# Hierarchy in Armaments Imports: European Fighter Jet Procurement*

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Traditionally, states prefer self-reliance in arms procurement. However, with increasing technological complexity, few states can produce their desired weapons independently. Instead states rely on procurement from abroad, amongst other acquisition strategies. When importing armaments, states are concerned about cost, interoperability, technology transfers, and/or military capabilities of the armament, facing political, economic, and military trade-offs in their final choice of supplier. Generally armaments are purchased from allied or aligned states, which limits the number of potential suppliers, especially with sophisticated armaments. Yet when faced with several viable options to purchase a desired capability, what explains a state's supplier choice? One region apt to explore this question is Europe, with numerous viable, comparable, suppliers of sophisticated armaments. Drawing upon European fighter-jet procurements since 1950, we argue that when selecting a platform, states' economic and security hierarchical relationships with potential suppliers (various European states and the US) interact with the aforementioned trade-offs. As respective hierarchy scores increase, states are more likely to select either US or European fighter-jets. This has significant implications for understanding not only why states select specific suppliers for sophisticated armaments when there is more than one potential supplier but also how economic and security hierarchies influence high-politics decisions.

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**Introduction**

On the 11ᵗʰ of February 2022, the Prime Minister of Finland announced the results of its fighter procurement program. By winning this $9.4 billion contract, the F-35's streak of winning fighter procurement decisions by various European states was extended. Yet this selection came in face of serious efforts made by Sweden' Saab, France's Dassault, and the European conglomerate Airbus to sell their respective fighters to Finland. Saab's offer was particularly intense with official backing of the Swedish government, which advocated heavily for it and believed its fighter had an edge for Finland's strategic needs, as it is able to conduct dispersed operations from highways (Lehto and Stone 2021). Twenty years before, Hungary and Czech Republic were also in the market for new fighter jets. Just having joined NATO in 1999 both states wanted to increase their interoperability with their new NATO allies and decrease dependence on Soviet/Russian armaments. The two states had the possibility to purchase planes from Sweden's Saab, France's Dassault, the Eurofighter from European conglomerate Airbus, and General Dynamics's F-16. Although it was widely believed that the F-16 was the preferred platform for Hungary, which would have increased alliance interoperability significantly, in both cases Sweden's Saab Gripen was selected (Hoeffler and Mérand 2016). When Poland faced the same decision only two years later in 2003, it selected the F-16 instead of the Gripen. This raises the question: when faced with two or more viable options to purchase a desired capability what explains a state's supplier choice?

When states have no domestic option for procurement or are unable to collaborate with other states to co-develop and co-produce an armament, states are forced to pursue 'off-the-shelf' procurement . Existing literature on arms procurement shows how selecting the origin state of an armament is constrained by the state's desire to balance a host of political, economic, and military considerations and trade-offs (e.g. Avery 1978; Brzoska 2004; Catrina 1987; Ringsmose 2013; Rounds 2019). States have finite budgets and consider the capability of all potential armaments, proposed offsets with contracts that can either disperse costs by increasing domestic economic activity or lead to future technological spin offs, and alliance interoperability. These tradeoffs are especially salient in existing alliances, with clear understandings of the armament's capabilities as well as pre-existing relationships across a number of factors. We argue that when selecting an armament within an alliance states' security and economic hierarchical relationships with potential suppliers interact with the aforementioned

considerations. As the hierarchy indicators increase, states are more likely to select one potential supplier's armaments over another's. In turn, once a selection has taken place we also expect the hierarchical relationship to intensify.

One region to best explore this variation is Western Europe. After 1970, Western Europe had multiple, viable, and comparable suppliers of sophisticated armaments coming from the United States, France, Sweden, and European conglomerates with the United Kingdom, Germany, Italy, and Spain contributing to various projects. Drawing upon West European fighter-jet procurement decisions since 1970 and overall European procurement decisions since 1991, we explore how procurement decisions interact with security and economic hierarchy. The paper is structured as follows: First we discuss the theory. Second we introduce the concept of hierarchy and how it can be measured. Third we introduce the model and its variables. Fourth we discuss the findings and draw some preliminary conclusions.

**Theory**

When faced with the decision to procure weapon systems, states can choose between three general strategies to pursue: (1) autarky, (2) collaboration, or (3) foreign dependence (Jones 2007: 140f.; see also DeVore and Weiss 2014: 498). Since military procurement policies fall under the domain of 'high politics' autarky is the preferred option for sovereign states (Holm 2001: 21ff.; Thiem 2011: 2). This is due to the fact that cooperation in the realm of high politics is harder to achieve (Hoffmann 1966: 882; Jervis 1982; Lipson 1984: 2ff.; Larivé 2016: 29). Robert Art stipulates that "[t]he default position of states, especially when it comes to military matters, is not dependence, but autonomy and independence, if they can achieve it" (Art et al. 2005: 185). Autonomy or autarky, however, is a very costly exercise[1] which only large states, with a respective military force that acquires military equipment in all domains, can pursue (Maye 2017: 33ff.). The United States is the most emblematic example of a country whose defense technological and industrial base (DTIB) is able to provide its military with the full spectrum of equipment, at least since World War II (Head 1974b: 414; Brooks 2005: 13; Jones 2007: 142). Especially, smaller technologically advanced states might, therefore, choose to collaborate in order to develop advanced weapon systems which entail high financial costs

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[1] As an example: According to the Selection Acquisition Report submitted to the US Congress in June 2017 the F-35 program costs are estimated at US$ 406.5 billion which is about 10% of the US federal budget of 2017 (Capaccio 2017).

(Jones 2007: 143f.). Marc DeVore finds that "budgetary pressures have driven a steady expansion of armaments collaboration since the 1960s" in Europe (DeVore 2014: 415). At least, in theory, state budgets ought to be relieved through sharing of development costs as well as the benefits of economies of scale decreasing individual unit costs since larger numbers of units are manufactured due to the larger number of states acquiring the developed weapon system (Ibid.: 415f.).

In order to avoid any development costs, countries can either license produce weapons systems or purely rely on foreign supply of weapon systems and 'buy off a weapons producing country's shelf.' The latter was more or less the case for Western Europe after World War II, when it needed most of the available public funds for reconstruction and, consequently, the United States held a strong "quasi-monopoly" on military aircraft supply to Western Europe during that time (Harkavy 1975: 86). Even when military aircraft came from domestic sources the United States acted as the *big spender* which was the case when "the US government launched the postwar rise of France's leading military aircraft company, Dassault, by buying the entire series of the company's first postwar model, 225 planes, and presenting them to the French air force" (Moravcsik 1991: 33).

But even if countries decide to import weapons from a weapons manufacturing country they tend to "demand economic-industrial offsets, resulting in coproduction, licensed production, or other compensation arrangements" (Catrina 1987: 42). These offset agreements may help to sustain a recipient country's domestic defense technological and industrial base and lower the overall costs of procuring high-technology weapon systems (see also Kapstein 2004).

Financial considerations are but one aspect of defense procurement decisions. Acquiring weapon systems is a process which entails political calculations, decisions, and also political costs, as evidenced by the tension created through the Turkish decision to procure the Russian-made S-400 air defense system instead of sticking to its previous procurement pattern of buying American (the American alternative would have been the Patriot air defense system) or at least 'Western' weapon systems (Mehta 2019). Turkey following through with its procurement of the Russian system, ultimately led to its exclusion from the F-35 program, despite Washington's repeated warnings of this consequence (Ibid.). Sweden's decision to procure the American Patriot system in August 2018 has been interpreted as signaling a consolidation of the country's security and defense cooperation with the United States, despite Sweden not being formally

allied to the U.S. Furthermore, the Swedish government decided to miss out on offset and other financial benefits which would have been part of a deal to buy the French/Italian SAMP/T-system to underline its willingness to cooperate with the U.S. (Haas and Vuille 2018: 4). Seen from the supplier side "[a]rms sales are useful tools for maintaining communication, strengthening relationships, and keeping political adversaries at bay" (Rounds 2019). Catrina provides an excellent overview of the politico-military benefits and costs as well as the economic benefits and costs for exporting as well as importing countries which is based on research conducted by Kemp and Miller, Arlinghaus, and Klare (Catrina 1987: 71f., 74ff.; see also Kemp and Miller 1979; Arlinghaus 1983; Klare 1984). The overview highlights the fact that, because of its sensibility to national security and sovereignty, the defense equipment market is distinct from other markets in which goods are traded.

In general, the defense equipment market is different from most markets insofar as it is a highly politicized market. This means that the demand side, mostly state governments, determines the shape of the supply side by purchasing products offered by defense equipment companies. Seth Jones depicts the relationship in the following way: "Defense firms generally don't develop equipment and then attempt to sell it to their governments. Rather, governments and defense departments collect classified information about foreign capabilities and threats, devise a grand strategy to curb those threats, and then equip themselves accordingly" (Jones 2007: 139; see also Flamm 1999). Furthermore, because of its close link to security, which is "one of the most basic goals of states", the "[a]rms transfers are something apart from 'normal' trade in other commodities" (Catrina 1987: 12).

Theories explaining defense equipment procurement decisions tend to differ between rational-choice and constructivist approaches. Proponents of the constructivist approach such as Eyre and Suchman dismiss rational-choice arguments such as superpower manipulation, national security, and factional interests to explain weapons acquisition (Eyre and Suchman 1996: 83). They argue that high-technology weaponry is sold and bought "because of the highly symbolic, normative nature of militaries and their weaponry" (Ibid.: 86). While highlighting the symbolic value of high-technology weapon systems such as modern fighter jets they can only explain why countries buy such systems at all and not why they procure from one source over another. But if one follows the constructivist approach to military procurement, the concept of strategic culture plays a significant role. Vucetic and Duarte define strategic culture as "a collection of widely

shared beliefs and assumptions that shape how decision makers choose the means and ends of security and defense objectives" (Vucetic and Duarte 2015: 409). A country's strategic culture has a profound effect on the military equipment it selects as well as on the decision from which supplier it procures (Meyer 2011: 678).

What these assessments clarify is the fact that the decision where to buy defense equipment interacts with international relations in general. In fact, weapons acquisition can be "a tool of diplomacy, to create or reinforce alliances" (Head 1974a: 410). Snider states that arms transfers can be seen as a "policy instrument that a major power might use to persuade" another nation "to act according to that supplier's preferences" (Snider 1979: 243). Hence, the arms recipient may feel obliged to adjust its foreign policy to the supplier's preferences in order to receive the desired weapon system as well as to guarantee subsequent maintenance and possible future deliveries. Seen from this perspective, arms transfers may lead to the creation or reinforcement of international hierarchy in which the supplier country takes on the dominant role and the recipient country subordinates itself to the hierarchy structure (Catrina 1987: 16; see also Väyrynen 1980: 135). Furthermore, the decision to procure from a particular source establishes a recipient-supplier relationship that usually lasts longer than the weapon system's delivery date since "recipients have in most cases to rely on the original supplier for technical support such as maintenance, overhaul, and the supply of spare parts" (Catrina 1987: 196f.). To avoid outright dependency on one supplier in a "sole-supplier relationship" countries may choose to diversify their sources of supply which might, on the other hand, entail a trade-off in interoperability of weapon systems (Harkavy 1975: 104). Earlier procurement decisions heavily influence a country's decision since "securing new suppliers" comes with "formidable" transaction costs (Vucetic and Tago 2015: 109). Hence, a decision to buy from a particular source creates a form of path dependency which makes it likelier that the same source will be given future military equipment acquisition orders (Johnson 2019).[2]

As suggested by Eyre and Suchman, countries "are not autonomous, independent actors in pursuit of national interests" within an anarchic world (Eyre and Suchman 1996: 89). Rather, their choices are shaped by international institutions such as alliances. This is especially valid for defense procurement decisions which are heavily influenced by alliances. The transfer deals "are akin to mini-alliance treaties" or, put differently "supplier-receiver relationships are a function of

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[2] See Johnson 2019 for an overview of when and why states shift in "importer acquisition patterns."

alliances" (Vucetic and Duarte 2015: 403; Vucetic and Tago 2015: 110). Therefore, states desiring to procure weapon systems are not completely free to choose the weapon's sources even if equivalent alternatives exist. Snider identifies four factors that determine "[t]he number of alternative suppliers of an equivalent weapon system" resulting in this number not being identical with "the number of countries who produce an equivalent system" (Snider 1979: 244). Furthermore, the supplier of weapon systems may gain international influence through a well-chosen distribution of these systems (Caverley 2007: 613f.).

Following these considerations, this paper's theoretical lens is such that procurement decisions are expressions of patterns of international hierarchy and alliance preference. Derived from this line of thought and following the research question presented in the introduction, the following hypotheses will be tested in the analysis:

(H1): *The more subordinate a state is to the United States, the more likely it is to choose to procure US-made products instead of European plausible alternatives.*

(H2): *Countries having decided to acquire U.S.-made fighter aircraft stay more subordinate to the United States than countries having decided to procure from European sources.*

As has been mentioned above, states are not completely free in their decisions where to procure military equipment from. It is assumed that international hierarchy has a profound effect on the selection of weapon systems' sources. Hierarchy in the global defense market derives from the fundamental fact that *haves* (those countries with a defense industry, i.e. potential suppliers) and *have-nots* (those countries without a defense industry, i.e. potential recipients) interact in a relationship shaped by inequality. The second hypothesis derives from the consideration that "fighter jet transfers can be regarded as a means for establishing or reinforcing hegemony" because "they tend to improve military-to-military ties and influence national strategies via socialization practices" (Vucetic and Tago 2015: 111). H2 conceptualizes hierarchy, or rather subordination as a process that is set in motion or reinforced through iterative procurement decisions which, in turn, can be seen as critical junctures (Mahoney et al. 2016: 77). This is echoed by David Lake, who states that "[h]ierarchy becomes more robust […] as

subordinates acquire more assets that are dependent on that authority" (Lake 2009: 30). Whether this holds true in the European case is the objective of testing the second hypothesis. First, however, the following subchapter will elaborate on the meaning of international hierarchy and, more specifically, of subordination to the United States.

**Hierarchy**

<u>Conceptualization of Hierarchy in International Relations</u>

The theoretical lens through which the decision on a country's defense equipment's source is analyzed in this paper and, hence, the study's independent variables are drawn from the concept of hierarchy. Although sometimes overlooked, recent developments show that hierarchy is an equally important "organizing principle of international politics" (Barnett 2010: 912) to anarchy and has always been a "ubiquitous feature of international (that is, inter-state) politics" (Mattern and Zarakol 2016, 624).

Although definitions of hierarchy vary between authors and over time (e.g. Cooley 2012; Lake 1996; 2007; 2009; Zarakol 2017), the different conceptualizations generally focus on relations between two or more actors with one actor being able to impose its will on the other, subordinate actor(s) on a number of issues to varying extents. Conceptualizations of hierarchy vary when considering how hierarchies are created, how easily they can change, and what kind of actors are involved. The origins of hierarchies fall into two broad categories: narrow, where hierarchies "are founded on exchanges in which actors trade degrees of freedom for a desired social or political arrangement" (Zarakol 2017, 4) and broad, where hierarchies are "deep structures of organised [*sic*] inequality that are neither designed nor particularly open to renegotiation" (Ibid. 2017, 7). This divide lines up with but is distinct from discussions regarding the source of hierarchy, that focuses on legitimate authority (e.g. Lake 2009) or coercion (e.g. Organski 1958). Given the focus of our paper on hierarchy within formal arms procurement networks, we focus on the former set of hierarchies. Hierarchy is conceptualized narrowly and "by the extent of the authority exercised by the ruler over the ruled" with hierarchy increasing as the "number of possible actions by the ruled" decreases (Lake 2009, 9).

Hierarchy can present itself in a number of different areas. However, the most important hierarchy manifestations for this project are the hierarchical relationships present in actors'

security and economic relationships (Lake 2009, 52-59). The next section of this paper discusses these areas as well as the variation these two manifestations can take on.

Hierarchy and Security Relationships

The spectrum of security hierarchy between states ranges from no hierarchy, where states engage each other as equals and neither state has any subordinate security relationships with the other, to full hierarchy, where states in the subordinate position have no independence in their security related decisions. Examples for the former include relationships between great powers such as the relationship between the Soviet Union and the United States during the Cold War, where "neither ceded to the other any control over its own foreign policy" (Lake 2009: 53). The latter relationship is exemplified by relationships between states and their subordinates such as the relationship between the United States and the Philippines from 1935 to 1946, with Washington controlling foreign and military affairs for both states (Seekins 1993). Between these two ideal types, there is a number of decreasing or increasing hierarchical relationships between states based on differing aspects of the states' security relationship. These differing security hierarchical relationships can be measured by variation on a number of factors: 1) independent security alliances by the subordinate state, 2) military basing on the subordinate's territory, 3) military aid received by the subordinate, and 4) dependency by the subordinate on the superior's military exports.

The first major indicator of hierarchy between two states is the presence, or absence of independent security alliances between the subordinate state and the state at the top of the hierarchy. Independent alliances are alliances signed by the subordinate state with a third state, that the state with hierarchical potential does not have an alliance with (Lake 2009). As alliances with other states are one major way to gain additional security for the signing states (Waltz 1979, Morrow 1993), the presence of few or even no independent security alliances between two states has interesting implications. This circumstance may be an indicator of the existence of a hierarchical relationship, as decreasing numbers of independent alliances indicates that the two states' security policies are closely aligned, closing off the ability of the subordinate state to act independently. Drawing from ATOP (Leeds et al. 2002) examples of independent alliances include, from the point of view from the United States, France's alliance with Gabon, which D.C. does not have an alliance with, or Gabon itself which has several alliances with African states

that France does not have alliances with. Examples of states without independent alliances include Kiribati and Tuvalu only having a single alliance - with the United States.

The second major indicator of hierarchical relationships between two states is the presence of military bases and troops on the subordinate state's territory. The deployment of foreign troops to subordinate state's territory carries costs for the hosting state but these are not only tied to the domestic politics regarding the subordinate state's decision to accept to host foreign troops (Kim and Boas 2019). The mere presence of troops may constrict a state's ability to conduct security and foreign policies independent of the state deploying troops to its territory (Lake 2009), although recent work by Cooley and Nexon (2013) has shown that under certain circumstances the state in the subordinate position does not lose all ability to act independently. The current example of Russia's invasion in Ukraine, which is partly launched from Belarus' territory, further illustrates the potential consequences that a subordinate state can have if it hosts foreign troops. Not only is the range of its foreign and security policy constricted but it can be drawn into a conflict started by the dominant state. This showcases the subordinate state's lack of autonomy in security and foreign policy when it is hosting a state's troops. Notable examples of this include deployment of NATO forces in various states, most prominently the United States basing troops in West Germany throughout the Cold War, but also other powers like Russia basing troops in Belarus and Syria. On the other hand, some states, like Austria, prohibit the basing of foreign troops on its territory emphasizing its neutrality.

The third major indicator is the presence of military aid received by the subordinate state. Military aid can restrict the ability of a subordinate state to act independently in its foreign and security policies, giving the state in the stronger position the ability to leverage the aid. Under certain circumstances, subordinate states may find themselves either threatened with the loss of ongoing and future aid or with the promise to receive future aid if certain security or foreign policies are adopted (Sislin 1994). Depending on how dependent subordinate states are on the military aid promised or threatened to maintain their own security, this could restrict the ability of it to act independently in its foreign and security policies. Some states receive significant amounts of military aid. In 2020, Egypt and Iraq received $1.3 billion and $548 million in military aid from the United States, while Zimbabwe and Australia received no military aid from D.C. (U.S. Department of State).

The fourth and final indicator of a hierarchical relationship between two states is the degree to which the subordinate state is dependent on the other state for its arms imports. The purchase of major arms from abroad is often tied to dependency on the exporter for future sale of parts required for maintenance, logistics, and training, especially if local capacity is unable to fulfill related demands (Bitzinger 2021; DeVore 2017). This in turn reduces the subordinate state's ability to conduct a foreign and security policy independently of the supplier by creating path dependency where future sales in the same category are likely to come from the same state. Our second hypothesis aims to capture this process. While dependency on one state for a single category of armaments, such as main battle tanks, already reduces the ability of the subordinate state to conduct an independent foreign and security policy, dependency for more categories of weapons creates increasing hierarchical relations. For example, SIPRI TIV data shows that between 2010 and 2020, Japan relied on the United States for 94% of its total arms imports, while Brazil's reliance on its largest importer, also the United States, was only 21% over the same time period. Other states have no ties with each other, such as the Netherlands receiving no arms imports from the United Kingdom during the same period (SIPRI).
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## Hierarchy and Economic Relationships

Similar to security hierarchy, the range of economic hierarchy ranges from no hierarchy present, where states engage each other as equals via market exchange retaining full authority over their actions, to full hierarchy, where states in the subordinate position are fully dependent on the stronger state, ceding full authority to them in the realm of economic policy. Examples of the former include the current relationship between the United States and its Western European allies. Here neither side cedes any authority in their economic relationship directly to the other (Lake 2009). The latter relationship is best exemplified by historical and current relationships between the United States and various smaller states in the Western Hemisphere. Today this includes Panama and Costa Rica, whose economies are 'dollarized,' making them reliant on economic policy decisions made in Washington D.C. Between these two ideal types, there is a number of decreasing or increasing hierarchical relationships between states based on differing aspects of the states' economic relationship. The differing economic hierarchical relationships

are the result of a number of factors: 1) trade dependency of the subordinate state, 2) monetary policy coordination by the subordinate state with the superior, and 3) economic/development aid received by the subordinate state from the superior.

The first indicator of economic hierarchy is the level of trade dependence between two states. With increasing reliance on a single trading partner as both a destination for exports and as the originator for imports, states can move into a state of reliance on that specific partner, subordinating themselves. This in turn will give the other state, increasing leverage over the subordinate state, as long as the state in the stronger position does not find itself in a similar state of reliance. Trade has long been identified as a potential avenue of influence (Keohane and Nye 1977; Baldwin 1985). States in the stronger position could then utilize their leverage vis-à-vis subordinate state's to gain policy concessions in various areas while states with little or no leverage cannot refer to this option. An example of states in more equal standing attempting to utilize trade relationships and failing at this have been recent unsuccessful attempts by the United States to extract significant economic policy concessions from China and the European Union via tariffs during the Trump administration (Reuters). The other side of trade bringing influence is the concessions Israel had to make to the United States when it stopped exporting unmanned aerial vehicle parts to China fearing to be cut off from the F-35 supply (Caverley 2007: 612).

The second indicator of economic hierarchical relationships between two states is the dependence by one state on another's monetary policy. At the most subordinate point, a state simply adopts the stronger state's currency. This in turn makes the subordinate state fully dependent on another state's currency level and therefore currency value. Only reissuing a domestic currency would break this dependence (Lake 2009). On the other side of the dependence are states that have no hierarchical relationship in monetary policy with free-floating currencies. Examples of states' dependence on another state's monetary policy are abundant. For example, in 2002 Ecuador and Panama had dollarized economies, while in Europe Kosovo was a euroized economy (Rochon and Rossio 2003). On the flip side are economies that have no hierarchical relationship, with the value of their currencies free floating against each other such as the Swiss Franc with the Euro today.

The third indicator of economic hierarchical relationship between two states is the presence of economic/developmental aid received by the subordinate state. Dependence on economic and developmental aid can restrict the ability of the subordinate state to act

independently in its economic policy. Such aid can come with explicit strings attached, such as structural adjustments (Gilpin 2001), or may have implied expectations about how a state is supposed to structure its economic policy or utilize the provided aid (e.g. Schraeder, Hook, and Taylor 1998). The higher the overall dependence on a specific state's aid relative to all other aid received, the more subordinate it is to the state providing the aid. At the receiving end of significant amounts of aid are states that almost exclusively rely on one aid provider. For example in 2019 Guyana received $59.1 million in net ODA (official development assistance) with $47.7 million coming from Norway while Algeria received $90.7 million of its $115.1 million net ODA in 2019. In these instances states are dependent on the aid provider. On the other end of the spectrum are states like Laos, whose largest donors are all similar in relative contribution to net ODA, or Austria, which received no ODA in 2019 (OECD). Here there is little dependence on one state to provide ODA, indicating a lack of economic hierarchy for this measurement.

**Variables**

<u>Dependent Variable: 'Fighter Aircraft Origin'</u>

Data on the dependent variable 'Fighter Aircraft Origin' was collected from SIPRI Arms Transfer Data and is coded dichotomously (SIPRI). The data includes relevant data[3] regarding procurement decisions made by European states between 1970 and 2020 that involved fighter jets. Given our focus on Western Europe, we excluded Warsaw Pact states, Non-Aligned Movement member Yugoslavia, and Albania as importers until 1992, leaving us with a total of 145 arms procurement decisions. Two instances of Finnish (1973, 1978) procurement from the Soviet Union were also excluded from the data set given our focus on arms transfers within alliances. It is important to note that at this time this dataset only includes arms transfers that have already seen armaments delivered. As a result, instances like Belgium's 2018 procurement decision in favor of the F-35 are not yet in the dataset as it has not received any planes to date. We made the decision to only include cases of delivered fighter aircraft, as there are instances where procurements are canceled (e.g. Switzerland's 2015 referendum to cancel Gripen procurement). Further we utilized SIPRI's data on what specific weapons platform were imported to code all second hand and license produced armaments as though they were procured

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[3] Origin, Destination, Type of Plane, Second Hand Status, Year Ordered, Number Ordered

from the original exporter. This was done, as in virtually all instances of 're-exports,' the originally exporting state requires authorization under domestic regulations (e.g. ITAR in the United States), suggesting that the importer is willing to go through extra hoops to procure from this original producer and deal with the 're-exporter' than buying something 'off the shelf' elsewhere. Furthermore, buying second-hand fighter aircraft will most likely lead to a dependence on the originally exporting state for maintenance and service. Finally, all decisions that had the outcome of procurement from the United States were coded as 1 while all others (Sweden, France, Germany, the United Kingdom, Italy) were coded as 0.

Independent Variables

*Security Hierarchy*

For the four proposed measures of security hierarchy discussed above, we gathered data on two of the measures, 1) US military troops stationed in the importing state and 2) relative arms import dependence. Given the focus on Western Europe, we did not include data on independent security alliances. Although neutral states are present in the dataset, they generally received their armaments from Western sources even if they did not have explicit military alliances with other Western European states. The notable exception here is Finland, which signed the Finno-Soviet Treaty in 1948 and generally procured armaments from the Soviet Union, Sweden, and the United Kingdom. Further, we did not gather data on military aid given by the producers of fighter jets given data availability issues. Potential European suppliers, thus alternatives to the US, do not publish data on their military aid in the same way the United States does, thus impeding comparability.

*US Troops Stationed*

The data for the first indicator of security hierarchy 'US Troops Stationed' was collected from the Defense Manpower Data Center (DMDC). Data was collected for each country between 1970 and 2020, with all values fewer than 100 troops coded as zero. Values under 100 are likely the result of including US Marine Embassy Guards being stationed at the American embassy, military attachés, or US troops deployed for small exercises or training. As a result, these low numbers of US troops are unlikely to have a significant impact on procurement decisions made by the country. For example, the US has continuously stationed roughly 40 troops in Russia

according to the DMDC. It would be expected that the higher the numbers of US troops deployed to a country, the more subordinate the state's security relation to the United States will be, increasing the likelihood of making arms procurements from the United States. Values are computed by dividing the number of US troops stationed in a country by the country's population in a given year. Population data is taken from the World Bank database. After all the values are computed for each procurement instance they are normalized.

*Relative Arms Import Dependence*

The data for the second indicator of security hierarchy 'Relative Arms Import Dependence' was collected from SIPRI's Arms Transfers Database in trend indicator values (TIV). According to SIPRI the TIV values are "intended to represent the transfer of military resources rather than the financial value of the transfer" (SIPRI). Calculating the TIV score of the original producer vis-à-vis the importer's entire TIV within a given time period, will show the importer's relative dependence on arms from that specific country. Similar to the US troop data, after the values are calculated for all cases they are normalized. Here it would be expected that the higher the relative dependence for the importer, the more likely it would be to procure American or European fighters respectively. This expectation derives from military interoperability considerations and well as considerations regarding path dependent processes in arms procurement.

*Economic Hierarchy*

For the three proposed measures of economic hierarchy discussed above, we gathered data on one of the measures, 'Relative Trade Dependence.' We did not collect data on economic and developmental aid as well as monetary policy given their limited applicability for the procurement instances in question.

*Relative Trade Dependence*

The IMF Direction of Trade Database provided total trade combined with the World Bank's GDP from 1965 to 2020 for the first economic hierarchy indicator 'Relative Trade Dependence'. Unfortunately, the IMF reported only "one aggregated figures for Belgium and Luxembourg's trade activities" until 1996 (Barbieri and Keshk 2016: 5f.). To deal with this issue, we utilized

the Correlates of War Project's disaggregated Belgium data to collect Belgium's data from 1970 to 1996. Further World Bank GDP data for Switzerland was missing between 1970 and 1979 and could only be found as estimates from the Organization for Economic Cooperation and Development (OECD 2022). Although the GDP change from 1969 to 1970 and from 1979 to 1980 are 125% and 37% respectively, a Welch Two Sample t-test shows that the year-over-year changes in Switzerland's bilateral trade with fighter jet producing states relative to GDP is not statistically different in 1970-1980 compared to the years without GDP estimates, 1965-1969 and 1981-2020. Once all data was combined, US trade shares for all procurement instances were calculated by dividing total trade with the United States (both imports and exports) by the importing country's GDP. This was then repeated with European fighter producers (France, Germany, Sweden, the United Kingdom from 1970 to 2020, with Spain being added in 1985 due to its inclusion in the Eurofighter project) to get the European trade value. Once this value is created the European trade share value is subtracted from the US value. Afterwards 1 was added to all resulting values for each procurement instance, with the values subsequently being normalized. Here we would expect higher levels of relative trade dependence to increase the likelihood of procuring American fighter jets.

*Additional Variables*

The most important control variable is our network effect variable. The effect of armaments networks have been highlighted and discussed but thorough and systematic measurement is missing. When states purchase armaments, they do not do so in a vacuum. States have budgetary, capability-based, and domestic political reasons for procuring specific weapons platforms from the potential suppliers. What is not captured in these considerations is the network effect of the armament in question. This network effect increases interoperability with other states as well as economies of scale and learning. First, interoperability allows states' militaries that field the same armament to work together more effectively than if they have different armaments, creating an incentive to procure armaments that allied states already own. As a result of deploying the same armament in their armed forces, states will have an increased ability to operate together, which in turn increase the effectiveness of joint deployment, something that is particularly important for members of alliances. Second, prior procurements increase economies of scale for the armament. More units sold, *ceteris paribus*, decreases the per

unit cost of an armament as well as the cost for parts required for maintenance. Third, economies of learning with respect to the armament also increase. This results in increases in the efficiency of training and the maintenance provided for the armament purchased.

To measure the variable of network effect we utilized the Military Capabilities Data Set to create two variables (Gannon 2022). First we calculated the total number of states in Europe that fielded either American or European planes. This was then utilized to calculate the percentage of all European states that fielded American planes in a given year. Second we calculated the total share of American made fighter jets of all platforms in Europe in a given year. The first variable reflects the concept of interoperability within the network effect. As interoperability concerns itself mainly with interactions with other states, utilizing the relative number of states that field American planes in a given year best reflects considerations regarding the potential for interoperability. The second variable reflects economies of scale and learning in network effects. As economies of scale and learning benefit from larger numbers of planes fielded, looking at the relative percentage of American versus European planes in European states' air forces best reflects the potential impact of this portion of the network effect of fighters. In both variables we decided to aggregate the number of American and European planes instead of treating each platform separately. We made this decision as our research interest is the purchasing states' hierarchical relationship with the United States or the European suppliers.

Furthermore five additional control variables. First, in the SIPRI Arms Transfer Data all procurement decisions include data on the total number of units delivered. This was included as the United States has a significantly larger military industrial base and demand for fighter jets. This in turn may result in overcapacity on production lines or extra fighter jets as new models are developed, which in turn may be sold abroad to allies. We also included three dummy variables for decisions that were made during the Cold War as well as membership in the European Union and NATO. Finally, a dummy variable to reflect the potential for domestic production was included as well. Here Sweden, the United Kingdom, France, Italy, and Germany all were coded as "1" for the entirety of the dataset, while Spain was added to the list in 1998 as this marked major milestones in Spanish Eurofighter production.

**(Preliminary) Findings and Next Steps**

<u>Model Findings</u>

Utilizing the variables described above, the method of analysis is a logit model, which is appropriate given the dichotomous dependent variable. The results of our statistical analysis presented in Figure 1 (Model 1) show that only NATO membership appears to be a statistically significant factor contributing to the decision to buy American. Interestingly, EU membership or the lack thereof does not seem to have a statistically significant impact on countries' fighter aircraft procurement decisions. Apparently, EU membership does not lead to a European preference in fighter aircraft procurement pointing out the problems of achieving strategic autonomy through defense procurement decisions (Camporini et al. 2017). Most noteworthy for our purposes, neither security nor economic hierarchy (measured as US troops and relative trade with the US) have a significant effect on West European states selecting American or European fighter aircraft. The lack of the US troops IV influencing the DV may be the result of US stationing of troops in those countries in general, with many states having similar values of deployed troops in their territories. The lacking impact of relative trade on procurement decisions is surprising. Given the strong economic bonds European states started forming in the aftermath of World War 2, it would not be unreasonable to assume *a priori* that a state's relative trade with the United States versus the European producers could have a negative association with American procurement decisions. However we see a positive, if statistically insignificant, relationship here. Other variables such as the domestic industrial capacity and the two network effect measurements were not statistically significant.

**Results**

| | Dependent Variable: |
| --- | --- |
| | Fighter Aircraft Origin |
| Cold_War0 | -0.440 |
| | (0.334) |
| Cold War1 | -0.059 |
| | (0.256) |
| NATO Member | 0.586*** |
| | (0.106) |
| EU Member0 | 0.660 |
| | (0.415) |
| EU Member1 | 0.626 |
| | (0.419) |
| Number Ordered | 0.001 |
| | (0.001) |
| Domestic Industrial Capacity | 0.069 |
| | (0.162) |
| Relative Arms Trade Dependence | 0.007 |
| | (0.033) |
| Relative Trade Dependence | 0.002 |
| | (0.044) |
| US Troops Stationed | 0.004 |
| | (0.041) |
| Observations | 142 |
| Log Likelihood | -29.096 |
| Akaike Inf. Crit. | 150.191 |
| *Note:* | $p<0.1$; ***$p<0.05$***; $p<0.01$ |

While procurement orders are made in a specific year, they are usually preceded by years of deliberations and possibly eliminating alternatives in the procurement competition. The different actors involved in placing the final order – government, parliament, armed forces, and interest groups – aim to advance their preferences in a process that observers call "the political economy of […] defense acquisition" (Gholz and Sapolsky 2020).[4] Since three of the variables in our model are time-series[5] it is, therefore, reasonable to account for this process by computing a 3-year version and a 5-year version of these variables which signify the year long process it takes from announcing a need to finalizing procurement (e.g. Finland's decision to procure the F-35 was announced in 2021 but it started its search in 2015).

We proceed by running a 3-year and a 5-year model and figures 2 and 3 show the models' summaries.

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[4] For reconstructions of the deliberations to procure fighter aircraft see for example: (Vucetic and Rydberg 2015; Hoeffler and Mérand 2016).
[5] Relative Arms Import Dependence; Relative Trade Dependence; US Troops Stationed

**Model 2: Results**

| | Dependent Varriable: |
| --- | --- |
| | Fighter Aircraft Origin |
| Cold War0 | -0.120 |
| | (0.279) |
| Cold War1 | -0.065 |
| | (0.206) |
| NATO Member | 0.364*** |
| | (0.093) |
| EU Member0 | 0.763** |
| | (0.340) |
| EU Member1 | 0.716** |
| | (0.340) |
| Number Ordered | 0.002 |
| | (0.001) |
| Domestic Industrial Capacity | -0.047 |
| | (0.131) |
| Relative Arms Import Dependence | 0.231*** |
| | (0.032) |
| Relative Trade Dependence | 0.008 |
| | (0.037) |
| US Troops Stationed | 0.001 |
| | (0.037) |
| Constant | -0.211 |
| | (0.392) |
| Observations | 141 |
| Log Likelihood | 2.152 |
| Akaike Inf. Crit. | 87.696 |
| Note: | $p<0.1$; **$p<0.05$**; $p<0.01$ |

**Model 3: Results**

| | Dependent Variable: |
| --- | --- |
| | Fighter Aircraft Origin |
| Cold War0 | -0.342 |
| | (0.281) |
| Cold War1 | 0.042 |
| | (0.181) |
| NATO Member | 0.350*** |
| | (0.092) |
| EU Member0 | 0.793** |
| | (0.331) |
| EU Member1 | 0.737** |
| | (0.331) |
| Number Ordered | 0.002 |
| | (0.001) |
| Domestic Industrial Capacity | -0.043 |
| | (0.129) |
| Relative Arms Import Dependence | 0.247*** |
| | (0.032) |
| Relative Trade Dependence | -0.021 |
| | (0.037) |
| US Troops Stationed | -0.007 |
| | (0.038) |
| Constant | 0.028 |
| | (0.529) |
| Observations | 141 |
| Log Likelihood | 5.159 |
| Akaike Inf. Crit. | 81.682 |
| Note: | $p<0.1$; **$p<0.05$**; $p<0.01$ |

For the 3-year model, NATO membership remains significant while the log odds decrease. Non-EU and EU membership achieve higher levels of significance. Most noteworthy here is that arms dependency on the United States turns to be significant. The same holds for the 5-year model. Whether this is predominantly due to the overall US dominance in the arms market or a more country-specific feature is an issue to delve into.

<u>Next Steps</u>

Given the current state of this paper we plan on taking the following steps. First, we are working on interpreting the two control variables for network effects in the Models 1-3 presented above. Introducing the variables surprisingly brought little value added to the models, with only one or two values being statistically significant in each model from the baseline out of more than 45. Furthermore, the two variables measuring network effects are almost perfectly correlated, creating issues of multicollinearity within the models. To remedy this situation additional data sources will be utilized to create additional measures. Second, we have not assessed H2 at this moment. We are working on statistical models that capture whether a procurement decision (or process) is a critical juncture in the subordination process. For these models, our dependent and

some independent variables of interest will switch positions. The causal chain will become slightly more complex and look like this: US hierarchy increases procurement decisions in favor of US aircraft, which in turn reinforces subordination to the United States. However, given constraints on space for journal submissions H2 may become its own paper.

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