for most buyers and competing with each other under the price point of comparable United States drones.

While hegemonic suppliers are seeking leverage with buyers, they also face risks in selling drones to new buyers who may use them in reckless ways in their own conflicts. Stated more formally, hegemonic suppliers face a principal-agent problem, where once the drone is delivered the buyer is free to engage in risk-taking behaviour that may have adverse reputational costs for the seller.[47] Adverse public attention is particularly important for hegemonic sellers to avoid if they are selling their drones and seeking similar leverage with other buyers in the region. Beyond that, especially in cases where the seller has offered joint operation agreements, hegemonic exporters may find themselves being drawn by allies into conflicts that they do not want if they have signed training and joint operation agreements with the buyer.[48] Hegemonic suppliers want to sell widely but – if possible – also want to impose conditions designed to restrain buyers from adverse behaviour. During the Cold War, the United States did this with end-user agreements or Congressional requirements (like the Leahy laws) that arms sales were not used in ways that violate human rights. Following this logic, hegemonic suppliers may export drones with technical fail safes to restrain risk-taking buyers or guide their behaviour. They may also condition training and sales of related military technology on the behaviour of the buyer.

Industrial exporters

While hegemonic exporters face complex dilemmas in making sales, consolidating influence, and minimising risk, *industrial exporters* have a straightforward motive and calculation to make.

[44]Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Harvard University Press, 1998), available at: {https://hbsp.harvard.edu/product/863X-HBK-ENG}, accessed 12 October 2024; Paul Klemperer, 'Markets with consumer switching costs*', *The Quarterly Journal of Economics*, 102:2 (1987), pp. 375–94, https://doi.org/10.2307/1885068.

[45]Steven C. Salop and David T. Scheffman, 'Raising rivals' costs', *American Economic Review*, 73:2 (1983), pp. 267–71; Luís M. B. Cabral and Michael H. Riordan, 'The learning curve, predation, antitrust, and welfare', *The Journal of Industrial Economics*, 45:2 (1997), pp. 155–69, https://doi.org/10.1111/1467-6451.00041.

[46]Mike Loenard, 'Top Global Drone Maker Beats Predatory Pricing Claims', Bloomberg Law (19 March 2019), available at:{https://news.bloomberglaw.com/antitrust/top-global-drone-maker-beats-predatory-pricing-claims} accessed 30 September 2024.

[47]Keith Hartley, 'Chapter 33 The Arms Industry, Procurement and Industrial Policies', in *Handbook of Defense Economics*, ed. Todd Sandler and Keith Hartley, vol. 2 (Elsevier, 2007), pp 1139–1176, https://doi.org/10.1016/S1574-0013(06)02033-3.

[48]Thomas J. Christensen and Jack Snyder, 'Chain gangs and passed bucks: Predicting alliance patterns in multipolarity', *International Organization*, 44:2 (1990), pp. 137–68.

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Industrial exporters are profit-oriented and focused on the commercial exploitation of technology and drawing profits home to support their domestic arms industry. Because drones are a technology with widespread commercial and military applications, military sales can be an important gateway into achieving a foothold in another state's commercial market. It follows from this that drone exporters with an industrial orientation will focus on the volume of sales across multiple regions (i.e., with no specific focus driven by strategic objectives).

Due to the oligopolistic structure of the market, the inducements offered by industrial suppliers will look superficially similar to that of hegemonic suppliers (predatory pricing, bundling, and lock-ins), but there are differences in both emphasis and risk-mitigation. These inducements will be designed to build commercial leverage and access to the buyer's drone industry and market. This means that they will offer fewer military-related side payments – for example, joint operations and training – and instead focus on commercial-oriented opportunities like joint production agreements. They may also offer discounted related technology (such as electronic warfare or C-UAS systems) but without formal long-term defence cooperation agreements. As industrial suppliers see drone sales as a business proposition, they will be indifferent to political risk, taking few, if any, steps to restrain buyers from risk-taking behaviour.

Restrictive exporters

In contrast, *restrictive exporters* are highly selective in nature and let caution guide their sales rather than political influence or profit. According to SIPRI, restrictive sellers are willing to export only when the arms transfer improves regional stability. Sanjian argues that restrictive suppliers are rare and sometimes created because they lack extensive links for exports, but this is not always the case. Restrictive exporters may be powerful states who circumscribe the scope of their export of risky technologies to a close circle of allies. Selling to allies only means that there are fewer incentives for restrictive exporters to win them over with explicit inducements (like predatory pricing, bundling, and lock-ins). Equally, given that the seller has a long-standing relationship and some degree of trust with the buyers, there are few reasons to impose risk-mitigation safeguards that tie the hands of the buyers. Since the buyer is already likely to coordinate military action with the seller, a restrictive exporter will sell buyers technologies that significantly improve their military capabilities and capacity to launch joint operations.

Table 1 identifies the key differences in each export strategy.

Table 1. Supplier strategies.

Hegemonic sellers	Industrial suppliers	Restrictive suppliers
Inducements: Predatory pricing bundling, but military lock-in agreements	Inducements: Predatory pricing, bundling, commercial lock-ins	Inducements: Few, if any, because interoperability with allies already present
Mitigations: Military/technical safeguards to prevent risk-taking	Mitigations: None, indifferent to risk of buyers	Mitigations: Sales to only formal allies so not needed
Objective: Expand military influence	Objective: Expand commercial influence	Objective: Consolidate existing allies

Data

This paper seeks to determine whether drone exporters are acting in ways consistent with what each strategy would suggest. Because it is impossible to know the full reasoning for an export decision, it tests whether states are *as if* one model predominates in their decision-making. This will not be universally true; a state with a hegemonic export strategy may act that way most of the time but make exceptions with some sales for specific reasons. For example, a state that is worried about a buyer using the weapons inappropriately may act like a restrictive exporter for that buyer while

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acting as a hegemonic or industrial exporter for other clients. But if these models are valid, the broad behaviour of exporters in the aggregate should conform to the types and strategies identified here, even if the realities of a specific case are different.

To explore whether drone suppliers fit into these categories, this paper uses data from the SIPRI arms transfer database to identify the sale or transfer of military drones between two states between 2001 and 2023. The SIPRI database includes descriptive data on the designation (or name) of the drone, the weapons category (for example, armed UAV or not), the order year, number ordered, delivery year, whether the sale was for a new or used vehicle, and, in some cases, the cost of the transaction.[49]

This data focuses on all military-grade drones, including popular UAV and UACV models, except the light, low speed drones in Class 1 of the Department of Defense's classification scheme.[50] This data excludes commercial drones and loitering munitions from the analysis because there is no reliable data on these sales. Our focus has been the five major suppliers in the market: the United States, Israel, China, Turkey and Iran.

Since our focus is whether states can use drone exports as leverage, we use states as the organising category rather than private firms. We acknowledge that across these five states private firms might have different levels of agency; for example, an American aerospace company might have more freedom to sell drones than a state-backed company in China. Yet we argue that a focus on states using leverage is appropriate because (a) all five governments require prior authorisation and export permits for drones, radar, and manned aircraft; (b) all of the follow-on training, joint operation, and joint venture agreements we examine are run by governments and cannot be authorised by private firms; and (c) the Missile Control Technology Regime (MTCR), which governs all of the drones in our dataset, has a strong presumption of denial for drone exports and imposes government-led control mechanisms on the export process. While only the United States and Turkey are formal members of the MTCR, Israel and China have pledged to abide by its principles and follow its rules. In most cases today, drone exports are subject to a high level of government control that restrains many private firms from freely dealing them and offers governments a unique opportunity to draw leverage from their export.

We seek to determine whether the exporters are using drone sales to build leverage with their buyers. Since 'leverage' is an abstract concept and cannot be measured directly, we test this claim by seeing whether they have intensified the sale of related technology or signed follow-on agreements after an export. Following Wheelock's definition, the offer of follow-on sales and cooperation agreements is understood as attempts to capitalise on drone sales by coercing or inducing the buyer to act as the supplier wishes. We do not claim that this always works. Drone exports alone are typically insufficient to yield power over a seller, to fully influence their behaviour, or to alter a strategic outcome between the two states.[51] Our claim here is more modest: that states are using drone exports as a linchpin to intensify the relationship that they have with the buyer in an *attempt* to exercise leverage.

We classify exporters based on the SIPRI schema to determine whether and how they are trying to build leverage after a drone sale. Based on the strategies described above, we expect that hegemonic exporters will focus more on building or consolidating leverage through aggressive use of follow-on sales and joint agreements than industrial or restrictive ones. Industrial exporters will focus on the volume of sales and the use of joint production agreements to grant a commercial foothold in the market. Restrictive suppliers will sell to a select number of close allies, offering few, if any, inducements or risk mitigations to them.

For each sale or transfer from these five countries, we collected data on whether the buyer also purchased military equipment that is related to drones, including radars, manned aircraft,

[49] {https://www.sipri.org/databases/armstransfers/sources-and-methods}, checked 25 July 2024.

[50] Department of Defense, *Unmanned Aircraft Systems Airspace Integration Plan*.

[51] Emily Meierding and Rachel Sigman, 'Understanding the mechanisms of international influence in an era of great power competition', *Journal of Global Security Studies*, 6:4 (2021), ogab011, https://doi.org/10.1093/jogss/ogab011.

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electronic warfare packages, and counter-UAS systems. We collected data on whether these sales occurred concurrently with the drone sale or within three years of that sale. We collected the data over a three-year period following the sale in recognition that not every related sale will necessarily occur concurrently. States may take a longer time to negotiate a follow-on sale or have context-specific reasons – delayed budgetary or legal approval, for example – that mean that not all sales will happen at the same time. We do not try to evaluate whether the sale of manned aircraft or radar was a part of a larger sales agreement with the drones. It is possible that a follow-on sale of radars, for example, may be unrelated to the drone sale; equally, it is possible that they may be implicitly related and negotiated concurrently but announced separately for a variety of reasons. Rather than trying to resolve this, especially for states like China and Iran that do not disclose the details of their transactions fully, we opted for a straightforward binary coding of these variables, indicating only whether there a sale or agreement of some kind between the buyer and the seller either concurrently or within three years of the drone sale.

Our data sources are as follows. SIPRI includes data on radar and manned aircraft sales. For these, we developed a simple binary variable Radar, indicating a 1 if a sale was made concurrently or within three years and a zero if not. We also created a similar binary variable Manned Aircraft, indicating a 1 if a sale was made concurrently or within three years. For the variables Electronic Warfare and C-UAS, we used web scraping tools via a custom R script to track all sales from all countries reported in industry-specific journals and websites, including the SIPRI Arms Transfers Database, Jane's Defence Equipment and Technology, Fortune Business Insights, Airforce Technology, and MarketsandMarkets. We created a master dataset of recorded transactions of EW packages and C-UAS systems, which are matched with the transactions between sellers and buyers. To capture this, we created two binary variables – Electronic Warfare and C-UAS systems, indicating a 1 if a sale was made concurrently or within three years of the drone transaction. It is likely that both represent an undercount of the total number of transactions of these systems. Electronic warfare and C-UAS packages are sometimes classified and states do not always disclose their sale. These systems are also not always sold government-to-government; they may be sold via private companies, albeit typically with the blessing of the government, and are not necessarily disclosed to the public. If anything, we believe that these variables underestimate the total number of sales of electronic warfare and C-UAS systems that follow drone sales.

We collected data on whether drone sales were accompanied by one of three cooperative defence arrangements between the seller and buyer: (1) Joint Operations, in which the buyer and seller jointly operate or pilot the drones; (2) Training, in which the seller offers pilot or other training for the buyer; and (3) Joint Investment, in which the seller offers a joint venture or investment deal with the buyer's government or defence industry as part of the drone sale. Each of these variables is binary, with a 1 indicating that such an agreement happened either concurrently or within three years. Since this data did not exist and could not be web-scraped from trade and other industry-specific sources, we used keyword searches through both EBSCO and Google News to code whether an agreement of this kind was made between the seller and buyer within that time period.

Our data collection is designed to see if any of the drone exporters are behaving in ways consistent with being a hegemonic, industrial, and restrictive supplier. Since we do not have access to their internal reasoning for a sale, we are seeking to determine if they are acting *as if* they are that kind of supplier in *most* of their export deals with buyers. While we are collecting data on their subsequent interactions with the buyer, we are not arguing that the drone sales cause the secondary sale of military equipment or a cooperation agreement. That a sale of electronic warfare technology or a training agreement follows a drone sale does not imply that it was caused by it. The relationship between drone sales and closer ties is marked by endogeneity: drone sales may be a cause of closer ties over time, but they may also be a consequence of growing ties between the states in the years before the sale. We address this issue with robustness tests discussed below.

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Results

Our data tracks whether the sale or transfer of related military technology (radar, manned aircraft, electronic warfare, C-UAS systems) or of a cooperative defence arrangement (regarding operations, training, or investment) followed between the buyer and seller concurrently or within three years of the sale. Our goal is to classify exporters along the schema provided (hegemonic, industrial, and restrictive) and determine if the evidence is consistent with description of the strategies identified here. For example, we expect hegemonic sellers will aggressively engage in more follow-on military sales and agreements than their competitors, while industrial sellers will sell often but be less concerned with adding follow-on sales and agreements that yield political leverage with the buyers. Industrial suppliers seek entry into the military and defence market of the buyer but treat the political gains from these sales as secondary. We also expect that restrictive sellers will be cautious in follow-on sales and sell only to close allies. We begin with descriptive data and then use a t-test to see if there is a difference in means between one state's pattern of sales and the rest of the sample.

Descriptive data

The descriptive data reveals that each supplier has a different roster of buyers, with relatively few overlapping cases of countries that buy from two suppliers at the same time. For example, the United States has a narrow pool of buyers; it made eighty-two transactions with drones between 2001 and 2023, but thirty-eight (46.3 per cent) of them have been to NATO allies. Israel has made 101 drone transactions, more than any other supplier in the market, and to a wide range of countries, but with the limitation that it cannot sell to many states in the Middle East due to a lack of diplomatic relations with them. Even so, Israel has sold to thirty-nine unique buyers, far more than China (nineteen) or Turkey (thirty). China and Turkey sell to a wide range of clients who cannot or will not get American or Israeli drone technology, specifically focusing on three regions: the Middle East, Africa, and Central Asia. Iran has the smallest number of buyers (seven) and operates like a residual seller, offering drones to countries that Turkey and China are reluctant to do business with.

Table 2. Drone suppliers and buyers, 2001–23.

Seller	Sales recorded	Number of unique buyers
China	39	19
Iran	11	7
Israel	101	39
Turkey	42	30
United States	82	42
	275	

The United States has a comparative advantage in selling radar and manned aircraft to the same countries that it exports to. Within three years, the United States followed 29.26 per cent of its drone sales with sales of radars to the same country and 59.75 per cent of its sales of drones with sales of manned aircraft. Israel was almost able to match the United States with radar sales, following 25.75 per cent of its drone sales with the sale of a radar, but was virtually non-existent in the manned aircraft market. China, Turkey, and Iran were locked out of this market, selling relatively few radars or manned aircraft after drone sales and showing no real ability to capitalise on their drone exports in this way. One explanation for this is that the technological superiority of US manned aircraft means that the demand for manned aircraft and radar from other suppliers like China, Turkey, and Iran is low to non-existent. A second explanation is that the buyers to which China, Turkey, and Iran cater are states (or in Iran's case, non-state actors) with a modest defence budget that are

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unable to buy high-end manned aircraft or radars. Indeed, they may be buying drones precisely because they are lower cost and allow some of the same functionality as manned aircraft but at a lower price point.

China and Turkey are more competitive with the United States in selling both electronic warfare and C-UAS packages by bundling them with drone sales or by heavily discounting their price point. The data suggests that only Iran is unable to capitalise on its drone sales to also offer electronic warfare packages. Turkey is aggressive in exploiting the links between drone sales and electronic warfare packages, completing a sale of EW packages to 83.33 per cent of its drone buyers either concurrently or within three years of the sale. China is less successful in following its drone sales with EW packages, but still does so in 51.28 per cent of all cases. Similarly, Iran has sold EW packages to drone buyers after 36.36 per cent of its sales. Despite the sophistication of their technology and depth of their arms exports industry, the United States (42.68 per cent) and Israel (29.78 per cent) sell EW packages to a comparable level of their buyers as Iran.

A similar pattern is clear with C-UAS systems. Turkey exploited its market position with ruthless efficiency, selling C-UAS systems to 100 per cent of the countries that have purchased its drones. China has followed suit, selling C-UAS systems to 85.2 per cent of all countries that purchased its drones between 2001 and 2023. Both patterns are indicative of Turkey and China operating as hegemonic suppliers, exploiting their market position to consolidate their relationships with buyers by bundling and discounting related technology. By contrast, the United States, Israel, and Iran have done so in half of all sales or less.

These patterns vary when examining data on agreements to jointly operate, train drone pilots, and explore joint ventures for their drone production. Of all exporters, Turkey is the most successful in offering training with its drone packages, concluding training agreements with 23.8 per cent of its buyers either concurrently or within three years. Given the number of sales that they have made, it is notable that the United States and Israel are more reluctant to conclude similar agreements, doing so in 2.4 per cent and 1.9 per cent of all cases respectively. Joint operation agreements – that is, ones in which the buyer and seller agree to cooperate in flying the drones – are comparatively rare but are done mainly by the United States (14.6 per cent of all sales) and Iran (27.3 per cent of all sales). Notably, Israel and China have not concluded any training agreements at all, and Turkey has done so in a select number of sales (7.1 per cent).

Although no exporter refuses to engage in joint production of drones with their buyer, some are more willing than others to do so. On this count, Israel (35.64 per cent), Turkey (38.1 per cent), and Iran (36.36 per cent) are all willing to offer joint production and investment deals, while China has done so in 15.38 per cent of its sales. Of these, the United States has been the most reluctant to jointly invest in drone technology with its buyers, doing so in 2.4 per cent of sales.

T-tests

To test whether these results are statistically significant, we ran a series of two sample t-tests, comparing the means of one supplier's sales with the rest of the sample. The hypothesis tested is whether the difference between that country's supply and the rest of the sample is equal to zero. These are conducted at a 95 per cent confidence interval, with a double asterisk (**) indicating that the P value was less than 0.05 and that the difference in means was statistically significant and not equal to zero at that confidence level.

The results show that certain countries have a statistically significant mean from the sample, indicating that their behaviour in terms of the sale of related military technology and exchange of training, joint operation, or joint production agreements is different from the rest of the suppliers. This difference can operate in different ways, indicating that a supplier is much more willing to do something or much less so. This can be seen in the results for the United States, which is far more willing to offer radars and joint operation agreements. Notably, the United States is

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Table 3. Follow-on sales and agreements.

Radar			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in overall sample*
China	4	10.25	7.41
Iran	0	0	0
Israel	26	25.75	48.15
Turkey	0	0	0
USA	24	29.26	44.44
Total	54		
Manned aircraft			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in overall sample*
China	6	15.38	10.34
Iran	0	0	0
Israel	3	2.97	5.17
Turkey	0	0	0
USA	49	59.75	84.48
Total	58		
EW package			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in sample*
China	20	51.28	16.13
Iran	4	36.36	3.23
Israel	30	29.78	24.19
Turkey	35	83.33	28.23
USA	35	42.68	28.23
Total	124		
C-UAS			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in sample*
China	29	85.2	18.92
Iran	4	36.4	2.70
Israel	36	40.00	24.32
Turkey	42	100	28.38
USA	38	52.1	25.68
Total	148		
Training			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in sample*
China	4	10.25	21.05
Iran	1	9.09	5.26
Israel	2	1.9	10.53
Turkey	10	23.8	52.63

(*Continued*)

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Table 3. (*Continued.*)

Training			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in sample*
USA	2	2.4	10.53
Total	19		
Joint operation			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in sample*
China	0	0	0
Iran	3	27.27	16.67
Israel	0	0	0
Turkey	3	7.1	16.67
USA	12	14.6	66.67
Total	18		
Joint investment			
Supplier	*Frequency*	*Percentage of country drone exports followed by sale*	*Percentage of sales in sample*
China	6	15.38	9.38
Iran	4	36.36	6.25
Israel	36	35.64	56.25
Turkey	16	38.1	25
USA	2	2.43	3.13
Total	64		

Table 4. T-test results, at 95 per cent confidence interval.

	USA	Israel	China	Turkey	Iran
Radar	0.0087**	0.0524	0.1122	0.0005**	0.0949
Manned aircraft	0.0000**	0.0000**	0.03475**	0.0002**	0.0806
EW package	0.6025	0.0001**	0.4034	0.0000**	0.5544
C-UAS	0.1058	0.0000**	0.0150**	0.0000**	0.2375
Training	0.0571	0.0140**	0.3754	0.000**	0.7719
Joint operation	0.0010**	0.0011**	0.0834	0.7850	0.0030
Joint investment	0.0000**	0.0002**	0.2097	0.0134**	0.2961

*, **, *** represent significance at the 0.1, 0.05, and 0.01 levels, respectively.

different from the overall sample in its willingness to offer radar and joint operation agreements than the average exporter, but less likely to offer joint investment. Israel's patterns are clear as well: they supply almost no manned aircraft and are far less likely to offer training or joint operations than the hypothetical average exporter, but more likely than most to offer hardware like EW packages or C-UAS systems. China is less likely to offer manned aircraft than an average supplier, but more willing to offer C-UAS systems. Finally, Turkey is almost completely out of the radar and manned aircraft game, but is particularly aggressive in its sale of EW packages, C-UAS, and joint investment. Only Iran has no t-test value different from the mean, in part due its small sample size.

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Probit models

To test for country effects, we ran probit models with robust standard errors to determine whether specific suppliers are associated with specific types of follow-on sales or agreements. For the probit models, the dependent variable was the presence or absence of a specific follow-on sale or agreement (manned aircraft, radars, electronic warfare, C-UAS, training, joint operation, and joint production) and the key independent variable was a dummy variable for each supplier. For all models, we used two controls related to the buyer that may be correlated with whether these secondary sales or agreements occurred. First, we used data from SIPRI for military expenditures (in millions of US dollars) on the assumption that buyers with large military budgets are particularly likely to make follow-on sales. Second, following Horowitz et al.'s finding that regime type matters in drone sales, we use PolityV coding for whether the buyer is a democracy or not.[52]

The goal of the probit models was to see whether the patterns identified from the data could be confirmed as a statistically significant country effect, while holding constant the regime type of the buyer and the military expenditure of the buyer (on the assumption that countries with large budgets will naturally buy more from the supplier). The results of the probit models with robust standard errors are reported here.

Table 5. Probit models on the probability of a sale or agreement given a country dummy, all with robust standard errors.

Model	1	2	3	4
DV	MANNED AIRCRAFT	MANNED AIRCRAFT	C-UAS	JOINT OPERATIONS
USA	2.165***			1.308***
Israel		−2.031***		
China			0.829**	
Turkey				
Iran				
Military expenditure	0	0	0	0
Polity V recipient	−0.012	0.073	−0.24	0.13
Constant	−1.463***	−0.256***	−0.53***	−2.486
Observations	157	157	157	157
Pseudo R^2	0.406	0.351	0.085	0.203

*, **, *** represent significance at the 0.1, 0.05, and 0.01 levels, respectively.

Of all thirty-five probit models run, eight yielded results that were significant given these controls. The dummy variable for US sales was associated with an increase in the probability of a manned aircraft sale and a joint operation agreement, either concurrently or within three years, with the buyer. The United States was also particularly unlikely to offer a joint investment agreement compared to other sellers. Similarly, the dummy for Iran was associated with an increase in the probability of a joint operation agreement, in part due to the number of agreements it struck with Syria and Hezbollah. Finally, the dummy for Israel was associated with an increase in the probability of a joint venture or investment deal. In some cases, as in Turkey with C-UAS sales, probit models could not be run because the independent variable perfectly predicts the outcome variable. But Turkey was particularly likely to offer training packages, while China was particularly likely to offer follow-on sales of C-UAS systems compared to the rest of the sample. Neither regime type nor military expenditure was significant.

[52]Horowitz et al., 'Who's prone to drone?'.

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Table 6. Probit models on the probability of a sale or agreement given a country dummy, all with robust standard errors.

Model	5	6	7	8
DV	JOINT OPERATIONS	TRAINING	JOINT INVESTMENT	JOINT INVESTMENT
USA			−1.669***	
Israel				0.947***
China				
Turkey		2.239**		
Iran	2.916**			
Military expenditure	0	0	0	0
Polity V recipient	0.174*	0.091	0.009	−0.028
Constant	−3.092***	−2.595***	−0.494	−1.189
Observations	157	157	157	157
Pseudo R^2	0.153	0.146	0.154	0.101

*, **, *** represent significance at the 0.1, 0.05, and 0.01 levels, respectively.

These results suggest that drone exporters conform, albeit imperfectly, with the three types of suppliers offered by SIPRI. Turkey, China, and to a lesser extent Iran operate like hegemonic suppliers, attempting to exploit their drone sales with follow-on agreements over EW packages, C-UAS systems, and training agreements. Given their wide range of buyers in the Middle East, Central Asia, and Africa, these agreements can be seen as an attempt to build or consolidate their military influence in the region. All three hegemonic exporters are using training, joint investment, and follow-on sales of EW and-CUAS to build military influence while hedging against the risk that their clients will endanger their interests. As a residual supplier selling drones to those who cannot buy from other suppliers, Iran also leverages its expertise to offer joint operations to a significant number of its buyers, such as Hezbollah and Syria.

By contrast, Israel operates closer to the industrial exporter model, selling to a range of buyers for commercial reasons but limiting its exposure to risk even more than the hegemonic suppliers. Owing in part to its technological prowess, Israel has aggressively exported EW packages and C-UAS systems and offered extensive joint investment agreements to over a third of its buyers. Israel alone constitutes 56.25 per cent of all joint investment agreements in the sample. This is consistent with an approach that Israel takes to drone development, which involves extensive partnerships with local companies, including by manufacturing drones with Israeli technology under the name of a local company.[53] But Israel has offered little in the way of training or joint operation agreements, concentrating instead on how drones may be used for commercial advantage and forgoing some of the military influence that they could accrue.

The United States is perhaps the most paradoxical seller in the market. It retains a substantial technological lead and has sold the second most drones in the global market during this period; it has also sold more manned aircraft and radars to drone buyers than most other exporters. But it has been far less willing to engage in training programmes, joint operation, and even joint investment programmes than its peers. Its unwillingness to export broadly, and orientation towards only exporting to NATO allies, suggest it is closer to a restrictive exporter despite its power position and technological superiority. This is in part due to the restrictions of the MCTR, but it also is

[53] Uri Sadot, 'A Perspective on Israel', Center for New American Security: Proliferated Drones, available at: {https://drones.cnas.org/reports/a-perspective-on-israel/}, accessed 14 October 2024; Paul Iddon, 'Iranian, Turkish and Israeli Drones Will Be Built in Other Countries', Forbes (24 May 2022), available at: {https://www.forbes.com/sites/pauliddon/2022/05/24/iranian-turkish-and-israeli-drones-will-be-built-in-other-countries/}, accessed 14 October 2024.

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a political choice. Across administrations, US export strategy has been more tailored to limiting the risks to regional stability than to aggressively consolidating its position in the market. The result is that the United States has begun to lose its predominant market position to would-be hegemonic suppliers like China and Turkey, who are battling each other for influence by offering drones alongside other technology and cooperation agreements to consolidate influence with buyers.

Robustness check

As a robustness check for endogeneity, we ran additional models that controlled the effect of a prior relationship between the seller and buyer by coding whether there was a defence cooperation agreement prior to the sale. To do this, we use the Defense Cooperation Agreement dataset (DCAD) developed by Kinne (2020).[54] This dataset is current up to 2010. We use a binary coding for whether there was a defence cooperation agreement in effect between buyer and seller at the year of sale, or in 2010 if the sale was between 2010 and 2023.[55] For the US cases, we also ran the models with a dummy for whether the buyer was a NATO member or not to determine whether the effects seen were due to that alliance relationship. The results, presented in the appendix, do not change our main findings.[56]

Case studies

To trace how hegemonic powers are balancing their desires to build or consolidate influence with buyers and mitigate risk, we do a focused, paired comparison of two hegemonic sellers – China and Turkey – and one major buyer, Pakistan. Both China and Turkey have sought to project their influence in Pakistan and have used drones as leverage to do so. Our purpose is to see how these hegemonic sellers vary in their deployment of the proposed mechanisms (predatory pricing, bundling, and lock-ins) while balancing risk-mitigation. This paired comparison holds constant many contextual factors about the buyer – its security position, regime type, and military expenditure – but varies the hegemonic seller over time to see if the similar mechanisms are present.

China and Pakistan

China has played an increasingly important role in global military exports and dominates the current civilian drone export market.[57] China's drone manufacturing benefits from high levels of government subsidies, capital funding, and closed supply chains.[58] To compete internationally, China targets those who cannot buy drones from the United States or Israel. It offers them lower-priced drones of inferior but often 'good enough' quality, alongside financing and training packages necessary to operate the weaponry.[59] Chinese companies take advantage of government

[54]Brandon J. Kinne, 'The defense cooperation agreement dataset (DCAD)', *Journal of Conflict Resolution*, 64:4 (2020), pp. 729–55, https://doi.org/10.1177/0022002719857796.

[55]We use the variable DCAAnyV2 because it is the most expansive coding of this. See {https://drive.google.com/file/d/1EzZxcD5ICwGEdYxp6h-Lr8f4J0EenHIN/view}, accessed 25 July 2024.

[56]Both variables are mostly not significant. We find that DCAD is positively correlated with the US selling manned aircraft and the NATO variable is positively correlated with the US selling radar. Our findings remain consistent except that the dummy variable for Turkey is no longer significant for training once DCAD is added as a control.

[57]Jin Chen, 'Platform strategies of the Chinese commercial drone manufacturer: A theoretical and empirical study of ecosystem development', *International Relations and Diplomacy*, 11:4 (2023), pp. 145–160, https://doi.org/10.17265/2328-2134/2023.04.001.

[58]Michael S. Chase et al., *Emerging Trends in China's Development of Unmanned Systems* (RAND Corporation, 2015), available at: {https://www.rand.org/pubs/research_reports/RR990.html}, accessed 24 October 2025.

[59]Vivek Mishra and Sayantan Haldar, 'Emerging contours of contemporary Asian maritime connectivity: Economic and strategic objectives', *India Quarterly*, 76:3 (2020), pp. 461–78, https://doi.org/10.1177/0974928420936136.

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subsidies to compete on price for exports, deploying predatory pricing strategies to offer drones broadly similar to US models for 50–75 per cent% less.[60] It also takes steps to lock in buyers into long-standing relationships of military influence. Its drone training programmes involve training foreign pilots domestically within China, sending trainers to host countries, and providing PLA pilots for foreign drone operations.[61] China also offers electronic warfare and C-UAS sales, fostering military influence by offering system interoperability between defence systems, communications, and electronic warfare systems to the buyer. Yet China is also mindful of risk. There are also unproven allegations that China retains the ability to leverage the interoperability of their drones and satellites to govern what buyers can do with Chinese drones.[62] China has cut off suppliers for buyers (like Ukraine) involved in interstate conflict and tightened end-use restrictions on their drones to the point of asserting extra-jurisdictional control on drone activities outside China.[63]

Historically, China has supplied weapons to Pakistan across all branches of its military, including modern fighter jets, tanks, and naval ships.[64] China has cultivated its relationship with Pakistan as a counterweight to India, selling it fifty-three Wing Loong models, fifty CH-3, and ten CH-4A drones between 2011 and 2019. China used predatory pricing to entice Pakistan into the sale, offering 'deep price cuts' on a massive sale of forty-eight Wing Loong drones in 2018.[65] It offered joint production agreements with Pakistani companies to build UACVs[66] and set up special technology zones for joint research. Many of these sales have been complemented with bundled sales of radar, EW packages, and C-UAS systems. On balance, Pakistan has benefited from the infusion of Chinese technology. Its early investment with China allowed it to develop the Burraq drone, which it used for targeted killings. But Pakistan found itself locked in as a customer, having to seek more AR-1 missiles from China to operate with its CH-4 drones despite their high failure rate.[67] Dissatisfied with China's offerings and eager to have more choices for its ecosystem, Pakistan turned to Turkey as an alternative supplier.

Turkey and Pakistan

As an aspiring hegemonic supplier with interests in the Middle East, Turkey sought ways to expand its footprint while also ensuring that it does not pay the adverse costs of risk-taking with its buyers. This positioning has been clear in its exports with Pakistan. Pakistan has long been a client of China and has purchased drones, including armed models, from China since 2011. Turkey has sought to compete with China on drone sales by offering Pakistan its popular Bayraktar TB2 drones in

[60] Jacob Reimann, 'China Is Flooding the Middle East with Cheap Drones', Foreign Policy in Focus, available at: {https://fpif.org/china-is-flooding-the-middle-east-with-cheap-drones/}, accessed 18 February 2019.

[61] 'CHINA/DRC: Wuhan's Drone Academy Serves as International Training Platform for Beijing's Military Drones – 13/07/2023', Intelligence Online (13 July 2023), available at: {https://www.intelligenceonline.com/surveillance–interception/2023/07/13/wuhan-s-drone-academy-serves-as-international-training-platform-for-beijing-s-military-drones,110003316-eve}, accessed 10 July 2024.

[62] Royal United Services Institute, *Armed Drones in the Middle East* (2018), available at: {https://drones.rusi.org/context/}, accessed 25 October 2025.

[63] Jenny (Jia) Sheng and Chunbin Xu, 'China Issues New Export Control Regulations on Civil-Military Dual-Use Items', Pillsbury Law, available at: {https://www.pillsburylaw.com/en/news-and-insights/china-export-control-regulations-civil-military-dual-use-items.html}, accessed 30 January 2025.

[64] Sameer P. Lalwani, 'A Threshold Alliance: The China–Pakistan Military Relationship', *United States Institute of Peace Special Report*, no. 517 (March 2023), p. 1–9.

[65] 'China Sells Drones, Transfers Drone Technology to Pakistan', *Asia Times*, available at: {http://asiatimes.com/2018/10/china-sells-drones-transfers-drone-technology-to-pakistan/}, accessed 9 October 2018.

[66] 'China, Pakistan to Build 48 Strike-Capable Wing Loong II Drones', *South China Morning Post*, available at: {https://www.scmp.com/news/china/military/article/2167857/china-pakistan-sign-deal-build-48-strike-capable-wing-loong-ii}, accessed 10 October 2018.

[67] 'After India–US Pact for 31 Predator Drones, Pakistan Runs to China for UAVs & Weapons', *The Times of India*, available at: {https://timesofindia.indiatimes.com/india/after-india-us-pact-for-31-predator-drones-pakistan-runs-to-china-for-uavs-weapons/articleshow/101280816.cms}, accessed 26 June 2023.

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2021 and newer Akinci armed drones in 2022 at prices that compete with or undercut Chinese models. But Turkey has also pursued a lock-in strategy designed to ensure Pakistan's cooperation over the long run. Within three years of each sale, Turkey offered Pakistan EW packages, C-UAS systems, and training. But it also exploited these sales by building in interoperability requirements that would keep buyers like Pakistan coming back. As the International Crisis Group noted, only Turkish companies make the guided micro-rockets compatible with some Turkish drones, and customers must also turn to Türkiye to maintain optic systems or for the frequent upgrades to the artificial intelligence-supported software that makes weapons more precise. Because training takes time, it is easier for importers to keep buying new models, with similar operating systems, from the same provider. Such exports can give suppliers a certain amount of leverage over their clients.[68]

Turkey has also attempted to cement its position as Pakistan's indispensable drone ally by offering to deny India access to the same drones. Haluk Bayraktar, CEO of Baykar Technology, said that the company would deny India access to its drones to avoid war profiteering (i.e., selling to both sides in a conflict) and as part of a policy of only selling to 'brotherly' nations.[69] It has also offered a series of cooperative joint ventures to develop a long endurance drone.[70] For example, Turkey is now providing direct material assistance for the National Aerospace and Science and Technology Park near Rawalpindi to build warheads for UCAVs purchased from Turkey.[71]

But while Turkey seeks leverage with Pakistan, its interests are not identical. Pakistan's long rivalry with India presents a challenge for Turkey, especially if Pakistan uses Turkish drones to strike Indian forces in Kashmir.[72] Accordingly, Turkey has imposed a series of checks to ensure that the drones are not used in ways inconsistent with its interests. In a July 2024 interview, Mustafa Murat Şeker, deputy chairman of the Presidency of the Defense Industry (SSB), revealed the safeguards that Turkey has built into its drone exports.[73] Aside from routine checks on the appropriateness of the sale and transfer of sensitive technology at the Ministry of Defense and Ministry of Foreign Affairs, Turkey imposes end-use agreements designed to regulate their use. The drones themselves are equipped with GPS trackers to monitor their location to ensure that the drones are not sold to unauthorised third parties or moved from their approved locations. He also noted that sensitive products are equipped with additional software that allows for further tracking and control. İsmail Demir, head of the Presidency of the Defense Industry, also revealed that Turkey has implanted a 'kill switch' on exported Turkish drones to ensure that they will never be used against Turkey or elsewhere in conflicts that are contrary to Turkey's interests.[74]

[68]International Crisis Group, *Türkiye's Growing Drone Exports | Crisis Group* (2023), available at: {https://www.crisisgroup.org/europe-central-asia/western-europemediterranean/turkiye/turkiyes-growing-drone-exports}, accessed 24 August 2021.

[69]Ashish Dangwal, 'No Bayraktar Drones for India; Turkish CEO Says Will Sell TB2 UAVs Only to Brotherly Nations Like Pakistan, Ukraine', Eurasian Times, available at: {https://www.eurasiantimes.com/no-bayraktar-drones-for-india-turkish-ceo-says-will-sell-tb2-drones/}, accessed 7 September 2022,

[70]The Week (India), "Turkey expands cooperation with Pakistan on long-endurance drone," 22 August 2021, available at: {https://www.theweek.in/news/world/2021/08/22/turkey-expands-cooperation-with-pakistan-on-long-endurance-drone.html}, accessed 30 January 2026.

[71]'Pakistan, Turkey Collaborate on Armed Drone Production Amid Rising Demand', Times Now, available at: {https://www.timesnownews.com/world/asia/pakistan-turkey-collaborate-on-armed-drone-production-amid-rising-demand-article-110601890}, accessed 31 May 2024

[72]Air Marshal Anil Chopra, 'Pakistan "Plotting" UAV Attacks on Indian Military in J&K; How Can India Repel Next-Gen Terror Attacks? OPED', Eurasian Times, available at: {https://www.eurasiantimes.com/pakistan-plotting-uav-attacks-on-indian/}, accessed 11 July 2024.

[73]'Turkey Installs GPS Tracking and Spyware on Strategic Arms Exports', Nordic Monitor, available at: {https://nordicmonitor.com/2024/07/turkey-implements-gps-tracking-and-spyware-on-exported-arms/}, accessed 12 July 2024.

[74]'Turkey May Have Planted Kill Switches in Exported Bayraktar Armed Drones', Nordic Monitor, available at: {https://nordicmonitor.com/2022/01/turkey-may-have-planted-a-kill-switch-in-exported-bayraktar-armed-drones/}, accessed 3 January 2022.

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Conclusion

This paper examines the strategies of states that export military drones and finds that, in broad terms, they conform to the SIPRI classifications of different types of sellers (hegemonic, industrial, and restrictive). While sales may be pursued and made for different reasons (security gains, economic advantage, and prestige), each seller operates with a different overarching strategy. The global export market is increasingly driven by three suppliers who are operating with hegemonic ambitions: China, Turkey, and to a lesser extent Iran. Each of these countries has offered a variety of follow-on sales and cooperation agreements to consolidate their military influence with their buyers. By contrast, other suppliers have operated with different goals and strategies. Israel, for example, has operated as an industrial supplier, selling for profit and access to the commercial market, while the United States has been restrictive, stability-oriented, and unwilling to expand its sales beyond its allies.

Looking more closely at the transactions of hegemonic sellers like China and Turkey, we find that they are making a concerted effort to develop leverage with their buyers. But this hinges on more than just drones. Hegemonic sellers have bundled drone sales with agreements for electronic warfare packages, counter-drone systems, joint production ventures, and training programmes. They have also 'locked in' buyers through maintenance and support agreements and through the provision of technologies like electronic warfare that are integrated with the drones themselves. The underlying idea is to draw the buyers into their ecosystem, solidifying them as customers and reducing their freedom to turn to other suppliers. These follow-up arrangements, particularly prominent in regions like the Middle East, Central Asia, and Africa, are designed to expand their reach in these regions. Yet a fine-grained examination of their exports strategies suggests that even hegemonic sellers like China and Turkey are risk focused and consider ways to rein in their buyers with end-use agreements, kill switches, and GPS trackers. This suggests limits to drone diplomacy: hegemonic sellers may want to leverage drone sales for additional sales and agreements but their offers will be conditioned, explicitly and implicitly, on steps not to draw them into conflicts with other potential buyers.

The future for global drone exports will be determined in part by the market position and strategies of the leading suppliers. At present, there are only five major global suppliers. In the near term, the two hegemonic suppliers with the greatest industrial base – China and Turkey – are likely to make gains. China's emergence as a significant arms and drone exporter aligns with its geopolitical ambitions. China often fills gaps in the arms market by selling to countries facing restrictions from Western suppliers, offering cheap prices, flexible financing, training packages, and an array of related technology. As seen by its efforts to cultivate Russia, China is hoping to expand its reach by using technology transfers to position itself as holistic supplier to states not aligned with the United States. Turkey's emergence as a drone power is also indicative of its hegemonic ambitions in the Middle East. But Turkey also remains a NATO power and eager to remain on good terms with the United States. This means that it will expand its leverage through follow-on sales and training agreements but also prioritise risk-mitigation techniques (like GPS trackers and kill switches) in its drone export technology to prevent blowback from misuse by drone buyers. Due to industrial limits (Iran) or conscious choices to select a different strategy (Israel and the United States), it is less likely that other suppliers will reap the same leverage from drone sales in the near term.

The future of drone diplomacy will change if the export market diversifies. One possible change is the orientation of the United States under the Trump administration. If the United States reduces its export regulations to compete with China, it would expand its market footprint among states that can afford US technology but are banned from otherwise achieving it. But unless the United States engages in a deliberate strategy of predatory pricing, essentially selling its drones at a loss, it is unlikely to compete with China and Russia to sell drones to the more cash-strapped buyers on the market. Another change that may revolutionise the market is the arrival of new suppliers. The war in Ukraine has led both Ukraine and Russia to rapidly develop and produce thousands of new,

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cheap drones. At present, both are focused on fighting each other, but a ceasefire may lead either to pursue exports on the global market.[75] The widespread availability of cheap, effective drones that were battle-tested in the war in Ukraine may lead to a greater role for Ukraine and Russia and a corresponding diminishment of influence for the hegemonic sellers of today's market.

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[75]'Ukraine May Allow Drone Exports in Bid to Support Domestic Producers', Atlantic Council, available at: {https://www.atlanticcouncil.org/blogs/ukrainealert/ukraine-may-allow-drone-exports-in-bid-to-support-domestic-producers/}, accessed 3 February 2025.

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