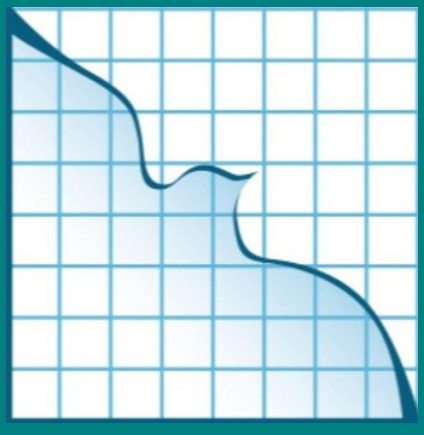
The Economics of Peace and Security Journal



The Economics of Peace and Security Journal — ISSN 1749-852X — http://www.EPSJournal.org.uk

THE ECONOMICS OF PEACE AND SECURITY JOURNAL

A journal of Economists for Peace and Security

Editorial Offices

EPS Publishing
Bristol
UK
Email: EPSJManagingEditor@EPSJournal.org.uk

ISSN 1749-852X

Aims and Scope

The Economics of Peace and Security Journal (EPSJ) addresses business and economic aspects of peace and security, ranging from the interpersonal and communal domains to transboundary and global affairs. Our scope includes all violent and nonviolent conflict affecting human and nonhuman life as well as their implications for our common habitat, Earth. Special attention is paid to constructive proposals for nonviolent conflict resolution and peacemaking. While open to noneconomic approaches, most contributions emphasize economic analysis of causes, consequences, and possible solutions to mitigate conflict and violence. Contributions are scholarly or practitioner-based. Written and edited to fit a general-interest style, EPSJ is aimed at specialist and nonspecialist readers alike, including scholars, policy analysts, policy and decisionmakers, national and international civil servants, members of the armed forces and of peacekeeping services, the business community, members of nongovernmental organizations and religious institutions, and any other interested parties. No responsibility for the views expressed by the authors in this journal is assumed by the editors, by EPS Publishing, or by Economists for Peace and Security.

Economists for Peace and Security

Economists for Peace and Security (EPS) is a network of affiliated organizations. Each is legally independent and determines its own membership criteria and activities. A group of prominent individuals serve as trustees for EPS. They are: Clark Abt, George Akerlof*, Oscar Arias*, Sheila Bair, Jason Furman, James K. Galbraith, Sir Richard Jolly, Richard Kaufman, Eric Maskin*, Daniel McFadden*, Roger Myerson*, George A. Papandreou, Robert Reich, Amartya Sen*, William Sharpe*, Robert Skidelsky, Robert M. Solow*, and Joseph E. Stiglitz*. Late trustees: Kenneth J. Arrow*, William J. Baumol, Barbara Bergmann, Andrew Brimmer, Robert Eisner, John Kenneth Galbraith, Sir Clive Granger*, Robert Heilbroner, Michael Intriligator, Walter Isard, Lawrence R. Klein*, Wassily Leontief*, Robert S. McNamara, Franco Modigliani*, Douglass C. North*, Thomas Schelling*, Robert J. Schwartz, Jan Tinbergen*, James Tobin*, and Dorrie Weiss. (*Nobel Laureate)

VOL. 19, NO. 1 (2024) – CONTENTS

ARTICLES

Sources of inefficiency in the procurement of major weapon systems. Estimates for the German case 5

MICHAEL BRZOSKA

Defense offsets and political leverage 23

JENNIFER SPINDEL

Does the intensity of protests induce terrorism? 40

DENIZ GÜVERCIN

ISSN 1749-852X

Sources of inefficiency in the procurement of major weapon systems. Estimates for the German case

Michael Brzoska

Michael Brzoska is Senior Research Fellow at the Institute for Peace Research and Security Policy at the University of Hamburg, Germany, and may best be reached at brzoksa@ifsh.de.

Abstract

The objective of this article is to provide a rough estimate of inefficiencies in German major weapons procurement. It is possible to derive estimates of procurement inefficiencies for 2022 programs—arising from a failure to exploit economies of scale, the complexity of co-production projects, cost overruns and time delays, and low weapon utilization rates. As the necessary data is only partly available to the public, these estimates rely on several assumptions and so are presented as ranges. This article identifies two main causes of symptoms of inefficiency in German major weapons procurement: (a) technological requirements beyond the reach of arms producers at the time decisions on procurements were made, and (b) protectionism, i.e. the favoring of national arms producers. Overall, it is estimated that German taxpayers could have been spared a least a third of total procurement costs had these inefficiencies been avoided.

The procurement of major weapons takes up a large share of military spending in many countries. NATO member states are committed to spending at least 20 percent of their military expenditures on major weapons. Germany decided on a major spending program of EUR 100bn over five years following the Russian invasion of Ukraine in early 2022. At the same time, weapon system procurement is prone to being wasteful. The objective of this article, which is based on a study prepared for Greenpeace Germany,[1] is to provide a rough estimate of the scale of the inefficiency manifested in the quantifiable aspects of recent German arms procurement.

The procurement of major weapons is a complex process, not least because it is driven by various, partly conflicting, interests and objectives. Armed forces seek systems that are on the cutting edge of the technological frontier, tailored to their specific national needs. Arms producers have an interest in expanding their sales through international competitiveness, but also in protecting their national markets through their governments. Politicians with political bases in locations where major arms are produced have an interest in bringing major procurement contracts to their constituencies. Those who focus on security policy will see a benefit in joint production with allies—an objective that is particularly strong among member states of the European Union. Procurement authorities exercise the utmost cautiousness in an environment marked by manifold legal requirements and political interference, leading to arduous and lengthy procurement processes.

The multitude of interests and objectives at stake in major weapons procurement can lead to technical inefficiency, defined as a failure to procure weapon systems of a desired quantity and quality with a minimum expenditure of resources. Secondary objectives beyond the primary goal of providing armed forces with appropriate weapons can lead to time delays, additional production costs, and poorly performing systems. From the taxpayer's perspective, such technical inefficiency has consequences for allocation—money could be saved, and thus put to other purposes, if procurement of major weapons were focused on providing armed forces with appropriate and functioning systems at the lowest possible cost, rather than pursuing various additional objectives.

Data on recent German major weapon procurements allow for rough estimates of the scale of inefficiencies

1 Brzoska (2022).

stemming from three major causes: a preference for nationally produced (or co-produced) arms; the imposition of specific national requirements on international co-production projects (the "Germanization" of weapon systems); and overcomplexity of major weapon systems. When it comes to the German armed forces' weapon system inventory, these are reflected in non-competitive pricing, cost overruns and time delays, and low utilization rates. Much insight for cost overruns and time delays can be gleaned from the available official German data—the causes of non-competitive pricing, which can roughly be quantified based on the available data, include a failure to exploit potential economies of scale and overly complex co-production programs. Beyond the official data, this article relies on a number of assumptions to arrive at ranges of estimates of additional costs stemming from these four symptoms of German procurement programs current in early 2022.

Within the constraints of the publicly available data and consequent necessary assumptions, difficulties associated with the complexity of both weapons production and the weapon systems procured by the German armed forces were the largest source of inefficiency for Germany. Another important source was inefficiencies stemming from the organization of production, including Germany's preference for national production and its willingness to enter into complex forms of co-production. Major savings could have been achieved with better economies of scale through pooling procurement with partners or buying from producers with long production runs. Additionally, large savings would have been achieved had they been satisfied with achievable levels of technological advancement.

Symptoms and sources of inefficiency

There are various ways to critically assess the efficiency of procurement processes. One is to focus on the weapon systems procured with a given budget and to analyze whether they are optimal with regard to the assigned functions of national armed forces.

Another way—one that avoids the thorny issue of measuring the degree to which procured weapon systems fulfil the assigned functions of national armed forces—is to consider efficiency in procurement from the angle of minimizing financial input for a given output: in this case, major weapon systems. Here, no attempt is made to assess weapon systems with respect to their quantity and quality; rather, it is assumed that procurement authorities order an optimal number of weapon systems for military preparedness. Even when this is assumed, however, inefficiencies can arise for a number of reasons, for example when:

- governments buy weapon systems at prices that are higher than they could have paid;
- procurement processes last longer than planned, with consequences for both military preparedness and costs (thanks to inflation during the procurement period and the additional cost of maintaining outdated weapon systems); and
- weapon systems that were considered optimal with respect to quality when procurement decisions were made, do not function as advertised—leading to additional costs associated with improving them or buying alternative systems.

Economies of scale

There are many reasons for the first symptom of inefficiency listed above (procurement prices being higher than could have been paid), such as not having an overview of the major weapon system market or corruption in the procurement process. Another reason—one that is discussed in more detail and assessed in quantitative terms below—is a failure to exploit economies of scale. Larger production runs generally lead to lower unit costs, and thus buying major weapons produced in larger quantities is likely to be cheaper than those of the same quality produced

Table 1: Protectionism in German arms procurement

Procurement from German sources (national "key technologies")	*Procurement from European cooperation or global sourcing*
Artificial intelligence	Air defense
Cryptography	Fixed wing aircraft
Electronic warfare technologies	Helicopters
IT communication hardware	IT communication hardware
Naval shipbuilding (surface and submarine)	Missiles
Networked operations control	NBC defense
Protected/armored vehicles	Small arms
Protection technologies	Unprotected vehicles
Security-relevant IT and communications technologies	
Sensorics	

Source: Bundesregierung (2020).

in smaller numbers. Procuring weapons from smaller production runs, when larger runs were possible, produces *economies of scale inefficiency*.

Why would procurement authorities forego the savings that could be achieved through larger production runs? In the German case,[2] several factors have led to economies of scale inefficiency in the recent past.[3] One is the objective of maintaining national arms production capabilities, implemented through protectionist measures. A second factor is the German armed forces' preference for weapon systems that are tailored to their specific requirements. As a consequence, the German armed forces have often lobbied for German-produced systems ("Germanisation") which differ from the weapon systems procured by other armed forces and thus do not come with the same cost-saving benefits as systems produced on a larger scale.

A further cause is the objective of fostering European arms co-production. Producing arms jointly with other European nations increases production runs beyond national production but is also often protectionist against the formidable U.S. market—and this particularly so because co-production introduces costs of its own. Much depends on how co-production is carried out. In many cases, it is similar to national production through "Germanization" and an insistence on *juste retour* in production shares, as discussed below.

The interest in protecting the German arms industry in procurement decisions and agreements with partners on German work-share in collaborative projects has several sources: from the self-interest of arms producers to regional politics, and the widespread assumption that even if one is militarily dependent on a military alliance (such as NATO), having a national arms industry is strategically important. While allowing protectionist interests to influence procurement decisions is logical from the perspective of certain interest groups—such as politicians who are politically tied to constituencies where major arms are produced—they result in economies of scale inefficiency when

2 For an overview of German arms production capacities and policies, see Brzoska (2019).
3 Following the Russian attack on Ukraine in February 2022, the German government authorized a major fast-track procurement program of EUR 100bn, which could not be served by the German arms industry in major areas, leading to several foreign purchases, including F-35 fighter aircraft and CH-47 Chinook helicopters from the United States.

ISSN 1749-852X

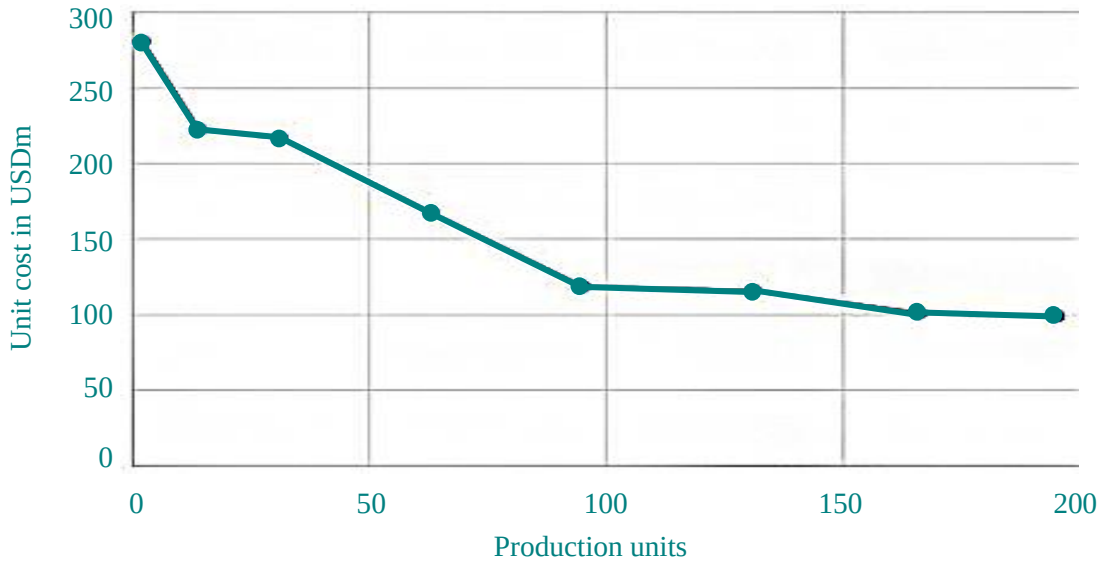


Figure 1: Learning cost curve for production batches of the F-35
Source: Arepally (2017).

comparable weapon systems with longer production runs could have been purchased.

The German government and the German arms industry have negotiated lists indicating which types of weapon systems should be reserved for production in Germany, those which ought to be procured from European sources, and which could be procured from anywhere. The last such list of "key technologies" was made public in 2021, when surface naval ships were added (see Table 1 above). Remarkably, the list includes both technologies that are widely seen as security sensitive, such as cryptography and IT communications hardware, and technologies that are not, such as armored vehicle production and shipbuilding. Interestingly, measured by exports to other countries, German producers are highly competitive in these two areas of arms production, indicating that the list may have been shaped by political lobbying power in addition to security concerns.

Even though exports of small and medium-sized submarines, surface naval ships, and tanks from Germany are sizeable, economies of scale obtained by German arms producers remain limited in these areas of arms production. They are much smaller in some other areas, particularly aerospace and electronics, where companies mainly have to rely on the German domestic market, which is small from a global perspective.[4] In many areas of military procurement, purchases from other countries are likely to be more cost efficient. The U.S. arms industry in particular has the potential to be more cost effective because of its technical proficiency, thanks to very high research and development expenditures and its generally longer production runs (due to the significant procurement spending for the U.S. armed forces and the United States' unparalleled levels of arms exports). Fixed costs, such as research and development expenditures and the cost of tooling production lines, can be distributed across a greater number of systems, resulting in lower unit costs. Furthermore, longer production runs imply cost savings through learning—this is particularly so for major weapon systems, which are typically produced in comparatively small numbers and so are more comparable to artisanal production than industrial production.[5] A typical example of a learning cost curve

4 Brzoska (2020).
5 Hartley (2008, 2013); Essig et al. (2016); Hogan (2020).

Vol. 19, No. 1 (2024) | doi:10.15355/epsj.19.1.5

is shown in Figure 1 for the F-35 Lightning Multirole Fighter, produced in the United States. Arepally (2017) calculated a learning rate of 15.5 percent, meaning that a doubling of the number of systems produced reduces unit costs per aircraft by this amount. Learning costs in the range of 10 to 15 percent are typical of the production of major weapon systems in many Western countries.[6]

Pooling demand

The basis for economies of scale is a strong demand for a particular weapon system. Among allied countries, demand beyond the requirements of one country is often created by "pooling" procurement projects. This requires countries to agree on common specifications for weapon systems and the timing of weapon acquisitions. Pooling, for instance in NATO, has proven a difficult undertaking due to armed forces' opposition to compromising on specifications and timelines and disagreement among governments about production sites and shares. This lack of pooling has long been identified as a source of financial waste in NATO.[7] Potential pooling cost savings from pooling have been estimated in a number of studies. Of special interest has been increased pooling among European NATO members and EU member states. Estimates for this range from about 10 percent to 30 percent of procurement costs,[8] with the rates growing with the number of states and the number of their requirements.[9]

Co-production

In Western Europe, agreements on pooling demand for weapon systems often require parallel agreements on the details of production. A general practice is to go by the principle of *juste retour*, i.e. the principle that national shares in production ought to equal countries' shares in the funding of a joint procurement program. Such arrangements tend to lead to technically inefficient production. The companies chosen to participate in co-production projects are often not the producers the main contractors would have chosen had they been able to choose freely—with additional, non-optimal costs related to logistics and coordination among producers. In some cases, participation in co-production projects is primarily motivated by the goal of involving national producers (in order to generate employment or gain technical skills) rather than an interest in pooling. All this adds to the cost of weapon systems produced through co-production agreements compared to the cost of weapon systems produced through the use of a prime contractor.[10]

Co-production projects generally result in the provision of largely identical weapon systems for all partners. When the participating countries insist on specific requirements, however, this results in the production of widely different varieties of a common weapon platform. This further limits the savings that could have been obtained from pooling and exploiting economies of scale. An example is the Tiger attack helicopter, which was co-produced in widely different versions for the French and the German armed forces. Because of high costs and major time delays, in 2003 Germany finally cancelled its further participation in the program, which had been running for more than two decades.[11]

Cost overruns and time delays

A second symptom of inefficient procurement is cost overruns and time delays, i.e. departures from the costs and timelines originally agreed by procurement authorities and arms producers. These have been a regular feature of many large German procurement programs since the end of the Cold War.[12] A major source of cost overruns and

6 Hartley (2013); NATO (2015); Essig et al. (2016).
7 NATO (2015).
8 Küchle (2006); Wolf (2015).
9 Ballester (2013); Briani (2013); European Commission (2013, 2017).
10 Hartley (2008, 2016).
11 ESUT (2023).
12 Brzoska (2022).

time delays is overly demanding performance requirements imposed by armed forces, which are often stimulated (or at least tolerated) by arms producers. The willingness of arms producers to contract technological advances that they have yet to achieve is often based on a hope for technology gains funded by the procuring governments. Once such programs begin, governments are locked in and must generally agree to provide additional funds beyond the amounts initially required to cover the costs of trying to achieve promised benchmarks.

Another important source of cost overruns and time delays are changes to design and detail requirements made by armed forces during the procurement process. While in some cases these are small and easy to accommodate, in others they are major. As procurement programs often run over many years, such changes make sense as military technologies advance and the needs of armed forces change. However, this process often involves a catch 22: changes to design and detail lengthen procurement time, which in turn increases the likelihood of changes to design and detail.

Cost overruns and time delays are interrelated. Difficulties in meeting requirements and unplanned design changes will directly increase costs, and, indirectly, through the additional time it takes to produce the weapon system. At least in the German case, procurement contracts include inflation provisions, but the funds allocated to projects at the time of authorization only cover costs for the agreed procurement periods. Production beyond the agreed procurement timescale will be more expensive because of the longer inflationary period.[13]

Time delays are also likely to lead to additional costs beyond price inflation. Older weapon systems, which are often expensive to maintain, may need to be kept in service longer than planned, and stop-gap measures such as the interim procurement of alternative weapon systems may have to be adopted.[14]

Utilization rates

Once delivered to purchasing armed forces, weapon systems should be ready for use. When it comes to highly technologically advanced or overly demanding procurement programs, however, this is often not the case. Ideally, initial problems should be fixed in a timely manner. Weapon system utilization rates, defined as the share of fully operational weapon systems in the total number of weapon systems nominally held by the armed forces,[15] will rarely approach 100 percent, as systems often need to be in maintenance or are not fully operational because of a lack of trained personnel. However, low utilization rates are an indicator of bad procurement decisions and inefficiency with respect to spending procurement funds.

The German armed forces have had to cope with very low utilization rates when it comes to newly introduced weapon systems, such as various types of helicopters, but also ships and armored vehicles. Furthermore, there have been low utilization rates for weapons that have already been in service for some time, due to major technical problems or a lack of spare parts and trained personnel. The defense ministry and the German armed forces have launched several initiatives over the years to bring major weapon system utilization rates up to a considered acceptable level of 70 percent. These have been met with some success, but utilization rates for several weapon systems in the German armed forces have remained below this benchmark.[16]

Summary of symptoms and sources of inefficiency

Inefficiency in weapons procurement has a number of sources. Prominent among these in the context of Germany is a preference for involving German producers, either by procuring nationally or by insisting on *juste retour* in co-production projects. Political support for national producers is mostly driven by the regional economic interests of

13 Essig et al. (2016); (Wolf 2015).
14 Hartley (2020).
15 This is the definition used in this article. It corresponds to what is reported by the German Ministry of Defense in its reports (BMVg 2017a, 2019-2021a). Weapon systems procured by the armed forces but not currently in their possession because they are in maintenance with private companies are not considered.
16 BMVg (2021a).

parliamentarians but also stems from the perceived security benefits of maintaining a German arms industry. Lobbying by national arms producers majorly supports such perceptions.[17]

Another important source of inefficiency is the imposition of overly demanding requirements. Often, these aim at technological advancements near or beyond the capabilities of arms producers. While there is a case to be made for insisting on modern weapon systems, the additional costs of minor technological improvements often do not make operational sense. An insistence on weapon systems that are specifically tailored to an armed forces' preferences also limits the efficiencies that could otherwise be derived from the pooling of procurement.

Inefficiencies are also a feature of the way in which many co-production programs are organized. The German government is committed to increasing co-production in Europe but, along with its partners, has often been unable or unwilling to organize co-production efficiently. The weapon systems produced for the various partners in co-production programs often differ, sometimes substantially, and an insistence on distributing production shares according to shares in financing adds additional costs to production, beyond those resulting from the coordination of partners from various countries.

Data on German major weapons programs

Data on program cost, cost overruns, and time overruns

There is a long tradition of criticism of German major weapons procurement, and of procurement reforms, that mostly focuses on the bureaucracy surrounding procurement. In both the wider public and policy circles in Berlin, however, the general impression is that things got worse in the early 2000s, which saw projects with large cost overruns (such as the A400M transport plane) and costly weapon systems with major technical problems (such as the K-130 class corvettes).

When Ursula von der Leyen became Germany's first female Minister of Defense in 2013, she initiated another major attempt at procurement reform. Numerous outside business consultants were hired.[18] Lack of transparency in procurement processes was identified as a major source of inefficiency. The Defense Ministry decided to increase both the level of inhouse control over procurement processes and the level of publicly available information on procurement programs.

The Ministry of Defense began to publish biannual *Rüstungsberichte* in 2015.[19] In addition to a general discussion on the state of procurement and procurement reforms, these reports contain data on cost overruns and time delays in major weapon system procurement processes. Both the base data on weapon systems and the degree of information has changed over time, with less and less data made available to the public. Since 2018, the reports have been divided into two parts, with only the first part, containing general information and data on certain weapon systems, available to the general public.

The weapon systems included in the *Rüstungsberichte* differ among the biannual reports. Some projects are closed, and no further data is provided. New programs are included at the time they are appropriated by the German Bundestag. Furthermore, the scope of the reports has shifted, with later reports only covering very large programs, whereas earlier ones included a wider spectrum of weapon systems.

Changes in reporting and publication practices limit the usefulness of comparisons over time. Still, the available data suggest that both time delays and cost overruns have plagued procurement projects at similar rates from 2015 to

17 Brzoska (2019).
18 High expenditures for both business consultants and contract procedures led to major criticism, resulting in a special parliamentary investigation that found a good number of irregularities.
19 The reports can be found on the Website of the Ministry of Defense, www.bmvg.de/de/themen/ruestung/ruestungsmanagement/ruestungsbericht

Table 2: Aggregate data on German major weapon procurement programs, aggregated by production type

	Program costs, in EUR bn	*Program costs as a percentage of total*	*Additional costs as a percentage of original procurement costs*	*Average time delay over first parliamentary approval, in years*
Foreign direct purchases	2	3%	12%	-0.3
Simple co-production	15	23%	21%	8.2
Complex co-production	31	50%	26%	4.7
National production	15	24%	16%	3.1
Total	**62**	**100%**	**19%**	**4.6**

Note: Programs current in early 2022.
Source: Appendix A, author's own estimate based on information in BMVg 2019-2021.

at least 2022 (the latest report available at the time of writing). This period saw a mixture of programs that were on time and within planned costs and those that experienced significant time delays and cost overruns (such as the A400M).

The analysis that follows in the next section is based on the detailed data on original program costs (at the time of first parliamentary approval), as well as cost overruns and time delays in major weapon system procurement processes in early 2022 (see Appendix A for details). This base data has been aggregated into four categories of "production types" (see Table 2) and used for the estimation of inefficiencies in later sections—the rationale being based on the sources of inefficiency discussed earlier in this article. National procurement and production in Germany tend to result in small production runs, while purchases of complete weapon systems from producers outside of Germany, with or without procurement pooling, are generally made from large production runs.

Weapons procured from arrangements, involving both pooling and co-production, have been divided into two categories: complex and simple co-production. In complex co-production, the procured weapon systems differ significantly from partner to partner. While the basic designs are identical, this implies major additional design and production inputs to satisfy national requirements. The cost savings from procurement pooling are largely or even fully outweighed by the additional costs of production. In simple co-production, by contrast, the weapon systems procured by the partners are largely identical or feature only small national modifications. The categorization of co-productions was made by examining the characteristics of weapon systems in the inventories of participating partner countries.[20]

The data shows major differences with respect to shares in total procurement, time delays, and cost overruns among the four production types. Measured by current program costs (original program costs plus cost overruns by 2022), co-production projects with partners had the largest share among procurement programs—50 percent for complex co-production and 23 percent for simple co-production. The high share for complex co-production stems primarily from some joint programs for aircraft, including Eurofighter and Tiger helicopters.

Measured in relation to original program appropriations by the German Bundestag, complex co-production projects saw the greatest cost overruns among the four categories, while simple co-production projects had the longest

20 Brzoska (2022).

Table 3: Major weapon system utilization rates in the German armed forces

	Air force	*Navy*	*Army*	*Average*
Average major weapon system utilization rates, 2017	60%	49%	51%	54%

Reported utilization rates by lifetime phase	*Introductory and growth phase*	*Ripeness phase*	*Saturation and degeneration phase*
Complex co-production	<40%	>70%	<50%
National production	70% / 79%	75% / 75%	<60% / 69%
Total	**85%**	**77%**	**65%**

Source: BMVg (2017a, 2019a-2021a)

time delays on average. Purely national procurement and production, with a share of 23 percent of the procured weapon systems included in the analysis, had lower cost overruns and time delays than co-production.[21] Purchases from foreign producers, which were the least important for German procurement (measured by contract value), had the fewest problems with cost overruns. On average, weapon systems were even delivered earlier than originally foreseen. These lower cost overruns and time delays can likely be explained by the fact that systems were already in production when the German parliament first authorized procurement.

Weapon system utilization rates

Another series of reports, *Berichte zu Rüstung und materieller Einsatzbereitschaft der Bundeswehr*, which were at least partly publicly available between 2017 and 2021, discuss and report on the use of major weapon systems in the German armed forces. Reporting has, however, been uneven and inconsistent over time.[22]

The earliest versions of the reports list and explain utilization rates for all major weapon systems (*Hauptwaffensysteme*). After 2017, however, the published reports no longer contain information by weapon system. Instead, information is aggregated according to the "lifetime phase" of the weapon system in question, distinguishing between an introductory and growth phase, a ripeness phase, and a saturation and degeneration phase. Furthermore, the scope of the weapon systems included in the reports has been expanded beyond major weapon systems. As no details on the inclusion and exclusion of weapon systems are provided, it is difficult to compare utilization rates over time.

Table 3 contains both information from the aggregation of the detailed data in the report for 2017 and data by lifetime phase contained in later reports. While reported average utilization rates have substantially improved, it is unclear how much of this is due to actual improvements and how much to the inclusion of a wider range of weapons than in the 2017 report. These improvements notwithstanding, a good number of weapon systems still fall short of the German armed forces' 70 percent goal. In late 2021, the average utilization rate for 71 weapon systems was 77 percent, with 33 below 70 percent, and 11 (mostly older weapon systems) below 50 percent.[23]

21 Weapon system types are not evenly distributed over production types (Appendix A, Table A1). National production mainly concerns shipbuilding, while in both co-production and foreign purchases aircraft programs dominate.
22 BMVG (2017a, 2019-2021a).
23 BMVg (2021a, p. 4).

Estimates of potential cost savings through more efficient procurement

Failure to profit from economies of scale

A first source of inefficiency considered here is going it alone in procurement and production when buying directly from foreign sources or where procurement pooling with allies was an option. The assumption made in the following section is that buying from foreign sources, or as a partner in pooling, allows buyers to profit from longer production runs (with its associated learning cost savings) compared with going it alone.

A standard formula for a simple learning cost function is:

$$C_n = C_1 n^b, \text{ with } b= (\ln(l/100)/\ln 2)$$

C_n is the cost of the nth weapon system, C_1 the cost of the first system, and l the learning rate.

The total cost of the production P of a batch of weapon systems, from the first to the nth weapon system, can be calculated (using Wright's formula) as:

$$P_n = C_1 n^{b+1}$$

since n times $n^b = n^{b+1}$.

Table 4: Model calculation, savings from larger procurement runs

Number of buyers	*1*	*2*	*3*
Number of systems per buyer	200	200	200
Total production run	200	400	600
Unit cost	10.0	8.5	7.7
Procurement cost per buyer of 200 units	2000	1700	1546
Savings for buyer 1 compared to being sole buyer	0%	-15%	-23%
Total	**62**	**100%**	**19%**

Note: Calculated with a learning rate of 15 percent.

There are clearly major differences between weapon systems. As indicated above in Section 2.2, learning costs are generally assumed to be quite high in defense procurement. This is illustrated in Table 4 for a very simple case with a learning rate of 15 percent. The doubling of units of production reduces the unit cost of weapon systems by 15 percent, and the tripling of production by 23 percent.

Estimating the potential savings that could be achieved by better exploiting economies of scale through foreign purchases or a larger degree of pooling is more difficult. To be reliable, such an estimate would require very detailed data on the requirements of both the German armed forces and potential partners for pooling, and the availability and prices of the weapon systems needed to fulfil these requirements.

Table 5 provides a very rough estimate based on two extreme sets of assumptions but using the actual data for German procurement reported in Table 2 and a learning cost rate of 15 percent. *Assumption (a)* is that larger production runs could only have been exploited in those cases where procurement and production were national. In this case, it is assumed that purchases from production runs twice the size of the national German procurement could have been made. This would have resulted in procurement costs that were 15 percent lower than the cost of procuring and producing nationally. *Assumption (b)* is that savings from learning costs were available but not exploited for all categories of procurement except foreign direct purchases. Furthermore, a doubling of production runs was assumed for both types of co-production, and a tripling of production runs for national procurement and production. The last row in Table 5 gives the range of potential savings for German procurement using these two extreme assumptions.

Table 5: Estimate of potential savings for German procurement projects through the better use of economies of scale

	Program costs, in EUR bn	*Percent savings with assumption (a)*	*Percent savings with assumption (b)*	*Range of savings, in EUR bn*
Foreign direct purchases	2	0	0	0
Simple co-production (largely identical weapon systems)	15	0	-15%	0 – 2.3
Complex co-production (weapon systems with substantial national differences)	31	0	-15%	0 – 4.7
National production	15	-15%	-23%	2.3 – 3.5
Total	**62**	**4%**	**17%**	**2.3 – 10.4**

Reducing the complexity of co-production

A second source of inefficiency is briefly discussed in section *Co-production* above. Due to its high share in German procurement, complex co-production is of major importance. An often-used assumption for co-production is that costs grow with the square root of the number of partners S.[24] The co-production cost of a batch of weapon systems (V_n) can then be calculated as:

$$V_n = P_n S^{1/2}$$

with P_n as the production costs of a single producer.

However, a distinction should be drawn between co-production in which more-or-less identical weapons are produced and co-production where the final products differ substantially. In the standard formula for co-production, the additional costs of co-production apply to all production costs, including the fixed costs of developing weapon systems, tooling, etc. This may be overly pessimistic with respect to the additional costs associated with co-producing weapon systems that are basically identical for all partners.

This is captured here insofar as the co-production factor is only applied to the variable costs of production C_V, but not the fixed costs C_F:

$$J_n = C_F + C_V S^{1/2}$$

Where the fixed costs are substantial, simple co-production can provide major cost savings compared to complex co-production. Unfortunately, data on the share of fixed costs in major German procurement programs is limited to data on research and development costs. These range between 20 and 40 percent of procurement program costs.

Again, a reliable estimate for the German case would require data on costs within various co-production programs that are not publicly available. Still, the potential range of savings through avoiding complex co-production projects in favor of co-producing largely identical weapon systems can be estimated. This is done in Table 6 by using two extreme alternatives, and by assuming that the number of partners was 2.5 and that fixed costs were 30 percent of

24 Hartley and Braddon (2014); Ford (2015).

Table 6: Estimate of potential savings for German procurement projects from less complex co-production

	Program costs, in EUR bn	*Percent savings with assumption (a)*	*Percent savings with assumption (b)*	*Range of savings, in EUR bn*
Complex co-production (weapon systems with substantial national differences)	2	0	0	0
Total	**62**	**12%**	**17%**	**7.6 – 11.4**

production costs. One alternative, *assumption (a)*, is that the actual procurement programs involved simple rather than complex co-production, avoiding the additional fixed costs associated with adapting systems to national specifications. The other alternative, *assumption (b)*, is that an identical number of weapon systems was produced without the cost increases typical of complex co-production—that is, the costs associated with largely different weapon systems and *juste retour*—thus avoiding both the additional costs associated with having more than one production partner and additional fixed costs related to national differences.

Estimating cost overruns and time delays

Further symptoms of inefficiency were identified in section *Cost overruns and time delays* above. Data from the German Defense Ministry on cost overruns and aggregated by weapon category in Table 2 are reported in column 1 of Table 7.

However, not all cost overruns and time delays can be attributed to technical inefficiency in weapons procurement. Some of the additional costs and time delays are due to requests for technical improvements coming from the armed forces within procurement processes and/or suggestions for such improvements that come from the industry and are accepted by procurement authorities. Very little quantitative information is available on the sources of cost escalation and program time delays. However, it can be assumed from the verbal reporting in the *Rüstungsberichte* that such improvements are a regular feature of procurement processes, which generally run over many years. It is assumed here that about 20 percent of reported cost overruns of the funds originally appropriated by the German Bundestag is due to such improvements, here called “innovation share”. Corresponding data is reported in column 2 of Table 7.

Cost overruns and time delays are interrelated,[25] however it makes sense to consider them separately. The estimates using data on cost overruns and time delays will be different but should indicate the range of inefficiency resulting from them.

A first estimate of additional costs from time delays AT ignores improvements in weapon systems over time. Here, it is calculated similar to a linear depreciation over the lifetime t_l of a weapon system, with t_d standing for time delay and P_o for original program costs:

$$AT = P_o (t_d / t_l)$$

Results using data by category for program costs and time delays reported in Table 2 are reported in column 3 of Table 7, using the additional simplifying assumption of an average lifetime of 40 years for all categories of weapon systems.

A second estimate for time overruns, reported in column 4 of Table 7, considers improvements during the procurement process. Such improvements reduce the inefficiency inherent in time delays.

25 See the above section Cost overruns and time delays.

Table 7: Estimates of cost overruns and time delays for German major weapons

	Cost overruns without innovation share, in EUR bn	*Cost overruns with 20 percent innovation share, in EUR bn*	*Costs of time delays without innovation share, in EUR bn*	*Cost of time delays with innovation share of 5 percent per year, in EUR bn*	*Range of estimates, in EUR bn*
Foreign direct purchases	0.2	0.2	0.0		0 – 0.2
Simple co-production	2.6	2.1	2.5	1.5	1.5 – 2.6
Complex co-production	6.4	5.1	2.9	2.2	2.2 – 6.4
National production	2.1	1.7	1.0	0.8	0.8 – 2.1
Total	**11.3**	**9.0**	**6.4**	**4.5**	**4.5 – 11.3**

Note: Data as of early 2022.
Source: Calculated from BMVg (2019-2021); programs listed in Appendix A.

It is assumed here that the innovation share X_t grows over time, as potential technical improvements become available during the procurement process:

$$AT= P_o (t_d)/40) (1-X_t* t_d)$$

For the numbers in column 4 of Table 7, it is assumed that X_t takes the value of 5 percent per year for all weapon categories, corresponding to the overall innovation share of 20 percent used for the calculation of cost overruns.

Estimating low utilization rates

A final source of inefficiency in procurement considered here is the low utilization rate recorded for many of the major weapons newly introduced into the German armed forces (reported on in the section *Weapon system utilization rates* above).

The costs from low utilization rates, CU, are here conceived of in terms of lost time—i.e. the period over which a weapon system could have been in use but was not—or, put differently, the cost of not having a functioning weapon system that has been paid for with procurement funds.

For rough estimation, the cost of low utilization rates is calculated as the difference between the actual utilization rate U_w and what is seen as an acceptable utilization rate U_a. As per the German Ministry of Defense, U_a is set at 70 per cent. The difference in utilization rates is multiplied by the value of the relevant weapon system in the German armed forces:

$$CU= (U_a - U_{w)} * V$$

V is estimated by using data on the number of weapon systems in the inventory of the German Bundeswehr with an estimated unit price, both based on data contained in the *Rüstungsberichte*. The price estimate takes into account the age of the individual systems (for details, see Appendix B).

Two calculations of utilization rates are reported in Table 8. Both are based on data from the official reports on

Table 8: Estimated cost of low major weapon system utilization rates

	Average utilization rates for weapon categories	*Estimated value of systems in Bundeswehr, in EUR bn*	*Value of non-usable units, in EUR bn*
Estimate 1: Based on data for 2017			
Army	*60*	*7.5*	*2.0*
Navy	*49*	*4.6*	*0.9*
Air force	*51*	*16.9*	*5.3*
Total/average	***54***	***29.0***	***8.1***
Estimate 2: 2017 data with 15 % improvement in utilization rate	0.2	0.2	0.0
Army	75	7.5	0.9
Navy	64	4.6	0.5
Air force	66	16.9	2.1
Total/average	**69**	**29.0**	**3.5**

Source: BMVg (2017a); Appendix B.

utilization rates published by the German Ministry of Defense.[26] Only systems with utilization rates below 70 percent are considered. Because the data are reported by armed service in the official reports, this is also done here for illustrative purposes. Actual calculations, however, were performed by individual weapon system covered in Appendix B.

The first estimate reported in Table 8 is based on the detailed data contained in the 2017 report on the availability of weapon systems.[27] The second is a rough estimate based on the assumption that utilization rates increased substantially in later years, as indicated in later, less detailed reports on utilization rates.[28] The improvement in utilization rates after 2017 is estimated at 15 percent. For the second estimate of the cost of low utilization, the detailed data for weapon systems reported in 2017 is recalculated with this improvement in utilization rates for all weapon systems with utilization below 70 percent.[29]

Summary

Table 9 summarizes the results of the four earlier rough estimates of inefficiencies, with low and high estimates reported in Tables 5 to 8.

All four inefficiencies are substantial. While it is tempting to add up the four estimates, there are obvious overlaps, particularly between complex co-production on the one hand and cost overruns and time delays on the other. However, even if we only consider one of these two categories, the total cost inefficiency estimated here ranges from more than EUR 10bn to almost EUR 30bn, corresponding to between 16 percent and 48 percent of procurement costs

26 BMVg (2017a, 2019a-2021a).
27 BMVg (2017a).
28 BMVg (2019a, 2021a); See also Table 3.
29 BMVg (2017a).

ISSN 1749-852X

Table 9: Summary of estimated procurement inefficiencies

	Low estimate, in EUR bn	*High estimate, in EUR bn*
Limited economies of scale (Table 5)	*2.3*	*10.4*
Unwarranted complex co-production (Table 6)	*7.6*	*11.4*
Cost overruns and time delays (Table 7)	*4.5*	*11.3*
Low major weapon system utilization rates (Table 8)	*3.5*	*8.1*

(totaling EUR 62bn) for the procurement programs included in the analysis.

The estimates allow for a comparison of the inefficiencies discussed in this article. A failure to fully exploit economies of scale through foreign purchases and the joint pooling of procurement with partners turns out to be a lesser source of inefficiency in German arms procurement than complex co-production, cost overruns and time delays, and low utilization rates. Clearly, these results are dependent on the various assumptions made for the estimates reported above, including concerning the additional costs of co-production and the possibility of making better use of economies of scale. To arrive at more reliable estimates, additional data on weapon systems procured by the German armed forces would need to be made publicly available. This article had to rely on plausible assumptions, some of which were based on information obtained in the broader literature on weapons procurement.

Seen in a broader light, the analysis suggests that difficulties associated with the complexity of both weapons production and the weapon systems procured by the German armed forces were the largest source of inefficiency for Germany (at least during the period until early 2022 covered here). Another important source was inefficiencies stemming from the organization of production, including Germany's preference for national production and its willingness to enter into complex forms of co-production. Major savings could have been achieved had decision-makers been willing to better exploit potential economies of scale through pooling procurement with partners or buying from producers with long production runs (rather than insisting on their own specifications). Additionally, large savings would have been achieved had they been satisfied with achievable levels of technological advancement rather than aiming far beyond the capabilities of national arms producers and partners in co-production projects.

References

Arepally, S. 2017. Riding the Experience Curve, *Army AL&T Magazine*, July-September, pp. 19–24.

Ballester, B. 2013. *The Cost of Non-Europe in Common Security and Defence Policy*. Available at: https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/494466/IPOL-JOIN_ET%282013%29494466_EN.pdf (Accessed: 10 March 2024).

BMVg (2018-2021). *8.–14. Bericht des Bundesministeriums der Verteidigung zu Rüstungsangelegenheiten*. Available at: https://www.bmvg.de/de/themen/ruestung/ruestungsmanagement/ruestungsbericht (Accessed: 10 March 2024).

BMVg (2017a, 2019-2021a). *Bericht zur materiellen Einsatzbereitschaft der Hauptwaffensysteme*. Available at: https://www.bmvg.de/de/themen/ruestung/ruestungsmanagement/ruestungsbericht (Accessed: 10 March 2024).

Briani, V. 2013. *The Costs of non-Europe in the Defence Field*. Roma: Instituto Affari Internazionali.

Brzoska, M. 2019. Germany. *The Economics of the Global Defence Industry*. London: Routledge, pp. 194–214. https://doi.org/10.4324/9780429466793-9

Brzoska, M. 2022. *It's not the money, stupid! Die Hauptprobleme im Beschaffungswesen der Bundeswehr*. Hamburg: Greenpeace Germany.

Bundesregierung 2020. *Strategiepapier der Bundesregierung zur Stärkung der Sicherheits- und Verteidigungsindustrie*. Available at: https://www.bmwi.de/Redaktion/DE/Downloads/S-T/strategiepapier-staerkung-sicherits-und-verteidigungsindustrie.pdf?__blob=publicationFile&v=4 (Accessed: 3 October 2023).

Essig, M., A. H. Glas und S. Mondry. 2016. A Cost Increase Analysis of Weapon Systems Using the Paasche Index: Cases from the German Bundeswehr. *Journal of Military Studies*, 3(1), pp. 1–30.

https://doi.org/10.1515/jms-2016-0181
ESUT (2023). *German Tiger Attack Helicopters Are Not To Be Modernized*. Available at: esut.de/en/2023/05/meldungen/42027/deutsche-tiger-kampfhubschrauber-sollen-nicht-modernisiert-werden/ (Accessed: 3 October 2023).
European Commission (2013). *Commission Communication on 'Towards a More Competitive and Efficient Defence and Security Sector*. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52013DC0542 (Accessed: 10 March 2024).
European Commission (2017). *Defending Europe. The Case for Greater EU Cooperation on Security and Defence*. Available at: https://commission.europa.eu/system/files/2017-06/defending-europe-factsheet_en.pdf (Accessed: 3 October 2023).
Ford, R. 2015. *Understanding the cost of cooperation*. Available at: https://www.frstrategie.org/en/publications/defense-et-industries/understanding-cost-cooperating-2015 (accessed: 10 March 2024).
Hartley. K. 2008. Collaboration and European Defence Industrial Policy. *Defence and Peace Economics*, 19(4), pp. 303–315. https://doi.org/10.1080/10242690802221585
Hartley, K. 2013. The Economics of Smart Defense. *Connections*, 12(3), pp. 1–8. https://doi.org/10.11610/Connections.12.3.01
Hartley, K. 2016. *The Economics of European Defence*. Available at: https://www.iris-france.org/wp-content/uploads/2016/12/ARESGroup-Economics_of_European-Defence-d%C3%A9c2016.pdf (Accessed: 10 March 2024).
Hartley. K. 2020. Rising Costs: Augustine Revisited. *Defence and Peace Economics*, 31(4), pp. 434–442. https://doi.org/10.1080/10242694.2020.1725849
Hartley, K and D. Braddon. 2014. Collaborative projects and the number of partner nations. *Defence and Peace Economics*, 25(5), pp. 535–548. https://doi.org/10.1080/10242694.2014.886434
Hogan, D. W. 2020. *An Analysis of Learning Curve Theory and Diminishing Rates of Learning*. Available at: https://scholar.afit.edu/etd/3607/ (Accessed: 3 October 2023).
Küchle, H. 2006. *The cost of non-Europe in the area of security and defence*. Available at: https://www.bicc.de/publications/publicationpage/publication/the-cost-of-non-europe-in-the-area-of-security-and-defence-study-for-the-european-parliament-288/ (Accessed: 3 October 2023).
NATO (2015). *Cost Efficiency Implications of International Cooperation.* Available at*:* https://www.sto.nato.int/$$TR-SAS-090-ALL (Accessed: 3 October 2023).

Appendix A: Base data for German major weapon procurement projects current in early 2022

Table A1: Base data for German major weapon procurement projects current in early 2022

	System type	*Procurement costs for Germany as of early 2022, in EUR m*	*Additional costs since parliamentary procurement decision, in EUR m*	*Time delay over parliamentary decision, in years*
Foreign purchases				
C-130J	Transport aircraft	1,025	82	-0.3
CH-53G	Helicopter	638	102	0
Sum/ Average		1,663	184	-0.2
Simple co-production				
A400M with DIRCM	Transport aircraft	9,039	1,627	13.5
NH90 TTH	Helicopter	4,153	1,329	11.2
NH90 NTH	Helicopter	1,100	55	0.0
AESA Radar	Radar	341	92	0
Sum/ Average		14,633	3,103	8.2
Complex co-production				
KH TIGER	Helicopter	4,143	953	6.7
Eurofighter with AESA	Fighter aircraft	26,938	7,812	2.8
Sum/ Average		31,081	8,765	4.7
National production				
F125	Frigate	2,190	1,117	5.8
K130 2. Los	Corvette	2,392	311	0.8
F126	Frigate	4,800	96	0.0
Puma	Armoured personnel carrier	4,975	1,393	5.8
SVFuA	Communication system	164	46	0
TanDEM-X	Satellite system	483	-116	0
Sum/ Average		15,005	2,847	3.1
Total sum/ average		**62,382**	**14,899**	**4.6**

Appendix B: Data for estimating the costs of low major weapon system utilization rates in the German Bundeswehr, 2017

Table B1: Costs of low major weapon system utilization rates in the German Bundeswehr, 2017

	System Type	*Utilization rate,in %*	*Number of weapon systems in Bundeswehr inventory*	*Estimated unit cost of weapon system, in EUR m*	*Estimated total value of system in Bundeswehr inventory, in EUR m*	*Estimated value of non-usable units in inventory, in EUR m*
Army systems						
Leopard 2	Main Battle Tank	60	176	15.0	2,640	377
Boxer	APC	65	167	3.0	501	36
Marder	Light Tank	66	319	1.0	319	18
Puma	Light Tank	43	112	6.0	672	259
Fuchs	APC	77	684	1.0	684	n.a.
Fennek	APC	77	180	1.6	288	n.a.
PzH 2000	Howitzer	56	75	1.6	120	24
MARS II	Rocket thrower	67	15	2.0	30	1
Tiger	Helicopter	31	39	57.0	2,223	1,239
Average/Sum		***60***			***7,477***	***1,954***
Navy Systems						
Klasse 122/123/124	Frigate	83	6	300	1,800	n.a.
Klasse 212A	Submarine	32	2	500	1,000	543
Sea Lynx	Helicopter	32	18	12	216	117
Klasse 130	Corvette	75	4	300	1,200	n.a.
P-3C Orion	Maritime Surveillance Aircraft	41	5	12	60	25
Sea King	Helicopter	31	16	22	352	196
Average/Sum		***49***			***4,628***	***881***
Air Force Systems						
Transall	Transport aircraft	68	25	20	500	14
A400M	Transport aircraft	38	8	175	1,400	640
MRCA Tornado	Fighter aircraft	41	26	100	2,600	1,077
CH-53	Helicopter	40	40	30	1,200	514
Eurofighter	Fighter aircraft	48	81	120	9,720	3,055
Patriot	Air defense system	70	10	150	1,500	0
Average/Sum		***51***			***16,920***	***5300***

Note: Sorted by military service, value of non-usable units calculated on the basis of an acceptable utilization rate of 70 percent

Defense offsets and political leverage

Jennifer Spindel

Jennifer Spindel is assistant professor of political science at the University of New Hampshire in Durham, New Hampshire, USA. She may best be reached at jennifer.spindel@unh.edu.

Abstract

Why do states agree to offset provisions when they purchase weapons, and what are the consequences of different types of offsets? This article takes a network approach to understanding the causes and consequences of offsets in the arms trade. It argues that offset clauses create network ties that affect a state's position and power in the global arms production network. This depends on the type of offset it pursues—only a small subset of states with advanced technological manufacturing capabilities can maintain a central and powerful position by leveraging direct offsets. Other states must pursue indirect offsets, which have the opposite effect and keep these states locked into peripheral positions of limited power. Through case studies of offset use in India and Malaysia, this article shows how difficult it is to achieve network interdependence (India), and the difficulties of using indirect offsets to achieve political goals (Malaysia).

In 2019, Turkey stunned its NATO allies by purchasing the Russian-made S-400 air defense system. While Turkey wanted air defense systems, it was equally interested in gaining access to technology and information that would benefit its domestic defense manufacturing. Turkey explained that non-NATO suppliers were more willing than NATO partners to transfer the technological knowhow that would help Turkey boost its indigenous defense production capabilities.[1] Turkey's desire to get more than just the weapon from arms purchases is not unique (in this case, technology and information). States have long been interested in countertrade and offsets through weapons procurement contracts. While most states are interested in the transfer of technology, states are increasingly looking at non-defense offsets when they buy arms. While non-defense offsets are not new,[2] states are being more systematic and thoughtful about their use of this type of offset. For example, Malaysia negotiated PhD placements in the U.K. when buying arms from British suppliers, so that Malaysian students would be able to return home with greater technical knowledge. It is clear that sales of major conventional weapons are more complicated and nuanced than a simple exchange of money for weapons.

Offsets are contractual clauses that require the selling state and/or company to undertake activities that "offset" the cost of purchasing a weapon. This could mean allowing a company in the purchasing state to produce components for the weapon, requiring the selling state to: buy something from the purchasing state and resell it; transfer technology; or to make exchanges, or other investments, outside the defense sector. While data on offsets is often shrouded in secrecy, data from U.S. firms indicate that offset requirements are common and high—between 2000 and 2021, U.S. firms agreed to offsets totaling USD 111.4bn. On average, contractors were required to offset 64% of the total purchase cost.[3] Offsets are puzzling from an economic perspective because scholarly literature suggests that,

1 Spindel (2019); Hacaoglu (2015); Sazak (2016).
2 In 1986, a US congressman noted "one major defense contractor may end up rivaling Gucci and Pappagallo as one of the world's foremost shoe marketers" due to offsets (Hammond,1987, p. 181).
3 US Bureau of Industry and Security (2023).

despite their commonness, offset schemes are inefficient and often unsuccessful.[4] Additionally, the U.S. Government sees offsets as "economically inefficient and trade distorting," and the European Defence Agency is trying to encourage its members to move away from offset provisions.[5] As Hall and Markowski questioned, "If offset schemes are really so inefficient, why is it that they have persisted for so long and are so widespread?"[6]

Weapons sales have become increasingly complex and interdependent, with sales seeing increasing use of offsets. However, it is difficult to achieve desired lasting political or economic gains when employing offsets in weapons purchasing agreements. Without advanced technological manufacturing capabilities, direct offsets fail to deliver a central and powerful position within current the global weapons supply network. Similarly, indirect offsets serve to lock states into peripheral positions of limited power.

This article builds on the existing economic scholarship on offsets by shifting the focus to the political calculus states make when pursuing offsets during weapons procurement. Taking a network perspective, and drawing on fieldwork at weapons exhibitions and government documents, suggests that states pursue offsets because their political leaders believe there will be longer-term political benefits that result from joining the global weapons production network (despite little evidence of economic benefit). Leaders believe that offsets will create enduring political ties that will, in the long run, reshape the global arms network in a way that gives them greater political leverage and influence over the behavior of others.[7] The goal of offsets is not economic benefit, but political power through interdependence. However, this article also suggests that, for most states, this logic is wishful thinking; only a small subset of states with advanced technological manufacturing capabilities can take advantage of offsets to integrate into the global weapons production network. Other states must pursue a different type of offset, *indirect offsets*, that, ironically, have the opposite effect and keep these states locked into peripheral positions with limited leverage and power. By using case studies of offset use in India and Malaysia, this article shows how difficult it is to achieve network interdependence (India), and the difficulties of using indirect offsets to achieve political goals (Malaysia).

To explain the political interdependence logic of offsets, and why it is an unlikely pathway to power for most states, this article proceeds as follows. First, explaining what offsets are and why existing literature says that offsets are inefficient and often fail. Next, explaining the political logic of offsets, and showing the different types of relationships created by direct and indirect offsets. Then: offset policies in India and Malaysia are traced to demonstrate how ties are created; how offsets do (and do not) create political power are explored; and finally, the implications for scholarship and policymakers are described.

Understanding offsets in defense contracts

In agreeing to an offset, the seller agrees to undertake "some reciprocal transaction over and above that associated with a purely cash transaction."[8] Some states have formal offset requirements, i.e., once a procurement contract reaches a certain value, there is a requirement that a specific percentage of the contract be offset. Other states have informal offset requirements where there is flexibility in offset percentage and type (even though there is still an expectation of offsets). For example, a state might have an offset requirement of 100%, which would mean the manufacturing company would have to create offset activities equal to the purchase price of the weapon. But the buying state might have a multiplier, which affects the credit accorded to different types of offset activities. A common multiplier is for the transfer of technology. Imagine a sale of $100 with an offset requirement of 100%. A

4 Brauer and Dunne (2004, p. 1); Martin (2014, p. 18); Behera (2015, p. 10); Transparency International (2010, p. 3). Additionally, offsets are often shrouded in secrecy, which makes evaluating their effects extremely difficult.
5 Behera (2015, p. 16); US Bureau of Industry and Security (2023, p. 3).
6 Hall and Markowski (1994, p. 174).
7 Farrell and Newman (2019).
8 Martin (2014, 15). See also Hammond (1990); Brauer and Dunne (2004).

ISSN 1749-852X

multiplier of 5 for technology transfer would mean that the seller manufacturer could offer $20 worth of technology, but would receive credit for $100 ($20 times the multiplier of 5). In practice, multipliers range from one to twenty, with higher numbers generally reserved for the transfer of technology.[9]

Most offsets are "direct" offsets, which result in the purchasing state producing a component which is sold to the primary supplier for the final weapons system. An oft-cited example is South Korea's direct offset agreement with the U.K. company AgustaWestland relating to the Lynx helicopter. Through direct offsets, South Korea produced the engine for the Lynx, which it then sold back to the U.K. The U.K. then assembled and sold the completed Lynx to South Korea and other states. Though AgustaWestland produced the final Lynx helicopter, it relied on engines produced in South Korea.[10]

Indirect offsets involve projects in non-defense sectors. Emerging and developing economies have been creative and innovative in their use of indirect offsets to try to jumpstart their overall level of development. Indirect offsets are attractive because they can make arms purchases more politically tolerable. As one defense expert observed, "they can spend their budgets on arms and along with it, upgrade their industries, both through developing their arms-related industries and other related and unrelated/ancillary industries."[11] Indirect offsets can make weapons purchases more politically tolerable by convincing the public that weapons procurement generates "some social 'return' in employment and technology."[12] As Matthews noted, many less developed countries view offsets as a catalyst for "deeper" industrialization.[13]

Why do selling states tolerate these offset clauses? First, most states need to export arms to keep their own production lines running.[14] If making a sale requires offsetting activities, then states will generally agree in order to secure the deal. Even U.S. firms, who can reliably count on purchases by the U.S. government, see offsets as a matter of routine policy.[15] In a report to investors, Raytheon noted that offsets "are designed to return economic value to the foreign country by requiring us to engage in activities supporting local defense or commercial industries, promoting a balance of trade, developing in-country technology capabilities or addressing other local development priorities."[16] Data collected by the U.S. Department of Commerce (DoC) shows that Raytheon is not alone. Figure 1 shows the percentage of procurement contracts required to be offset from 1993 to 2021. After falling from a peak in 2002, offset provisions are on the rise in the post-COVID period, with a 2021 average requirement of 72% of the price to be offset.[17] U.S. defense contractors entered into new offset agreements valued at USD 1.41bn in 2021, and fulfilled outstanding offset agreements with a value of USD 8.73bn. Between 2000 and 2021, U.S. defense contractors agreed to offsets valued at USD 111.4bn, at an average percentage rate of 64%.[18] The DoC explains, "US defense contractors generally see offsets as a reality of the marketplace for companies competing for international defense sales."[19]

9 United States Bureau of Industry and Security (2012, p. 28).
10 Fieldwork, DSEI, 2015.
11 Mehta (2015, p. 149).
12 Brauer (2004, p. 2).
13 Matthews (2004, p. 91). See also Transparency International (2010, p. 20).
14 Erickson (2015, p. 6); Catrina (1988, p. 74).
15 United States (2004, p. 3).
16 Raytheon (2016, p.72).
17 United States Bureau of Industry and Security (2023, p. 9).
18 Ibid.
19 Ibid, (p. 3)

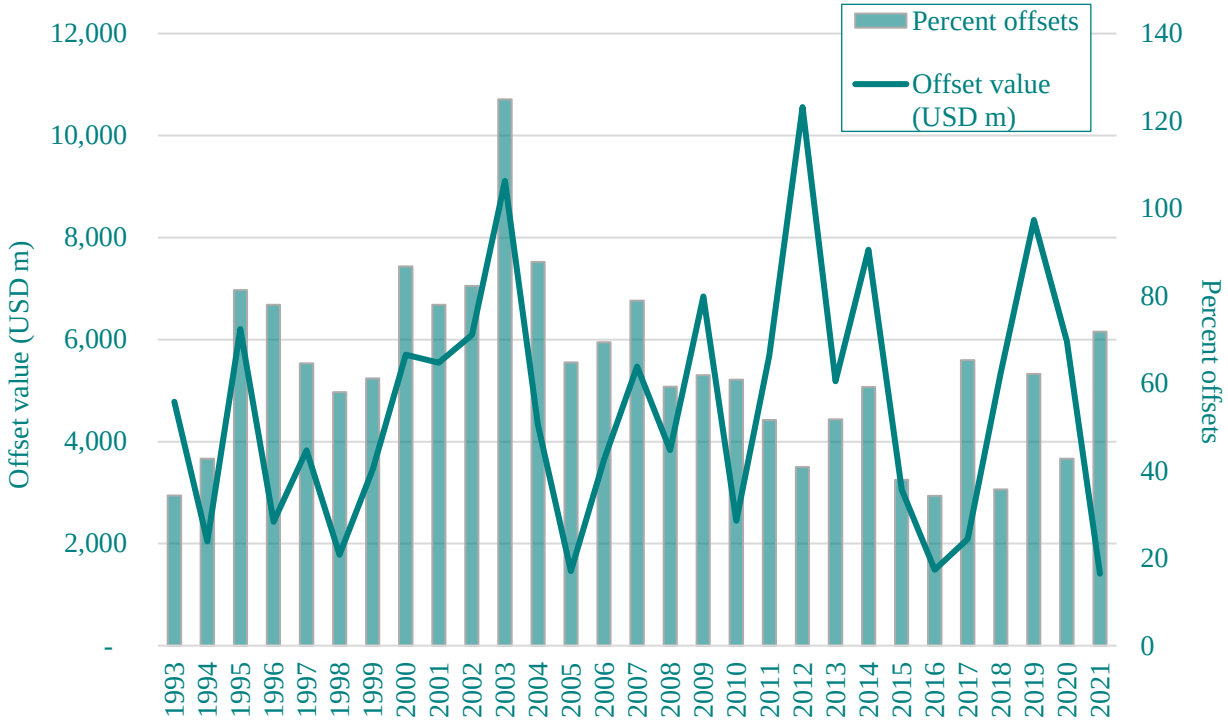


Figure 1: U.S. firms' offset obligations, 1993–2021.
Source: United States. Bureau of Industry and Security (2023).

The lower value of offsets in 2021 is unsurprising given the shutdowns related to the COVID-19 pandemic. As states resume regular patterns of arms purchases (especially in the context of the ongoing war in Ukraine), this value should once again increase.

The political logic of offsets

Economic inefficiencies, long used to explain the problems of offsets, are actually a feature of offsets, not a bug. Take, for example, the Eurofighter Typhoon, the fighter jet jointly produced by more than 400 companies in the U.K., Germany, Spain, and Italy.[20] Matthews and Al-Saadi critique the Eurofighter for its economic inefficiencies, noting the "arbitrary inclusion into the supply chain of relatively inefficient companies simply to achieve pre-agreed national work quotas."[21] These pre-agreed national work quotas are, in fact, the political point of offsets—being involved in the production supply chain can give states political leverage. For most states for most of the time, securing political leverage is worth some economic inefficiencies.

Why are states willing to tolerate economic inefficiencies? Part of the problem is the deeply hierarchical nature of the arms trade. It is incredibly difficult to become a new supplier of conventional arms. The top three arms-producing states (U.S., Russia, France) account for 67% of all arms exports, and the top ten (U.S., Russia, France, China, Germany, Italy, U.K., Spain, South Korea, and Israel) account for 90% of all arms exports.[22] How is a state interested

20 Eurofighter Typhoon (2023)
21 Matthews and Al-Saadi (2023, p. 240)
22 Wezeman, Gadon and Wezeman (2023, p. 2).

in producing full weapons systems supposed to break into this monopoly? One way is to use direct offsets to force their way in and become a crucial link in the weapons supply network.

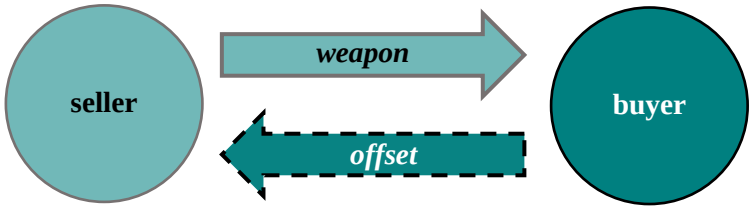


Figure 2: Direct offsets.

Economic inefficiencies are the price to pay for interdependence. Offset agreements create network ties between buyer/seller and producer/sub-producer, that in turn effects the shape and structure of the global weapons network.[23] However, not all ties are the same; while some ties may create a relationship of relative equality between actors, other ties emphasize and deepen asymmetries.[24] Applying this to offsets, direct offsets create reciprocal ties that lead to mutual dependencies, yoking the two together and further integrating the weapons buyer into the global weapons supply network (see Figure 2). This is politically desirable because of the network structure they create—with the mutual dependencies pulling the two actors closer together.[25] These ties generate *rich-get-richer* dynamics because of their reciprocal nature. Direct offsets are essentially an invitation to join the club, and successful execution of a direct offset project serves as proof that the buyer belongs in the club. Membership in the club is beneficial, as Farrell and Newman describe, "central nodes in networks have access to more information and relationships than do other members of the network."[26] Direct offsets help states *integrate* into global weapons supply networks by becoming a crucial link in the chain. From a network power perspective, direct offsets are the gold standard. However, direct offsets are only an option for states that possess a robust science and technology infrastructure, and industrial skill base.[27]

Mutual dependencies created by direct offsets are politically desirable because they create situations of leverage and political power. Political leverage can come in multiple forms. One is the ability to shape the behavior of others without having to engage in coercive means. By that standard, states with advanced production capacity can use direct offsets successfully. For example, the United Kingdom used a formal policy of direct offsets throughout the early 2000s to demand work be done in the U.K. by U.K. subcontractors. This resulted in new and increased production lines.[28] The U.K. was then able to abandon its formal policy of offsets in 2012, because major arms manufacturing companies like Boeing, L-3 Communications, Rheinmetall, and Airbus already had work taking place there.[29] Even though they are no longer required to undertake their offset work within U.K. borders, it is more expensive for these companies to relocate their production lines elsewhere. They are tied to the U.K., and the U.K. is tied to them. This U.K. policy is articulated as reciprocal offsets that strengthen bilateral relations, and will help the U.K. keep its position as the second-largest global defense exporter.[30] Direct offsets, in this case, allowed the U.K. to transition to a less coercive and informal offset policy, while still guaranteeing that companies locate work in the U.K.

Another form of political leverage involves direct coercion or threats. This is again a type of power that states can find from effective use of offsets. After the Saudi murder of journalist Jamal Khashoggi in Turkey in October 2018, many European states imposed an arms embargo on Saudi Arabia. However, disagreements soon emerged about how

23 Podolny (2001, pp. 33–34); Hafner-Burton and Montgomery (2006, p. 560).
24 Keohane and Nye (2011); Farrell and Newman (2019, p. 48).
25 The actors being nodes in network parlance.
26 Farrell and Newman (2019, p. 51); See also Oatley et al. (2013).
27 Brauer (2004, p. 53); Balakrishnan and Matthews (2009, p. 356); Mitra (2009, p. 48).
28 Matthews (2014, pp, 1, 67)
29 Ibid., 87.
30 United Kingdom Ministry of Defence (2012, p. 31); United Kingdom Department for International Trade (2017) .

long an embargo should last, with the U.K. and France interested in lifting the embargo to resume exports, while Germany wanted to keep the embargo in place as punishment for Saudi Arabia's behavior.[31] The interconnected nature of the European arms industry meant that Germany had an outsized influence on the U.K. and France derived from Germany producing components for arms that they sell. This has meant that a German arms embargo effectively also held up U.K. and French sales.[32] One of the effected weapons systems was the Eurofighter Typhoon, which relied on advanced components made by German producers. The German embargo meant that the U.K. could not complete sales of the Eurofighter to Saudi Arabia.[33] This form of weaponized interdependence is created by the reciprocal ties of direct offsets and is what grants political power. Similarly, South Korea could threaten to stop producing engines for the Lynx helicopter unless the U.K. altered its behavior or did something that South Korea wanted. Re-sourcing an engine producer would hamper the U.K.'s ability to complete helicopter sales and would entail significant costs. However, South Korea also had a vested interest in continued production and sale of the Lynx, and therefore had to carefully calculate its threats so that it did not look like an unreliable partner.[34]

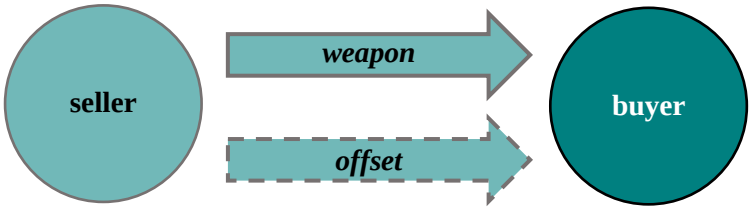


Figure 3: Indirect offsets.

The theory, then, is that offset use will allow states to create mutual dependencies, and that these dependencies create their own internal political incentives, *and* give states levers to try to shape the behavior of others. However, not all states have the option to jump in as nodes in the global weapons network. Doing so requires substantial domestic production capacity, technological know-how, and often a track record of prior production abilities. States are unlikely to pursue reciprocal ties with a new or untested supplier. As a result, only states that already have advanced industrial manufacturing capabilities will be able to pursue direct offsets and benefit from reciprocal ties.

For states *without* substantial industrial production capabilities, direct offsets are not a viable option. They instead pursue indirect offsets, which leaders use as the first step in a long chain toward successfully using direct offsets. The logic is that there needs to be a society-wide jump start of manufacturing, technological know-how, and capacity, which leaders believe can be achieved through indirect offset use. Indirect offsets are not as a rule, as leaders hope, a pathway to future direct offsets. Instead, indirect offsets create asymmetric ties that actually undermine the seller's political power and leverage, pushing them further to the periphery of the global weapons network.

One of the problems with indirect offsets is that they often result in the buyer relying on the seller for weapons *and* something else. Rather than serving as a pathway to direct offsets, indirect offsets deepen dependencies by perpetuating a hub and spoke configuration that keeps actors on the periphery. Over time, it becomes increasingly difficult for these outsiders to break into the centralized network and become a core part of the global weapons supply network.[35] As Farrell and Newman described, these ties result in "specific, tangible, and enduring configurations of power imbalance."[36] Figure 3 represents this network configuration.

In contrast to direct offsets, the ties for indirect offsets flow in the *same* direction. Rather than pull the seller and buyer closer together, this pushes the buyer further away; it does not create mutual dependencies. The result is an

31 Noack (2018); Spindel (2019); Bisaccio (2020).
32 Noack (2019); Sprenger (2019).
33 Wintour (2019); Deutsche Welle (2019).
34 Bitzinger (2004, p. 258).
35 Faul (2015, p. 4); Farrell and Newman (2019, p. 53)
36 Farrell and Newman (2019, p. 49).

asymmetric relationship, in which the buyer is relying on the seller for the weapon and something else. Because indirect offsets can be scattered throughout different economic sectors, states rarely develop independent expertise and, as a result, only increase their dependence on the state that is providing the goods or services. Even when indirect offsets build infrastructure, states often don't receive the technology transfer or skill enhancement that come from direct offsets.[37] Indirect offsets can provide short-term developmental gains to countries, but in the long-run reproduce hierarchies of power.[38] In the short-term, leaders may think they are getting a quick boost to a specific sector or need, but in the long-term states do not achieve mutual dependence and instead are locked into a peripheral position.

Why then do states continue to pursue indirect offsets? One reason is wishful thinking, with leaders hoping that they can model their programs on other successful ones. Malaysia's offset program, for example, explicitly builds on similar programs in South Korea, Japan, and Turkey.[39] There is also an enduring belief that offsets are ways to build industrial capacity.[40] Many states see offsets as a way to "double dip"—they justify their military expenditures by pointing to economic or social benefits they receive through indirect offsets.[41] As previously described, offsets provide political cover for military purchases by allowing leaders to say they are getting some other social or economic benefit as a result of arms procurement. Though scholars know this is an overly rosy picture, it is a simple and attractive narrative to justify arms purchases.

Offsets in Malaysia and India

To demonstrate the different network relationships caused by offsets, and the difficulties of using offsets to become part of the global weapons supply network, offset policies in Malaysia and India are traced. The cases illustrate the wide variety of offset use, with Malaysia using primarily indirect offsets and India trying to secure direct offsets. They also highlight the political logic of offsets with Malaysia focusing offsets on knowledge and skills-based transfers, including green technologies and education, to transform from a commodity-based to a knowledge-based economy. These offset ties have been unidirectional, and as a result Malaysia has remained politically peripheral. However, India wants to gain political power from integration into the weapons production network, and sees direct offsets as its pathway for doing so. Yet India's experience with offsets illustrates the difficulties of successfully using direct offsets for political power—India does not have sufficient advanced production capacity, and has struggled to domestically produce its own weapons. Officials from the Indian government have even admitted their reluctance to buy arms as simple as rifles from Indian producers.[42]

Much of the case analysis draws on fieldwork conducted at the Defense & Security Equipment International Exhibition (DSEI) in London in 2015. Seminars offered by government and military representatives from various countries were attended, and documents and brochures relating to weapons sales and decision-making within governments were collected. The case analysis that follows builds on information and evidence collected at DSEI supplemented by official government procurement documents.

Malaysia: Indirect offsets at the periphery

Malaysia is a good example of a state using indirect offsets for short-term economic gains, even though it will realize limited, if any, longer-term economic or political benefits from offset use. Malaysia has been a creative user of indirect offsets to pursue a range of economic development projects across the state and in different sectors. One difference with the Malaysian offset program compared to other states is that it organizes offset policies through the

37 Hammond (1990, 151).
38 Brauer (2004, p. 58).
39 Abdullah and Safari (2018, p. 160).
40 Transparency International (2010, p. 3).
41 Brauer and Dunne (2004, p. 2); Singh (2014, p. 13).
42 Fieldwork, DSEI 2015.

Ministry of Finance, rather than the Ministry of Defense. Nonetheless, Malaysia's offset policy has not brought it economic gains. As Balakrishnan and Matthews noted, nearly forty percent of Malaysian offset recipients continue to rely on "foreign sources of technology, components, parts, and process machinery."[43] Malaysia's indirect offset trajectory stands as a clear example of how indirect offsets, even when creatively implemented, create and sustain asymmetric dependencies.

Though the government first decided to set an offset policy in 2005, it took until 2011 for an official policy to be promulgated. In its desire to transition from a commodity-based to a knowledge-based economy, Malaysia's general goal is to use offsets to assist infrastructure development and to jumpstart an indigenous aerospace program.[44] Malaysia's office that manages offset programs explained that "indirect offset offers a bigger potential to provide more economic impact" compared to direct offsets.[45] This belief has led Malaysia to pursue weapons purchases that include indirect offsets in green and cyber technology, healthcare, and education.[46] The Malaysian government has explicitly explained offsets as "a policy to strengthen the country's socio-economic achievement," and to help local industry participate in the global, non-defense, supply chain.[47]

When government officials describe Malaysia's offset policy, they repeat the expected narrative about economic benefits leading to political benefits. For example, in 2019 the Prime Minister's Office released a national defense policy document explaining Malaysia's view of defense projects. The description is a perfect explanation of the logic of indirect offsets, "The defence industry contributes towards job creation, savings in foreign exchange, technology transfer, foreign direct investment, dual-use technology, and developing downstream industries for other economic sectors."[48] Specifically in reference to the offset program, the document frames offsets as a way to develop strong reciprocal ties through "international strategic partnerships that could contribute towards industrial enhancement."[49] The Minister's office also sees offsets as a way to promote "Human resource development and local expertise and skills enhancement."[50] This hope that offsets could jumpstart the entire domestic economy has animated Malaysia's official offset usage.

Malaysia has an extremely low offset threshold, requiring offsets of 100% for all contracts above USD 15.8m.[51] This means nearly every weapon purchased by the Malaysian government required manufacturers to invest a similar amount in the country. Malaysia prioritizes aerospace, automotive, rail, maritime, and energy projects as offsets, which the Malaysian government explains as giving priority to "activities that provide an active platform for local industry participation in selected sectors contributing to the national aspiration towards achieving developed country status."[52] In other words, offsets are designed to affect a variety of domestic sectors to push Malaysia toward higher development. To systematize these knowledge gains, in 2013, Malaysia added higher learning placement programs.[53] The formal offset policy has resulted in offset obligations of USD 6.72bn from procurement contracts of USD 10.34bn between 2010 and 2020.[54]

What is particularly innovative about the Malaysian use of offsets is that the government has deliberately connected defense offsets to all areas of government procurement. Thus, even when seeking Airbus A380 aircraft for

43 Balakrishnan and Matthews (2009, p. 351).
44 Matthews and Yip (2013).
45 Abdullah and Safari (2017, p. 169).
46 Fieldwork, DSEI, 2015.
47 Malaysia Ministry of Finance (2013, p. 3-1); Global Supply Chain panel, DSEI, 16 September 2016.
48 Malaysia Prime Minister's Office (2019, p. 29).
49 Ibid, p. 30.
50 Ibid.
51 Matthews and Yip (2013).
52 Malaysia Ministry of Finance (2013, p. 2).
53 Malaysia Ministry of Finance (2013, p. 3-1).
54 Mahadzir (2022). Offset obligations were of RM31.278 billion from RM48.09 billion.

Malaysian Airlines, the government insisted Rolls-Royce give offsets to help develop the Malaysian aerospace industry.[55] Under this scheme, defense procurement is treated as just another type of government economic activity, not something unique to the military or defense.

The Malaysian government lists six objectives for its offset program, the first of which is to "develop and strengthen the expertise, capabilities, capacity and marketing, and export potential of Malaysia's industries."[56] In pursuit of this goal, Malaysia has applied offsets to a wide range of sectors and projects, including green technology, nanotechnology, and human capital development.[57] For example, a domestic green technologies developer GreenTech Malaysia is supported by a number of different offset arrangements that have provided technology to the company.[58] Malaysia also prioritizes investing in higher education initiatives.[59] Officials at DSEI joked that the Malaysian government's purchase of tanks would fund a new generation of PhD. students, both those studying within Malaysia as well those sent abroad for further education. Through offsets related to Malaysia's purchase of naval guns, U.K. arms manufacturer BAE is sponsoring a new post-graduate program in Cyber Security at the National Defence University of Malaysia.[60]

While Malaysia does get short-term economic investments from its arms procurement, it has not been able to translate these into economic or political gains. As Balakrishnan and Matthews summarized, most of Malaysia's offset projects "have involved low-level 'metal-bashing' and build-to-print activities" rather than higher-level skills development or advanced manufacturing projects.[61] So, contrary to Malaysia's political aims, but in line with the political logic, its reliance on indirect offsets has created ties all running in the same direction, *from* the seller *to* Malaysia. Expansive indirect offsets have not helped Malaysia build and sustain domestic manufacturing at a level needed to become a key node in the weapons supply network. As such, Malaysia will have limited, if any, opportunities to gain more political power or exercise leverage over other states (beyond whatever it has been able to extract from the weapons contract itself); nor has it been able to use indirect offsets to jumpstart its economy to a point where it could transition to direct offsets. As the existing literature on the economics of offsets clearly shows, there are limited, if any, long-term economic benefits to indirect offsets.

India: The limits of direct offsets

Despite coordinated efforts to employ direct offsets to become a central node in the weapons supply network, India has not yet realized any economic or political gains. It is a useful example of the limits of direct offsets, and India's experiences suggest that the ability to gain political power through network closeness is limited to states with existing advanced production capabilities. India's experience also suggests that there was a window during which states could use direct offsets to build their domestic production capabilities, which fed back into their ability to use direct offsets. Given the relative stability of the weapons production network, it is difficult for new producers to break into the network. However, India's experience provides a different type of network blueprint for states looking to leverage arms production for political power.

Indian weapons acquisition policies are determined by the Ministry of Defense, detailed in Defense Procurement Procedure (DPP) manuals. The guiding principles, as explained in these manuals, is to "use offset[s] as a route to amalgamate into global defense supply chains, in addition to self-sustenance of the Indian Armed Forces."[62] From

55 Fieldwork, DSEI, 2015.
56 Malaysia Ministry of Finance (2011, p. 3).
57 Malaysia Industry-Government Group for High Technology (2015).
58 Fieldwork, DSEI, 2015.
59 Malaysia Ministry of Finance (2011, p. 3).
60 BAE Systems (2015).
61 Balakrishnan and Matthews (2009, p. 351).
62 Fieldwork, DSEI, 2015.

2005 to 2017, the DPP manuals showcased India's learning process and the evolution of an offset policy spurred by the anticipation of massive weapons purchases to replace its aging arsenal.[63] India began with an offset requirement of 30 percent, which remained steady through 2015.[64] Offsets were designed to encourage foreign investors to enter meaningful, long-term relationships with private domestic industries.[65] In 2008, India allowed foreign weapons manufacturers to use foreign direct investment in Indian defense industries as a way to fulfill their offset requirements.[66] Even so, it was not until 2011 that the DPP had a clear objective for offsets, "The key objective of the Defense Offset Policy is to leverage capital acquisitions to develop Indian defense industry by (i) fostering development of internationally competitive enterprises (ii) augmenting capacity for Research, Design, and Development related to defense products and services and (iii) encouraging development of synergistic sectors like civil aerospace and internal engineering."[67] Also in 2011, India began to incentivize the transfer of technology through the use of multipliers. In 2013, India finally incorporated offsets into the regular 15-year defense planning cycle, meaning that projects to be accomplished through offsets could be planned and scheduled into the future.[68]

India's learning process through offsets is best seen through its threshold for offset requirements. Initially, it required the 30 percent offset to be applied to all contracts greater than USD 45m, and did not incentivize one type of offset compared to the other. As a result, nearly every weapon purchased by the Indian government automatically required offsets, which led to logistical and bureaucratic complexity as India tried to manage and monitor these offset projects. In April 2016, India raised the offset threshold to purchases greater than USD 305m, and incentivized direct offsets (the transfer of technology and manufacturing of weapons components), rather than having factories or railways built through offsets.[69] In the most recent DPP of 2020, India explains the avenues for meeting these offset requirements, and explicitly excludes "civil infrastructure and related equipment."[70] The guidelines emphasize "co-production, co-development and production or licensed production of defense products," and allows for a multiplier of 3 or 4 to be applied when critical technology is transferred as the offset—thus demonstrating India's prioritization of direct offsets.[71] Also included is a clear list of exclusively defense-related "products eligible for discharge of offset obligations" such as small arms, naval platforms, aircraft including unmanned aerial vehicles, and electronics and communications equipment.[72] In this way India's offset policy evolution has mirrored that of countries such as the U.K.

India tried to ensure that its direct offsets were effective through a "Make in India" campaign, which was developed in 2014 to encourage investment in, and government procurement from, Indian manufacturers. The Make in India policy, which was given center stage at DSEI, privileges domestic content in weapons purchased by the Indian government. The campaign was described as trying to create a hub and spoke program that would build and sustain domestic production capabilities.[73] Make in India uses direct offsets to create reciprocal ties that the Indian government believes will pull it closer to the center of the global arms production network. However, Make in India has encountered a number of obstacles, and the 2020 manual notes that there needs to be more done to build domestic capabilities.[74] Without these capabilities, India cannot successfully be part of the hub and spoke weapons production

63 Narasimhan (2015, p. 39); India Department of Defense Production (2017).
64 Verma (2009, pp. 10-11).
65 Ibid., 21.
66 India (2013).
67 India (2011).
68 Sodhi and Bhargava (2015, p. 33).
69 Fieldwork, DSEI, 2015.
70 India Ministry of Defence (2020, p. 109, 112)
71 India Ministry of Defence (2020, p. 109)
72 India Ministry of Defence (2020, p. 126-127)
73 Government of India, The Lion in on the Move, Reinvigorating the Indian Economy 2014-2015, material collected from DSEI.
74 India Ministry of Defence (2020, p. 321)

network.

India's struggles can be seen through incomplete and paused weapons production deals over the past decade. After the 2014 Make in India campaign and DPP 2016, foreign manufacturers including Raytheon, BAE, Lockheed Martin, Rafael, Airbus, and Dassault all announced they would work with Indian companies to manufacture weapons.[75] Despite this rhetoric, India has not completed these deals. Boeing and Lockheed Martin were "aggressively pursuing" opportunities to establish manufacturing lines in India for the F-16 and F-18 fighter jets, both to sell to India, and for exports to third parties.[76] Lockheed Martin has offered India exclusive rights to produce Block 70/72 F-16 jets, and has said India will be allowed to veto sales to countries including Pakistan.[77] However, U.S. manufacturers and India have disagreed about technology transfer and Indian production capabilities, which has significantly delayed the project.[78] Additionally, the U.S. has expressed concerns that India's track record with producing sophisticated aircraft could hamper F-16 production, even if technology transfer were to occur.[79] Notably in 2015, after four of Ecuador's fleet of seven Indian-made Dhruv helicopters crashed, it grounded the remaining and canceled its contract to buy more.[80]

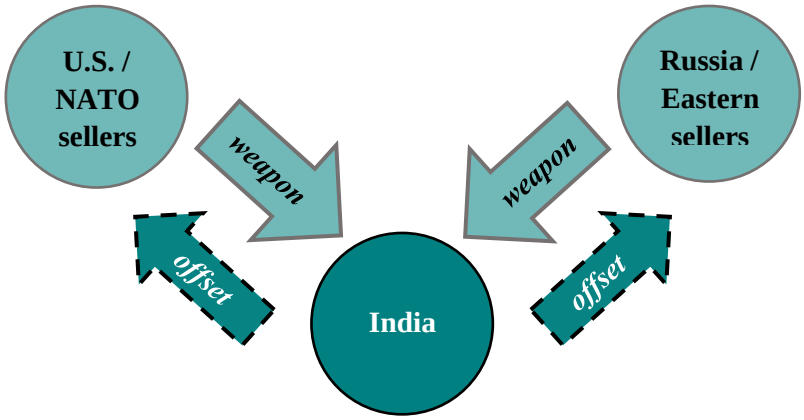


Figure 4: Structural power position for India.

In light of these production concerns, Lockheed Martin floated the potential of India making wings for the F-16 rather than the full plane. Making a component and selling it back to the producer would have been a textbook way for India to become a crucial node in the weapons supply chain.[81] But doubts about India's production capabilities continued to dog the project; as of March 2023, there is only a Memorandum of Understanding between Lockheed Martin and Indian producer Tata to build 29 fighter wing shipsets starting in 2025.

Despite India's policy of direct offsets and incentives for transfer of technology, it has not been successful in developing reciprocal ties to bolster its political power. Had the deal with Lockheed Martin gone through, India's ability to veto F-16 sales to Pakistan would have been a clear example of how states can use offsets to gain political power. But the questions about India's production capabilities have prevented it from capitalizing on its direct offset policies and from becoming a central node in the global weapons supply network. India has not yet cracked the list of the top 25 arms exporters despite being the top importer of arms (with the accompanying huge direct offset opportunities to become a major supplier)—in the periods 2013–2017 and 2019–2023, India was the largest importer of conventional arms in the world.[82]

India has not met its goal of using offsets to become a producer of weapons components. But its struggles and

75 Ibid.
76 Smith and Werman (2016)
77 Lam (2016)
78 Insinna (2016)
79 Ibid.
80 Som (2015)
81 Economic Times (2018)
82 Wezeman, Gadon and Wezeman (2023, p. 2, 6)

limited successes do offer a *different* model for how offset ties can create political power. India has an opportunity to carve a niche as a refurbisher for both U.S. and Russian-made systems, making it one of the few states with a tie to both production blocs. As one analyst reflected on the deal with Lockheed Martin, "The deal opens the door for India to be the only vendor in the world that can acquire the expertise and infrastructure to integrate and upgrade existing Russian, European, and American platforms."[83] India already has joint production ventures with Russia (the Brahmos missiles), so securing even wingset production agreements would put India in a unique structural position, as illustrated in Figure 4.[84]

Note in this figure that the ties are weighted differently; while the ties run in both directions (to *and* from India), the ties from India to the U.S./Russia are much weaker than the ties from the U.S./Russia to India. This reflects India's likely status as a net importer of conventional weapons, and represents a more limited tie in the reverse direction. Unlike the U.K., Germany, or Italy, which have ties of roughly equivalent strength, India's ties are unequal. Even if it can move into this structural position, it is not one of equality with the major weapons producers. However, this type of brokerage position can carry with it political power, especially if India can become the go-to state for repairs and refurbishing of older weapons systems.

India would be smart to pursue this broker model of political power, rather than try to use direct offsets to become a node in U.S. or Russia supply chains. India's experience suggests that there is limited opportunity to use direct offsets to create reciprocal ties for states who are *outside* of the global weapons production network. Even if India had been able to address the manufacturing capability concerns, the weapons exports move fast enough that most established companies can't wait ten years for a state to commission new factories—especially just to produce a legacy weapon. Direct offsets may be the privilege of states that have existing advanced weapons production capabilities, meaning that the central states will deepen their ties over time, making it harder and harder for those on the periphery to break into the core.[85]

Conclusion

The secrecy involved in weapons procurement contracts and offsets means that an important first step is simply understanding the new ways that offsets are being used today. While direct offsets have been used in the past, they are now ubiquitous and are one of the ways that arms sales have wider economic effects. Indirect offsets are a newer way of obtaining an economic benefit, though in the long term they create asymmetric dependencies that deepen global inequalities and power hierarchies, as seen in the case of Malaysia. The case of India demonstrates the limits of direct offsets, and shows how states with limited advanced production capabilities struggle to secure and make use of direct offsets. Despite India's multi-decade effort, it has not been able to use offsets to become a key node in the global weapons supply network, and must therefore pursue alternate structural positions to gain political power.

For scholars, this article suggests that states have a more holistic view of military power. Buying arms remains an important activity, but, following the example of Malaysia, arms purchases can also be means to an economic end. Future work should more closely examine the economic dynamics of the global arms trade. Although many predicted that the end of the Cold War would result in a "buyer's market" and a general opening of the arms trade network, we have instead seen the consolidation of power and production in the hands of a few central states, with limited ability for new producers to break into the network.[86] The asymmetric dependencies created by offsets partially explain this outcome, and future research can investigate additional domestic economic decisions that help keep the arms market centralized.

83 Ibid.
84 Reuters 2023
85 Farrell and Newman (2019, p. 51)
86 Klare (1996)

For policymakers, this article shows how complex and interdependent weapons sales have become. While agreeing to direct offsets might secure a sale, it has long-term implications for the manufacturer's relationships with partners overseas. Indirect offsets, rather than bolstering a state's production capabilities, can actually increase dependencies and lock states into asymmetric power relationships.

Future research could investigate how different types of direct offsets result in mutual dependencies. For example, do co-production agreements create more durable mutual dependencies compared to licensed production? Do direct offsets tend to aggregate over time, such that once two states enter into a direct offset agreement, all other arms sales between the two are likely to include direct offsets? This more fine-grained analysis of offsets would help scholars and policymakers better understand the long-term consequences of direct offsets. Similarly, are there conditions under which a state has been able to successfully transition from indirect to direct offsets? Future research can analyze the factors (likely unrelated to arms transfers) that enable a state to increase its domestic manufacturing capability so that it can successfully participate in direct offsets.

References

Abdullah, A. and Safari, Z. 2018. Industry Collaboration Program (Icp): Empowering Technology Development For National Economic Growth. *Journal of Advanced Manufacturing Technology* 12(1), pp. 159–172.

BAE Systems. 2015. *BAE Systems Partners to Bring New Cyber Security Capability to Malaysia*. Available at: https://www.baesystems.com/en/article/bae-systems-partners-to-bring-new-cyber-security-capability-to-malaysia. (Accessed 29 March 2023).

Balakrishnan, K. and Matthews, R. 2009. The Role of Offsets in Malaysian Defence Industrialisation. *Defence and Peace Economics*, 20(4), pp. 341–358. https://doi.org/10.1080/10242690802333117

Behera, L.K. 2015. *Defence Offsets: International Best Practices and Lessons for India*. New Delhi: Institute for Defence Studies & Analyses.

Bisaccio, D. 2020 'Germany Extends Arms Embargo on Saudi Arabia', *Defense Security Monitor*. Available at: https://dsm.forecastinternational.com/wordpress/2020/03/24/germany-extends-arms-embargo-on-saudi-arabia/ (Accessed 30 March 2021).

Bitzinger, R. 2004. Offsets and Defense Industrialization in Indonesia and Singapore. In: Brauer, J. and Dunne, J.P., eds. *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets*. London: Routledge, pp. 255–70. https://doi.org/10.4324/9780203392300_chapter_17

Brauer, J. 2004. Economic aspects of arms trade offsets. In: Brauer, J. and Dunne, J.P., eds. *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets*. London: Routledge, pp. 54–65. https://doi.org/10.4324/9780203392300_chapter_4

Brauer, J., and Dunne, J.P. 2004. Introduction. In: Brauer, J. and Dunne, J.P., eds. *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets*. London: Routledge, pp. 1–15. https://doi.org/10.4324/9780203392300

Catrina, C. 1988. *Arms transfers and dependence*. New York: UNIDIR.

Deutsche Welle. 2019. *Germany rebuffs UK over Saudi arms exports*. 20 February. Available at: https://www.dw.com/en/germany-rebuffs-uk-call-to-lift-ban-on-arms-exports-to-saudi-arabia/a-47596782 (Accessed 16 November 2023).

Economic Times. 2018. *Lockheed Martin to start producing Made-in-India F-16 wings in next 2-3 years*. 14 October. Available at: https://economictimes.indiatimes.com/news/defence/lockheed-martin-to-start-producing-made-in-india-f16-wings-in-next-2-3-years/articleshow/66183715.cms?from=mdr (Accessed 29 March 2023).

Erickson, J. 2015. *Dangerous Trade: Arms Exports, Human Rights, and International Reputation*. New York: Columbia University Press. https://doi.org/10.7312/columbia/9780231170963.001.0001

Farrell, T., and Newman, A. 2019. Weaponized Interdependence: how global economic networks shape state coercion. *International Security*, 44(1), pp. 42–79. https://doi.org/10.1162/isec_a_00351

Faul, M.V. 2015. Networks and Power: Why Networks are Hierarchical Not Flat and What Can Be Done About It. *Global Policy*, 7(2), pp. 185-197. https://doi.org/10.1111/1758-5899.12270

Hacaoglu, S. 2015 'Turkey to Keep Missile System Outside NATO as China Deal Looms', *Bloomberg*, 19 February. Available at: http://www.bloomberg.com/news/articles/2015-02-19/turkey-to-keep-missile-system-outside-nato-as-china-deal-looms (Accessed: 5 June 2015).

Hafner-Burton, E.M. and Montgomery, A.H. 2006. Power Positions International Organizations, Social Networks, and Conflict. *Journal of Conflict Resolution*, 50(1), pp. 3–27. https://doi.org/10.1177/0022002705281669

Hall, P. and Markowski, S. 1994. On the normality and abnormality of offsets obligations. *Defence and Peace Economics* 5(3), pp. 173–188. https://doi.org/10.1080/10430719408404791

Hammond, G. 1987. Offsets, Arms, and Innovation. *The Washington Quarterly*, 10(1), pp. 173-85. https://doi.org/10.1080/01636608709477376

Hammond, G. 1990. *Countertrade, Offsets and Barter in International Political Economy*. London: Pinter Publishers.

India. Ministry of Defense. 2011. *Defense Procurement Policy*. Available at: https://cgda.nic.in/ifa/DPP2011.pdf. (Accessed 10 April 2024).

India. Ministry of Defense. 2013. *Defense Procurement Procedure*. Available at: http://cgda.nic.in/pdf/DPP2013.pdf. (Accessed 13 December 2017).

India. Department of Defense Production 2017. *Defense Manufacturing Sector Achievement Report*. Available at: https://drive.google.com/file/d/0B-Tv7_upCKANRmtia05TUWsxRms/view. (Accessed 13 December 2017).

India, Ministry of Defence. 2020. *Defence Acquisition Procedure 2020*. Available at: https://www.ddpmod.gov.in/sites/default/files/DAP%202020%20%2011%20Nov%2021_0.pdf (Accessed 1 November 2023).

Insinna, V. 2016. 'US Air Force: Tech Transfer Issues Key to F-16 Production Line Move to India,' *Defense News*, 8 September 8. Available at: https://www.defensenews.com/air/2016/09/08/us-air-force-tech-transfer-issues-key-to-f-16-production-line-move-to-india/. (Accessed 21 January 2018).

Kapur, V. 2013. *US-Indian Defence Technologies for Transfer: Cultural Change*. New Delhi: Institute for Defense Studies and Analyses.

Keohane, R. and Nye, J. 2011 *Power & Interdependence*. Boston: Pearson.

Klare, M. 1996. The arms trade in the 1990s: changing patterns, rising dangers. *Third World Quarterly* 17(5), pp. 857–874. https://doi.org/10.1080/01436599615155

Lam, D. 2016. 'Why Lockheed Martin's Bid to Build Lethal F-16 Fighters in India Could be a Game Changer,' *The National Interest*, 12 August. Available at: http://nationalinterest.org/blog/the-buzz/why-lockheed-martins-bid-build-lethal-f-16-fighters-india-17329. (Accessed 29 March 2023).

Mahadzir, D. 2022. 'DSA 2022: 'Benefits of Malaysian offset programme remain unclear.' *Shephard Media*, 28 March. Available at: https://www.shephardmedia.com/news/defence-notes/dsa-2022-benefits-of-malaysian-offset-programme-ar/ (Accessed 25 September 2023).

Malaysia. Ministry of Finance. 2011. *Policy and Guideline on Offset Programmes in Government Procurement*. Available at: https://docplayer.net/21884835-Policy-and-guideline-on-offset-programmes-in-government-procurement-ministry-of-finance-malaysia.html (Accessed 10 April 2024). https://doi.org/10.46501/IJMTST1004

Malaysia. Ministry of Finance. 2013. Policy and Guidelines on Industry Collaboration Programme in Government Procurement. Available at: https://web.archive.org/web/20170406065349/http://tda.my/wp-content/uploads/2016/03/ICPpolicyBI.pdf (Accessed 10 April 2024).

Malaysia. Industry-Government Group for High Technology. 2015 *Offsets* Available at: https://web.archive.org/web/20140624002020/https://might.org.my/en/solutionpages/offset.aspx. (Accessed 10 April 2024).

Malaysia, Prime Minister's Office. 2019 *Malaysia's National Defence Policy*. July. Available at: https://www.pmo.gov.my/wp-content/uploads/2019/07/National-Defence-Policy.pdf. (Accessed 29 March 2023).

Martin, S. 2014. *The Economics of Offsets: Defence Procurement and Countertrade*. Amsterdam: Harwood Academic Publishers.

Martin, S. 2014. Countertrade and Offsets: An Overview of The Theory and Evidence. In: Martin, S., ed., *The Economics of Offsets: Defence Procurement and Countertrade*. Amsterdam: Harwood Academic Publishers, pp. 15–48.

Mathew, T. 2009. Essential Elements of India's Defence Offset Policy - A Critique. *Journal of Defence Studies* 3(1), pp. 1–17.

Matthews, R. 2004. Defense offsets: policy versus pragmatism. In: Brauer, J. and Dunne, J.P., eds. *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets*. London: Routledge, pp. 89–102. https://doi.org/10.4324/9780203392300_chapter_6

Matthews, R. 2014. *The UK Offset Model: From Participation to Engagement*. London: Whitehall Reports.

Matthews, R. and Al-Saadi, R. 2023. Organisational Complexity of the Eurofighter Typhoon Collaborative Supply Chain. *Defence and Peace Economics* 34(2), pp. 228–243. https://doi.org/10.1080/10242694.2021.1987022

Matthews, R., and Yip, T. 2013. The Push and Pull of Offset in the Development of Malaysia's Defense and Security Technology Park. *Defense Review Asia*, 28 January. Available at: http://www.defencereviewasia.com/articles/203/The-Push-and-Pull-of-Offset-in-the-Development-of-Malaysia-s-Defence-and-Security-Technology-Park. (Accessed 21 January 2018).

Mehta, S. 2015. Knowledge Arbitrage through Defence Offsets. In: Sodhi, M.S. and Bhargava, R. eds., *Perspectives on India's Defence Offset Policy*. New Delhi: SAGE Publishing India, pp. 147–152.

Mitra, A. 2009. A Survey of Successful Offset Experiences Worldwide. *Journal of Defence Studies*, 3(1), pp. 43–62.

Narasimhan, S.L. 2015. 'India's needs and defense offsets.' In: Sodhi, M.S. and Bhargava, R. eds., *Perspectives on India's Defence Offset Policy*. New Delhi: SAGE Publishing India, pp. 37–44.

Noack, R. 2018. 'Germany halts arms deals with Saudi Arabia, encourages allies to do the same.' *Washington Post*, 22 October. Available at: https://www.washingtonpost.com/world/2018/10/22/germany-its-allies-well-halt-future-arms-sales-saudi-arabia-until-we-have-clarity-khashoggi-so-should-you/ (accessed 30 March 2021). https://doi.org/10.26715/jbms.1_21022018

Noack, R. 2019. 'Analysis | Germany halted all arms exports to Saudi Arabia. It worked too well, and now Berlin is looking for a way out.' *Washington Post*, 27 March. Available at: https://www.washingtonpost.com/world/2019/03/27/germany-halted-all-arms-exports-saudi-arabia-it-worked-too-well-now-they-are-looking-way-out/ (accessed 8 October 2019).

Oatley, T., Winecoff, W.K., Pennock, A., et al. 2013. The political economy of global finance: A network model. *Perspectives on Politics* 11(1), pp. 133–153. https://doi.org/10.1017/S1537592712003593

Opall-Rome, B. 2015a. 'IAI Courts India with Offsets, Tech Transfer,' *Defense News*, 16 March, Available at: https://www.defensenews.com/industry/2015/03/16/iai-courts-india-with-offsets-tech-transfer/. (Accessed 24 December 2015)

Opall-Rome, B. 2015b. 'F-35 Work for Israeli Firms Reaches $770M', *Defense News*, 20 December. Available at: http://www.defensenews.com/story/defense/policy-budget/industry/2015/12/20/f-35-work-for-israeli-firms-reaches-770m/77663536/ (Accessed: 24 December 2015).

Petty, F.S. 1999 *Defense Offsets: A Strategic Military Perspective*. Carlisle: Army War College Press. https://doi.org/10.21236/ADA363929

Podolny, J.M. 2001. Networks as the Pipes and Prisms of the Market. *American Journal Of Sociology* 107(1), pp. 33–60.

https://doi.org/10.1086/323038

Raghuvanshi, V. 2016 'Saab To Partner with Tata Power To Manufacture LEDS in India,' *Defense News*, 29 March. Available at: http://www.defensenews.com/land/2016/03/29/saab-to-partner-with-tata-power-to-manufacture-leds-in-india/ (Accessed 29 March 2023).

Raytheon. 2016. *Annual Report to Investors.* Available at: https://web.archive.org/web/20170508043911/http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9Mzc0MTk1fENoaWxkSUQ9LTF8VHlwZT0z&t=1&cb=636276783789225271 (Accessed 10 April 2024).

Reuters. 2023. *India says defence production exceeds $12 billion for first time*. 19 May. Available at: https://www.reuters.com/world/india/india-says-defence-production-exceeds-12-billion-first-time-2023-05-19/ (accessed 29 November 2023).

Sazak, S. 2016 'Why Turkey Chose, and Then Rejected, a Chinese Air-Defense Missile', *Defense One*, 3 February. Available at: http://www.defenseone.com/ideas/2016/02/turkey-china-air-defense-missile/125648/. (Accessed 29 November 2023).

Singh, B. 2014. *Indian Defence Offset Policy— Does it Help Boost Indigenisation.* Available at: https://www.claws.in/static/MP51_Indian-Defence-Offset-Policy-Does-It-Help-Boost-Indigenisation.pdf (Accessed 29 March 2023).

Smith, J., and Werman, A. 2016 'Assessing US-India Defense Relations: The Technological Handshake,' *The Diplomat*, 6 October. Available at: http://thediplomat.com/2016/10/assessing-us-india-defense-relations-the-technological-handshake/ (Accessed 12 January 2018).

Sodhi, M., and Bhargava, R. 2015. *Perspectives on India's Defence Offset Policy*. New Delhi: SAGE Publishing India.

Som, V. 2015 'After 4 Crashes, Ecuador Grounds Fleet of Indian Dhruv Choppers, Cancels Contract', *NDTV*, 15 October. Available at: https://www.ndtv.com/india-news/after-4-crashes-ecuador-grounds-fleet-of-indian-dhruv-choppers-cancels-contract-1232715. (Accessed 21 January 2018).

Spindel, J. 2019a. 'The Case for Suspending American Arms Sales to Saudi Arabia', *War on the Rocks*.' Available at: https://warontherocks.com/2019/05/the-case-for-suspending-american-arms-sales-to-saudi-arabia/ (accessed 12 March 2021).

Spindel, J. 2019b 'What Turkey's Purchase of a Russian Air Defense System Means for the U.S. And NATO', *The Washington Post Monkey Cage*, 23 July. Available at: https://www.washingtonpost.com/politics/2019/07/23/what-turkeys-s-purchase-means-us-nato/. (Accessed 12 March 2021).

Sprenger, S. 2019. 'Germany to extend Saudi weapons embargo until month's end', *Defense News*, 6 March. Available at: https://www.defensenews.com/global/europe/2019/03/06/germany-to-extend-saudi-weapons-embargo-until-months-end/ (Accessed 16 November 2023).

Taylor, T. 2004. 'Using procurement offsets as an economic development strategy.' In: Brauer, J. and Dunne, J.P, eds., *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets*. London: Routledge, pp. 30–43. https://doi.org/10.4324/9780203392300_chapter_2

Tellis, A. 2011. *Decoding India's MMRCA Decision*. Available at: https://carnegieendowment.org/files/Decoding_Indias_MMRCA_Decision.pdf. (Accessed 29 March 2023).

Transparency International. 2010. *Defence Offsets: Addressing the Risks of Corruption & Raising Transparency*. Available at: https://ti-defence.org/wp-content/uploads/2016/03/1004_corruption_risk_offsets.pdf (Accessed 25 September 2023).

Ungaro, A.R. 2013 *Trends in the Defence Offsets Market*. Available at: http://papers.ssrn.com/abstract=2386528 (Accessed: 14 December 2015). https://doi.org/10.2139/ssrn.2386528

United Kingdom. Ministry of Defense. 2012. *National Security Through Technology*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/27390/cm8278.pdf. (Accessed: 26 March 2023).

United Kingdom. Department for International Trade. 2017. *UK Defence & Security Export Statistics for 2016*. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20190803200724/https://www.gov.uk/government/publications/uk-defence-and-security-export-figures-2016/uk-defence-and-security-export-statistics-for-2016. (Accessed 26 March 2023).

United States. Bureau of Industry and Security. 2023. *Offsets in Defense Trade: Twenty-Seventh Study*. Available at: https://www.bis.doc.gov/index.php/documents/sies/3269-public-version-27-annual-offsets-report/file. (Accessed 15 October 2023)

United States. Bureau of Industry and Security. 2012. *Offsets in Defense Trade: Sixteenth Study*. Available at: https://www.bis.doc.gov/index.php/documents/other-areas/strategic-industries-and-economic-security/offsets-in-defense-trade/396-offsets-in-defense-trade-sixteenth-study/file (Accessed: 10 April 2024).

United States. Bureau of Industry and Security. 2005. *Offsets in Defense Trade: Tenth Study*. Available at: https://www.bis.doc.gov/index.php/documents/sies/127-tenth-report-to-congress-1-06/file (Accessed: 16 August 2017).

United States. Bureau of Industry and Security 2004. *Offsets in Defense Trade: Eighth Report*. Available at: https://www.bis.doc.gov/index.php/documents/sies/123-eighth-report-to-congress-7-04/file. (Accessed: 10 April 2024).

United States. Government Accountability Office. 2000. *Defense Trade: Observations on Issues Concerning Offsets*. Available at: http://www.gao.gov/assets/110/108708.pdf(Accessed: 16 August 2017). (Accessed: 16 August 2017).

Verma, S. 2009. Offset Contracts Under Defence Procurement Regulations in India: Evolution, Challenges and Prospects. *Journal of Contract Management* 7(1), pp. 1–32. https://doi.org/10.2139/ssrn.1464709

Wezeman, P., Kuimova, K., and Wezeman, S. 2022. *Trends in International Arms Transfers, 2021*. Available at: https://sipri.org/sites/default/files/2022-03/fs_2203_at_2021.pdf (Accessed 29 March 2023). https://doi.org/10.55163/CBZJ9986

Wintour, P. 2019. 'Jeremy Hunt urges Germany to rethink Saudi arms sales ban', *The Guardian*, 20 February. Available at: https://www.theguardian.com/world/2019/feb/20/jeremy-hunt-urges-germany-to-rethink-saudi-arms-sales-ban (Accessed 16 November 2023).

Does the intensity of protests induce terrorism?

Deniz Güvercin

Deniz Güvercin is a Lecturer in Economics in University of Lincoln, U.K. (ORCID ID: 0000-0001-6158-3877) and may be reached at dguvercin@lincoln.ac.uk.

Abstract

This article examines the impact of protests and demonstrations on the terrorist attacks within a country. While some studies in the relevant literature have explored the relationship between these variables, this research is unique in its empirical approach using panel data, with a specific focus on the intensity of protests and their effect on terror attacks. This article's proposed mechanism underscores the significance of political stability as a deterrent against terrorism—a stability that can be undermined by ongoing protests. Using a sample of 26 countries for the period 2002–2018, the empirical findings strongly support the hypothesis that persistent protests are connected to an increased likelihood of terror attacks—a relationship robust even when control variables are considered. The estimation results also reveal that an augmented military strength has a negative impact on the occurrence of terror incidents. Furthermore, the durability of a political regime is linked to a decrease in the number of terror incidents. Additionally, the results indicate that the level of democracy contributes to the occurrence of terror incidents.

It seems that people are taking to the streets to protest against their governments more frequently in recent decades. The average number of protests in the period 1990–2010 was 937, while the average number of protests in the period 2011–2019 was 3,481 (Clark and Regan, 2016). The number of protests increased dramatically following the first few months of the Covid-19 health crisis, sparked by issues such as corruption, political transition, police brutality and discrimination, democratic backsliding, and rising authoritarianism. Covid restrictions, increases in fuel prices, rising general inflation, women's rights, and farm laws have been the key drivers of protests occurring around the globe since 2020.[1]

Such protests and demonstrations against government can be seen as forms of democratic participation in the policy-making process and the setting of the public agenda. The recent rise in protests around the globe reflects the increase in the number of problems encountered in economies, political restrictions on civil and political rights, and problems that span entire political regimes at the global scale. Protestors have used the streets to defend their civil and political rights, which may often be the only viable option in countries suffering from a democratic deficit and corrupt bureaucrats and politicians.

As the number of protests and demonstrations continues to increase worldwide since 2015, an important question arises—does this trend potentially foster terrorism on a global scale? A recent case that illustrates this connection is the Arab Spring, which yields insightful findings regarding the interplay between protests and terrorist incidents. Korotayev *et al.* (2022) report a significant surge in the number of terrorist attacks and guerilla warfare following the Arab Spring. For instance, organizations like ISIS, which emerged in the aftermath of the Arab Spring, capitalized on the unstable political landscape to further their objectives. This underscores the potential linkage between prolonged protests, political instability, and the proliferation of terrorist activities.

There is some empirical evidence that supports the argument that such political instabilities can foster an

[1] Chenoweth (2023); Dave *et al.* (2020); Iacoella *et al.* (2021).

environment conducive to terror attacks across countries, but the number of empirical studies on this topic is very limited. To the author's knowledge, Schumacher and Schraeder (2021) and Issaev *et al.* (2021) are the only two studies directly investigating the link between protests and terrorism. This article further contributes, by considering the relationship between anti-government protests, demonstrations and terrorism, with a particular emphasis on the evolving intensity of the protests over time. Specifically, the article's study distinguishes itself from closely related studies by using a dataset covering a greater number of years and accounting for the lagged impacts of protests on terrorist attacks.

The nature of protests and their evolution over time can be crucial determinants in shaping the potential for terror incidents. Where responsible state institutions fail to take actions in response to civil demands, the likelihood of exposure to terrorism increases regardless of the regime type and state repression capacity. This likelihood increases in conjunction with a weakened military capacity and the instability of the political regime, particularly in comparison to autocracies with robust military capacities and stable institutions.

The next section briefly reviews the existing literature and locates this article within it. This is followed by a discussion of the links between protests and terrorism and provides a hypothesis—which is then considered with a cross country panel data analysis. The concluding section summarizes the main findings and contributions of this article.

The determinants and effects of protests

There is a range of literature that has considered the determinants and effects of protest. Studies on collective action have tried to determine the factors that spark social gatherings, protests, and demonstrations[2].Other studies have assessed the outcomes of protests, arguing that: they offer remedies for defects in democracy;[3] demonstrate the strength of public opinion against government failures, marginal policies, or extreme partisan politics;[4] provide an opportunity for marginalized groups to raise group-specific issues and express their preferences against government policies;[5] and reflect the group-wide emotions of unfair treatment by the incumbent government.[6] Other work has shown that protests and demonstrations occur more frequently in democracies, due to fewer restrictions on social gatherings and participatory politics,[7] while in autocracies protests are rare and more likely to be met with repression.[8]

Studies on the impact of protests refer to their effects on political regime switches,[9] power shifts,[10] policy-making,[11] election outcomes,[12] quality of candidates,[13] changes in preferences and attitudes,[14] and trust in political leaders.[15] Other studies have examined the impact of anti-government actions, whether violent or non-violent, on the economy. Using data on riots that occurred between 1964 and 1971, Collins and Margo (2007) demonstrated that

[2] These include the free-rider problem (Olson, 1965), the efficacy problem (Schofield and Pavelchak,1989; Stürmer *et al.* 2003), activist identification (Simon *et al.* 1998; Kelly and Breinlinger,1995), and value expression (Hornsey *et al.* 2003). Efficacy refers to people's belief in changing condition through protests or group-wise actions. People also identify their values with the majority's values and protest on behalf of the group.
[3] Putnam (1997); Gause (2022).
[4] Fisher *et al.* (2019); Chenoweth *et al.* (2022).
[5] Battaglini (2017).
[6] Passarelli and Tabellini (2017).
[7] Johnston and Almeida (2006); Tilly and Tarrow (2015).
[8] Cook (1996).
[9] Collier (1973); O`Donnell (1973).
[10] Frye and Borisova (2019).
[11] Madestam *et al.* (2013); Matsueda *et al.* (2020); Huet-Vaughn (2013).
[12] Madestam *et al.* (2013); Gillion and Soule (2018); El-Mallakh (2020); Castro and Retamal (2022).
[13] Gillion and Soule (2018),
[14] Gillion (2020); Mazumder (2018).
[15] Sangnier and Zylberberg (2017).

riots had persistent negative impacts on income and employment of black individuals. Acemoglu *et al.* (2018), using data from 177 firms in the period 2005–2013, showed that as protests increase, the stock market value of firms connected to political power decreases relative to non-connected firms.

As the number of protests and demonstrations continues to increase worldwide since 2015, an important question arises—does this trend potentially foster terrorism on a global scale?[16] The Arab Spring illustrates the manner in which prolonged protests characterized by high levels of participation create an environment conducive to political and economic instabilities that may, in turn, contribute to an increase in terror attacks. Korotayev *et al.* (2022) report a significant surge in the number of terrorist attacks and guerilla warfare following Arab Spring, with organizations like ISIS, which emerged in the aftermath of the Arab Spring, capitalizing on the unstable political landscape to further their objectives.

Persistent protests and terrorism

A reasonable hypothesis to consider in this empirical study is that persistent protests and terrorist attacks are complementary across countries. Certainly, protests in democracies express social dissatisfaction arising from minor policy issues that significantly impact the economic conditions and/or the civil or political rights of specific groups, non-groups, mainstream groups; or reflect the public concerns regarding general economic and political conditions. Public protests represent a direct form of political action by civil forces, where government or state institutions do not act as intermediaries—unlike in voting, political party participation, or lobbying.[17] In particular, non-violent mass mobilization protests against governments have played a crucial role in eliminating restrictions on civil and political rights—such as the abolition of slavery and labor exploitation, the extension of the franchise, and the granting of rights to women and minorities.[18] In liberal democracies, which are founded on principles of liberty and popular sovereignty, protests contribute to upholding the foundational tenets of liberal democracy while promoting social justice.

Protests, often arising in the wake of economic crises, challenges to the social contract, or the allocation of political power, have frequently resulted in democratic transitions in autocratic regimes. Celestino and Gleditsch (2013) using data for the period 1900–2004 demonstrated that non-violent protests are more likely to facilitate democratic transitions compared to violent and direct actions. Noteworthy examples include the collapse of the Guatelmalan regime in the 1950s, the Marcos regime in the 1980s, and the Egyptian and Tunisian regimes in the 2010s—all of which followed non-violent protests. Additionally, instances of electoral fraud followed by mass protests, as seen in Ukraine in 2004, Kyrgyzstan in 2005, Georgia in 2003, and Serbia in 2000, led to annulments of election results.[19] Nevertheless, non-violent protests can potentially escalate into violent protests or even give rise to terrorist attacks. Instances exist where sustained non-violent and peaceful protests have transformed into violent forms. Protestors turn to violence after becoming frustrated with the lack of responsiveness from government authorities toward their demands, or due to provocations by government entities and police forces. This phenomenon was evident, for example, during the Arab Spring and has occurred repeatedly in Ethiopia.[20]

Terrorism differs from protests, especially non-violent ones, primarily due to its choice of tactics—specifically, violence against the public. However, there are instances where terrorist groups might employ non-lethal tactics for intimidation purposes. Conversely, in some cases, non-violent protests might transition to violent ones. Therefore, violence alone might not be a clear distinguishing factor between protests from terrorism. Protests can represent a

[16] Schumacher and Schraeder (2021); Issaev *et al.* (2021).
[17] Martin (1994).
[18] Ibid.
[19] Tucker (2007).
[20] Allo (2017).

democratic action with social legitimacy, while terror attacks do not.[21] Terrorist attacks have the potential to escalate when protests persist, serving as a signal of strong societal backlash against government actions. Terrorist organizations can exploit the political instability fueled by persistent protests to undermine the regime and state institutions, inflicting maximum harm. Viewing political instability as an advantageous situation, they can further erode regime stability by instigating attacks on civilians, police forces, or government institutions. This exploitation of instability can exacerbate an already precarious political climate.

There are studies in the literature suggesting why individuals in countries with limited access to democratic avenues might turn to terrorism as a means of expression.[22] Young and Dugan (2008) showed that political systems with veto powers for individuals and institutions can cause deadlocks, resulting in an increasing number of terrorist attacks. Chenoweth (2013) reported a cycle of protests following government deadlocks that were themselves followed by terrorist attacks. Other work has suggested that terrorist attacks result from economic poverty,[23] economic inequality,[24] ethnic discrimination,[25] and human rights violations.[26] Tarrow (1989) sees terrorism as the final phase of a protest cycle, emerging as a tactical innovation, while Baker *et al* (2016) argue that terrorism arises as a societal response to state repression of dissident groups. For Tarrow (1989) terrorism is seen as an extension of protests, whereas Moore *et al.* (2013) argue that it results from strategic interactions between dissident groups and the government. Both studies strongly emphasize the link between prolonged protests and deep dissatisfaction arising from unresponsive governance to civil society's demands. Focusing on the context of the Gulf War in the 1990s, Ross (1993) points to the presence of other forms of political unrest as contributing factors to terrorism, such as civil disobedience, protests, and demonstrations.

This article approaches the nexus between terrorism and protests along similar lines to Chenoweth (2013), who argues that terrorism usually occurs because of dissatisfaction with the status quo and with government policies and institutions that may be failing some parts of the population. The claim is that street mobilization, even without the state provoking non-violent protests through violent repression, can escalate into violence or tactics leading to terrorist attacks. On the other hand, when groups engage in prolonged conflicts with the state, they might increasingly resort to more violent opposition methods. Ross (1995) posits that social unrest creates an environment in which demonstrators become more experienced and tolerant of violence, potentially motivating a more active terrorist presence in the country. Limited cross country empirical evidence exists, Schumacher and Schraeder (2021) use data from 156 countries from 2011 to 2014 and find a direct relationship between an increase in domestic political instability and the occurrence of terrorism—they also show that a rise in anti-government demonstrations corresponds to an increase in the occurrence of terror attacks. Issaev *et al.* (2021) reports that protests following the fall of an authoritarian regime lead to a significant rise in terrorist attacks, such as occurred in Burkina Faso—suggesting that, triggered by the antigovernment protests, terrorist attacks could intensify in insecure and politically unstable environments.

[21] Jarzabkowski *et al.* (2022).
[22] Aksoy (2012).
[23] Enders and Hoover (2012).
[24] Krieger and Meierrieks (2019).
[25] Piazza (2011).
[26] Walsh and Piazza (2010).

Table 1: Summary statistics

Variables	*Source*	*N*	*mean*	*sd*	*min*	*max*
Terror	Global Terrorism Database	442	177.4	433.2	1.100	3,934
protest	Mass Mobilization Protest Data	429	95.49	491.4	1.100	9,173
growth	World Development Indicators	442	3.942	5.06	-36.65	53.38
Unemployment	World Development Indicators	442	7.096	5.020	0.250	27.47
Inflation	World Development Indicators	442	6.766	8.221	-30.20	46.48
trade	World Development Indicators	442	57.13	22.58	11.86	154.2
military	World Development Indicators	442	2.232	1.269	0.311	6.896
governance	By Author	442	3.01e-09	1.670	-2.734	3.676
polity 2	Polity V	432	4.951	5.461	-9	10
durable	Polity V	442	23.83	28.88	0	138
Number of Countries		26	26	26	26	26

Empirical analysis

To contribute to this limited literature on the relationship between persistent protests and terrorist attacks, a range of variables were chosen guided by the previous studies. The data used for terror incidents was collected from the Global Terrorism Database (GTD). GTD provides panel data of *terror* incidents by providing information about the time and location as well as other key variables defining aspects of terror incidents[27]. defines terrorism as, "The threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation". This article uses the number of terror incidents occurring in a given year in a country. The data for the key explanatory variable, *protest* numbers are collected from the Mass Mobilization data provided by the Harvard Dataverse.[28] The data shows the number of protest incidents occurred given a year in a country for the period 1990–2020. The definition of protest is defined by the Mass Mobilization Data set as a gathering of 50 or more people to make a demand from the government; as such, it does not include inter-community disputes.[29]

Political control variables employed in this study include the *polity* variable, which indicates the level of democracy in a given country and year, a variable *durable* which indicates the number of years since the most recent political regime change (Marshall *et al.*, 2020). The *polity* variable ranges between -10 and 10, with higher values signifying a higher level of democracy; -1 indicating a complete authoritarian regime and 10 indicating a complete democracy. Other control variables used are *inflation, unemployment, trade, military,* and *growth* which are collected from the World Development Indicators dataset.[30] Moreover, we used the governance indicators from the Worldwide Governance Indicators dataset.[31] To enhance the control over governance indicators, a *governance* index was constructed using Principal Component Analysis.[32]

Table 1 details the sources of the data and the summary statistics—the sample used for the estimation covers the

[27] Start (2022, p.11)
[28] Clark and Regan (2021).
[29] Ibid.
[30] World Bank (2023a).
[31] World Bank (2023b).
[32] Principal Component Analysis is used to reduce the number of variables. The Pca command in STATA 17.0 is used, see Appendix A for further details.

period 2002–2018 for 26 countries.[33] The sample is simply selected on according to data availability. The data used for military and trade variables had missing values which filled through interpolation[34]. Table 1 shows the descriptive statistics for the variables used in the empirical estimation and indicates that both terror statistics and protest variable have significant variation. The coefficient of variation is approximately 2.5 for terror and 5 for protest indicating a significant dispersion of these variables. The logarithms of the number of terror incidents, protest numbers and GDP per capita were taken to decrease this high dispersion.

The method used for the estimation is the fixed effects model as it performs well in controlling unobserved country level heterogeneities. A lagged dependent variable and several control variables are included in the model. The model used is:

$$Terror_{i,t} = \beta_0 + \beta_1 Terror_{i,t-1} + \beta_2 Protest_{i,t} + \beta_3 Protest_{i,t-1} + \beta_4 Protest_{i,t-2} + \Gamma Z_{i,t} + \gamma_i + \varepsilon_{i,t}$$

The vector Z is the vector of control variables and the vector Γ is the vector of coefficients for control variables, where $\varepsilon_{i,t}$ is the idiosyncratic error term,[35] and γ_i captures the country fixed effects. The model incorporates a lagged protest ($Protest_{i,t-1}$) and a two-year lagged protest ($Protest_{i,t-2}$) variable to assess the impacts of previous years' protests on subsequent terror attacks.

The estimation results for the determinants of terror attacks are displayed in Table 2 and show a strong persistence from previous terrorist attacks. While there is no effect of contemporaneous protests[36], the first and second lags are significant, positive, and robust to addition of control variables. The effect of the two-year lagged protest on the number of terror incidents remains remarkably robust after controlling for various factors, suggesting a 0.015 percentage increase of terrorist incidents in the current year, resulting from a 100 percent increase in protests, holding all other variables constant. So, if the majority of civil forces engaging in demonstrations do so only within a short timeframe (within a single year), this does not lead to any significant terrorist incidents, but will do so in the future. This implies that a lack of responsiveness from the government or the deepening conflict between the government and the societal forces can escalate the level of violence in protests and can eventually lead to the emergence of organized terrorist incidents. It also implies that if reactions against government actions do not endure over an extended period, terrorism is not likely to be triggered.

While many of the conditioning variables are insignificant, there is also some evidence of a relatively large negative effect of military strength on terror incidents, though only at $p<0.1$ in Model 2. This supports the findings of Bapat and Zeigler (2016), Plumber and Neumayer (2010), Tahir (2020), and Chen and Reynal-Querol (2008), and suggests that military strength reduces terrorism. Conversely, it contradicts Okafor and Piesse (2018), Rosendorff and Sandler (2004), and Drakos and Giannakopoulos (2009) who contended that military strength would increase terrorist activities, through a backlash that leads to a rise in terrorism. The results do not suggest that the durability of the political regime reduces terror incidents, nor the level of democracy, as measured by the Polity variable. Of the economic conditioning variables, only inflation is significant and has a negative effect. The results also show that inflation reduces terrorist activity and growth has a negative effect, but only at $p<0.1$.

Overall, the results provide a useful stepping-stone for further research, suggesting strong persistence in terror incidents over time and a clear impact of past protests. Persistence in protests against government can indeed lead to the emergence of terrorist incidents, but democracies where institutions respond to civil demand by taking appropriate actions can reduces the likelihood of terrorist action.

[33] See Appendix B for the list of countries.
[34] The missing data was filled by estimating a value with linear relationship between missing and non-missing values.
[35] The heteroskedasticity robust standard errors used in estimations. The STATA 17.0 statistical package is used to make estimations.
[36] Since the level effects were insignificant in all econometric models, they are dropped from Table 2 to ease the viewing of estimation results.

Table 2: Estimation results

Variables	*Model 1*	*Model 2*	*Model 3*	*Model 4*
L.terror	0.59***	0.57***	0.56***	0.57***
	(0.061)	(0.058)	(0.06)	(0.057)
L.protest	0.00014*	0.00014*	0.00014*	0.00014*
	(0.000)	(0.000)	(0.000)	(0.000)
L2.protest	0.00015***	0.00015***	0.00016***	0.00015***
	(0.000)	(0.000)	(0.000)	(0.000)
Inflation		-0.016**	-0.02**	-0.015**
		(0.0068)	(0.0076)	(0.0066)
military		-0.31*	-0.33**	-0.33**
		(0.18)	(0.16)	(0.15)
Unemployment		-0.021	-0.026	-0.015
		(0.015)	(0.015)	(0.017)
trade		0.007	0.007	0.006
		(0.006)	(0.006)	(0.005)
growth	-0.006	-0.021*	-0.029*	-0.02*
	(0.011)	(0.0119)	(0.017)	(0.011)
durable			-0.0019	
			(0.011)	
polity2			0.0072	
			(0.02)	
governance				0.190
				(0.218)
Constant	1.48***	2.15***	2.3***	2.17***
	(0.22)	(0.74)	(0.75)	(0.66)
Observations	360	360	353	360
R-squared	0.449	0.468	0.468	0.469
Number of countries	26	26	26	26

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. L.terror is the lagged value of the (logarithm of) number of terror incidents, L.protest and L2.protest are the lagged and second lagged (logarithm of) values of number of protests. The military variable shows the percentage share of military expenditure in GDP, trade shows the percentage share of sum of import and export in GDP, unemployment shows the percentage share of unemployed people in total labor force. The estimation is based on the ILO estimate. The youth unemployment variable is the percentage of unemployed people whose age is between 15 and 24 in total labor force. The estimation is based on the ILO estimate. Inflation data is based on the changes in the annual GDP deflator. The governance variable is the index calculated by the author using Principal Component Analysis. The variables used in the governance index are rule of law, control of corruption, and voice and accountability.

Conclusion

This article seeks to make a useful contribution to the existing literature by examining the impact of protests on terrorism for a panel of countries 1990–2018. It sheds light on the dynamic relationship between protests and terrorism, revealing that the nature of protests and their evolution over time can be crucial determinants in shaping the potential for terror incidents. Protests, serving as a conduit through which society communicates its reactions to state policies have the potential to trigger terrorist incidents over a prolonged period.

The findings, even after accounting for regime type and state repression capacity, highlight that in states where the responsible state institutions fail to take actions in response to civil demands, the likelihood of exposure to terrorism increases. Moreover, an argument can be made that escalating civic pressure on the government is likely to result in an increase in the occurrence of terror incidents. Taken together, these findings propose that in democracies where the governing authority consistently defers negotiations on civil demands or fails to respond in the face of escalating social tension and conflict between the government and civil forces, the probability of experiencing terror incidents is higher. This likelihood increases in conjunction with a weakened military capacity and the instability of the political regime, particularly in comparison to autocracies with robust military capacities and stable institutions. These are useful and compelling results to have, though future research will need to try to extend the country coverage and to deal with issues of heterogeneity and endogeneity.

References

Acemoglu, D., Hassan, T.A. and Tahoun, A., 2018. The power of the street: Evidence from Egypt's Arab Spring. *The Review of Financial Studies*, 31(1), pp.1–42. https://doi.org/10.1093/rfs/hhx086

Allo, A. 2017. Protests, terrorism, and development: On Ethiopia's perpetual state of emergency. *Yale Hum. Rts. & Dev. LJ*, 19, p.133.

Bakker, R., Hill Jr, D.W. and Moore, W.H., 2016. How much terror? Dissidents, governments, institutions, and the cross–national study of terror attacks. *Journal of Peace Research*, 53(5), pp.711–726. https://doi.org/10.1177/0022343316655020

Bapat, N. A., and Zeigler, S. 2016. Terrorism, dynamic commitment problems, and military conflict. *American Journal of Political Science*, 60(2), pp. 337–351. https://doi.org/10.1111/ajps.12211

Battaglini, M. 2017. Public protests and policy making. *The Quarterly Journal of Economics*, 132(1), pp.485–549. https://doi.org/10.1093/qje/qjw039

Castro, F. and Retamal, R., 2022. Does electoral behavior change after a protest cycle? Evidence from Chile and Bolivia. *OSF Preprints. May*, *13*. https://doi.org/10.31219/osf.io/h28kg

Celestino, M. R., and Gleditsch, K. S. 2013. Fresh carnations or all thorn, no rose? Nonviolent campaigns and transitions in autocracies. *Journal of Peace Research*, 50(3), pp.385–400. https://doi.org/10.1177/0022343312469979

Chen, S., N. V. Loayza, and M. Reynal-Querol. 2008. The aftermath of civil war. *World Bank Economic Review* 22 (1): pp. 63–85. https://doi.org/10.1093/wber/lhn001

Chenoweth, E. 2013. Terrorism and democracy. *Annual Review of Political Science*, 16, pp. 355–378. https://doi.org/10.1146/annurev-polisci-032211-221825

Chenoweth, E., Hamilton, B. H., Lee, H., Papageorge, N. W., Roll, S. P., and Zahn, M. V. 2022. *Who protests, what do they protest, and why?* (No. w29987). National Bureau of Economic Research. https://doi.org/10.3386/w29987

Chenoweth, E., 2023. Can nonviolent resistance survive COVID-19?. In *Rights at Stake and the COVID-19 Pandemic* (pp. 134–146). Routledge.

https://doi.org/10.4324/9781003270195-20
Clark, D. and Regan, P., 2021. Mass Mobilization Protest Data. Harvard Dataverse V5.
Collins, W. J., and Margo, R. A. 2007. The economic aftermath of the 1960s riots in American cities: Evidence from property values. *The Journal of Economic History*, *67*(4), pp. 849–883. https://doi.org/10.1017/S0022050707000423
Dave, D., Friedson, A., Matsuzawa, K., Sabia, J. J., and Safford, S. (2020). *Black lives matter protests, social distancing, and COVID–19* (Vol. 27408). Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.2139/ssrn.3631599
Drakos, K., and Giannakopoulos, N. 2009. An econometric analysis of counterterrorism effectiveness: the impact on life and property losses. *Public Choice*, *139*(1–2), pp. 135–151. https://doi.org/10.1007/s11127-008-9384-9
El-Mallakh, N. 2020, How do protests affect electoral choices? Evidence from Egypt. *Journal of Economic Behavior & Organization*, *179*, pp. 299–322. https://doi.org/10.1016/j.jebo.2020.09.005
Enders, W., and Hoover, G. A. 2012. The nonlinear relationship between terrorism and poverty. *American Economic Review*, 102(3), pp. 267–272. https://doi.org/10.1257/aer.102.3.267
Fisher, D.R., Andrews, K.T., Caren, N., Chenoweth, E., Heaney, M.T., Leung, T., Perkins, L.N. and Pressman, J., 2019. The science of contemporary street protest: New efforts in the United States. *Science advances*, 5(10), p.eaaw5461. https://doi.org/10.1126/sciadv.aaw5461
Frye, T., & Borisova, E. (2019). Elections, protest, and trust in government: A natural experiment from Russia. *The Journal of Politics*, 81(3), 820–832. https://doi.org/10.1086/702944
Gause, L. 2022. Revealing issue salience via costly protest: How legislative behavior following protest advantages low–resource groups. *British Journal of Political Science*, 52(1), pp. 259–279. https://doi.org/10.1017/S0007123420000423
Gillion, D. Q. 2020. *The loud minority: Why protests matter in American democracy*. Princeton University Press. https://doi.org/10.1515/9780691201726
Gillion, D. Q., and Soule, S. A. 2018. The impact of protest on elections in the United States. *Social Science Quarterly*, 99(5), pp. 1649–1664. https://doi.org/10.1111/ssqu.12527
Hornsey, M. J., Majkut, L., Terry, D. J., and McKimmie, B. M. 2003. On being loud and proud: Non-conformity and counter-conformity to group norms. *British journal of social psychology*, 42(3), pp. 319–335. https://doi.org/10.1348/014466603322438189
Iacoella, F., Justino, P. and Martorano, B., 2021. *Do pandemics lead to rebellion? Policy responses to COVID-19, inequality, and protests in the USA* (No. 2021/57). WIDER Working Paper. https://doi.org/10.35188/UNU-WIDER/2021/995-2
Issaev, L., Fain, E., and Korotayev, A. 2021. Impact of the Arab Spring on terrorist activity in the Sahel. *Ideology and Politics Journal*, 19(3), pp. 34–49.
Jarzabkowski, P., Unger, C. J., and Meissner, K. 2022. Terrorism and violent protests: where do these disruptive events meet?.
Johnston, H., & Almeida, P. (Eds.). 2006. *Latin American social movements: Globalization, democratization, and transnational networks*. Rowman & Littlefield.
Kelly, C., & Breinlinger, S. 1995. Identity and injustice: Exploring women's participation in collective action. *Journal of Community & Applied Social Psychology*, 5(1), pp. 41–57. https://doi.org/10.1002/casp.2450050104

Korotayev, A., Shishkina, A., and Khokhlova, A. 2022. Global echo of the Arab Spring. In *Handbook of revolutions in the 21st century: The new waves of revolutions, and the causes and effects of disruptive political change* (pp. 813–849). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-86468-2_31

Krieger, T., and Meierrieks, D. 2019. Income inequality, redistribution and domestic terrorism. *World Development*, *116*, pp. 125–136. https://doi.org/10.1016/j.worlddev.2018.12.008

Madestam, A., Shoag, D., Veuger, S., and Yanagizawa–Drott, D. 2013. Do political protests matter? evidence from the tea party movement. *The Quarterly Journal of Economics*, 128(4), pp. 1633–1685. https://doi.org/10.1093/qje/qjt021

Marshall, M.G. and Gurr, T.R., 2020. *Polity5: Political regime characteristics and transitions, 1800–2018*. Center for Systemic Peace, 2.

Martin, B. 1994. Protest in a liberal democracy. *Philosophy and Social Action*, 20(1–2), pp. 13–24.

Matsueda, R.L., Robbins, B.G. and Pfaff, S.J., 2020. Under What Conditions Are Students Willing to Protest? Selective Incentives, Production Functions, and Grievances. *SocArXiv. October*, *29*. https://doi.org/10.31235/osf.io/z3myc

Okafor, G., & Piesse, J. 2018. Empirical investigation into the determinants of terrorism: Evidence from fragile states. *Defence and Peace Economics*, 29(6), pp. 697–711.

Passarelli,F.,and Tabellini,G. 2017. Emotions and political unrest. Journal of Political Economy,125(3), pp. 903–946. https://doi.org/10.1086/691700

Piazza, J. A. 2011. Poverty, minority economic discrimination, and domestic terrorism. *Journal of Peace Research*, 48(3), pp. 339–353. https://doi.org/10.1177/0022343310397404

Plumber, T., and E. Neumayer. 2010. The Friend of My Enemy is My Enemy: International Alliances and International Terrorism. *European Journal of Political Research*, 49 (1), pp. 75–96 https://doi.org/10.1111/j.1475-6765.2009.01885.x

Putnam, R. 1997. Democracy in America at century's end. *Democracy's victory and crisis*, pp. 27–70. https://doi.org/10.1017/CBO9780511558832.003

Rosendorff, B. P., and Sandler, T. 2004. Too much of a good thing? The proactive response dilemma. *Journal of Conflict Resolution*, 48(5), pp.657–671. https://doi.org/10.1177/0022002704268278

Ross, J. I. 1993. Structural causes of oppositional political terrorism: Towards a causal model. *Journal of Peace Research*, 30(3), pp.317–329. https://doi.org/10.1177/0022343393030003006

Ross, J. I. 1995. The relationship between domestic protest and oppositional political terrorism in connection with the Gulf conflict. *Journal of Contemporary Criminal Justice*, 11(1), pp. 35–51. https://doi.org/10.1177/104398629501100105

Sangnier, M., and Zylberberg, Y. 2017. Protests and trust in the state: Evidence from African countries. *Journal of Public Economics*, 152, pp. 55–67. https://doi.org/10.1016/j.jpubeco.2017.05.005

Schofield, J. W., and Pavelchak, M. A. 1989. Fallout From The Day After. The Impact of a TV Film on Attitudes Related to Nuclear War 1. *Journal of Applied Social Psychology*, 19(5), pp. 433–448. https://doi.org/10.1111/j.1559-1816.1989.tb00066.x

Schumacher, M. J., and Schraeder, P. J. 2021. Does domestic political instability foster terrorism? Global evidence from the Arab Spring Era (2011–14). *Studies in Conflict & Terrorism*, 44(3), pp. 198–222. https://doi.org/10.1080/1057610X.2018.1538124

Simon, B., Loewy, M., Stürmer, S., Weber, U., Freytag, P., Habig, C., Kampmeier, C. and Spahlinger, P., 1998. Collective identification and social movement participation. *Journal of personality and social psychology*, 74(3), p. 646.

https://doi.org/10.1037//0022-3514.74.3.646
Start (National Consortium for the Study of Terorism and Response to Terrorism), 2022. *Global Terrorism Database, 1970–2020.* Available at: https://www.start.umd.edu/gtd .
Stürmer, S., Simon, B., Loewy, M., and Jörger, H. 2003. The dual–pathway model of social movement participation: The case of the fat acceptance movement. *Social Psychology Quarterly*, pp. 71–82. https://doi.org/10.2307/3090142
Tahir, M. 2020. Terrorism and its determinants: panel data evidence from 94 countries. *Applied Research in Quality of Life*, 15(1), pp. 1–16. https://doi.org/10.1007/s11482-018-9660-x
Tarrow, S. G. 1989. Democracy and disorder: protest and politics in Italy, 1965–1975.
Tilly, C., and Tarrow, S. G. 2015. *Contentious politics*. Oxford University Press.
Tucker, J. A. 2007. Enough! Electoral fraud, collective action problems, and post–communist colored revolutions. *Perspectives on politics*, 5(3), pp. 535–551. https://doi.org/10.1017/S1537592707071538
Walsh, J. I., and Piazza, J. A. 2010. Why respecting physical integrity rights reduces terrorism. *Comparative Political Studies*, 43(5), pp. 551–577. https://doi.org/10.1177/0010414009356176
World Bank, 2023a. *World Bank Development Indicators 2023.* The World Bank.
World Bank, 2023b. *World Bank Governance Indicators 2023*. The World Bank.
Young, J., and Dugan, L. 2008. Terrorism and Veto Players. In *annual meeting of the International Studies Association.*

Appendix A: Principal component analysis for governance

The variables used in the governance index are rule of law, control of corruption, and voice and accountability. The weight matrix for the governance index is below:

Table A1: Weight matrix for governance index

Components	*Proportion*	*Cumulative*
Control of Corruption	93 %	93 %
Voice and Accountability	6 %	99%
Rule of Law	1%	100%

Appendix B: List of panel countries

Algeria	Colombia	Greece	Italy	Myanmar	Philippines	UK
Bangladesh	Congo	India	Kenya	Nigeria	Spain	Yemen
Burundi	France	Iran	Lebanon	Pakistan	Thailand	
China	Germany	Iraq	Mexico	Peru	Turkey	

THE ECONOMICS OF PEACE AND SECURITY JOURNAL

A journal of Economists for Peace and Security

VOL. 19, NO. 1 (2024)

ARTICLES

MICHAEL BRZOSKA on sources of inefficiency in the procurement of major weapon systems. Estimates for the German case

JENNIFER SPINDEL on defense offsets and political leverage

DENIZ GÜVERCIN on does the intensity of protests induce terrorism?