Do transfers of coercive capabilities between states, especially military aircraft, conform to broader theoretical explanations of international relations, or are these transfers somehow unique? The study of war is central to many of our theories about both the causes and consequences of world politics, but the willing transfer of capabilities to wage war has been steadily understudied by IR research. The acquisition of arms by states to increase their military power is taken for granted in major theories of IR. Yet, the theoretical mechanisms for states to acquire military equipment from outside states have not adequately been studied by security scholars. Internal and external balancing are long-recognized mechanisms for states to protect themselves against threats from other states. However, most states lack the capacity to manufacture advanced weapons systems on their own. This works against the theoretical construct that the international system is "self-help" in any meaningful sense, since the bulk of states need to seek alliances or arms from abroad in order to maintain their security.

Recent scholarship has begun to address this problem. Vucetic and Tago (2015) examined how the transfer of fighter aircraft fit into different theories of IR. They tested fighter aircraft purchases using conceptions of power and hierarchy by Lake (2009), and found that purchasing is closely related to measures of military and economic dependence on the United States. Spindel (2018, 3) argued that arms transfers matter because they serve as a credible signal about relationships between states – even when those transfers do not meaningfully affect the balance of power. Caverley and Kapstein (2012) argued the strategic wisdom for the US to cater more to the export market in order to expand and cement influence with different states.

This scholarship represents an important step in toward linking arms sales to other international relations problems. We seek to contribute to the understanding of arms in international relations by testing hypotheses generated by major theories of IR using aircraft transfers. We focus on aircraft since they are primarily used for interstate conflict and give the possessor power projection capabilities. Aircraft have long lifespans of up to 30 years with proper support and maintenance (Johnson 2019), so there is opportunity for importers to export their older models when they upgrade their fleet.

Our tests allow us to either begin to integrate this research with mainstream arguments of IR – a difficult prospect in the past – or to begin eliminating potential explanations as we seek to find more general theories of arms transfers. We further limit these sales to states that are not the United States and the USSR/Russia. Examining such mid-tier states comes with some trade-offs. The primary cost from our sample choice is that the US and Russia account for the majority of global arms trade historically. However, mid-tier producers comprise a sizable portion of the trade. These suppliers are understudied compared to the superpowers, despite comprising a sizeable portion of the market. They have complicated motivations and constraints in the arms trade that deserve their own study.

We focus on two gaps in the literature as identified in some of the most recent comprehensive work on arms transfers. The first is the general lack of theorizing about arms transfers and their effect on international relations (Spindel 2018, 15; see also Erickson 2015, 31). The second is that specialized arms research often uses large-n research design to test hypotheses, something that the literature on arms transfers that deals with broader IR theories has consistently failed to do well (Spindel 2018, 31). We fill in these two gaps by clearly identifying the expectations of

each major IR paradigm separately and by conducting quantitative tests that parse out how well the theoretical expectations perform empirically. Quantitative methods are necessary since we examine the 24 mid-tier state aircraft producers.

We first address the literature on arms transfers and identify areas where our understanding of arms transfers could be informed by theories of IR. Next, we theorize about how arms-exporting states may take security, economics, and identity into consideration when exporting offensive weapons. We test the hypotheses generated from this theory using OLS and logistic regression models with variables to account for the different theoretical explanations. We find that trade, rather than democracy, is the best "liberal" predictor of arms transfers. We observe some minor support for realist expectations in aircraft transfers – states take into account region and power differentials before transferring aircraft. We also find mixed support for our constructivist hypotheses for arms transfers.

What We Know About Arms Sales

Arms scholars have thought about the capabilities of arms producers in terms of states' ability to use transfers to affect change in recipient states (Kinsella 1998; Catrina 1998; SIPRI 1975). Recently, security scholars have used case studies of arms transfers to describe different relationships between major power states and their clients or protégés. Yarhi-Milo and colleagues (2016) frame their discussion of arms transfers by the US to Israel and Taiwan under the logic of the "Patron's Dilemma" outlined by Snyder (1997). This dilemma is unique to a particular type of powerful state in the international system and is not generalizable to most state relations.

While important, work that focuses only on the exceptionally powerful states in the system, has limited explanatory power for a large portion of arms transfers. Such work also largely ignores the growing corpus of work that has systematically examined both the economic and security factors considered by exporting and importing states (e.g. Brauer 2003; Krause 2004; Hartley and Martin 2003; Levine et al. 2003). The literature on arms exports has its own theoretical shortcomings: a focus on state-level economic factors in exporting states to explain arms transfers. Work which ignores the international context and the realities of power and coercion of both the arms transferred and the actors involved in those transfers can provide only partial explanations of arms transfers (Akerman and Seim 2014; Comola 2012; Qingmin 2006).

Arms sales are treated as an economic problem by many studies in the empirical arms literature (e.g., Akerman and Seim 2014; Comola 2012). These studies, grounded in the economics and IPE literature focus on the domestic factors that incentivize states to export arms. However, the strict regulation of arms sales by most exporting states, and the involvement of the state in their sale even in states that are non-restrictive and non-discriminating, like Russia, means that arms are treated differently than other economic goods (Willardson 2013). Additionally, realist theories that discuss state security typically attribute state power to internal factors or to alliances. Arms are not included in the elements of power in the most well-known measure of state power (Singer et al. 1972) even though military composition is a key element of immediate threat to states (Gray 1993).

An early study of arms transfers classified supplier states into three types in relation to their exports to Third World countries that were incapable of supporting weapons development and

production on their own. The three types of suppliers were hegemonic, using arms to influence the behavior of recipient states; industrial, using arms to maintain domestic production in the exporting state; and restrictive, supplying weapons, but careful not to become involved in local or international conflict (SIPRI 1975, 21-26).

A slightly different classification looked at arms production capabilities from an economic and technical perspective. This was necessary as major weapon systems – aircraft, air defense systems, armored vehicles, artillery, missiles, naval weapons, and ships based on classifications by the Stockholm International Peace Research Institute (SIPRI) – require varying levels of technical sophistication that impact R&D costs and support/maintenance costs. These variations occur across and within categories (e.g. aircraft versus armored vehicles and trainer versus fighter aircraft) (Johnson 2017). A linked issue is the interaction between R&D costs and lifetime of advanced weapon systems – producers are continually creating newer models of major weapon systems despite some systems, such as fighter aircraft, having a lifespan of up to 30 years when properly maintained (Johnson 2019).

Under these conditions, only a few states were able to produce advanced weapons and sustain domestic production without aggressive export policies; some states could produce sophisticated weapons, but only if they also aggressively exported weapons to support domestic industry; and some states were simply incapable of producing sophisticated weapons (Krause 1992; Smith, Humm, and Fontanel 1985). Arms transfer scholars using these classifications have concluded that states export weapons for power, influence, and/or economic reasons (Akerman and Seim 2014; Blanton 2005; Comola 2012; Erickson 2015; Keller and Nolan 1997; Platte and Leuffen 2016; Stohl and Grillot 2009).

Only the USSR and the US fell into the top category because those states were capable of producing advanced weapons systems across the entire military spectrum. They had the economic and military capacity to absorb the costs associated with large amounts of military spending – especially R&D. More recently, Willardson (2013) showed that neither the US nor Russia are fully capable of ignoring the need for exports to maintain domestic production. For the US (and Russia to a lesser degree), economics isn't the driving factor behind *all* arms sales decisions, but simply one of many domestic and foreign policy pressures.

It is the middle-tier exporter states that find themselves in an interesting position. Production capability hinges on a few distinct competencies and two stand out. First is the technical capability of producing extremely sophisticated military equipment. Second is the economic ability to turn technical ability into production capability without damaging the overall economy. The second dominates the foreign policy of arms sales – the imperative to increase the market for weapons systems in order to offset the expense of R&D and production (Krause 1992, 141). States need to disseminate coercive technology in order to keep the capability of producing it for themselves (Kapstein 1992; Kinsella 2002; Pearson 1994; Sanjian 1991). This pressure can potentially reduce the role of strategy and politics in arms-export decisions (Smith, Humm and Fontanel 1985).

Paradoxically, most economic benefit arguments for producing and exporting weapons are specious. Arguments about the strategic importance of arms sales may hold true, but economic

arguments have fallen short. The balance of payments has been a primary justification for exports (Eikenberry 1995; Keller and Nolan 1997; Krause 1992). When the United Kingdom began actively increasing exports in 1965, balance of payments was the primary consideration (Ministry of Defence 1965). Later research showed a one-third reduction in British exports would only decrease the balance of payments deficit by 0.5% (Hartley 2000). The Ministers of the RAF and Royal Navy also noted that commitments to arms exports would have the "effect on British industry of tying up capital and skilled labour in armaments" (Ministry of Defence 1965: 201).

The arms literature covers the supply side (Blanton 1999, 2005; Erickson 2011, 2015; De Soysa and Midford 2012), demand side (Kinsella 2002), and the effect of transfers (Johnson and Willardson 2018; Kinsella 1994; Kinsella and Tilemma 1995; Mintz and Heo 2014), there are few attempts to apply IR theory to large-n empirical studies of arms transfers with the exception of some very recent studies (Vucetic and Tago 2015). This lack of a theoretical link between international relations and quantitative studies of arms is surprising given the growing trend of quantitative studies in the discipline. One explanation is an over-focus on the superpowers when applications of IR theory are made; with two states, qualitative case studies and historical research can make a valuable contribution. But, with around two dozen mid-tier suppliers, quantitative tests are necessary.

Arms transfers are by definition an exchange of power, and power is *the* driving force in large swaths of IR theory. Structural (Waltz 1979) and power transition (Kadera 2001; Organski and Kugler 1989) explanations of international relations focus on explanations of long-term state power. These theories describe the behavior of the most powerful states that shape the international system. Gilpin (1988, 612) noted that states consciously decide to go to war, while seeking to avoid system-altering war. This difference suggests that for most states the primary security concern is about the short-term capabilities of other states.

Arms sales epitomize immediate capability shifts as finished weapon systems are transferred.[1] One manifestation of arms transfers is arms races between states (Buzan and Herring 1998). They represent immediate capability balancing. States that find themselves in competition monitor and match their own arms imports in order to not be caught off balance, leading to a continuing cycle of uncertainty about the balance of immediate capabilities. A fundamental difficulty in tying arms sales to balancing behavior is that most balancing literature focuses on long-term capabilities.

Airpower

Air power has been a key component of national military power since its effectiveness and use was demonstrated decisively in World War II. The extent to which airpower can stand alone in terms of military strategy is debated by military and security experts. Air power holds an important place in studies of international security (Pape 1990, 1996), military history (Black 2016), and in the public mind. The debate about military air power is not primarily about the extent of its uses.

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[1] We acknowledge that many weapon systems require extensive training, but training can begin before delivery.

The importance of air power in the public mind (see Vick 2015), and more importantly, in civilian and military leaders' minds (Byman and Waxman 2000), leads to an important puzzle regarding international arms transfers. Why would states transfer a weapon that can be used coercively against it? Why put powerful weapons in the hands of friends, if those friends could one day be enemies? Why put them in the hands of those states that are not currently friends or allies? This puzzle is one that has not been adequately addressed in the literature on the arms market. The puzzle deepens when weapons are undeniably offensive.

Aircraft are offensive weapons (Garthoff 1980). Aircraft provide power projection capabilities greater than land weapon systems. There are limitations in power projection beyond the short-term without backup from land and sea forces. Troops placed by aircraft can be supported by aircraft. As aircraft are offensive in nature, they provide a good test of realist assumptions about balancing against both power and threat. Neorealist theory would assume that states should not allow the exchange of powerful weapons at all. A more nuanced reading, based on the ideas of either hegemony, or theories of offense/defense, may allow for the exchange of major weapons systems when they are clearly defensive in nature. Deterrence theory supports the idea that great power states transfer weapons to strengthen ties between the defender and its protégé (Huth and Russett 1984, 523).

Aircraft transfers may also grant the more powerful state leverage (Sislin 1994) and economic advantages. Aircraft transfers can make alliance partners more capable, and therefore increase the strength of the alliance. Such arguments may account for why aircraft transfers from mid-tier states may be expected. They do not account for the biggest issue, however, which is the change in short-term balance of capabilities even if these capabilities are naturally decaying over time.

A hegemonic power or exporter may not worry about transfers of offensive weapons that do not significantly challenge its military dominance, and which may help allies. Hegemonic extended deterrence is a possible explanation for arms transfers to its allies. Security hierarchies are another explanation for the transfer of offensive arms (see Lake 2009; Vucetic and Tago 2015). Mid-tier states[2] are capable of producing advanced weapons, but are not capable of supporting the development and production of those weapons solely for the domestic market. Such states are usually not in a position to be the defender as defined in the extended deterrence literature. Some of the mid-tier state arms producers (France, UK, Germany, China) are great powers that should behave in ways consistent with realist theories.

Theoretical Explanations of Arms Transfers

Arms races are the most common exploration of arms transfers in mainstream IR research. The security dilemma can lead to a long-term cycle of defense spending and acquisition for the states involved. The acquisition of new weapons systems through production or purchase, leads to a stronger sense of insecurity in rivals, triggering additional arms production or purchases. Arms races have been explored in relationship to conflict (Diehl and Crescenzi 1998; Wallace 1979, Sample 2018), deterrence (Gibler et al 2005), costs (Kydd 2000), and interstate relations and

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[2] As described by SIPRI (1975).

foreign policy (Klare 1993). Some scholars have questioned the usefulness of the concept of arms races (Gray 1996).

Arms races serve as a bridge between the realist concepts of power and security in international relations and arms, which are tools used to provide that security. Gray (1993) noted that weapons do not make war; states and their leaders do. They do so based on their strategy, interests, and assessment of the intentions and capabilities of other states. Even if weapons themselves are not the proximal cause of war, it is difficult to imagine civilian and military leaders ignoring the arsenal of their potential adversaries.

Previous work has outlined an economic logic for arms transfers. By examining the logic of realism, liberalism, and constructivism and testing whether that logic applies in the face of strong evidence from previous studies that economics is the primary driver, we have a strong test for determining which theory/argument drives arms transfers. Realism allows us to examine power and security motives, while liberalism's identification of factors leading to pacific relationships may also lead to the provision of arms. Constructivism allows for examination of the role that ideas, images, and prestige may play in import decision making.

Realist Explanations

A key logic of realism is that states exist in an anarchical environment in which they must make decisions and survive (Bull 1979; Waltz 1979; Wendt 1999). This environment incentivizes states to focus first on their own survival. The power of the state is measured against other states, because other states pose the primary external threat to survival. Power in structural realism is measured in the long-term capabilities of states to generate war-making materials and populations. The short-term balance of power between states, however, must take into account the present military power of both states (Diehl and Crescenzi 1998, 113). Military power comes both from arms and alliances (Chatterjee 1975; Colaresi and Thompson 2005; Morrow 1993; Yarhi-Milo et al 2016); however, traditional capability measures do not examine alliances. The effectiveness of alliances is also conditioned on the text of the treaty (Leeds et al. 2002) and so it is important to take treaty language seriously when using treaties to measure potential balancing behavior via defense pacts.

States are sovereign only if they can reasonably dictate what happens within their own borders and protect themselves from violent incursions and the dictates of other states (Rotberg 2004). Sovereignty, security, and power are interwoven and are often vague and slippery terms (Biersteker 2002) when discussing the actual actions and interactions of states. We treat states as sovereign actors who seek security through the accumulation of power through internal and external balancing (Morrow 1993).

The purchase of arms is helps a state internally balance by increasing the capability of the state rather than externally balancing by committing to, or shifting alliance ties to other states (Lieber and Alexander 2005, 119). Acquisition of weapons is a signal to potential partners that the state is a capable ally. The capability of allies has been used as a measure of alliance reliability (Holmes 1988, 173). States increasing military capabilities signal both their own capabilities, and their potential to be a capable ally to other states in the international system. Spindel (2018)

argues that arms transfers are a signal about a state's status, and so alliances can be strengthened and their status more deeply understood through an examination of arms transfers.

Balancing against other states' power through alliances is the primary mechanism in the neorealist conception of international relations. Other realists disagree about the mechanics of Waltz's (1979) balancing and order, but agree with the basic tenets of realism. Schweller (1997, 928) characterizes realism as a theory, or philosophy, that international relations are governed by group competition under conditions of scarcity. In his conception, competition is not about the importance of absolute advantages, but about the relative advantage that states hold in discrete contests of power.[3] The military balance (Holmes 1988, Glaser and Kaufmann 1998) is a measure of the present ability of those states to compete in a discrete contest for power.

The provision of arms from one state to another represents an immediate enhancement of the recipient state's coercive capacity. We do not expect that any state would provide another state with such coercive capabilities, preferring instead to balance with alliances. This naïve assumption deals with the issue of internal balancing by building weapons and externally by forming alliances.

Alliances are useful because they can be changed when the underlying or immediate power capabilities of states change. Coercive capabilities cannot be changed quickly unless they are destroyed. War is the primary method of destroying other states' capabilities. Logically, the transfer of weapons should be avoided by status quo states because such a provision could lead to the need for future conflict if the intentions of recipient states change. We have two caveats to this explanation. First is recipient dependency on exporters (Johnson, 2019). Combat aircraft require continued support from the exporter to remain air-worthy giving the exporter some leverage after transfer. However, recipients may be willing to shoulder the costs involved with finding a new supplier (Rounds 2019). The second caveat is that arms become relatively less capable over time, so any single arms transfer can be considered threatening only temporarily.

There is some evidence that states may prefer a strategy arming allies. The US "Nixon Doctrine" explicitly pledged to provide economic and military aid to states while insisting those states provide their own manpower to defend themselves (see Thies 2013, 280).[4] This is also the logic of the patron-client dilemma (Yarhi-Milo et al 2016). Such logic may not apply to exporting states without overwhelming advantages in power over their import partners. The logic is much clearer for the two Cold War superpowers. We do allow for the potential that alliances may increase the probability of arms transfers. Even so, we expect that such transfers would favor defensive over offensive weapons. Since alliances are a key component in both realism and liberalism, we condition our hypotheses by stating that *any effect should be increased with the presence of a defense pact.*

The patron-client relationship is one where balancing via arms transfers is seen as better for the exporting state. In this case there is a clear power imbalance between supplier and recipient. In both examples by Yarhi-Milo et al. (2016), the recipients were also located far away from the

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[3] Other realists focus on the threat posed by the adversary (see Van Evera 1998). Since aircraft are offensive states will likely be more circumspect in providing these arms in general.
[4] We thank a reviewer for pointing out this additional logic of arms transfers.

supplying state. Our naïve assumption that states will not transfer weapons is tempered by the logic of perceived threat. The greater the power imbalance and the greater the distance, the less the perceived threat, and the greater likelihood that arms will be transferred.

The most-used measure of state capabilities focuses on the long-term power potential of the state via an index created from six key factors (Singer and Small 1966). The balance of power is inherently important for military decision making (Rosenberg 1990, 290) and the Composite Index of National Capabilities (CINC) measure (Singer and Small 1966) includes factors representing the long-term military balance in contrast to the immediate military balance. Over the short term, the military capability of potential adversaries – states with whom the exporter does not have pacific relationships with – is more important for decision-making. The present shift in actual military balance is the more salient measure for understanding the actions of states than is the potential for accumulating such capabilities (Lobell 2018). Balance of power considerations damage the logic of selling arms to potential adversaries.

H1: Mid-tier states will be more likely to supply aircraft only to states that have lower material capabilities.

This hypothesis relies on the logic that states may operate under rational time horizons (Toft 2006). If a recipient state is significantly less capable than the supplying state – and this is a condition that should be somewhat static – a supplier state might take the calculated risk of providing that state with arms. While such action potentially weakens strong realist assumptions, it is a reasonable exception for states to carve out – especially for states located in a relatively peaceful international environment facing strong domestic incentives to export arms.

H2: Mid-tier states will be more likely to supply aircraft to states with similar or higher overall capabilities if those states are outside of the supplier state's geographic region.

This assumes that states act rationally in terms of balancing threats. Most threats come from states that are nearby. This is true of great power states as well as mid-tier arms producers. The logic of this hypothesis comes from in an opportunity/willingness (Most and Starr 1989) framework, or in work on the geographic determinants of conflict (Vasquez 1995).

We expect that Hypothesis 1 may be conditioned by geographical proximity. States will be more likely to transfer out of region and to transfer to states that are less powerful. We also believe that states will be less likely to transfer weapons to more powerful states outside their region if those weapons could potentially be used against them. More powerful states have greater power projection capabilities that may negate the effects of proximity that we account for with the region measure. To examine Hypothesis 2, we use an interaction term of capabilities and geographic region.

Liberal Explanations

Liberalism shares the same underlying assumptions of an anarchic international system and state as the primary actor in international relations as realism. Liberal arguments, however, have a comparatively larger number of quantitative tests providing support for its assertions.

Democracies rarely go to war against each other due to structural and normative features of these regimes. Maoz and Russett (1993) found stronger support that normative factors work because democratic states look like each other and trust the openness and intentions of other similar states. Structural features of democracies prevent escalation through democratic states' domestic veto players and public discussion. Regardless of which set of arguments is more valid, both explanations are directly applicable to arms transfers.

Democratic peace arguments revolve around trust and openness. States with similar norms and values where information is available are less likely to escalate disagreements to levels where military force results in the loss of life. This applies to arms transfers directly: if democracies do not engage in high-level militarized conflict with one another, then they can be trusted with weapons providing coercive capability. Providing coercive capabilities creates opportunities to an importer that were not present before, which is different than just not fighting. Structural arguments suggest that transferring arms to other democracies is comparatively safe since both states have the relevant understanding of the other's capability and resolve leaving greater room for negotiation and non-violent outcomes.

H3: Mid-tier states will be more likely to supply aircraft to states if they share a democratic regime type.

The other primary relationship in the liberal peace argument is trade. Hirschman (1980, 17) provides a clear rationale for democracies to supply one another with coercive capabilities: states may trade weapons with each other in order to protect valuable shared trade and economic linkages.

Liberal peace arguments apply where higher trade creates more losses if conflict occurs; thus, trade partners can be trusted more with weapons. Additionally, states that have increased trade will be likely to trade across the full range of products, including arms. However, trade and economic incentives are the most used explanation in the arms literature. Arms transfers typically occur with trade offsets (Brauer and Dunne 2004).

H4: Mid-tier states will be more likely to supply aircraft to states as overall trade increases.

The final relationship from the liberal peace arguments is joint intergovernmental organization (IGO) membership. States that share a greater number of IGO memberships have greater over-lapping interests and contact, which results in lower levels of international conflict with each other.

H5: Mid-tier states will be more likely to supply aircraft to states as joint IGO overlap increases.

Constructivist Explanations

Constructivist theory somewhat overlaps with liberal theory, but with different underlying assumptions. Constructivism assumes that states are the main unit of analysis, the system is intersubjective (as opposed to materialist in rationalist theories), and state identity and interests are in part determined by the structure of the system (Zehfuss 2002). Boiled down,

constructivism asserts that ideas, culture, and identity matter (Jepperson, Wendt, and Katzenstein 1996); however, differentiating between liberalism and constructivism empirically with quantitative tests is difficult (e.g. Maoz 2006).

Vucetic and Tago (2015, 102) tie arms sales to constructivist thought by noting that "… arms are manifestations of socialization, recognition, identity relations, and status-seeking." Vucetic and Tago (2015) focus on hierarchy in international relations as their independent variable. Their variable is derived from Lake's work, and focuses on security and economic reliance on the US to establish hierarchy.

To unpack constructivism and arms imports we link how importer culture, identity, and ideas are impacted by the possession of arms and their relationships with other states. Colonial relationships are linked with constructivism. Many mid-tier major weapon exporters were colonial powers and had a cultural influence in their possessions. The successor society was socialized by the former possessor and they share similar values. One way this is done is by preserving military links between the two states, which can be formalized with arms transfers. For example, comparison of order and delivery dates in SIPRI's arms trade register with state formation dates from the Polity IV Project show that many newly independent states ordered major weapon systems from their former colonial power in the year(s) *before* independence occurred. Another way is to provide officer training to former colonies. For example, the UK's arms relationship with Jordan was directly linked to providing officer training and the UK saw a threat in Jordanian officers beginning to be trained in the US (Foreign & Commonwealth Office 1967: 57). Thus, a shared military culture is linked by colonial relationships in multiple ways.

H6: Mid-tier states will be more likely to supply aircraft to states if they are a former colonial possession.

How does a former colonial relationship relate to arms beyond a shared military culture linked with security concerns? First, we consider how identity – specifically national identity – link with arms imports. The importance of national identity explains why states import weapons they do not need for security (Wezeman 2010). Suchman and Eyre (1992) compare the symbolic linkage of weapon possession with a flag – they both are a symbol of national sovereignty. Thus, a so-called "modern" military gives a state an identity by providing an image of power regardless of any actual security threat. Morgenthau (1962) noted that fighter-jet imports by lesser developed states provide no real military benefit. Instead, import can provide prestige a belief echoed by a wide body of research (Kaldor 1981; Kinsella and Chima 2001; Suchman and Eyre 1992; Wendt and Barnett 1993). Spindel (2018, 3) argues that arms sales are credible signals of political relationships.

Which states need greater prestige in terms of aircraft imports? Prestige is given by others (Galtung 1964) and has recently been linked with alliance centrality (e.g. Maoz 2011; Renshon 2016). States with lower alliance centrality have less prestige and, in turn, wish to become more important internationally. Aircraft imports could be a signal that a state wishes to increases its status and that states with lower capability alliance networks have a greater motivation to do so. As aircraft are of less military use to these states, there is little reason to deny the transfer.

H7: Mid-tier states will be more likely to supply aircraft to states with lower capability alliance networks.

Data and Tests

Our data cover 1990-2010. We focus on the post-Cold War period since the arms market completed its shift from a seller's market into a buyer's market. Additionally, the previous bipolar nature of the system theoretically limited transfer options for states, but in the post-Cold War environment the limit in customer base was largely removed. The unit of analysis is the supplier-importer dyad.

All producing states of planes and helicopters are included in the sample except the superpowers – the US and Russia.[5] Much of the literature that bridges the arms-IR gap deals with the US and USSR. We have reason to believe that the motivations and logic for arms exports are different for these states. We also use this fact to leverage our other explanations. If the mid-tier states are exporting primarily for economic purposes, we would expect the logics of liberalism and trade to be dominant in their patterns of arms sales.

The dependent variables are coded using data from the SIPRI arms trade register and Jane's Defence publications via Johnson (2017) and SIPRI trend-indicator valued (TIV) data broken down by model of aircraft transferred. The Johnson data has arms exports broken down by weapon's type, age, condition (new/used), version, etc. and SIPRI's TIV by model allows for application of Johnson's categories using TIV. The TIV is a measure of the military value of a transfer, not the amount paid for the transfer. We leverage this data by examining the transfer of different types of aircraft and their capabilities to test the hypotheses.

There are two dependent variables, one binary and one continuous, for the transfer of planes and the transfer of helicopters. A value of '1' is given if a transfer occurred and the logged value of the TIV is the continuous measure.

The independent variables come from a variety of sources. For Hypotheses 1 and 2, we use data from the Correlates of War (COW) National Material Capabilities (NMC) data version 5.0 (Singer, Bremer, Stuckey 1972; Singer 1987). NMC is an index created from total population, urban population, iron and steel production, energy consumption, military personnel, and military expenditures. *Capability Ratio* is calculated by taking the log of exporter capability divided by importer capability; thus, positive values indicate the exporter is stronger than the importer and negative values indicate the importer is stronger than the exporter. While the composites of the index may seem better suited on their own, the data set authors caution against using the data in this manner.

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[5] SIPRI identifies the following states as producers; however, this list does not include states who produced but did not export. With aircraft, we are unaware of any state that produced aircraft yet did not ever export; while some states may not export all models produced, they do export some type(s) of aircraft. Argentina, Australia, Brazil, Canada, Chile, China, Czech Republic, Czechoslovakia, France, Germany, India, Israel, Italy, Japan, Netherlands, Poland, Russia, South Africa, South Korea, Spain, Sweden, Switzerland, United Kingdom, Ukraine. This list does not include states that produced under licensing assembly agreements.

The location of the importer is the other part of the conditional Hypothesis 2. We create a dummy variable indicating if the exporter and importer are in *Different Regions* based on the Correlates of War country codes. A '1' indicates the exporter and importer are in different regions. Due to our interest in focusing on realist assumptions in our tests, we create interaction terms between *Capability Ratio* and *Different Region*. The interaction terms allow us to identify how our variables of interest have a conditional effect on transfer decision-making based on multiple factors (Franzese and Hays 2007).

Regime type data comes from the Polity IV project polity levels (Marshall, Gurr, and Jaggers 2010). Specifically, the Polity2 measure ranging from -10 to 10 is used. Higher values indicate the state has more democratic characteristics. *Joint Democracy* is coded as '1' if both the exporter and importer have a polity score greater or equal to seven.

Trade data comes from Gleditsch (2002) measured in millions of dollars. *Trade* is the logged value of yearly trade between the exporter and importer.

IGO data come from the COW data by Pevehouse et al. (2020). *Joint IGO Count* is the logged value of overlapping IGO membership.

Defense pacts are included since alliance participation is a key to balancing. Defense pact is coded using the Alliance Treaty Obligations and Provision (ATOP) data (Leeds et al. 2002). If a defense pact is present it is coded as '1'.

Former colony status is included as a proxy for constructivism via shared culture. It is coded as a '1' if the importer gained independence from the exporter post-World War II. These data are from Hensel and Mitchell (2007).

Ally capability is created from the CINC data and ATOP data. It is the additive value of the capabilities of the importer's alliance network. Based on alliance network capability, states are then reverse rank so importers with more powerful alliances have a higher value. Due to the distribution we log this variable. It ranges from 0-4.96 where a value of zero indicates the importer had no alliances.

States that produce aircraft are included as a binary control where a value of '1' indicates the state produces at least one type of plane or helicopter in that year. Producer states are important as their need is arguably lower; thus, the threat of transfer is also lower. This data comes from Johnson (2017).

Tests

We conduct two sets of tests: if a transfer occurs versus the size of the transfer. We conduct logistic regressions on the binary dependent variable that measures the presence or absence of a transfer. Previous research shows that the decision to transfer is affected more by the traditional international relations independent variables than the size of transfer (e.g. Johnson and Willardson 2018; Blanton 2005). We conduct OLS regressions on the continuous variable that

measures the size of transfers. In both set of tests, standard errors are clustered on the exporter-importer dyad.

Results

We present results in two tables and two figures. Table 1 shows results of the models for Hypothesis 1 with the non-interaction models and Table 2 shows results for the interaction models for Hypothesis 2. Hypotheses 3-7 are tested in both sets of tests. The two figures show marginal effects of capability ratio when varying the presence of the liberal and constructivist independent variables and interaction effects of capability ratio and different region. The former allows us to evaluate the realist versus non-realist arguments. The latter allows us to evaluate the strength of the realist results when accounting for location. We first present cursory discussion of the models in terms of transfers versus size of transfer and planes versus helicopters before examining substantive differences.

The tables present the results for plane transfers in the first two columns and helicopters in the second two columns. The results in Table 1 provide support for Hypothesis 1 with the helicopter models while the opposite occurs in the plane models. As the exporter's capabilities increase compared to the importer, the likelihood in the transfer of planes decreases as does the size of a transfer. With helicopters, transfers are more likely to occur as the exporter becomes comparatively stronger.

In Table 2, the realist variables and their interaction term show that there is support for Hypothesis 2 in both helicopter models. The coefficients for capability ratio and different region are positive and significant in those models indicating that, on their own, mid-tier exporters transfer to increasingly less powerful states and states outside of their region. The interaction term coefficients, however, are negative, which indicates that when the importer is in a different region there is a reduction in the likelihood and size of transfer as the capability ratio grows in the exporter's favor. The importance of capability is reduced when the importer is in a different region, supporting Hypothesis 2 for helicopters. For planes, capability ratio is insignificant while the different region coefficients are positive, which indicates that capability is substantively less important than region when considering exports – providing minor support, or at least not negating, Hypothesis 2. In the plane logit models, the interaction term is also negative and significant. Interaction terms need to be visualized for a full interpretation of the results.

Hypotheses 3, 4, and 5 on the impact of joint democracy, trade, and joint IGO overlap, respectively, on arms transfers are consistent across all of the models. While joint democracy and joint IGO overlap have been shown to have a negative impact on war and conflict in a plethora of studies, they are consistently statistically insignificant across all of the models in both tables. Trade, however, has positive significant coefficients across all of the models, supporting Hypothesis 4. The lack of significance for joint democracy and joint IGO overlap weakens any assertion that arms trade happens due to liberal hypotheses.

The constructive hypotheses do not fare much better. We find mild support for Hypothesis 6. In both tables' logit models only the transfer of planes to former colonial possessions is positive and statistically significant. Hypothesis 7 has greater support. In two of four models in Table 1, and three of four models in Table 2, as the importer's alliance network capability rank increases,

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transfers decrease. In other words, as the capability of the alliance network increases, the probability of one of the suppliers providing aircraft decreases.

Defense pact is positive and significant in seven of the eight models; the non-significant coefficient has a p-value of 0.06. Exporters are more willing to export aircraft, and in larger numbers, to states they have a defense pact with. This consistent finding is not surprising – if you are willing to fight with someone you should be willing to provide weapons. However, assigning defense pacts to a single paradigm is difficult as they are related to realism via balancing, to democracy and liberalism via shared norms and values, and linked via shared identify to constructivism.

The last control variable measures when the importer is a producer of aircraft. In all of the plane models, the coefficient is negative and significant whereas they are all insignificant in the helicopter models. Aircraft producers are less likely to import planes than non-producers presumably because they do not need to import as many planes if they have some production capability. There are fewer helicopter producers than plane producers.

While the tables show us the impact of the individual coefficients, we are also interested in the substantive impact while controlling for the effect of other variables. We do this visually with interaction and marginal effects, respectively. While we calculated the effect for all of the independent variables, we only present the findings that had significant effects in Table 2 when varying the relevant independent variable and capability ratio while holding the other variables in the model at their mean. We visually compare the impact of capability ratio versus other relationships. Figure 1 shows all of the plane models and Figure 2 the helicopter models with 95% confidence intervals.

Across the 12 graphs in the two figures, we present the interaction terms, trade, and defense pact as all the other calculated substantive effects had overlaps in the confidence intervals across the entire range of capability ratio in both tests. Thus, there is no substantive support for the constructivist hypotheses despite some statistical significance in the models, which means we are now determining if the transfer of aircraft occurs under realist beliefs or in a way that cannot be accounted for by the three primary theories of IR.

Figure 1 presents the two models for planes. Figure 2 presents the two models for helicopters. In both, the first column is the interaction effects of capability ratio and different region, the second column is the marginal effects of trade accounting for capability ratio, and the third column is the marginal effects of defense pact when accounting for capability ratio.

In the first column of Figure 1, we see what is expected – no significance in the bottom graph due to the lack of statistical significance of capability ratio in Table 2. The top graph has an almost imperceptible split in confidence intervals at the -1 value in the top graph, which indicates that realism via Hypothesis 2 does not do a great deal in motivating transfers of planes. This is shown by the overlapping confidence intervals that negate the importance of region when accounting for capability and the mostly flat slope of the solid lines when different region equals zero.

Trade – in the middle column – is a significant predictor of transfer in both models. The values used are that of no trade, mean level of trade, and trade two standard deviations above the mean. In both graphs there is separation of the confidence intervals across wide ranges of capability ratio on the x-axis, which indicates that greater levels of trade lead to transfer of planes and as exporter capability increases versus importer, the impact of trade is tempered a bit. Exporters are more willing to transfer planes to more powerful importers who are also large trade partners.

The impact of defense pacts is present in both graphs where separation of the confidence intervals occurs when the importer and exporter have near similar capabilities through the exporter having moderately greater capabilities than the importer. In both graphs a defense pact indicates a greater willingness to engage in plane transfers.

The graphs in Figure 2 are similar except the slope of the effect lines are opposite with a positive slope as capability ratio increases. There is no effect in the logit model graphs in the top row for region or defense pact, which means the substantive impact of region and defense pact are diminished when accounting for the results of the full model. However, high levels of trade are a significant factor in the middle column with a positive relationship with helicopter transfers. Unlike planes, as helicopter exporters' capabilities increase in relation to the importer, they are more likely to transfer helicopters to high level trade partners and in larger amounts as shown in the bottom middle graph. The visualization of the interaction effect, in the bottom row, shows that different region matters for helicopter transfers when the importer has greater capabilities than the exporter – the willingness to transfer helicopters to states in a different region with more capabilities supports Hypothesis 2. Lastly, defense pact matters in a similar way to Figure 1.

Discussion and Conclusions

The combined implications of these tests is that aircraft transfers do not clearly follow the logic of any the major paradigms. The greater willingness for exporters to transfer helicopters to less capable states provides some support for the realist arguments we made. Joint democracy and joint IGO membership are consistently insignificant discounting liberalism. Likewise, our constructivist hypotheses are not supported. The former colony variable is largely insignificant and substantively insignificant when other variables are accounted for. Alliance capability rank as a proxy for prestige seeking is negative regardless of statistical significance. While there is a clear relationship between trade and arms transfers, and trade is a key part of liberalism, we believe the trade results are better explained by the economics of the arms trade; particularly the use of countertrade in arms deals as opposed to trade creating pacific relationships. Lastly alliances play a role in all three paradigms; thus, the consistent positive and significant coefficients of defense pact inform us that alliances matter. Mid-tier exporters support alliance partners. Importers with stronger alliance networks import fewer aircraft.

The transfer of coercive capabilities between states is complicated. Our strongest statistical result is that arms sales follow trade. Trade is a key component of Liberal theories of IR, and our results make clear that even goods that have the potential to cause harm are traded. Trade may also be an indicator of other types of cooperative relationships and shared values: strong results for trade may point towards the potential of constructivist arguments of arms sales.

The results hint at cautious application of realist principles by arms exporting states that are not at the top of the security hierarchy (Lake 2009). There is some support for the idea that mid-tier states prefer to export out of their region, but very little evidence that power differential matters. We asserted that in a realist anarchical world *all* other states are potential future adversaries. Helicopter-exporting states seem to assess the current state of relations by transferring larger orders out of their own region when the power dynamic is not in their favor. This is a significant finding about the prudent behavior of states embedded within a broader security hierarchy. This is true even though these transfers seem to be driven first and foremost by economic and trade concerns.

Recent literature on arms has highlighted the role that arms play in balancing power (Yarhi-Milo et al. 2016). Such theorizing is important to understanding the role of arms transfers at all levels of power in the international system. We focused on states that do not necessarily share the same capabilities and vulnerabilities, but found that caution has a limited role in arms sales. Our models also suggest that less powerful states may export planes to more powerful states that are part of the same defense pact.

Given the arguments in the specialized arms transfer literature, the lack of support for most liberal factors and minor support for realist and constructivist factors is somewhat surprising. This is, to our knowledge, the first study which has systemically attempted to assess these dynamics based on large-n empirical analysis of the transfer of arms between states. We have focused on non-superpower states as superpower arms transfers have been the area studied more robustly in the past.

Our tests of the three paradigms was limited in terms of engaging many specific propositions from those theories. We expect that there are connections between offense-defense theories and arms transfers, for example. We suspect that this may be one of the factors that accounts for the differences between fixed-wing and rotary aircraft transfers in our analysis.

This may be particularly true of defensive weapons systems that may be transferred to maintain the status quo, or to protect states from other states that may have revisionist tendencies. By arming neighboring states with defensive capabilities, a state may attempt to stabilize its neighborhood (Krause 1992) though the opposite may happen (Cahn 1979; Eikenberry 1995; Stanley and Pearton 1972). A neighborhood full of defensively hardened states is not an attractive target for an individually powerful country – especially when those states are allied with one another. Such defensive arming may also serve to discourage other states' leaders within the neighborhood from contemplating revisionist behavior. Future arms transfer research should examine this further.

This paper offers potential topics for researchers who are interested in looking more closely at decision-making processes within states. Factors that may be difficult to discern in large-n observational studies may be discoverable in other research designs.

States buy and sell arms. But they do so for specific economic, identity, and security concerns, and they take into account many factors when doing so. While researchers have systematically studied the transfer of arms between states for more than forty years, the mechanisms of this decision-making are still in need of deep study, especially work that ties the specialized arms transfer literature to theoretical and empirical work on international relations.

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Table 1: Binary Logit and OLS Models on Determinants of Aircraft Transfers

	Plane Logit	Plane OLS	Helicopter Logit	Helicopter OLS
Capability Ratio (Log)	-0.106*	-0.002**	0.131**	0.001*
	(0.04)	(0.00)	(0.04)	(0.00)
Joint Democracy	-0.181	-0.005	0.090	-0.000
	(0.14)	(0.00)	(0.16)	(0.00)
Trade (Log)	0.265**	0.006**	0.308**	0.003**
	(0.02)	(0.00)	(0.04)	(0.00)
Joint IGO Count (Log)	-0.013	-0.003	0.187	0.001
	(0.14)	(0.00)	(0.21)	(0.00)
Former Colony	1.044**	0.026	0.613	0.001
	(0.31)	(0.02)	(0.33)	(0.00)
Ally CINC Rank	-0.070	-0.002*	-0.096*	-0.001
	(0.04)	(0.00)	(0.04)	(0.00)
Defense Pact	0.707**	0.022**	0.523	0.014*
	(0.20)	(0.01)	(0.28)	(0.01)
Importer Producer	-0.779**	-0.014*	-0.135	0.000
	(0.20)	(0.01)	(0.26)	(0.00)
Constant	-5.895**	0.015	-8.103**	-0.009
	(0.48)	(0.02)	(0.79)	(0.01)
Observations	71694	71694	71694	71694
R-squared		0.005		0.003

* p<0.05 ** p<0.01
Standard Errors Clustered by Directed Dyad in Parentheses

Table 2: Binary Logit and OLS Models on Determinants of Aircraft Transfers – Interaction Models

	Plane Logit	Plane OLS	Helicopter Logit	Helicopter OLS
Capability Ratio (Log)	0.064	0.000	0.294**	0.003**
	(0.07)	(0.00)	(0.08)	(0.00)
Different Region	0.566**	0.013*	1.049**	0.011**
	(0.20)	(0.01)	(0.32)	(0.00)
Capability Ratio * Different Region	-0.207**	-0.003	-0.177*	-0.002*
	(0.08)	(0.00)	(0.09)	(0.00)
Joint Democracy	-0.177	-0.005	0.129	0.000
	(0.15)	(0.00)	(0.16)	(0.00)
Trade (Log)	0.269**	0.006**	0.329**	0.003**
	(0.02)	(0.00)	(0.04)	(0.00)
Joint IGO Count (Log)	0.068	-0.001	0.449	0.003
	(0.14)	(0.00)	(0.26)	(0.00)
Former Colony	1.054**	0.025	0.496	0.001
	(0.31)	(0.02)	(0.33)	(0.00)
Ally CINC Rank	-0.069	-0.002*	-0.123**	-0.001*
	(0.04)	(0.00)	(0.04)	(0.00)
Defense Pact	0.822**	0.026**	0.858**	0.018**
	(0.21)	(0.01)	(0.30)	(0.01)
Importer Producer	-0.737**	-0.013*	-0.191	0.001
	(0.20)	(0.01)	(0.27)	(0.00)
Constant	-6.699**	-0.003	-10.022**	-0.024**
	(0.54)	(0.02)	(1.08)	(0.01)
Observations	71694	71694	71694	71694
R-squared		0.005		0.004

* p<0.05 ** p<0.01
Standard Errors Clustered by Directed Dyad in Parentheses

Figure 1: Marginal Effect of Independent Variables on Plane Transfers with 95% Confidence Intervals
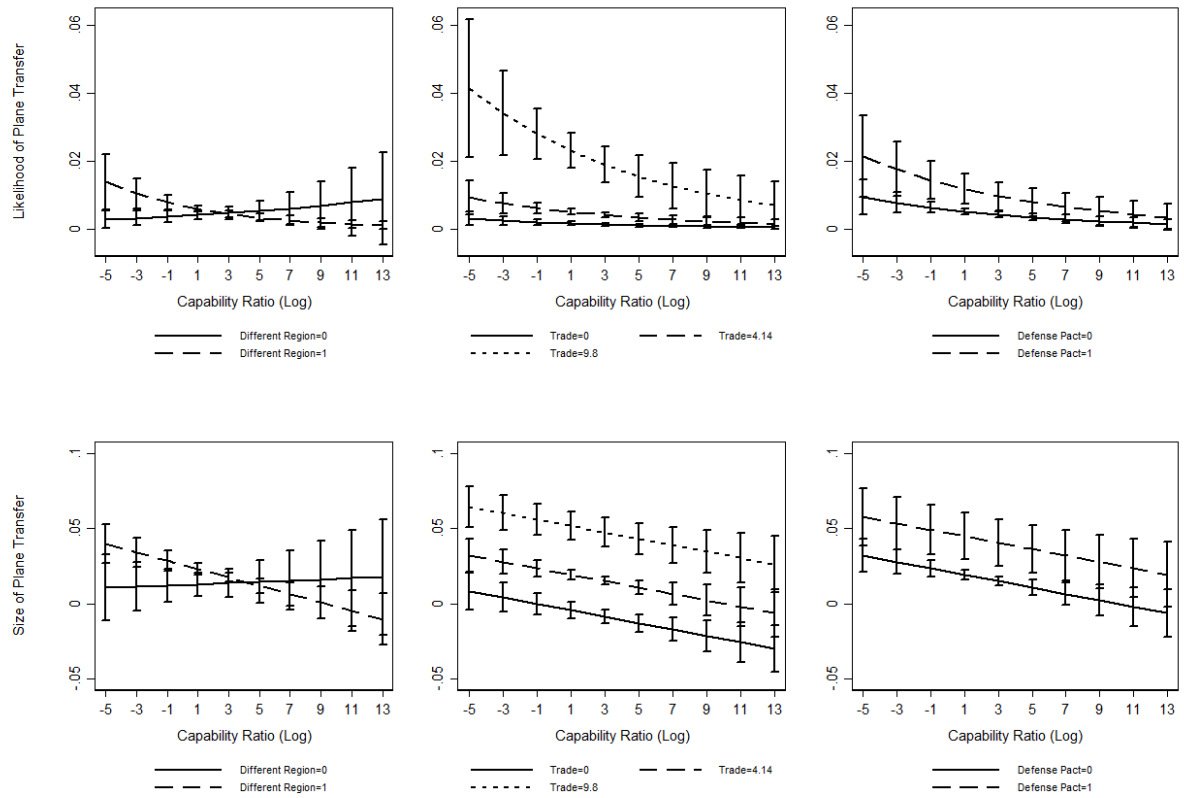
Figure 2: Marginal Effect of Independent Variables on Helicopter Transfers with 95% Confidence Intervals