



HOW BIG IS THE INTERNATIONAL ARMS TRADE?

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INTRODUCTION

The international trade in arms is an issue of major concern for many reasons: unrestrained trade in arms can lead to destabilizing arms build-ups, threatening regional stability; it fuels civil wars and external military interventions leading to massive civilian death and suffering, caused by both government forces, rebel groups and external interveners; props up dictatorships and human rights-abusing regimes; it also diverts enormous resources from potential civilian uses, including through the vast corruption often associated with the trade. On the other hand, many states view the export of arms as a key tool of foreign policy and a means of strengthening allies. Almost all significant arms exporters maintain a rigorous system of export controls—which generally do not stop the sale of arms to questionable recipients, but which do ensure that transfers (usually) only occur with the permission of the government—and an Arms Trade Treaty was recently signed by most UN member states as a first attempt to bring some form of international regulation to the trade.

In the light of this, it is perhaps surprising, and certainly unfortunate, that the data on the international arms trade is so poor. For a phenomenon so significant in international relations, access to clear and reliable data is of enormous value for both citizens and policy-makers. But, as this article will discuss, even estimating a figure for the total value of the legal world trade in arms is fraught with difficulties, and breaking this down in more detail, in terms of buyers and sellers, is even more problematic. This article will attempt to produce such a global estimate, or rather a range of estimates, while explaining the problems with the data, including for some of the largest western arms exporters, from whom one might expect a greater level of transparency: most notably, the USA.

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Section 1 examines the available sources of data on the international arms trade, and the availability of data for different countries, including through international transparency mechanisms, and their limitations. **Section 2** attempts to build an estimate of the global arms trade, going through the key arms exporters country by country, explaining the problems with the data and attempting to derive reasonable estimates on the basis of the available information. **Section 3** reflects on the issues and problems revealed by this exercise, and concludes.

1. TRANSPARENCY AND SOURCES OF INFORMATION IN THE INTERNATIONAL ARMS TRADE

The issue of transparency in the international arms trade has gained prominence in recent decades, as an essential precondition for enabling rigorous export controls, preventing proliferation of sensitive technologies (including for WMD), promoting international cooperation on arms control, and enabling a meaningful voice for parliaments, civil society and citizens in decisions on arms exports. The 1990s saw a number of significant transparency initiatives in the wake of the first Gulf War, in particular the Wassenaar Arrangement and the UN Register on Conventional Arms. More recently, international efforts to negotiate and sign the Arms Trade Treaty (ATT) have highlighted the importance of transparency, while efforts to support implementation of the ATT will also involve measures to promote transparency. At a regional level, the EU Common Position on arms exports was a major step forward in common reporting standards for arms transfers—although as we shall see, even this is lacking in key respects.

Information on the arms trade includes both qualitative and quantitative information, and both are of central importance for transparency. The question posed by this article, “How big is the international arms trade”, relates to the quantitative side, and is the main focus of this paper, but qualitative information, regarding the actual military equipment and

services ordered, licensed and transferred, is also a critical element of transparency in the arms trade, and so will briefly be considered here. A survey of international and regional transparency instruments relating to the arms trade is presented each year in the SIPRI Yearbook chapter on Arms Transfers.

The UN Register of Conventional Arms (UNROCA)

Probably the most important international transparency instrument for the arms trade is the UN Register of Conventional Arms (UNROCA),¹ which was established in 1991, with a goal of building confidence between states and ‘to prevent the excessive and destabilizing accumulation of arms’. All UN member states are requested to submit, on a voluntary basis, annual reports of their imports and exports of seven classes of major conventional weapons: battle tanks, armored combat vehicles, large-caliber artillery systems, combat aircraft, attack helicopters, warships, and missiles and missile launchers. In addition, states are invited to report on their procurement of such systems from national production, and on imports and exports of small arms and light weapons.

At its height, in 2001, 126 states submitted reports to UNROCA (including ‘nil’ reports), but this has been steadily falling, with only 44 states reporting for 2015 as of February 2017.² A number of major exporters, including China, France, and Italy, failed to report for 2015.

Aside from the low reporting rate, UNROCA has numerous shortcomings. First of all, its coverage is very limited, leaving out the entire range of military electronic systems and sensors, so-called C4ISTAR (Computers, Command, Control, Communications, Intelligence, Surveillance, Target-Acquisition and Reconnaissance) that is so crucial to modern warfare, as well as major and costly force multipliers such as transport and tanker aircraft. Secondly, analysis by SIPRI regularly

1 <https://www.unroca.org>

2 E.g. Bromley, M. & Wezeman, S., “Transparency in arms transfers”, Chapter 10 section III in SIPRI Yearbook 2017: Armaments, Disarmament, and International Security, OUP, 2017.

shows discrepancies between what is reported on the exporter side with what is reported on the importer side. Reports to UNROCA from both sides also frequently understate records collected in SIPRI's own Arms Transfers Database. Thus, UNROCA is far from being fully comprehensive, even for the limited range of weapons systems it covers and states that report.

National reporting

National arms transfers reporting is the main basis for financial information on the arms trade, and also frequently contains detailed qualitative information. In particular, the EU Common Position on arms exports requires members to produce annual reports detailing export licenses granted and refused across the common EU Military and Dual Use Lists of equipment and technologies covered by the Common Position. National reports typically include considerable detail of the nature of the equipment licensed, although not the specific make or the company producing it, for reasons of commercial confidentiality.

Far more limited is information on the equipment actually transferred, which is a significant gap, as it cannot be assumed that all equipment licensed is ultimately delivered. More importantly, the reporting only includes any quantitative element (numbers of equipment as well as value) for individual licenses, which authorize a single shipment of a specified quantity and value to a specific destination. Transparency is much weaker in relation to open licenses, which allow for multiple shipments, in unspecified quantities and values, for a type of equipment to a specific recipient, often over a longer period of time than applies for a single license. For example, in the 2nd quarter of 2017, the UK issued 33 Single Individual Export Licenses (SIELs) for exports to Saudi Arabia worth £836 million, each covering a specific type and quantity of equipment, and each with a specified value. However, during the same period, 11 Open Individual Export Licenses (OIELs) were issued or amended for exports to Saudi Arabia, covering 216 separate categories of equipment, in unlimited quantity and value over the period for which they remain

in operation.³ The United Kingdom uses open licenses far more than most other EU member states, but their use is increasing elsewhere as well, severely limiting the degree of transparency provided by national arms export reports.

The Stockholm International Peace Research Institute (SIPRI) Arms Transfers Database

The most widely cited source of international arms trade data, and the one generally accepted as most authoritative, is the SIPRI Arms Transfers Database (ATDB),⁴ which provides detailed qualitative and quantitative information on international arms transfers. The qualitative information, provided in the Trade Registers, provides information on specific orders and deliveries of major conventional weapons, including buyer and seller, years of order and delivery, type of equipment sold, numbers ordered and delivered to date (known or estimated), whether the deal is a direct sale or licensed production, and additional notes, sometimes including the price, where known.

The ATDB covers a wider range of systems than UNROCA, but is still limited to what SIPRI classifies as “major conventional weapons”. The categories currently covered are:⁵

- Aircraft
- Air defense systems
- Armored vehicles
- Artillery
- Engines for aircraft, ships, and armored vehicles
- Missiles (excluding unguided bombs)
- Naval weapons
- Satellites (surveillance only, though the inclusion of military communication

³ UK export licensing statistics, <https://www.gov.uk/government/statistics/strategic-export-controls-licensing-statistics-1-april-to-30-june-2017>

⁴ SIPRI Arms Transfers Database, <https://www.sipri.org/databases/armstransfers>.

⁵ For full details, see SIPRI ATDB Sources & Methods, <https://www.sipri.org/databases/armstransfers/sources-and-methods#Coverage>

- satellites is being explored)
- Sensors (radars, including both stand-alone radar systems, and those embedded in other platforms, e.g. fire control radars)
 - Ships
 - Other, including turrets for armored vehicles and ships, and air refueling systems.

The database does not cover subsystems other than those listed above (sensors, engines, and turrets), military command, control, and communications systems, components of military equipment, or small arms and light weapons (SALW).

The SIPRI ATDB draws its information from a wide variety of sources: official government reports, company reports, general and specialist media, and even sources such as photos of military parades on blog sites for weapons enthusiasts, which can help confirm delivery of a system. SIPRI's researchers believe that they thereby capture the great majority of orders and deliveries in the categories covered. However, there are inevitably gaps and uncertainties; for systems, such as missiles or lighter armored vehicles, which typically involve large numbers and low unit values, the total order may not be disclosed (and is thus estimated), and even where it is, deliveries are frequently estimated on the basis of educated guesswork as to the likely pace of delivery over the period of the contract. For larger systems, however, there is typically much better information available on deliveries.

Quantitative and financial information

International trade is an area in which there is, for most industries, exceptionally good data, both because it is of enormous economic interest to governments and business, and because all legal international trade transactions are recorded as they pass through customs at both the importer and exporter ends. So why does this not apply to the arms trade?

The UN [Comtrade](https://comtrade.un.org) database has data on imports, exports and re-exports to and from all countries and territories, broken down by Standard Industrial Trade Classification (SITC), based on

reporting by countries' customs authorities.⁶ The database was created in the 1960s. Unfortunately, there is no SITC code, or collection of codes, that properly captures the international arms trade. There is a category "Arms and ammunition" (including for civilian use, although the more detailed breakdown allows for a better distinction between military and civil), but this only captures, to put it bluntly, the things that go boom: guns, artillery, missiles, bombs, torpedoes, rocket launchers, etc. There is another category, "Tanks and armored fighting vehicles", which covers another sector of international arms trade. However, military aircraft and their subsystems are subsumed under broader aircraft and aerospace categories, while naval vessels are subsumed under marine vessels in general. The vast range of military electronics systems, radars, etc., that form a crucial part of military platforms and weapons, are likewise mixed in with the broader civilian category.

The United States, for example, exported \$5.4 billion worth of "Arms & Ammunition" in 2016, and \$1.7 billion of "Tanks and other armored vehicles" and components thereof. This is only a small proportion of total US arms exports.

This illustrates the key problem with collecting data on the international arms trade: it is not something that is routinely collected as part of international trade activities. Whether data is available for a country therefore depends on whether anyone within the country is actually collecting the data, and then on whether and how much of this data the government chooses to publish. This in turn depends on government interest first in having the data, and secondly in making it available to the public.

Given this lack of a clear international standard for measuring and reporting arms transfers, those seeking to compile data on the international arms trade must rely on a variety of national, international, and media sources of information. A number of organizations, governmental and non-governmental, attempt to produce data on arms transfers at a global level, with both total levels of exports

⁶ UN Comtrade database, <https://comtrade.un.org>

and imports per country, and the levels of transfers between specific pairs of countries.

The SIPRI Trend Indicator Value (TIV) measure

The qualitative information on arms transfers contained in the SIPRI ATDB (see above), is used to compile a quantitative measure of the volume of deliveries of major conventional weapons each year, broken down by buyer, seller, and type of equipment, using SIPRI's [‘Trend Indicator Value’](#) (TIV) measure. A TIV is assigned to each individual weapon system, so that the total TIV of each delivery can be calculated, and summed over countries and years. According to the most recent data release by SIPRI, the total volume of the trade in major conventional weapons in 2017 was 31,106 million TIV units.

The goal of the TIV is to assign a similar value to similar items of military equipment, regardless of the price paid; the reason SIPRI does this is that in many arms deals, the price paid is not publicly revealed. SIPRI also seeks to account for transfers that are made as military aid. First of all, a set of ‘base systems’, mostly US systems, are given a TIV value based on their unit production cost (which is information publicly available in the US), converted into constant 1990 prices. Other, non-US systems, are assigned a TIV value based on the nearest equivalent base system, as judged by the SIPRI team. For example, one of the most advanced Russian combat aircraft, the Sukhoi Su-30MK, is assigned the same value as a US F-35 Joint Strike Fighter.

This is a well-tried system, which aims to give an accurate measure of the volume of international arms transfers, including the volume of transfers between specific pairs of countries, which would often be very hard to do for a financial measure. But it does not give us a financial measure, and in fact when looking at specific countries the TIV value of exports or imports often does not correlate very well with financial values, where these are known. The TIV measure can do what the name describes – it can measure trends in the international arms trade, and can also give meaningful comparisons between countries or groups of countries; but the absolute values cannot be directly compared with economic and financial measures, such as GDP, military

expenditure, or overall levels of trade.

One concern regarding the SIPRI TIV system is the lack of transparency regarding the assignment of TIV values to individual systems. There is no comprehensive list of the TIV values assigned to individual systems, although the TIV for most systems can be determined, provided that at least one has been delivered, using the Excel version of SIPRI's database. However, the criteria by which individual systems are compared to US ‘base’ systems are not disclosed, the decision on TIV values are made by a single member of the SIPRI team, and no internal or external peer review of these values has been conducted since the early 2000s. Nonetheless, while the values assigned to individual weapons may be open to debate, the grounding of the TIV system in the unit costs of US base systems ensures a clear objective basis for the measure, which remains the best available quantitative measure of conventional arms transfers worldwide.

The Congressional Research Service (CRS)

The CRS publishes an annual report on “Conventional arms transfers to developing nations”, which provides data on the international arms trade as a whole (including to developed nations), but with a more detailed focus on transfers to developing countries. According to the 2017 CRS [report](#),⁷ the total value of global arms deliveries in 2015 (to developed and developing countries), was \$46.2 billion. (The CRS report also measures orders/agreements, which it gives as \$79.9 billion in 2015).

This seems straightforward, but there are two problems with the CRS data. First, the CRS does not give any information as to its sources, some of which may come from US intelligence, making it impossible to interrogate their methodology.

More importantly, the figures are, for some countries, directly contradictory to official national sources, where there is no reason to disbelieve the latter. For example, the report

⁷ Theohary, C. A., “Conventional arms transfers to developing nations, 2008-2015”, Congressional Research Service, 19 Dec. 2016, available at <https://fas.org/sgp/crs/weapons/R44716.pdf>.

gives the total value of deliveries by Italy to be \$1.8 billion in 2015, while the EU 18th Annual Report on arms transfers, to which all member states provide data, gives the figure for Italian deliveries as \$3.6 billion. The figure given for Germany is \$1.8 billion, but this corresponds (approximately), only to official German figures for deliveries of Weapons of War, which is a subcategory of military equipment representing only a minority of German arms exports. Figures for some other countries or groups of countries also appear to be unduly low. As discussed above, since CRS does not give any indication of its sources, or the methodology it applies in obtaining their data, it is not possible to understand the reasons for the difference between CRS and official European figures. EU data, by contrast, are based on deliveries made under export licenses granted for equipment on a commonly agreed, and detailed, Military List. While it is likely that these figures are not completely accurate (for example, incomplete reporting by companies), they represent a more solid source than the numbers presented, without background, by the CRS.

World Military Expenditure and Arms Trade

The US State Department Bureau of Arms Control, Verification and Compliance produces the World Military Expenditure and Arms Trade (WMEAT) dataset. Up to the late 1990, this used to be published annually, originally by the Arms Control and Disarmament Agency, but was discontinued. It was revived a few years ago and now once again produces annual updates, generally with data a couple of years in arrears.

The [most recent edition](#) of WMEAT, for 2017,⁸ provides data on international arms transfers from 2005-2015. The total it gives for the value of the global arms trade in 2015 is \$192 billion, over four times the CRS figure. Like the CRS data, the sources are non-transparent, and also give far lower figures for several European countries than those provided by national and EU reporting. The suspicion may arise that US sources are seeking to downplay the importance of European

competitors in the international arms market.

The reason that the WMEAT total is so massively higher than the CRS figures, however, is the methodology they have used for estimating deliveries under US Direct Commercial Sales (DCS) exports of military equipment and services.

US arms sales go through two different channels: Foreign Military Sales (FMS), which are government-to-government agreements, where the US sells equipment to a foreign government, and then subcontracts the production of the equipment to a US arms producer. The second is Direct Commercial Sales (DCS), where exports are agreed directly between a US company and the recipient government, requiring a license from the US government.

Unfortunately, as is discussed in more detail below, DCS data is incomplete, severely lacking in transparency, and presented in an extremely user-unfriendly fashion. WMEAT's authors [argue](#) that the figures for DCS shipments in particular are a severe underestimate.⁹ However, the WMEAT methodology, which assumes that all DCS equipment and service authorizations ultimately turn into deliveries over the course of their period of validity, gives what I consider to be a massive overestimate of US arms sales. (CRS, conversely, takes the approach of excluding DCS sales altogether due to the unreliability of official data, which certainly leads to a severe underestimate of US arms exports).

IHS Janes

The international defense-specialist publishing company, IHS Jane's, [estimated](#) the total value of global arms deliveries in 2016 at \$62.3 billion.¹⁰ Unfortunately, IHS data suffer from two main disadvantages: first, like the US sources, its methodology is not transparent. Secondly, and more importantly, you have to pay for it. (They also appear to underestimate some of the

⁸ World Military Expenditures and Arms Transfers, 2017, <https://www.state.gov/t/avc/rls/rpt/wmeat/2017/index.htm>.

⁹ WMEAT Sources & Methods, <https://www.state.gov/documents/organization/266015.pdf>

¹⁰ "Global Defence Exports Expected to Decline for First Time Ever, Jane's by IHS Markit Says", IHS Markit, 19 July 2017, <http://news.ihsmarkit.com/press-release/aerospace-defense-security/global-defence-exports-expected-decline-first-time-ever-jan>.

European exporters, compared to the EU figures).

National data

In addition to these data sources with international coverage, many countries provide reports on their national arms exports, to a greater or lesser degree of comprehensiveness, from a press release with a total annual figure and some key customers, to detailed records of the value and type of equipment exported to each recipient.

As discussed, what information is collected will depend on a government's interest in collecting it, and what is provided will depend on what they wish to communicate to their own citizens and the wider world (influenced also by the strength of demands for transparency from Parliament and civil society). There are three key types of information that may be collected and published by arms exporters, each with a different purpose: information on export licenses is mostly used for assessing the way in which export controls are being applied, but typically does not reflect well what is ultimately delivered. Information on orders or agreements gives a picture of a country's relative success in the international arms market, and their arms trading relationships with individual partners and clients. Information on deliveries, which is what we are most interested in here, allows the best assessment of what military capabilities are actually being transferred when.

The most detailed information tends to come from the US, Canada, and European nations, although there are still significant deficiencies with many of these. In addition, the EU [Annual Report](#) on arms transfers collates information provided by all EU member states, reporting on the number and value of both approved export licenses and (for most countries) deliveries by each EU member to each recipient, broken down by the 21 categories on the EU Common Military List.¹¹

In terms of making meaningful quantitative assessment of the value of the arms trade, either for an individual country or at a global level, it should be noted that export

license data is essentially useless for this purpose, due to the wide variation in national practices regarding export licensing.

As discussed, in the EU, only the value of single export licenses is reported, and not the value of open licenses, as these allow for multiple deliveries so that a total value cannot be determined in advance. This is more significant for some countries than others; the UK, for example, makes far greater use of open licenses than most, so that their license figures are severe underestimates of the magnitude of the arms trade; but there are indications that the use of open licenses is expanding in other EU countries as well.

In general, the long-term ratio of the values of licenses to deliveries (among those countries reporting both) varies enormously between EU countries; from about 1:1 for Sweden, for example, to about 10:1 for Hungary. The reasons for this variation are not apparent.

France was, until recently, fairly near the median of this range, with values around 1.5:1 or thereabouts. However, from 2015, France has simplified their licensing system, which formerly had three stages: one license giving permission to negotiate; one at the point of signing a contract; and one prior to delivery. These have now been merged, so that the licenses are all given at the negotiation stage. As a result, most of the licenses are for sales that never materialize, and the value of French export licenses has grown to levels of about €150 billion a year, clearly bearing no relation to what is actually likely to be sold.

US export license values also massively overstate actual exports to foreign governments and entities, as they include the value of licenses for equipment delivered to US forces stationed overseas. This leads to huge license values for countries such as Japan, South Korea and Iraq that have a large US troop presence, which does not reflect actual exports to the governments of these countries. Moreover, the 10-year duration of licenses for defense services makes the relationship between licenses and sales a tenuous one.

Export license data does provide information on

¹¹ EU Annual Reports are available at https://eeas.europa.eu/headquarters/headquarters-homepage/8472/annual-reports-on-arms-exports-_en.

policy—what types of equipment governments will allow to be sold to what recipients. In some cases, license values may give an indication of the relative level of sales to different countries by an exporter (though not, as noted above, for the US, or more recently France), and they may give an indication of trends over time (though not when countries change their licensing systems, or if for example open

an estimate in the next section. Specifically, the top 20 exporters of major conventional weapons over the period 2012-16 accounted for 97.8% of the total trade, according to SIPRI data.

Of these, all apart from China and Belarus have provided at least some public data on the financial value of their arms exports in recent years. In addition, other EU member states

Table 1: National data availability on arms transfers by country

Country	Licenses	Orders	Deliveries
USA	Yes, for DCS only (but see below)	Yes, for FMS only	Yes, for both (but see below for DCS)
Russia	No	No	Yes
China	No	No	No
France	Yes, but see above	Yes	Yes
Germany	Yes	No	Yes, for “weapons of war” only
United Kingdom	Yes, but see above	Yes	No
Spain	Yes	No	Yes
Ukraine	No	No	Yes, with gaps
Italy	Yes	No	Yes
Israel	No	Yes	No
Netherlands	Yes	No	Yes
Sweden	Yes	No	Yes
South Korea	No	Yes	No
Switzerland	Yes	No	Yes
Canada	No	No	Yes
Turkey	No	No	Yes
Norway	No	No	Yes
Belarus	No	No	No
South Africa	Yes	No	No
Australia	Partial data	No	No
Belgium	Yes	No	For Wallonia only
Other EU (except Greece, Ireland)	Yes	No	Yes
Serbia	No	No	Yes, with gaps

licenses become more important over time), but they give absolutely no indication of the actual magnitude of a country’s arms exports.

Therefore, in seeking to measure the value of the arms trade, we must look at figures for deliveries and/or orders; more countries provide data on the former, some on both, but a few countries (e.g. the UK, South Korea and Israel) provide data only for orders.

The international arms trade is dominated by a relatively small number of major exporters, which we will focus on in attempting to produce

provide data on their arms export deliveries to the EU Annual Report. Together, countries providing some usable public data account for about 98.7% of total transfers. While SIPRI figures do not correspond directly to financial values, it can be stated with very high confidence that these countries account also for the overwhelming majority of the financial value of the international arms trade.

Table one summarizes the information on arms exports provided by different countries, including the top 20 exporters, and a number of other significant exporters:

National reports on arms exports by most countries that produce them, as well as EU Annual Reports, can be accessed via the [SIPRI database on national arms exports reports](#).¹²

2. BUILDING AN ESTIMATE

Before we can measure something, we need to be clear what we are measuring. For the purposes of this article, we are defining the international arms trade as the permanent transfer between countries of military equipment, to the armed forces of the recipient country or to non-state armed groups. By ‘military equipment’, we include weapons and ammunition (including personal firearms when transferred to a military customer or non-state armed force, but not e.g. to police forces or to civilians for self-protection or sporting purposes), and all equipment and services with a specifically military purpose, or that has been specifically adapted for military use.

We will restrict attention to the legal arms trade, which is either conducted directly or is authorized by governments. Naturally, the scale of the illegal trade in arms is essentially impossible to measure, but it is certainly much smaller than the legal trade. Much of the illegal trade consists of small arms and light weapons; where it concerns heavier equipment, it is likely to be second-hand in many cases. While the illegal trade can have devastating consequences in terms of conflict and human rights abuses (as can the legal trade), it is far smaller in financial and military value than the legal, which includes the sale of expensive, high-tech systems such as major combat aircraft, submarines and major surface vessels, etc.

This article will focus on measuring deliveries, that is the value of arms transfers actually delivered to the importing country in any given year. The main viable alternative is the value of orders. This can be valuable in assessing the state of the market at any given time. However, not all orders turn into actual deliveries of arms (and corresponding payments).

Moreover, on a practical level, more countries provide data on deliveries than on orders.

If we want to get a measure of the financial value of the international arms trade, in a way that can be verified or challenged based on open sources, it is necessary to do so piece by piece, by looking at the arms sales of the major exporters. SIPRI in fact does attempt to do this, providing an estimate for 2014 of at least \$94.5 billion for its most recent figure. Below, I build an estimate based on the same principles as SIPRI, using national sources of data where available, but attempting to go into more detail with some particularly problematic countries, to produce reasonable estimates or ranges of estimates.

Unfortunately, the “particularly problematic” countries include several of the top global arms exporters, including the number one, the USA.

The estimate will be an average for the period 2012-16, to attempt to smooth over annual fluctuations in deliveries by some countries, and in hopes of reducing the margin of error where deliveries must be estimated based on other data such as orders.

For those countries where data on deliveries is available, we can use this data directly. For several countries, however, most notably the UK, Germany, Israel and South Korea, it is necessary to estimate deliveries on the basis of other information. In the case of Belarus and China, in the absence of any publicly available official data, we must rely on other data providers, such as WMEAT, CRS or IHS, whose data is based on non-open sources.

We now go over the figures and estimates country by country. Data up to 2015 in most cases is obtained from SIPRI’s data on the financial value of states’ arms exports,¹³ which is compiled from national reports. Data for 2016, for countries not covered by the SIPRI financial value data, and for US DCS sales, are from the relevant national reports, and from media reports.

¹² “National reports on arms exports”, SIPRI, <https://www.sipri.org/databases/national-reports>.

¹³ SIPRI, “Financial value of the global arms trade”, <https://www.sipri.org/databases/financial-value-global-arms-trade>

USA – the problem

US arms exports are conducted through two main separate routes: Foreign Military Sales (FMS), which are government-to-government contracts between the US government and a foreign government, with the US DOD subcontracting the delivery of the equipment and/or services to a US defense company; and Direct Commercial Sales (DCS), which are negotiated directly between the US exporting company and the client government, and which must receive an export license from the Directorate of Defense Trade Controls (DDTC) in the US Department of State.

The data situation is very different for these two types of sale. Detailed country-by-country data on both orders and deliveries for Foreign Military Sales are provided by the DOD Defense Security Cooperation Agency (DSCA), covering both equipment and services in each case; the data are updated in subsequent years as more information becomes available, and as far as it is possible for an outside observer to tell, is comprehensive and accurate. Full details of individual contracts are published on the [DOD website](#).¹⁴ The average level of FMS deliveries for 2012-2016 was **\$15,975 million**.

In contrast, the publicly available data for Direct Commercial Sales are unclear, non-comprehensive, appear to vary considerably in methodology over time, and are not updated with new information after initial publication. While notification to Congress is required for individual license requests over a certain size, the details of these are buried within the overall [record of activities](#) of the House Foreign Affairs Committee,¹⁵ although the Security Assistance Monitor has extracted a [full list of notifications for 2016 and 2017](#).¹⁶

14 US Department of Defense, “Contracts”, <https://www.defense.gov/News/Contracts/Search/foreign/>.

15 E.g. U.S. House of Representatives Committee on Foreign Affairs, Survey of activities January 3 – January 6 2017, available at <https://securityassistance.org/sites/default/files/HFAC%202017.pdf>.

16 “U.S. arms sales notifications spike under the Trump administration”, Security Assistance Monitor, <https://infogram.com/us-arms-sales-notifications-spike-under-the-trump-administra->

Data on DCS licenses and deliveries by country are provided by the DDTC in their annual [Section 655](#) report.¹⁷ These give totals by country for licenses approved, broken down by category of good on the US military list, but only a single total by country for the value of goods shipped. As discussed earlier, the data on DCS license approvals are essentially worthless in that they include licenses for deliveries to US forces overseas, and due to the long period for which licenses, especially for services, are valid.

The data for the value of equipment shipped have one major lacunae, in that they do not include the value of military services delivered, unlike for FMS. The US Government Accountability Office (GAO) [estimated](#) in 2010 that about a third of the value of FMS contracts tends to be for services.¹⁸ Delivery of services is not reported to US Customs, and there is no reporting requirement for companies in relation to the provision of military services overseas. Thus, no-one collects data for the export of military services via DCS. Where services are provided as part of FMS contracts, the data is collected as part of the US Government’s monitoring of FMS delivery.

A second flaw is that the data for deliveries is not revised in subsequent years as more information becomes available.

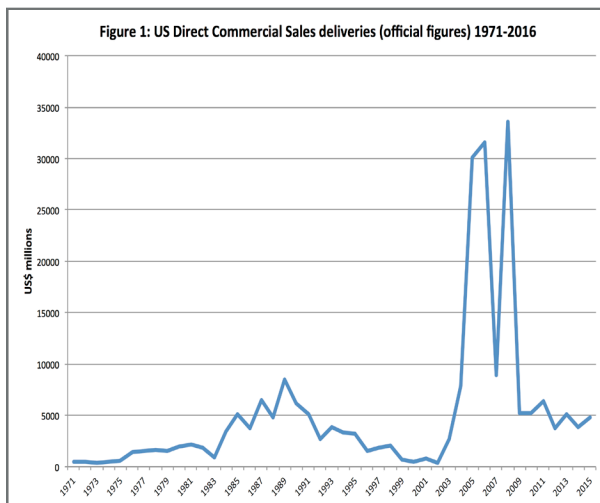
Moreover, the annual data for total DCS deliveries ([see figure 1](#)) fluctuates wildly in a way that cannot be explained by changes in actual levels of arms exports. In particular, the figures for 2005, 2006, and 2008 are vastly higher than for other years, over \$30 billion, and include figures for individual countries such as Japan and Iraq that cannot be accurate given these countries’ levels

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17 The State Department website where the Section 655 reports are stored is down at the time of writing. They are available from the Security Assistance Monitor at <https://www.securityassistance.org/content/section-655-report-us-arms-transfers-and-military-aid-state-department-contribution>

18 US Government Accountability Office, “Defense exports; reporting on exported articles and services needs to be improved”, September 2010, “reporting on exported articles and services needs to be improved”, <https://www.gao.gov/products/GAO-10-952>.

of military spending (and in the case of Japan the amount of equipment they source domestically). The reason for this would appear to be that the figures for these years include deliveries to US forces, being based on a complete search of the US customs database. The basis for the figures in other years is unclear; whether it is based on customs data, or returns by companies from used or expired licenses, and if the latter if this reporting is mandatory or voluntary. I have heard different stories from different sources. Reporting based on license use would naturally give underestimates, as licenses for equipment are valid for 4 years, so a company might only



return a used license after the full 4 years, by which time it would be too late to include any shipments made in the first 3 years in the Section 655 reports for the years in question (which, as noted, are not revised in subsequent years).

In some years, in particular in the late 1990s, the level of DCS deliveries reported sinks to below \$1 billion, which seems hard to believe given the level of US arms exports overall at the time.

Finally, the presentation of the section 655 reports by the DDTC has become progressively less user-friendly over the past decade or so. In 2008 and 2009, the reports were provided in both PDF and spreadsheet form, and had detailed introductions. Since then, the spreadsheets have been removed, and the introductions have become less detailed. No global total figure is provided, so that this must be obtained by manually adding up the figures for each

country. The PDF documents provided appear to come from a printout of an Excel spreadsheet, implying that an effort has been made to convert the more usable format into a less usable one. Finally, the report covering exports in 2016 has been buried in an extremely obscure location on the DDTC website (fortunately the reports are [reproduced](#) by Security Assistance Monitor), and the introduction has disappeared completely. It is almost as if the DDTC do not actually want the public to have the information.

Due to the suspected underestimation of DCS deliveries, the US State Department's World Military Expenditure and Arms Transfers (WMEAT) estimates these figures by assuming that all DCS licenses are delivered over the 4-year period for which they are valid; however, this makes the mistake of including deliveries to US forces overseas, thus producing huge overestimates. The degree of overestimation is likely to be even worse for military service exports for several reasons:

- i. The largest proportion of such authorizations that are for services provided to US forces overseas, as such maintenance and logistic services are overwhelmingly outsourced to the private sector;
- ii. Authorizations may cover a 10-year period, rather than 4-year, according to the GAO report, with the value of services exported often lower than what is authorized;
- iii. The section 655 reports state, in relation to service agreements, (e.g. in the 2016 report) "Export authorizations furnished in FY 2016 also include certain activities occurring in prior years because the scope of the Department's regulatory authority over such agreements continues for as long as these multi-year agreements remain in effect."

The interpretation of this is not clear, but it may mean that the value of authorizations reported in each year is the total value of authorizations for all agreements that are still in operation; this would imply that, rather than each authorization being counted only in the year it is granted, they are counted towards the total for each year for which they apply.

Hence, the WMEAT approach to estimating DCS exports cannot be considered viable.

By contrast, the Congressional Research Service (CRS), in its annual reports on the global arms trade, considers the DCS data to be so unreliable that it excludes it altogether.

Evidence that—with the exception of 2005, 2006 and 2008—official data for DCS deliveries is underestimated is supported by two sources.

First, a [GAO report](#) in 2010 makes a rigorous assessment of US defense equipment (not services) exports from 2005-2009, under both FMS and DCS, based on a detailed search of the US Customs database, taking care to exclude DCS exports made under temporary export licenses, and those for deliveries to US forces overseas.¹⁹ The figures for DCS deliveries range from \$9.6 billion in 2005 to \$13.3 billion in 2013; much lower than the official figures for the outlier years of 2005, 2006 and 2008, but much higher than those in 2007 and 2009. The report criticizes the quality of reporting on US arms exports through DCS.

Secondly, there is data from the annual reports to Congress by the Bureau of Industry and Security (BIS) on Offsets in Defense Trade. While the main purpose of these reports is to provide information on offset agreements made in relation to US arms exports, the reports also provide annual data for total US defense merchandise exports (not including services), through FMS and DCS combined. The [most recent report](#) covers data up to 2015.²⁰ The GAO figures are presented in the report in constant 2009 dollars; these have been converted into current dollars using the DOD deflator used in the report, taken from budget tables from the Whitehouse Office of Management and Budget.

[Table 2](#) shows the figures for the various different sources for FMS, DCS, and combined totals, from 2005-2016.

¹⁹ See note 18.

²⁰ US Department of Commerce, “Offsets in defense trade, 21st study”, December 2016, <https://www.bis.doc.gov/index.php/documents/pdfs/1620-twenty-first-report-to-congress-12-16/file>.

The offsets report is based on US trade census data, using end-user codes that relate to military products. The codes included are: export end-use codes: (50000) Military aircraft, complete; (50010) Aircraft launching gear, parachutes, etc.; (50020) Engines and turbines for military aircraft; (50030) Military trucks, armored vehicles, etc.; (50040) Military ships and boats; (50050) Tanks, artillery, missiles, rockets, guns, and ammunition; (50060) Military apparel and footwear; and (50070) Parts for military-type goods. The GAO report, meanwhile, includes the following subcategories of military equipment: military aircraft and spares; satellites, communications and electronics equipment, and parts; aircraft; vehicles, weapons, and parts; other equipment and parts; missiles and parts; ammunition, explosives, and parts; firearms and parts; and ships and parts.

These two would appear to cover the same ground, except for the “satellites, communications and electronics equipment, and parts” category in the GAO report, which has no counterpart in the offsets report; presumably as the trade data does not distinguish between satellites and communication systems etc. for military and civilian use. While not providing an annual breakdown or an exact figure, a bar graph in the GAO report shows the total for each category for the five-year period. The apparent figure for the satellites etc. category of around \$19 billion (in current prices) corresponds almost exactly to the difference between the totals for 2005-09 between the two sources. Hence, the GAO report and the offsets report are mutually consistent in their figures for total exports of defense articles for 2005-09, supporting the contention that the official DCS figures for 2007 and 2009 are underestimates, and suggesting that figures for other years (apart from the methodological outliers of 2005, 2006, and 2008) may also be underestimated.

Further support for this claim comes from a comparison of the offset report figures with the official figures for FMS and DCS in later years. Bear in mind that the offset report excludes FMS services, which typically account for around a third of the FMS total, according to the GAO report. (For the period 2005-09, services appear

to have accounted for 39% of the FMS total, based on the difference between the official figures for total FMS, and the GAO figures for FMS articles only). Moreover, the offset report appears to exclude satellites, communication and electronics equipment and parts, from both FMS and DCS figures—a category that accounted for approximately 20% of defense equipment exports over 2005-09 according to the GAO report.

Nonetheless, the total figure for defense equipment exports from the offset report for 2014, \$20.6 billion, is actually higher

A final piece of evidence in support of the claim that DCS figures are underestimated in later (and possibly earlier) years as well as in 2007 and 2009 comes from my own analysis of US exports of major conventional weapons over time, based on the SIPRI Arms Transfers Database. I examined the records for individual arms transfers in SIPRI’s internal database, looking at all US arms deliveries over the two periods, 2005-09, and 2012-15, and identifying those which were, or were most likely, DCS sales. The result was that, over the period 2005-09, DCS sales averaged a TIV value of 3285 per year, or 46% of the total

Table 2: US arms export data, various sources

Year	Official data			GAO report 2010			21st offset report
	FMS (articles + services)	DCS (articles only)	Total	FMS (articles only)	DCS (articles only)	Total	FMS + DCS articles only
2005	11.3	30.1	41.5	7.4	9.6	17.0	12.8
2006	11.8	31.6	43.4	7.9	11.0	18.9	16.6
2007	12.6	8.9	21.4	7.7	11.8	19.5	16.9
2008	12.0	33.6	45.6	7.4	12.0	19.4	16.6
2009	16.4	5.2	21.7	8.8	13.3	22.2	14.8
2010	13.4	5.2	18.7				15.3
2011	13.7	6.4	20.1				14.9
2012	14.3	3.8	18.0				17.2
2013	15.7	5.2	20.8				17.6
2014	15.3	3.9	19.1				20.6
2015	17.0	4.8	21.7				20.3
2016	17.3	4.7	21.9				

All figures are in US\$ billion. Sources: Official data from DOD Defense & Security Cooperation Agency FMS Fiscal Year Tables as of September 2016, <http://www.dsca.mil/resources/dsca-historical-facts-book-fiscal-year-series>; and Department of State Directorate of Defense Trade Controls, Arms Export Control Act Section 655 reports, available at <https://securityassistance.org/content/section-655-report-us-arms-transfers-and-military-aid-state-department-contribution>. GAO report: Belva Martin et al., “Defense Exports: Reporting on Exported Articles and Services Needs to Be Improved”, Government Accountability Office, September 2010, <https://www.gao.gov/products/GAO-10-952>. 21st Offset report: US Department of Commerce Bureau of Industry and Security, “Offsets in defense trade 21st study”, December 2016, <https://www.bis.doc.gov/index.php/documents/pdfs/1620-twenty-first-report-to-congress-12-16/file>.

than the total official figures for FMS and DCS, indicating a severe underreporting of DCS exports (assuming that the FMS figures are to be considered accurate).

In other years, the official FMS+DCS total is higher than the offset report, but in some cases only slightly higher, so that the share of FMS services and satellites etc. in the total would have to be implausibly small for the figures to be consistent. (The difference amounts to just 4.5% of the total of official FMS+DCS figures in 2012, and 6.5% in 2015, for example).

for US arms deliveries. Over the period 2012-2016, this declined to an average annual TIV of 2768, a decline of 16%, and only 26% of the total TIV value of US deliveries for the period.

Against this decline, we may note that there has been some inflation between the two periods (with military cost inflation likely at least as high). Overall, it would appear from this analysis of SIPRI data that the volume of DCS arms deliveries has probably not changed substantially in either direction. At any rate, the apparent decline from the average of \$11.5

billion a year for 2005-09 reported in the GAO report, to just \$4.5 billion for 2012-16 according to the official figures, seems too large to be plausible. Hence, if the GAO figures—which, as noted, are consistent with the offset report—are to be believed, then the official DCS figures for later years must be considered highly suspect.

While not completely conclusive, the accumulation of evidence suggests a systematic under-counting of DCS exports in official figures. The reasons for this likely under-counting cannot be determined without far greater methodological transparency from the DDTC, which was not forthcoming under the previous administration, and is hardly likely to be more so under the current one.

A provisional conclusion

The analysis of the TIV values of US arms exports by type from 2012-2016 suggests not much change in the level of US arms sales through DCS compared to the 2005-09 period, when the annual average was around \$11.5 billion, or possibly a slight decline.

An alternative approach to triangulating an estimate can be produced from comparing the offset report data on total US defense articles exports, at least up to 2015. The problem here is twofold: first, the FMS figures include services, which the offset report figures do not. Second, the offset report excludes the communications, satellites, and electronic equipment category, which amounted to \$19 billion, or \$3.8 billion a year between 2005-2009 (FMS and DCS combined).

We may estimate the DCS articles exports from the offset reports data by making assumptions about the proportion of services in the FMS data, and the total level of the excluded satellites etc. category. The GAO report states that the share of services in exports was fairly steady, at around one third of total FMS deliveries.²¹ I applied assumptions as to the share of FMS services ranging from 20% to 40% for the period 2012-2015.

²¹ Comparing the figures from the GAO report with the official figures, the figure is more like 39%, but the FMS delivery figures may have been revised upwards since the GAO report was produced.

For the volume of excluded defense articles from the offset figures, I applied assumptions ranging from \$2.5 billion to \$5 billion per year, compared to \$3.8 billion in 2005-09. It is irrelevant what proportion of these come from FMS or DCS, as we can apply the formula:

$$\begin{aligned} &(\text{FMS} - \text{FMS services}) + \text{DCS} = \\ &\text{Offset report} + \text{Communications etc.} \\ \text{Therefore DCS} &= \text{Offset report} + \\ &\text{Communications etc.} - (\text{FMS} - \text{FMS services}) \end{aligned}$$

Thus, the higher the share of services we assume for FMS, and the higher the level of exports of satellites, communications and electronic equipment, the higher the resulting estimate for DCS exports.

The resulting estimates range from \$9 billion to \$14.6 billion. We may note that this is somewhat conservative, as it allows for a range of shares of services that goes much further below the GAO figure of one third than it does above.

Based on this, the conclusion from the SIPRI TIV data that the level of DCS exports has probably not changed much from the \$11.5 billion reported by GAO in 2005-09 is plausible.

To allow for a considerable margin of error given the uncertainties, I propose a range of estimates of **\$9 – 14 billion** a year for DCS exports. As this is based partly on a comparison with the GAO figures, which do not include sales to Canada (and potentially other countries, to a lesser extent) under license exemptions, I will include an additional \$1 billion a year to account for such sales, for a total of **\$10-15 billion** per year.

This does not take account of DCS services exports, whereas noted there is no data for deliveries, only for authorizations. Such services include, according to the GAO report, “logistical support, repairs, training, and technical assistance”.

Unfortunately, there is no basis on which to make a viable estimate for these.

As noted, the GAO report gives a figure of one third for the share of services in FMS exports. Almost

certainly, DCS service exports are non-zero: the export of equipment is frequently accompanied by the provision of long-term maintenance, repair and overhaul (MRO) services, as well as training in the use of the equipment, technical assistance, etc. On the other hand, it is possible that the developed countries that most use DCS exports are more likely to contract with their domestic arms industries for MRO. Hence, given the already large uncertainty regarding DCS equipment exports, any attempt at an estimate, or even a range of estimates for DCS services, based on the available information, would be tenuous in the extreme. Thus, there is an entire area of US companies' business with and support for foreign militaries that is completely non-transparent, falling more or less entirely outside any reporting system.

Countries providing data on deliveries

Most EU countries, Russia, and several other arms exporters provide annual data on the value of arms export deliveries. In some cases, such as Russia, only a single total figure is provided, with no possibility of verifying its reliability, but it is the only official, open source data available. For 2012-2016, the average value of arms export deliveries for these countries was as follows:

Russia	\$15.1 billion
France	\$5.8 billion
Spain	\$4.1 billion
Italy	\$3.7 billion
Sweden	\$1.3 billion
Other EU	\$3.7 billion
Turkey	\$1.6 billion
Others	\$2.6 billion

It should be noted that the figures for EU countries, based on the EU Annual Report, may not include all service exports, although it does include "Technical assistance" as one of the sub-categories on the EU Common Military List. 'Others' include Canada, Norway, Serbia, Switzerland, and Ukraine. The averages for Serbia and Ukraine are based on incomplete data (with one year missing in each case),

while the figure of \$700 million for Canada excludes exports to the US, which do not require an export license, and which likely account for at least half of Canadian arms exports. I estimate a range of \$400 - \$1000 million for the missing Canadian exports to the US.

Countries providing data on orders but not deliveries

Three significant arms exports provide annual data on the value of arms export orders, but not deliveries: the United Kingdom, Israel, and South Korea. The UK, along with Germany, Belgium, and Ireland, is one of the few countries that do not report deliveries to the EU Annual Report, providing only the value of export licenses. Separately, the Department of Trade and Industry reports the total value of defense export orders each year, broken down by region. Israel and South Korea both provide only annual totals for export orders. As discussed above, the UK's export license data is not useful for estimating the value of the UK arms trade.

The major problem in estimating deliveries on the basis of orders is that the time between order and delivery is immensely variable, depending on the type of equipment and other factors. Two countries, the US (for Foreign Military Sales), and France, provide data on both orders and deliveries, allowing a comparison. The figures for US FMS sales from 1970 onwards are shown in [figure 2](#) below, while French data from 1991 is shown in [figure 3](#).

In the US figures, trends in deliveries clearly lag those in orders. Experimenting with different options, we find that a 5-year moving average of orders, lagged by one year (so the average of orders from 1 to 5 years ago) gives a graph that, until recently, tracks the figures for deliveries fairly well (see [figure 3](#)). A 4-year lag gives an even better correlation. In recent years, however, orders have massively outpaced deliveries; this is largely due to several very large contracts for F-35 Joint Strike Fighters, made from 2007-2010, which have only just begun to see the first deliveries.

The French figures are less clear, but again, a 4-year lag of the 5-year moving average of orders appears to give the best fit to the delivery data.

The correlation for the French data, however, is only 0.51, compared to 0.76 for the US data.

Looking at long-term US figures, excluding the most recent years where the orders have only barely begun to see deliveries, and applying the same 4-year lag of the 5-year MA. We find that about 90% of total order value eventually turns into deliveries. For the French data, the comparable figure is 78%.

Figure 2: US Foreign Military Sales agreements, deliveries, and 5-year moving average of agreements, 1970-2016

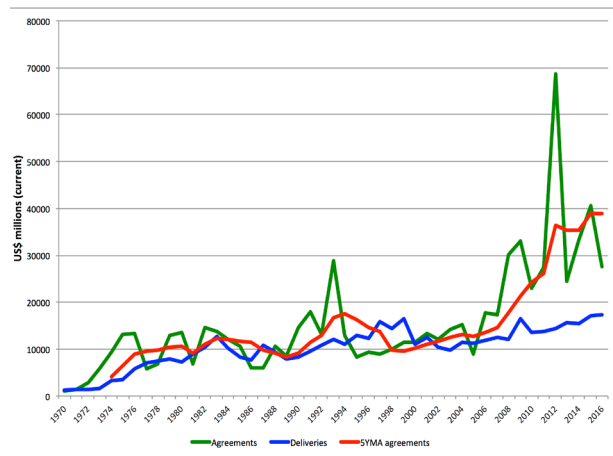
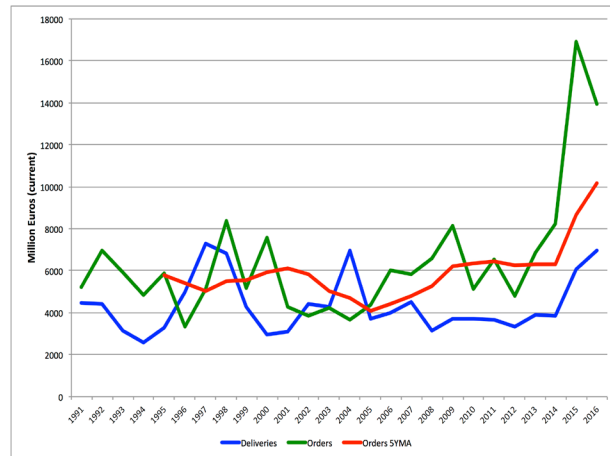


Figure 3: French arms export orders, deliveries, and 5-year moving average of orders, 1991-2016



This illustrates that significantly different results can be obtained for different countries. The UK probably more closely resembles the US case, in that for both countries a high proportion of arms exports are in the form of services, which is not the case for France, where services rarely comprise more than 10% of total arms orders

or deliveries. It is likely that the delivery of military services follows a smoother and more consistent pattern following orders, as they are performed on a continuous basis, rather than major equipment, which is often delivered in uneven batches with a long lead time depending on the complexity of the equipment, whether it is a new system or “of the shelf”, financing arrangements, company workload, etc.

The UK

By far the UK’s largest arms export customer is Saudi Arabia, through a series of huge government-to-government contracts, Al-Yamamah (negotiated in the 1980s), Al Yamamah 2 (1990s), and Al-Salam (2000s). The prime contractor for these agreements is BAE Systems. However, the annual figures for defence export contracts includes only claims made in the given year under these large ongoing deals, rather than including the total value in the year they are signed and nothing in other years.²²

Therefore, in estimating UK arms export deliveries based on the order figures, and using a lagged moving average as above, we must adjust this to take account of the fact that a significant proportion of the “order” figures are in fact deliveries under these government-to-government programmes. If we assume that 30% of the order figures represent G-G deliveries in the same year, then we obtain an estimate, and then apply the 5-year moving average with 4-year lags to the remaining 70% of the totals, and also assume that 10% of the total value of orders is never delivered, we obtain an estimated total level of arms exports for the UK for 2012-

²² The methodology to the UK defence export statistics states: “Government-to-Government Programmes: a figure is included annually for exports achieved under the G2G programmes, i.e. the Salam Project and the Saudi British Defence Co-operation Programme. These are based on the value of customer-approved claims submitted against budgetary provisions included within the various underlying agreements for goods and services and any fixed priced purchase orders. This information is provided by the MOD Saudi Armed Forces Projects Office.” See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/631345/Defence_Export_Statistics_Methodology_2016.pdf

2016 of £30.6 billion, or \$47 billion. Increasing this share to 40% gives a figure of £31.4 billion, or \$48.4 billion, and to 50% (similar to the share of Saudi Arabian exports in the UK total based on SIPRI data), we get £32.3 billion, or \$49.8 billion. The difference is therefore not great.

An alternative approach (for the UK at least) to attempting to estimate the value of arms deliveries on the basis of orders is to use SIPRI's arms transfers database to attempt to assess the pattern of lags between orders and deliveries for a given country, and specifically what equipment is delivered during the years in question (2012-2016). This makes use of both the trade registers from SIPRI's main Arms Transfers Database, and the less-publicized Excel query function of the database, from which one can obtain a report of all individual delivery records between countries for each year, including the type of equipment, the TIV value per unit, and the number of units delivered.²³

Using this data, it is possible to construct a matrix for a given country showing, for each pair of years X and Y, the total TIV value of major conventional weapons ordered in year X and delivered in year Y. Using the trade register, which shows equipment ordered as well as delivered, it is almost possible to determine the total TIV value of equipment ordered in year X but not yet delivered. The exception to this is where there have been orders of an item for which no deliveries have yet been made to any country, and for which the TIV value per unit is not recorded in the spreadsheet of deliveries. (In some cases, for a very new system, SIPRI will not yet have estimated a TIV value per unit). A reasonable estimate can be made, however, by using TIV values for similar equipment, perhaps increasing by a small amount to account for improvements in a new generation. There are only a handful of these cases for the countries for which I did this, however. Using this information, one could attempt

²³ This database can be found at <http://armstrade.sipri.org/armstrade/html/tiv/index.php>. The link is publicly accessible, but is not publicized, and is not linked to from any other SIPRI web page. This is a remnant of SIPRI's historic distrust of the data-using public, which made it reluctant to provide complex data to those who might misuse it.

to estimate annual deliveries based on the proportion of equipment, by TIV value, ordered in each year that is delivered in the years one is estimating, and then applying the heroic assumption that the share of the financial value of orders from year X that are delivered in year Y is the same as the share of the TIV value.

Unfortunately, this assumption is better described as anti-heroic rather than heroic, in that it is demonstrably false. The figures for the UK show virtually no correlation between the total TIV values of orders in each year with the financial value of orders. For example, the year 2013 is a peak year for the financial value of orders, at £9.8 billion, but a low point for the TIV value of orders. The principal reason for this is a major new service contract signed in 2013 with Saudi Arabia for the Typhoon aircraft.

However, while one cannot use the specific TIV figures for orders and deliveries in particular pairs of years, and infer a financial value for deliveries based on the financial value of orders and the TIV value of deliveries (as, for example, this would greatly exaggerate the deliveries figures for the years in which most of the TIV value of major equipment orders in 2013, if these were different from the years of service performance), it is possible that one can get a reasonable estimate by observing the typical patterns of order-delivery lag over a long period. This will reduce the distorting effect of individual years where the order-delivery pattern in financial terms is very different from the TIV pattern. Based on orders from the UK made from 1999-2007, the percentage of the TIV value delivered after a given number of years is as follows:

No. of years lag/share of deliveries (%)			
0	2.4	6	12.5
1	8.1	7	11.2
2	11.6	8	10
3	11.1	9	7.7
4	7.3	10	3.8
5	5.6	>10	8.7

We use these figures for lag patterns to produce an estimate for the financial value of UK deliveries, based on the order figures. Once

again, we assume variously that 30%, 40% or 50% of the value of orders consists of actual deliveries on G-G contracts with Saudi Arabia, while the other 70%, 60% or 50% is delivered in accordance with the lag pattern above. I assume that deliveries taking over 10 years are split evenly between 11-15 years. Once again, I multiply the final result by 0.9, assuming that 10% of orders are never delivered. The resulting estimates are £31.4 billion (£48.2 b.), £32.2 b. (\$49.4 b.), and 32.3 b. (\$50.6 b.), based on same-year G-G delivery figures of 30%, 40% and 50% respectively. Thus, the results are not hugely dependent on the assumption made as to this share, and are very similar to those obtained from the simpler method based on the 5-year moving average with a 4-year lag.

The various methods we have used for the UK have produced estimates ranging from an average of \$9.4 billion a year to \$10.1 billion. Given the considerable uncertainty in the methodology, a somewhat larger spread of **\$8.5 billion to \$11 billion** would seem a reasonable range.

Israel

In the case of Israel, the picture is helped by the fact that they used to provide delivery figures as well as orders, up to 2012, with some gaps. A large proportion of Israel's exports consist of components and subsystems that are not included in the SIPRI Arms Transfers Database, and that may well have a shorter lead time. The available order and delivery figures show no clear evidence of a lag, and the order figures are relatively stable in recent years. Therefore, a more straightforward approach seems justified, simply taking the actual delivery figure for 2012 and the order figures for 2013-2016. This gives an annual average of \$6.4 billion. Thus, **\$5.4 - \$7.4 billion** would appear to be a reasonable range of estimates.

The fact that such a high proportion of Israel's exports do not consist of major conventional weapons argues against using an order-delivery pattern based on SIPRI TIV values to estimate Israeli arms deliveries.

South Korea

The case of South Korea is more difficult than

the UK and Israel, as the annual volume of orders has increased dramatically in recent years, from an average of \$250 million a year from 2001 to 2006, to a little over \$1 billion a year for 2007-10, then \$2.4 - \$3.6 billion a year for 2010-2016. Moreover, the amount of actual deliveries of major conventional weapons recorded in the SIPRI database is rather limited, so it is not so easy to obtain a 'typical' order-delivery profile for South Korean orders.

Applying the 5-year moving average with a 4-year lag, in line with the US and French data, to Korean orders would give an estimate of \$1 billion a year in deliveries on average between 2012-2016. Given the uncertainty generated by the very rapid rise in Korean orders, I will use a fairly wide range of estimates, of **\$0.5 - 1.5 billion**. The lower end of the range is more compatible with WMEAT's estimates, whereas the higher end would assume that some of the large orders made in recent years have begun to result in significant deliveries.

Countries providing license data and partial delivery data

Germany

Germany does not report arms export deliveries to the EU Annual Report, but only license values. However, in their national arms exports report, they do report deliveries of a subcategory of arms exports, "weapons of war" (Kriegswaffen). This includes what is often described as "lethal" military equipment, but not e.g. engines, radars, communications systems, and other subsystems and equipment. They also provide a figure for the value of (individual) licenses for weapons of war.

Moreover, the national report, as well as giving figures for individual export licenses, as reported in the EU Annual Report, also gives figures for the value of "collective" export licenses, which are a type of 'open' license that allows for multiple deliveries to various recipients over a longer period of time, as part of collective defense projects, usually with other EU or NATO states.

Based on the relative size of the figures for deliveries of weapons of war (WoW), and of the individual license values for weapons of war, it is

clear that at least some of the deliveries of WoW occur under collective licenses. This follows from the fact that the value of WoW deliveries actually exceeds the value of WoW individual licenses over a long period of time, and weapons cannot be delivered unless they are previously licensed. To estimate total German deliveries, I have made two somewhat heroic assumptions: first, that the proportion of collective licenses that are for weapons of war is the same as the proportion of individual licenses. This allows us to estimate a total license value for WoW, including both individual and collective licenses. Secondly, I assume that the ratio of licenses to deliveries for all military equipment is the same as that for WoW. This gives a ratio of 1.45:1 for licenses to deliveries. Finally, I average the value of collective licenses over the current and previous years, as these are valid for 2 years, whereas individual licenses are only valid for one.

These assumptions result in an average annual figure for German arms export deliveries for 2012-2016 of **\$7.5 billion** per year. To allow for the significant margin of error in this calculation, I assume a range of **\$6.5– 8.5 billion**.

Belgium

Belgium only reports license values, and not deliveries, in the EU Annual Report. However, in Belgium, arms export licensing is mostly devolved to its component regions of Flanders, Wallonia and Brussels, which each produce their own annual reports. Only equipment exported by the Belgium armed forces is licensed at a federal level. Wallonia accounts for the great majority of Belgium arms exports, and fortunately the Wallonian annual report does report deliveries as well as licenses. For the remaining Belgian exports, I assume the same ratio of licenses to deliveries as applies for Wallonia. However, there is one complicating factor, in that in 2014 Wallonia's export licenses surged to €4.3 billion, mostly due to a single 15-year export license worth €3.2 billion. For the purposes of calculating the long-term ratio of licenses to deliveries, I therefore allocated one fifteenth of the value of this license to each year from 2014-2016. The resulting long-term ratio of deliveries to licenses was 44%, which is consistent with the bulk of European exporters. This results in an estimate of around **\$600 million** a year for Belgium.

Countries providing data on export licenses only

Australia is only 20th on the list of SIPRI top arms exporters, but as most of its arms exports involve components, technology, and services, this tends to understate their level of exports. Unfortunately, Australia has some of the worst, least transparent data for arms exports of any industrialized democracy. Data in quarterly reports is provided only for export permits issued, and appears to be available only from financial year 2013-14. (Previously, data on deliveries was available up to 2003-04). Companies applying for export licenses may fill in an optional field for the value of the goods they are seeking a license for, but are not required to fill it in. The proportion of permits for which a value was declared has varied between 66% and 80% since 2013-14. Of course, there is absolutely no way of knowing if the average value of goods licensed in those applications that do not declare a value is similar to the average for those that are declared. The statistics for number of permits issued (but not the value) is broken down by continent, but not by country.

Moreover, the statistics appear to include permits for both military and dual use goods, which would result in a substantial overestimate compared to statistics for other countries. In addition, about a fifth to a quarter of licenses are issued with Australia as the destination, referring to goods that have been shipped overseas for repair and then returned, which are thus not exports. In other words, the available statistics provide essentially no useful information whatsoever on the value of Australian arms exports.

However, a [Defence Export Strategy](#) paper produced by the Australian Department of Defence in January 2018,²⁴ setting out plans to spend AU\$20 million (US\$15m.) a year to support defense exports, with the goal of becoming one of the world's top 10 arms exporters by 2028, provides some slightly more useful information. Specifically, it gives figures for the value of permits issued for military goods (excluding dual use) from 2013 to

24 Australia Department of Defence, "Defence Export Strategy", 2018, <http://www.defence.gov.au/Export/Strategy/Default.asp>.

2016, showing a steady increase in value from about AU\$500 million (US\$370m. - based on the bar chart provided) to AU\$1500 million (US\$1110 m. – figure quoted), with an average of roughly AU\$1 billion (US\$730 million) a year. This still has the twin problems of only covering those permit applications that cited a value on the one hand, to the inclusion of goods shipped overseas for repair and then returned to Australia on the other hand. Maybe these two cancel each other out, and maybe they don't.

The report also cites an Australian Bureau of Statistics survey of 2,700 companies forming part of the Australian defense industrial base, that showed that, in 2013-14, these companies made total exports valued at AU\$7.65 billion (US\$5.65 billion), although the proportion of these exports that were defense-related is unknown, and (according to the report), likely to be modest.

Based on these pieces of information, the report estimates that “Australia’s defence industry is currently achieving in the order of \$1.5 billion to \$2.5 billion in defence exports a year”.²⁵

In an attempt to produce an estimate from these scraps of data, I suggest US\$500 million to US\$1 billion as a reasonable range for an average from 2012 to 2016.

South Africa and **Ireland** also only provides license data. For South Africa, I have assumed a ratio of 2:1 for licenses to deliveries, giving a figure of \$260 million a year, while for the tiny levels of Irish exports, since Ireland used to report deliveries, I use the ratio that applied in previous years.

Significant exporters providing no official data

China

China does not release any data on the value of its arms exports, and the value of individual deals is rarely reported either by China or by their customers. For China, therefore, I looked at estimates from other sources. IHSJane’s provides an estimate for 2015 of \$1.5 billion. CRS gives an estimate of \$2.4 billion per year for 2012-15

(figures are not available up to 2016. WMEAT’s figures agree with CRS for the period 2012-2014, and are very similar for the period 2008-2011. In the absence of better data, I have assumed a range for China of **\$1.5 - \$2.5 billion** a year.

For **Belarus**, WMEAT estimates an average of around \$225 million a year for 2012-15, (no data is yet available for 2016), which we will use.

All other countries

The countries listed above, for which figures are available or for which estimates have been made, account for 99.0% of all transfers of major conventional weapons over the period 2012-16, according to SIPRI TIV data. I have assumed that the financial value of the remaining countries’ deliveries are in proportion to their TIV value, for an estimate of \$1 billion per year for all other countries combined, with a range of \$500 – 1500 million to allow for the considerable uncertainty in the estimate.

GRAND TOTAL

Adding up all the above estimates (see table 3) gives a grand total central estimate of around **\$97 billion** a year as the total financial value of the global arms trade (with rounding), or a probable range of **\$88 billion - \$105 billion** to allow for the very considerable uncertainties in many of the estimates. SIPRI’s estimate of at least \$94.5 billion in 2014 is comparable.

This total, however, excludes exports of military services by the US through the Direct Commercial Sales program, which almost certainly run into the billions of dollars, as well as most military services from most EU countries, and possibly from others. It includes service exports by the US through FMS, from the UK, from Norway (which reports service exports separately from equipment), “Technical Assistance” services from other EU countries, and possibly services from other non-European suppliers. For countries where we have estimated exports based on orders, however (Israel, South Korea), it may be reasonably presumed that the reported value of these orders includes associated services. The fact that FMS exports (according to the GAO, for 2005-09) account for one third of the FMF total does not provide

²⁵ *ibid.*, p. 34.

any guide to the situation in other countries. For Norway, for example, export of services only accounts for 7% of total arms exports, and for France the typical value is similar. Hence, it is not possible to make a meaningful estimate of the amount of ‘missing’ military services from these figures. Very cautiously, I would venture that they run into the low tens of billions.

3. REFLECTIONS AND CONCLUSIONS

The discussion above shows that the quality of financial data on the international arms trade is extremely poor. Countries that one might associate with high levels of transparency, including the USA, UK and Germany, fail to provide adequate data on their arms exports, even at a most basic aggregate level. The USA purports to provide such data, but on closer inspection, the data for Direct Commercial Sales exports is severely flawed and incomplete. The UK provides data on export orders, whose correspondence with actual exports is unclear, and on licenses, which fails to cover a large proportion of UK exports. Germany provides data on the exports of “weapons of war”, but only license data for other military equipment.

The fact that US DCS data crumbles under closer analysis may call into question the accuracy of apparently straightforward data from other countries. Most EU countries, for example, provide data on deliveries to the EU Annual Report, but how certain can we be of the comprehensiveness of this data? One feature of EU arms export data that is difficult to interpret is the fact that, for countries that do report both licenses and deliveries, the long-term ratio between the two is highly variable. License totals are almost always high in the long run than deliveries, as one would expect, as not all licenses are used; but the ratio for individual countries ranges from around 1:1 for Sweden to around 10:1 for Hungary, with typical values generally in the range 1.5 – 2.5.

One possible interpretation of this is that these differences relate to differences in countries’ export licensing systems: for example, to what

extent do countries make use of “open” licenses, which allow for multiple deliveries to one or more customer, and are values (or estimated values) of open licenses included in license totals? (They are not for the UK, for example). Some brief enquiries by SIPRI to export control officers in a number of EU states in 2016, however, did not find any evidence to support this, although the response rate was low. Another possibility that comes to mind, however, in the light of the DCS data, is that the differences may relate instead to the completeness of reporting of deliveries. Reporting of deliveries for EU member states is based on companies’ reports of licenses used, either on a rolling basis (at the point of use), or an annual or quarterly basis. However, how rigorously companies ensure that they report all licenses used, and the extent to which national export control authorities check up on these reports, is unclear. It is possible, therefore, that the reason for some countries having particularly high license to delivery ratios is that company reporting of license use is incomplete, which would mean that the delivery figures are in fact significant underestimates. Fortunately, the countries with such high ratios are not among the major European arms exporters. Nonetheless, incompleteness of data for some of the major countries cannot be ruled out.

The treatment of defense services is another area where there is inconsistency. As noted in the discussion of the US, the data for the US includes services for FMS, but not for DCS. UK data on arms export orders, on which the above estimates for actual UK exports are based, do include services. For other EU countries, where the delivery data is based on the export licensing system, technical assistance is included, but other services such as repairs, maintenance, and logistics, are not covered. For most other countries, it is not clear whether services are included in the available data.

In conclusion, this exercise of attempting to estimate the total financial value of the legal international arms trade, has underlined the abysmally poor quality of data for most countries. Official data for the world’s largest arms exporter, the USA, is incomplete and significantly underestimated, except in the few years from 2005-09 for which the General Accounting

Office has made a more rigorous analysis. UK and German delivery figures must be estimated from orders or licenses, Russian figures are apparently clear but the complete lack of detail raises questions as to their reliability. China provides no data at all, leaving guesstimates as the only option. As a result, the estimated range produced in this article, from \$87-104 billion, is rather wide, and even so excludes an unknown (and impossible to meaningfully estimate) quantity of service exports. This

not by country, as does Israel; while UK license data is broken down by country, as discussed this excludes a large proportion of UK arms exports that takes place under ‘open’ licenses. Of the major arms exporters, only France, Spain, and Italy provide (apparently) comprehensive annual data on exports to each recipient.

The state of transparency in the international arms trade is, thus, very poor. While various US government agencies, in particular the GAO

Table 3. Figures and estimates for annual average financial values of arms deliveries 2012-2016 by country (US\$ billions).

Country	Official figure	ESTIMATES		
		Low	Middle	High
USA (FMS)	16			
USA (DCS)		10	12.5	15
Russia	15.1			
UK		8.5	9.75	11
Germany		6.5	7.5	8.5
Israel		5.4	6.4	7.4
France	5.8			
Spain	4.1			
Italy	3.7			
China		1.5	2.0	2.5
Canada		1.0	1.4	1.8
Turkey	1.6			
Sweden	1.3			
Belgium		0.5	0.6	0.7
Other EU	3.7			
South Korea		0.5	1.0	1.5
Australia		0.5	0.75	1.0
Ukraine		0.55	0.65	0.75
South Africa		0.2	0.25	0.3
Belarus		0.1	0.2	0.3
Norway	0.5			
Switzerland	0.55			
Serbia	0.3			
Others		0.5	1.0	1.5
Grand total		88.4	96.65	104.9

strengthens the case for using instead a volume/ equivalent-value base metric for measuring the arms trade, as used by SIPRI, although of course the absence of a clear picture of the financial value of the trade remains frustrating.

The position looks even worse if we try to break down figures by recipient. Russia provides no such breakdown, although figures for the two or three top recipients are sometimes given. The UK only breaks down military orders by region,

and CRS, have argued that it is in the interests of the government and legislators to have more comprehensive and reliable information on what is often considered a key instrument of foreign and defense policy, it appears that such arguments are not convincing to many governments. This likely reflects the interests of the arms industry, who would prefer to avoid both the administrative burden of reporting, and excessive public scrutiny of their activities.