The evolution of global missile transactions between the 1950s and 2010s

A evolução das transações globais de mísseis entre as décadas de 1950 e 2010

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INTRODUCTION

According to the Brazilian Glossary of the Armed Forces, a missile is a "self-propelled and unmanned military space device that moves above the earth's surface with a pre-established trajectory or equipped with different guidance systems, which can be controlled or not, that direct it towards the target" (Brasil 2015). Although more general, this definition finds wide acceptance, with the Oxford English Dictionary, for example, bringing a convergent definition: "a long-distance weapon that is self-propelled, and directed either by remote control or automatically, during part or all of its course" (Simpson and Weiner 2010).

Despite these broader definitions, missiles emerge as an armament category that can be classified into different types (Brasil 2015), such as surface-to-surface and air-to-surface missiles (ballistic, cruise, anti-ship, anti-tank, etc.); surface-to-air missiles and anti-ballistic; air-to-air missiles; and anti-satellite weapons.

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The first recorded use of a weapon with such propulsion properties took place in 1232 in the military siege of Kaifeng when the Chinese used spears and arrows coupled with primitive forms of a simple solid-propellant rocket, filled with gunpowder. The gradual accumulation of later technological advances would result in the first modern ballistic missile, developed at the end of World War II, with the ability to establish a brief period of powered flight, follow a ballistic trajectory outside the atmosphere, and then curves back to an impact point on earth (Cirincione 2000).

Since then, missiles have been consolidated as an important defense product, with high technological potential and increasingly widespread use, emerging as one of the products most supplied by the largest companies operating in the field of defense. For instance, guided missiles, such as Javelin anti-tank, have advanced electronics that have improved to afford fire-and-forget capability. Produced by a partnership between US companies, Raytheon and Lockheed Martin, the Javelin has more than 200 types of semiconductors built into them (Miller 2022).

Aiming to better understand the dynamics of consolidation and diffusion, this article proposes to carry out a comprehensive exploratory data analysis about the evolution of global missile transaction flows in the period from the 1950s to the 2010s. Based on this assessment, it will be possible to draw a historical overview of which and under what circumstances countries established themselves as missile suppliers and consumers, as well as identify important correlations between some of these specific flows and the occurrence of geopolitical events.

The results attest to the expressive growth, over time, of the international transfers of missiles about the other categories of defense products, jumping from the seventh position, in the 1950s, to the third most prominent transferred weapon category in the 2010s, behind military aircraft and roughly tied with ships. No other specific weapon category showed such an expressive growth pattern as the missiles, taking into account the entire length of the period analyzed here.

Other findings were the high market concentration at the level of missile suppliers, with only three countries — United States, Soviet Union/Russia, and France — concentrating average exports of 84.6% of the total flows from the 1950s to 2010s. At the level of imports, it is possible to identify a less stable pattern strongly influenced by geopolitical nature events.

The next section details the data specifications and analysis methodology adopted in this paper. The third section presents the comparative results between the different categories of conventional weapons. The fourth section compiles data on missile transfers by countries over time, at

the export and import levels, allowing us to apprehend their dynamics and specificities. Finally, the 'Final considerations' summarize the main results found, with suggestions for possible future research.

DATA AND METHODOLOGY

An adequate understanding of the trends and dynamics of global missile transactions presupposes a rigorous exploratory analysis of import and export data over time. Through this exploratory data analysis, it will be possible to identify the most relevant flows of supply and demand, even making it possible to weave important correlations with the occurrence of geopolitical events.

Therefore, the credibility of information emerges as a fundamental element for analyzes of this kind. A widely recognized database in the field of international security studies is provided by the Stockholm International Peace Research Institute (SIPRI), an independent think tank founded in 1966, based in Stockholm, Sweden, focused on "data, analysis, and recommendations, based on open sources, for policymakers, researchers, the media and the interested public" (Sipri 2022a).

The SIPRI databases are composed of broad time series referring to the supply of the main conventional arms and military components through "sales, aid, donations and those made through manufacturing licenses" (Sipri 2022b), aggregating extensive statistical information for a total of 259 relevant national and international actors, such as countries, multilateral organizations and rebel forces, since 1950. It is noteworthy, however, that the availability of information for each national reality, however, can vary enormously from case to case.

The categories covered by this database are aircraft, air defense systems, armored vehicles, artillery, engines, missiles, naval weapons, satellites, sensors, ships, and others.

It is also important to note that the SIPRI time series assess not the financial value of arms transfers, but rather an estimate based on known unit production costs of a basic set of weapons: the trend-indicator value (TIV) (Sipri 2022b). In this way, the TIV can be used to represent the transfer of military resources, enabling comparisons and calculations of "trends in international arms transfers over periods percentages for suppliers and recipients, and percentages for the volume of transfers to or from particular states" (Holtom; Bromley; Simmel 2012, 3–4). According to SIPRI (2022b), "the main priority is to ensure that the TIV system remains consistent over time and that any changes introduced are backdated".

Table 1
SIPRI: Categories of conventional arms

Categories	Description
Aircraft	All fixed-wing aircraft and helicopters, including unmanned aircraft (UAV/UCAV) with a minimum loaded weight of 20 kg. Exceptions are microlight aircraft, powered and unpowered gliders and target drones.
Air defence systems	(a) All land-based surface-to-air missile (SAM) systems, and (b) all anti-aircraft guns with a caliber of more than 40 mm or with multiple barrels with a combined caliber of at least 70 mm. This includes self-propelled systems on armored or unarmored chassis.
Naval weapons	Rocket launchers, multiple rocket launchers and mortars for use against submarines, with a caliber equal to or above 100 mm.
Armored vehicles	All vehicles with integral armor protection, including all types of tanks, tank destroyers, armored cars, armored personnel carriers, armored support vehicles and infantry fighting vehicles. Vehicles with very light armor protection (such as trucks with an integral but lightly armored cabin) are excluded.
Artillery	Naval, fixed, self-propelled and towed guns, howitzers, multiple rocket launchers and mortars, with a caliber equal to or above 100 mm.
Engines	(a) Engines for military aircraft, for example, combat-capable aircraft, larger military transport and support aircraft, including large helicopters; (b) engines for combat ships — fast attack craft, corvettes, frigates, destroyers, cruisers, aircraft carriers and submarines; (c) engines for most armored vehicles — generally engines of more than 200 horsepower output.
Missiles	(a) All powered, guided missiles and torpedoes, and (b) all unpowered but guided bombs and shells. This includes man-portable air defence systems (MANPADS) and portable guided anti-tank missiles. Unguided rockets, free-fall aerial munitions, anti-submarine rockets and target drones are excluded.
Satellites	Reconnaissance satellites.
Sensors	(a) All land-, aircraft- and ship-based active (radar) and passive (e.g. electro-optical) surveillance systems with a range of at least 25 kilometers, except navigation and weather radars, (b) all fire-control radars, except range-only radars, and (c) anti-submarine warfare and anti-ship sonar systems for ships and helicopters.
Ships	(a) All ships with a standard tonnage of 100 tonnes or more, and (b) all ships armed with an artillery of 100-caliber or more, torpedoes or guided missiles, and (c) all ships below 100 tonnes where the maximum speed (in km/h) multiplied with the full tonnage equals 3500 or more. Exceptions are most survey ships, tugs and some transport ships.
Other	(a) All turrets for armored vehicles fitted with a gun of at least 12.7 mm caliber or with guided anti-tank missiles, (b) all turrets for ships fitted with a gun of at least 57 mm caliber, and (c) all turrets for ships fitted with multiple guns with a combined caliber of at least 57 mm, and (d) air refueling systems as used on tanker aircraft.

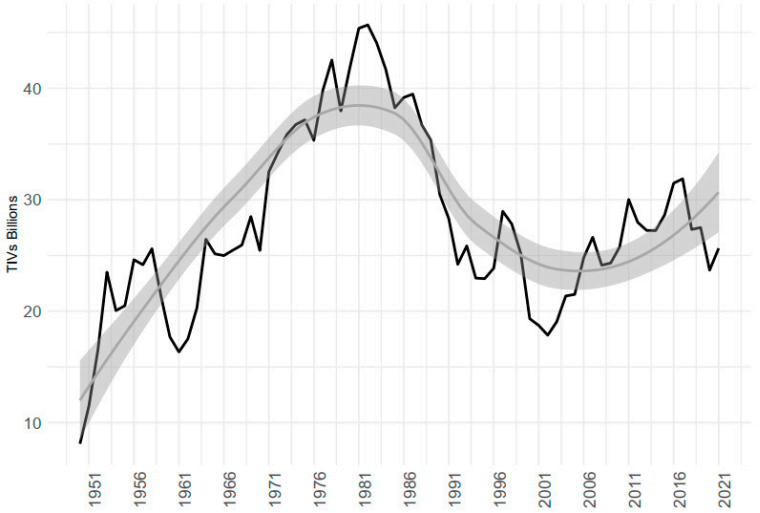
Source: SIPRI 2022b.

After these technical considerations and to fulfill the objectives established for this paper, the time series of global transactions of missiles over the period between the 1950s and 2010s will be thoroughly analyzed in the following section. The data will be segregated by decade, allowing us to more accurately identify the evolution of this dynamic and smooth out any occasional outliers. These missile-specific transactions will also be explored comparatively with total conventional arms transactions, enabling a better understanding of their respective weight and size over time.

MISSILE TRANSACTIONS FROM A GLOBAL PERSPECTIVE

Graph 1 presents the global evolution of total conventional arms transfers, based on the classification and conceptualization established by SIPRI, between 1950 and 2021. These flows started their trajectory at the level of TIVs 8.1 billion, growing substantially until 1982 when they reached TIVs 45.7 billion — a noteworthy growth of 464,5%. This escalation was supported by the Cold War arms, led mainly by the United States and the Soviet Union. The two powers had built an expressive stock of missiles, including intercontinental ballistic missiles (Miller 2022). They guaranteed their atomic weapons could be widely used. The tensest moment of Cold War was exactly named the Cuban Missile Crisis in 1962.

From 1982 onwards, the transfers of conventional arms presented an important inflection in their trend, resulting in a fall that lasted until 2002, when these flows reached the value of TIVs 17.8 billion — an accumulated decline of 61%. From then on, a new inflection reversed this negative trend, turning it into a positive one, boosting the total exports to TIVs 31.9 billion — a value 78,6% higher than in 2002, but 30,2% lower than the historical peak verified in 1982.

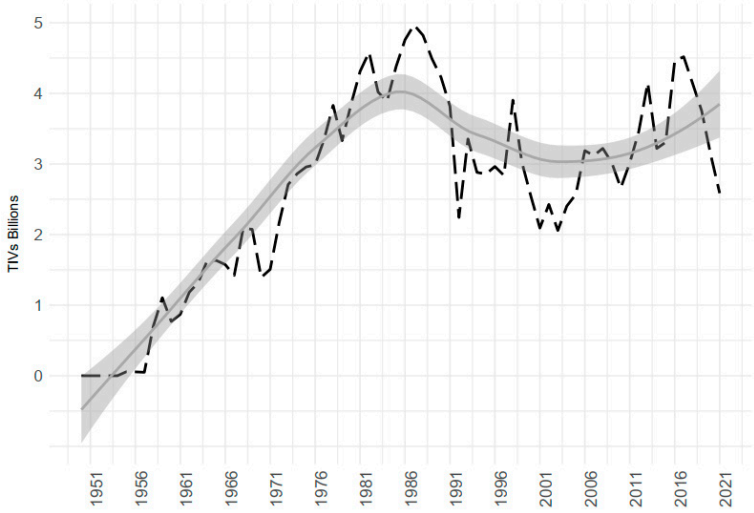


Graph 1 — Total transfers of conventional arms (1950-2021)
Source: Prepared by the authors based on SIPRI data (2022c).

Missile-specific transfer flows have certainly not escaped these global trends, although their evolution over time has varied in specific years: grew from TIVs 57 million in 1955 — the first year in which there are records of a transfer of this product category, according to the SIPRI database —, towards the historical maximum value of TIVs 4.9 billion in 1987 — an extraordinary growth of 8.619%. From then on, these flows faced a strong inflection point that would drop their global transfer volume by 55% until 1992, when the missile category totaled TIVs 2.2 billion.

It is from 1993 onwards that missile trade flows experienced great volatility, reaching TIVs 3.9 billion in 1998 and starting, shortly thereafter, a new downward trend that culminated in the total value of TIVs 2.1 billion by 2003. From 2003 to 2017, missile trade flows amounted to up to TIVs 4.5 billion. Finally, a new inflection point consistently drops this trade volume, reaching TIVs 2.6 billion in 2021.

To facilitate the visualization of this information, Graph 2 presents the isolated evolution of the missile trade flows throughout the analyzed period.



Graph 2 — Evolution of the missile trade flows (1950-2021)
Source: Prepared by the authors based on SIPRI data (2022c).

Table 2 that follows summarizes the percentage information regarding the transfer flows of all categories of war products covered by the SIPRI database, aggregated by decades. Data referring to 2021 — the last year for which information is available — were also incorporated separately. It is expected that this percentage distribution across the decades will facilitate the identification of general transfer trends in each of the conventional arm categories.

It is thus evident that the aircraft category has historically played a predominant role in the global transfer flows of conventional arms, having lost some relevance, however, during the 1990s and 2000s, when it reached the value of 43.6% of total trade flows — the lowest percentage value achieved by this specific category. The 2010s maintained relative stability at these levels, with 44.2% of total flows. The isolated year of 2021, in turn, showed a significant recovery in demand for military aircraft, reaching 51.1%.

The category of armored vehicles and ships also showed significant results in total trade flows, emerging, respectively, as the second and third most transferred categories of conventional arms. Since the 1990s, however, ships have surpassed the category of armored vehicles, maintaining relative stability in the following decades while the demand for armored vehicles gradually declines.

Table 2
Global distribution of conventional military transactions by product categories (TIVs billions)

Period	Aircraft	Air defence systems	Armored vehicles	Artillery	Engines	Missiles	Naval weapons	Satellites	Sensors	Ships	Other
1951-1960	12.087 TIVs (58.8%)	511 TIVs (2.5%)	3,030 TIVs (14.7%)	708 TIVs (3.4%)	1,035 TIVs (5.0%)	456 TIVs (2.2%)	117 TIVs (0.6%)	0 TIVs (0.0%)	308 TIVs (1.5%)	2.545 TIVs (12.4%)	0 TIVs (0.0%)
1961-1970	11,730 TIVs (49.7%)	1,705 TIVs (7.2%)	3,724 TIVs (15.8%)	856 TIVs (3.6%)	411 TIVs (1.7%)	1,519 TIVs (6.4%)	115 TIVs (0.5%)	0 TIVs (0.0%)	826 TIVs (3.5%)	2.715 TIVs (11.5%)	1 TIVs (0.0%)
1971-1980	17,830 TIVs (47.7%)	4,196 TIVs (11.2%)	5,980 TIVs (16.0%)	803 TIVs (2.1%)	822 TIVs (2.2%)	2,955 TIVs (7.9%)	125 TIVs (0.3%)	0 TIVs (0.0%)	740 TIVs (2.0%)	3.921 TIVs (10.5%)	37 TIVs (0.1%)
1981-1990	18,301 TIVs (46.2%)	2,783 TIVs (7.0%)	5,640 TIVs (14.2%)	1,152 TIVs (2.9%)	760 TIVs (1.9%)	4,445 TIVs (11.2%)	280 TIVs (0.7%)	0 TIVs (0.0%)	1.642 TIVs (4.1%)	4.573 TIVs (11.5%)	49 TIVs (0.1%)
1991-2000	10,877 TIVs (43.6%)	816 TIVs (3.3%)	3,492 TIVs (14.0%)	537 TIVs (2.2%)	624 TIVs (2.5%)	3,043 TIVs (12.2%)	216 TIVs (0.9%)	0 TIVs (0.0%)	1.229 TIVs (4.9%)	3.907 TIVs (15.7%)	199 TIVs (0.8%)
2001-2010	9,768 TIVs (43.6%)	849 TIVs (3.8%)	2,716 TIVs (12.1%)	440 TIVs (2.0%)	821 TIVs (3.7%)	2,676 TIVs (11.9%)	201 TIVs (0.9%)	50 TIVs (0.2%)	1.279 TIVs (5.7%)	3.456 TIVs (15.4%)	199 TIVs (0.9%)
2011-2020	12,511 TIVs (44.2%)	1,412 TIVs (5.0%)	3,060 TIVs (10.8%)	419 TIVs (1.5%)	1,545 TIVs (5.5%)	3,715 TIVs (13.1%)	194 TIVs (0.7%)	75 TIVs (0.3%)	1.421 TIVs (5.0%)	3.744 TIVs (13.2%)	232 TIVs (0.8%)
2021	13,111 TIVs (51.1%)	471 TIVs (1.8%)	2,526 TIVs (9.9%)	268 TIVs (1.0%)	1,564 TIVs (6.1%)	2,586 TIVs (10.1%)	152 TIVs (0.6%)	10 TIVs (0.0%)	923 TIVs (3.6%)	3.765 TIVs (14.7%)	261 TIVs (1.0%)

Source: Prepared by the authors based on SIPRI data (2022c).

About the missile category, it is possible to observe a substantial growth in its demand over the decades, rising from 2.2% in the 1950s — the seventh position among the most commercialized categories — to reach its historical peak in the 2010s — that is, 13.1%, consolidating itself in the third position among the most transferred categories, slightly behind the category of ships, in second place. This configuration remains in 2021, although it is possible to verify some relative loss of importance in the case of the missile category.

It is noteworthy that no other specific weapon category showed such an expressive growth as missiles — 715%, taking into account the entire length of the period analyzed. For comparison purposes, sensors, in second place, grew 361%.

MISSILE TRANSFERS IN NATIONAL PERSPECTIVES

To identify which countries most participated in the missile transfer dynamics over the decades between the 1950s the and 2020s, information regarding the main export and import flows of this specific class of war product will be analyzed below.

Major missile exporters and their respective flows

The analysis of export data referring to the 1950s (Table 3) shows that the first records of missile transactions took place in 1955, with a global value equivalent to TIVs 57 million, entirely exported by the United States. The second country to effectively export missiles was France, in 1956, although with a residual value of TIVs 4 million compared to the volume of TIVs 51 million exported by the United States that year.

The Soviet Union began to export this class of war product in 1957, initially reaching a volume of TIVs 12 million, slightly below the 13 million obtained by the United States. France, in turn, reached the expressive value of TIVs 24 million in missile exports, corresponding to 48.9% of global transactions.

It is from 1958 onwards that the hitherto incipient missile transfers begin to change levels: the United States totaled TIVs 578 million, a value 1.334% greater than the average achieved in the previous three years; the Soviet Union saw its exports grow 733% over the previous year, reaching TIVs 100 million; France, in turn, maintained the same export levels achieved in 1957.

In the following year, the United States again managed to achieve expressive growth rates in its missile exports, with an increase of 63% about

1958, totaling TIVs 942 million. The Soviet Union, at relatively lower levels, totaled TIVs 130 million, showing a growth of 30% for the previous year. Finally, by 1960, the United States missile export flows would regress to levels seen in 1958, with the Soviet Union maintaining its previous year's levels. France, in turn, reached the value of TIVs 72 million, while Switzerland entered this concentrated export market with a residual value of TIVs 2 million.

These four countries accounted for 100% of global missile transfers during the entire decade. The United States alone accounted for 80.3% of all this volume, emerging as the major exporter of this class of product; the Soviet Union accounted for 13.8% of the global flows; France, in third place, reached a share of 5.8%; Switzerland represented only 0.1%.

Table 3
Top global missile exporters for the period 1951-1960
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United States	219.8 TIVs	80.3%
Soviet Union	37.8 TIVs	13.8%
France	16 TIVs	5.8%
Switzerland	0.2 TIVs	0.1%
Total	273.8 TIVs	100%

Source: Prepared by the authors based on SIPRI data (2022c).

The beginning of the 1960s reveals the entry of new exporting players into the global missile market — although this market has maintained the same relative prominence achieved since the previous decade by the United States, the Soviet Union, and, to a lesser extent, France. It is worth noting, however, the significant loss of market by the United States, whose global share of exports dropped from 80.3% to 48.9%. The Soviet Union and France, meanwhile, increased their shares of the global missile market to 29.7% and 13%, respectively. The sum of transfer flows of these three countries totaled 91.6% of the global volume of exports in this period.

Germany, Norway, United Kingdom, Sweden, and China, the new entrants, accounted for 8.4% of this global flow, with market shares corresponding to 3%, 2.6%, 1.9%, 0.5%, and 0.3%, respectively. The sum of flows from these eight countries totaled 100% of the global volume of missile exports (Table 4).

Table 4
Top global missile exporters for the period 1961-1970
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United States	743.1 TIVs	48.9%
Soviet Union	450.8 TIVs	29.7%
France	197.7 TIVs	13%
Germany	45.6 TIVs	3%
Norway	40 TIVs	2.6%
United Kingdom	28.2 TIVs	1.9%
Sweden	8 TIVs	0.5%
China	5.1 TIVs	0.3%
Total	1,518.5 TIVs	100%

Source: Prepared by the authors based on SIPRI data (2022c).

In aggregate, the period 1971-1980 produced few changes in the dynamics observed in the previous decade. On a more specific level, it is worth mentioning the greater market share acquired by the Soviet Union, which became the largest global exporter of missiles between 1970 and 1976, with an average volume of TIVs 1.2 billion compared to the average of 769 million achieved by the United States in this more restricted period. At the end of the 1970s, however, it is possible to observe a greater recovery in the volume exported by the United States, ending the decade with an average volume of TIVs 1.037 billion in exports — value 3% lower than that of the Soviet Union, with TIVs 1.342 billion.

In the late 1970s, the Soviet Union accounted for 45.4% of global missile exports, while the United States accounted for 36.3%. The sum of flows from these two countries reached an even greater market concentration than in the previous decade — 81.7% compared to 78.6% in the 1960s. Adding to the market share then conquered by France, of 8.2% — 37% lower than that achieved in the previous decade —, there is a total of 89.8% of global missile transactions throughout the 1970s.

Germany, the United Kingdom, Italy, Israel, China, and Sweden together accounted for 8.2% of the remaining export flows shown in Table 5. The sum of these nine countries totaled 98% of missile transactions during the analyzed period.

Table 5
Top global missile exporters for the period 1971-1980
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
Soviet Union	1,342.1 TIVs	45.4%
United States	1,073.1 TIVs	36.3%
France	237.6 TIVs	8%
Germany	122.2 TIVs	4.1%
United Kingdom	56.2 TIVs	1.9%
Italy	29.4 TIVs	1%
Israel	16.3 TIVs	0.6%
China	11.3 TIVs	0.4%
Sweden	7.3 TIVs	0.2%
Total	2,908.8 TIVs	98.0%

Source: Prepared by the authors based on SIPRI data (2022c).

During the 1980s, it is possible to verify a slight deconcentration in the export market share achieved jointly by the Soviet Union and the United States, falling from 81.7% to 75.8% — 42.8% and 32.6% of the global exports, respectively. While France achieved only a small gain in its market share — 8% to 9.4% —, the sum of the other exporting actors — United Kingdom, China, Germany, Sweden, Italy, Israel, and Switzerland — totaled 14.5%, evidencing a greater market share by these new emerging players, despite the evident huge and still resilient market concentration around the export flows from the Soviet Union and the United States.

The sum of this entire set of countries corresponds to 98.7% of missile transactions in the decade (Table 6).

Table 6
Top global missile exporters for the period 1981-1990
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
Soviet Union	1,878.4 TIVs	42.3%
United States	1,447.8 TIVs	32.6%
France	418.5 TIVs	9.4%
United Kingdom	160 TIVs	3.6%
China	137.3 TIVs	3.1%
Germany	120.5 TIVs	2.7%
Sweden	88.2 TIVs	2%
Italy	81.9 TIVs	1.8%
Israel	51 TIVs	1.1%
Switzerland	4.5 TIVs	0.1%
Total	4,388.1 TIVs	98.7%

Source: Prepared by the authors based on SIPRI data (2022c).

It is only in the 1990s that more expressive changes can be observed in the dynamics of conventional arms transfers, including missiles — changes that are deeply associated with the geopolitical transformations caused by the end of the Cold War, in December 1989, and the definitive dissolution of the Soviet Union, in 1991, substantially impacting the political and economic environment that characterized the evolution of global military spending over the previous decades (Dunne and Watson 2005; Ruttan 2006). In the specific scope of the missile transfers, evidence that characterizes the aforementioned economic and geopolitical transformations can be seen through the expressive decrease in the total average commercial volume about the previous decade: from TIVs 4.388,1 billion to 2.972,8 billion, a decrease of 32.2%.

Although during this decade the Soviet Union only registered exports in the specific year of 1991, such volume of transactions was so significantly expressive that it placed the socialist bloc in the seventh position of largest missile exporters in this decade. From 1992 onwards, Russia, the main heir to the Soviet Union's mighty military complex, achieved a market share corresponding to an annual average of TIVs 358 million, or 11.8% of global exports, slightly above France, in third place, with 8.7 percent and an annual average of TIVs 263 million.

The United States, in turn, saw its share of exports go from 32.6% to 55.9%, with an annual average of TIVs 1.7 billion, emerging as the great beneficiary in this new trend of concentration in the global market for missiles.

The United Kingdom continued to gain incremental markets, reaching 5% of the missile export market share, with Israel (2.9%), Germany (2.8%), China (2.7%), Sweden (1.5%), Italy (0.7%), Ukraine (0.7%), and Switzerland (0.2%) coming next. The sum of exports from these smaller players totaled 16.5% of the global market — two percentage points higher than in the previous decade. The sum of this complete list totaled 97.7% of global missile transactions in the period (Table 7).

Table 7
Top global missile exporters for the period 1991-2000
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United States	1,700 TIVs	55.9%
Russia	358.3 TIVs	11.8%
France	263.2 TIVs	8.7%
United Kingdom	152.3 TIVs	5%
Soviet Union	148 TIVs	4.9%
Israel	87.5 TIVs	2.9%
Germany	85.7 TIVs	2.8%
China	81.2 TIVs	2.7%
Sweden	44.6 TIVs	1.5%
Italy	22.4 TIVs	0.7%
Ukraine	22.1 TIVs	0.7%
Switzerland	7.5 TIVs	0.2%
Total	2,972.8 TIVs	97.7%

Source: Prepared by the authors based on SIPRI data (2022c).

The period 2001-2010 brings Russia back to a majority position among the largest missile exporters, reaching a value equivalent to 35.6% of global flows of this class of defense product, with an average annual volume of TIVs 952,1 million. Alongside the United States, with an average annual volume of TIVs 828,3 million, both countries managed to reach the equivalent of 66.5% of the global transactions observed in the decade, continuing the slow process of commercial deconcentration seen in pre-

vious years — although a high level of concentration around these two countries continues to be evident.

Amid this slow process of market deconcentration, it is also worth noting the growth in the participation of countries such as Israel (5.1%) and China (4%), which, in addition to other national actors such as Germany (3.3%), United Kingdom (3.3%), Italy (1.3%), Sweden (1.3%), and Netherlands (0.3%), reached 20.8% of global missile transactions. The totality of this group of countries covered 97% of global transfers (Table 8).

Table 8
Top global missile exporters for the period 2001-2010
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
Russia	952.1 TIVs	35.6%
United States	828.3 TIVs	31%
France	258.1 TIVs	9.6%
Israel	136.4 TIVs	5.1%
China	106.5 TIVs	4%
Germany	88.1 TIVs	3.3%
United Kingdom	87.6 TIVs	3.3%
Italy	35.6 TIVs	1.3%
Sweden	33.6 TIVs	1.3%
Netherlands	8.4 TIVs	0.3%
Total	2,595.1 TIVs	97.0%

Source: Prepared by the authors based on SIPRI data (2022c).

Finally, the 2010s bring the United States back to the leading position among the leading global exporters, with 44.4% of total flows. The relative loss of market share by Russia did not severely impact the market concentration around the top two, totaling 67.6% of global transactions. China and Israel (both with 6.3%), in turn, are significantly close to the level of exports from France (6.8%), consolidating themselves in the global market as intermediate and non-negligible exporters of missiles. Germany, United Kingdom, Sweden, Ukraine, Italy, Turkey, South Korea, and Brazil complete this list with marginal positions, together totaling 11.4% of global export flows. The sum of all these countries corresponds to 98.3% of total global transactions (Table 9).

Table 9
Top global missile exporters for the period 2011-2020
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United States	1,649.3 TIVs	44.4%
Russia	861.5 TIVs	23.2%
France	251.6 TIVs	6.8%
China	233.8 TIVs	6.3%
Israel	233.2 TIVs	6.3%
Germany	145.3 TIVs	3.9%
United Kingdom	127.7 TIVs	3.4%
Sweden	52.7 TIVs	1.4%
Ukraine	40.8 TIVs	1.1%
Italy	38.6 TIVs	1%
Turkey	10.3 TIVs	0.3%
South Korea	4.6 TIVs	0.1%
Brazil	2.7 TIVs	0.1%
Total	3,652.1 TIVs	98.3%

Source: Prepared by the authors based on SIPRI data (2022c).

Major missile importers and their respective flows

Having concluded the exploratory analysis concerning missile export transactions, we will now proceed in this section with a specific analysis of the import flows. Keeping the same pattern previously established, we started the analysis in the period from 1951 to 1960.

As in the case of exports, the first missile transactions took place in 1955, totaling TIVs 57 million — of which 82.5% corresponded to United Kingdom demand, with the 17.5% remainder staying with Turkey. By the end of the decade, new actors had emerged as important consumer markets, varying only in the order of magnitude of their respective import flows.

Table 10 compiles the twenty main importers of this class of defense product, highlighting the expressive result achieved by the United Kingdom, which alone totaled 40.5% of missile imports during the decade. The second largest importer was Germany (9.6%), followed by China (8.7%), Italy (6.8%), Taiwan (4.1%), and Turkey (3.8%). The other countries

on the list accumulated percentages lower than 3% of the global imports. In total, the twenty countries account for 95.2% of global transactions.

Table 10
Top global missile importers for the period 1951-1960
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United Kingdom	111 TIVs	40.5%
Germany	26.4 TIVs	9.6%
China	23.9 TIVs	8.7%
Italy	18.7 TIVs	6.8%
Taiwan	11.3 TIVs	4.1%
Turkey	10.4 TIVs	3.8%
Japan	7.2 TIVs	2.6%
Belgium	7.2 TIVs	2.6%
Denmark	6.7 TIVs	2.4%
Czechoslovakia	5.8 TIVs	2.1%
Netherlands	5.3 TIVs	1.9%
Poland	4.8 TIVs	1.8%
France	4.4 TIVs	1.6%
Canada	3.7 TIVs	1.4%
Yugoslavia	3.2 TIVs	1.2%
United States	3 TIVs	1.1%
Sweden	2.3 TIVs	0.8%
Bulgaria	2.1 TIVs	0.8%
Greece	2 TIVs	0.7%
Australia	1.2 TIVs	0.4%
Total	260.6 TIVs	95.2%

Source: Prepared by the authors based on SIPRI data (2022c).

The 1960s were marked by a process of deconcentration in global demand for missiles: if in the period 1951-1960 the five largest importers accounted for 70% of total flows, in 1961-1970 this same indicator represented only 38.2%.

Although remaining at the top of the ranking of largest importers, the United Kingdom showed a significant drop in its share of global imports, from 40.5% to 14.3%. Germany, still in second place, maintained its de-

mand levels with relative stability, with 10.8%. Nations such as Viet Nam, the United States, Poland, East Germany, Canada, Egypt, and Sweden, in turn, began to acquire greater relative prominence in this market, reaching higher percentage levels than those seen in the previous decade. The sum of the twenty largest importers totaled 74.9% of global flows — which presented, about the 1950s, a growth of 336.7%.

Table 11
Top global missile importers for the period 1961-1970
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United Kingdom	216.8 TIVs	14.3%
Germany	164.7 TIVs	10.8%
Viet Nam	75.3 TIVs	5.0%
United States	67.0 TIVs	4.4%
Poland	56.2 TIVs	3.7%
East Germany	55 TIVs	3.6%
Canada	52.4 TIVs	3.4%
Egypt	49.1 TIVs	3.2%
Sweden	47.9 TIVs	3.2%
Turkey	46.4 TIVs	3.1%
Japan	46.2 TIVs	3.0%
Italy	45.2 TIVs	3.0%
France	33.6 TIVs	2.2%
Netherlands	30.5 TIVs	2.0%
Denmark	27.8 TIVs	1.8%
India	26.5 TIVs	1.7%
Switzerland	26.5 TIVs	1.7%
Greece	25.8 TIVs	1.7%
North Korea	23.3 TIVs	1.5%
Norway	21.7 TIVs	1.4%
Total	1,138 TIVs	74.9%

Source: Prepared by the authors based on SIPRI data (2022c).

The period 1971-1980 brought substantial changes and new deconcentration in the ranking of the largest missile importers, with Iran assuming the isolated leadership role, with 7.2% of the total flows. Syria and Libya were practically tied for second place, with 5.5%. The United Kingdom, although still in a prominent position, moved to fourth place, with import rates of 4.6% — relatively far from those achieved in previous decades. Fifth place went to Israel with 4.5%, also showing significant growth in missile acquisition levels.

Thus, there is an important reorientation in the leadership of the demand for this weapon category, with countries in the Middle East and North Africa joining the United Kingdom in the most outstanding positions. This reorientation takes place after the outbreak of the Yom Kippur War, a conflict that pitted Israel against Egypt and Syria, during the month of October 1973 — in this specific year, missile imports by Syria grew by 257.3% compared to the average of two previous years, while in the case of Israel, such growth was 447.2%. Egypt, in turn, already had a higher previous growth rate, going from an average of TIVs 38.8 million between 1961 and 1969 to 192.6 million between 1970 and 1974, returning to the level of 38 million between 1975 and 1980. It should be noted that this atypical pattern of growth in missile demand did not occur during the Six-Day War in 1967.

On the other hand, the strong growth in Iranian demand is part of the context of the gradual intensification of tensions with Iraq throughout the 1970s, motivated by border and religious issues that would trigger the Iran-Iraq War, between 1980 and 1988 (Tripp 2003). That same Iraq showed remarkable growth in the demand for missiles during the 1970s — increasing 720% about the previous decade —, although it maintained import averages substantially lower than the rival (see Table 12).

The sum of the twenty largest missile importers over the period 1971-1980 totaled TIVs 2.092.5 million, an increase of 83.8% about the period 1961-1970 and corresponding to 70.8% of global imports in the decade.

Table 12
Top global missile importers for the period 1971-1980
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
Iran	212.1 TIVs	7.2%
Syria	162.9 TIVs	5.5%
Libya	162 TIVs	5.5%
United Kingdom	134.9 TIVs	4.6%
Israel	133.3 TIVs	4.5%
East Germany (GDR)	127.8 TIVs	4.3%
Poland	122.8 TIVs	4.2%
Germany	108.1 TIVs	3.7%
Viet Nam	106.3 TIVs	3.6%
Egypt	105.3 TIVs	3.6%
India	87.4 TIVs	3.0%
Iraq	82.9 TIVs	2.8%
Saudi Arabia	80.4 TIVs	2.7%
Italy	78.5 TIVs	2.7%
Bulgaria	74.9 TIVs	2.5%
Japan	65.6 TIVs	2.2%
Greece	64.4 TIVs	2.2%
Netherlands	64.2 TIVs	2.2%
Czechoslovakia	63.6 TIVs	2.2%
South Korea	55.1 TIVs	1.9%
Total	2,092.5 TIVs	70.8%

Source: Prepared by the authors based on SIPRI data (2022c).

If the growing tension in the Middle East throughout the 1970s propelled Iran to the position of the largest global missile importer of that period, the outbreak of the Iran-Iraq War definitively catapulted Iraq into the majority leadership position in the 1980s, mobilizing TIVs 360.9 million in commercial transfers — value 335.3% higher than in the previous decade and equivalent to 8.1% of global missile flows.

India took second place in this ranking, mainly due to a greater demand associated with the second half of the 1980s — the average volume of imports jumped from TIVs 136 million between 1981-1985 to 409.4 million between 1986-1990, reaching a value corresponding to 6.1% of global flows in this decade. This increase in demand converges with the resurgence of several territorial conflicts and insurgencies in which the country has been involved, especially against Pakistan (Hoontrakul 2014).

In the third position appears Afghanistan, which for the first time in history stands out in such a prominent position in the ranking of missile importers, a result explained especially by the flows verified in the 1989-1990 biennium, with an average of TIVs 1.1 billion. This pattern would also be maintained in 1991, being, however, the last year in which there were significant records of missile transfers for this country. It is worth mentioning that the flows observed in these years do not largely correlate with the outbreak of the Soviet–Afghan War, from 1979 to 1989, coinciding only with the last year of this conflict.

Another country that stood out in the relative share of the global demand for missiles was Japan, reflecting an orientation in the conduct of its foreign policy towards the 1980s, given the greater political, military, and economic instability that characterized the 1970s. One of the assumptions of this positive foreign policy was based on the continuity of the "Japan-US friendly and cooperative relations" on the security arrangement and "continue its voluntary efforts to equip a proper-sized self-defense force to ensure Japan's security" (Japan 1979). This assumption was manifested in the largest acquisition of war products by this country throughout the 1980s.

The sum of flows from the twenty largest missile importers in the 1980s totaled 69.1% of global transactions, evidencing relative stability in terms of market concentration when compared to the previous decade, growing 46.8%.

Table 13
Top global missile importers for the period 1981-1990
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
Iraq	360.9 TIVs	8.1%
India	272.7 TIVs	6.1%
Afghanistan	262.5 TIVs	5.9%
Japan	248.2 TIVs	5.6%
Saudi Arabia	219.7 TIVs	4.9%
Germany	189 TIVs	4.3%
East Germany (GDR)	170.8 TIVs	3.8%
Syria	141 TIVs	3.2%
United Kingdom	138.4 TIVs	3.1%
Libya	129.3 TIVs	2.9%
Egypt	113.7 TIVs	2.6%
Yugoslavia	112 TIVs	2.5%
Netherlands	108.8 TIVs	2.4%
Poland	101.9 TIVs	2.3%
South Korea	90.3 TIVs	2.0%
Czechoslovakia	89.7 TIVs	2.0%
Taiwan	89.3 TIVs	2.0%
Iran	80.3 TIVs	1.8%
Bulgaria	76.8 TIVs	1.7%
Norway	76.2 TIVs	1.7%
Total	3,072 TIVs	69.1%

Source: Prepared by the authors based on SIPRI data (2022c).

The 1990s would be marked by the reversal of the growth trend in global missile transfers observed between the 1950s and 1980s — a decrease of 23%, totaling TIVs 2.3 billion, thus approaching the levels of the 1970s —, as well as by the reversal of the trend of deconcentration in import levels — from 69.1% to 77.8%.

The United Kingdom returns to the top of the ranking, with import values corresponding to 9.3% of global flows. Saudi Arabia, which had already been gaining more and more prominence in missile imports over the past few decades, came in second with 8.4%. Germany, another important historical missile importer, ranked third with 6.2%.

Also considering the top five positions in the ranking, it is worth noting the unprecedented presence of Greece, with a volume of transactions corresponding to 5.1% of the global volume in the decade. This strong expansion in the demand for missiles is part of the broader context of growing military expenditures observed in Greece, with spending averages continuously above those observed in the European Union and NATO since 1974, the year of the Turkish invasion of Cyprus. The perception of threats associated with Turkey was the main justification for the continued high levels of Greek military expenditure, leveraging it to a prominent position as a global importer of weapons until the onset of the debt crisis in 2009 (Nikolaidou 2016).

Turkey itself, which had already reached prominent positions in the 1950s and 1960s, is once again one of the biggest global importers of missiles, pressured by the blatant arms race with Greece. China, Taiwan, and South Korea also began to acquire more expressive shares of global imports as a result of the greater political instability that characterized the region, with the Third Taiwan Strait Crisis as its apex, following a series of missile tests carried out by China in waters surrounding Taiwan.

Table 14
Top global missile importers for the period 1991-2000
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
United Kingdom	283.7 TIVs	9.3%
Saudi Arabia	256.9 TIVs	8.4%
Germany	189 TIVs	6.2%
Greece	153.8 TIVs	5.1%
China	147.6 TIVs	4.9%
Taiwan	144.1 TIVs	4.7%
Turkey	139.2 TIVs	4.6%
Japan	136 TIVs	4.5%
South Korea	123.5 TIVs	4.1%
India	123 TIVs	4.0%
Egypt	109.5 TIVs	3.6%
Afghanistan	105.5 TIVs	3.5%
Iran	81.2 TIVs	2.7%
Norway	80.9 TIVs	2.7%
Italy	62.5 TIVs	2.1%
Spain	51.6 TIVs	1.7%
Netherlands	46.9 TIVs	1.5%
Pakistan	45.4 TIVs	1.5%
Australia	43.3 TIVs	1.4%
Algeria	42.8 TIVs	1.4%
Total	2,366 TIVs	77.8%

Source: Prepared by the authors based on SIPRI data (2022c).

Over the period 2001-2010, China and India managed to reach the two main positions in the ranking, with their defense spending driven by the strong economic growth at this time and by the greater geopolitical projection sought by these countries, in addition to the arms race resulting from the resurgence of specific regional tensions and conflicts — such as between India and Pakistan, even resulting in short-range missile tests as a demonstration of the arms power of both countries (Jornada 2008). In this sense, China and India would jointly account for 25% of global missile demand.

The United Arab Emirates (UAE), in turn, reached the best position since the 1950s, with 7% of global flows — a result explained by the im-

port flows in the period 2003-2007, with levels substantially above its historical average as a result of its participation in the US-led military operation in Afghanistan, in the context of the War on Terror. Algeria (3.3%) and Australia (3.1%) established themselves in relatively higher positions, consolidating the import levels reached in the 2000s. The United Kingdom, South Korea, Turkey, Pakistan, and Greece, among others, continued to occupy prominent positions among the largest global importers.

Global missile transaction flows for this decade continued the downward trend that began in the 2000s, with a further decline of 15.8%. The concentration of these flows remained reasonably stable, with a small drop of 3.4 percentage points.

Table 15
Top global missile importers for the period 2001-2010
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
China	402.6 TIVs	15.0%
India	270 TIVs	10.1%
UAE	186.9 TIVs	7.0%
United Kingdom	100.2 TIVs	3.7%
South Korea	95.4 TIVs	3.6%
Algeria	88.7 TIVs	3.3%
Turkey	88.4 TIVs	3.3%
Pakistan	87.3 TIVs	3.3%
Australia	84.2 TIVs	3.1%
Greece	79.8 TIVs	3.0%
Iran	72.2 TIVs	2.7%
Saudi Arabia	63.5 TIVs	2.4%
Japan	57.6 TIVs	2.2%
Germany	48.2 TIVs	1.8%
Italy	48 TIVs	1.8%
Malaysia	45.2 TIVs	1.7%
Singapore	44.8 TIVs	1.7%
Taiwan	44.8 TIVs	1.7%
Egypt	41.8 TIVs	1.6%
Chile	41.7 TIVs	1.6%
Total	1,991 TIVs	74.4%

Source: Prepared by the authors based on SIPRI data (2022c).

Finally, the period from 2011 to 2020 resulted in the Middle East and Asia countries as the largest global missile importers, thus consolidating important growth trends already apprehended in past decades — the case of Saudi Arabia, the United Arab Emirates, and India, totaling 32.3% of global flows, with a relative degree of balance between them.

Qatar, for the first time, came to occupy a prominent position in the ranking, reaching fourth place, with substantially higher imports in the second half of the decade — TIVs 401.6 million compared to 25.8 million achieved during the first half of this decade. This expressive growth of 1456% correlates with the worsening of tensions that culminated in a diplomatic crisis, in June 2017, when Saudi Arabia, the United Arab Emirates, Bahrain, and Egypt broke diplomatic relations with Qatar, accusing it of supporting terrorism (Berni 2020). As long as this instability persisted, Qatar was banned from accessing those countries' airspace and sea routes, with Arabia blocking Qatar's only land access crossing. The crisis officially ended in January 2021.

Countries such as South Korea, Pakistan, Algeria, Australia, Iraq, and Egypt, among others, which had already been standing out as importers of missiles in previous decades, remained in relevant positions amid these global flows, which grew again after two decades of decline — jumping to TIVs 2.883 million, a growth of 44.8% given the flows verified in the 2000s, with concentration levels reaching 77.6%.

Table 16
Top global missile importers for the period 2011-2020
(TIVs millions)

Country	Average missile exports	Global percentage of missile exports
Saudi Arabia	442.1 TIVs	11.9%
UAE	388.1 TIVs	10.4%
India	368.4 TIVs	9.9%
Qatar	237.4 TIVs	6.4%
South Korea	142.1 TIVs	3.8%
Pakistan	137.5 TIVs	3.7%
Algeria	125.9 TIVs	3.4%
Australia	117.1 TIVs	3.2%
Iraq	105.7 TIVs	2.8%
Egypt	102.8 TIVs	2.8%
China	93.1 TIVs	2.5%
Viet Nam	92.6 TIVs	2.5%
Turkey	81.6 TIVs	2.2%
Azerbaijan	79.8 TIVs	2.1%
Taiwan	76.4 TIVs	2.1%
Singapore	73 TIVs	2.0%
Israel	71.1 TIVs	1.9%
United Kingdom	63.8 TIVs	1.7%
Syria	58.2 TIVs	1.6%
Venezuela	49.7 TIVs	1.3%
Total	2,883 TIVs	77.6%

Source: Prepared by the authors based on SIPRI data (2022c).

FINAL CONSIDERATIONS

The exploratory analysis of national transfer data over seven decades allows us to identify how export flows remained continuously concentrated around the two main missile exporters, which alternated decade after decade in the position of absolute leadership: United States and the Soviet Union/Russia. At no time did the sum of these two main exporters reach a value lower than the impressive 66%.

It is also worth noting that at no time did France lose its third position among the largest national exporters of missiles, even though it is relatively far from the level reached by the two main exporters. Since 2001, however, new and important actors have gained increasing prominence in this market, especially in the cases of Israel and China. Over the last decade, these two countries, together with France, have consolidated their position as intermediary exporters of missiles.

The analysis regarding the flows of imports, in turn, shows a relatively less stable and perennial dynamic, subject, therefore, to greater changes in the order and classification of the largest global missile importers. The outbreak of geopolitical events exerted an important influence on this process, largely determining the levels of weapons acquisition by different nations over time.

It also shows a relatively less concentrated pattern than that seen in the export rankings: while the average market share corresponding to the three largest missile exporters between the 1950s and 2010s was equivalent to 84.6% of total flows, the sum corresponding to the three main importers in the same period was 30.8%.

The greater stability and market concentration presented in the export rankings attest to the high complexity inherent to military production, especially about products with greater technological implications, more dependent on large scales of production, high levels of investment in research and development, long term for the maturation of projects, the short life cycle of materials, and considerably restricted, highly competitive and regulated markets (Dunne 2005).

The missile market, which has consolidated itself as the third most prominent among the categories of weapons covered by the SIPRI database — only slightly behind the category of ships — has not deviated from this rigorous standard, to which a limited number of countries have shown themselves capable to serve on a global scale.

Considering that this paper was structured with the central objective of exploring and addressing the dynamics of missile transfers more comprehensively and from a global perspective, more specific cases and contexts around these weapons flows ended up being left out. They can certainly be addressed in future research that will contribute to the advancement of this understanding, within more particular case studies, around a category of weapons that is increasingly important in the defense and security efforts of nations.

REFERENCES

Berni, Hazal Muslu El. 2021. "The Perceptual Shock of Qatar Foreign Policy in 2017 Crisis: Systemic Factors, Regional Struggles Versus Domestic Variables." *Contemporary Review of the Middle East*, 8, no. 1: 96–119.

Brasil. Ministério da Defesa. 2015. *Glossário das Forças Armadas*. Brasília: Ministério da Defesa. https://www.gov.br/defesa/pt-br/arquivos/legislacao/emcfa/publicacoes/doutrina/md35-G-01-glossario-das-forcas-armadas-5-ed-2015-com-alteracoes.pdf/view.

Cirincione, Joseph. *Brief History of Ballistic Missile Defense and Current Programs in the United States*. https://carnegieendowment.org/2000/02/01/brief-history-of-ballistic-missile-defense-and-current-programs-in-united-states-pub-133.

Dunne, Paul, and Duncan Watson. 2005. "Manufacturing Growth, Technological Progress, and Military Expenditure." 0511. 0511. Bristol. https://ideas.repec.org/p/uwe/wpaper/0511.html.

Holtom, Paul, Mark Bromley, and Verena Simmel. 2012. *Measuring International Arms Transfers* 8 (Dec.). https://www.sipri.org/sites/default/files/files/FS/SIPRIFS1212.pdf.

Hoontrakul, Pongsank, Christopher Balding, and Reena Marwah (Eds.). 2014. *The Global Rise of Asian Transformation:* Trends and Developments in Economic Growth Dynamics. New York: Palgrave Macmillan, .

Japan. Ministry of Foreign Affairs. 1979. *Diplomatic Bluebook 1980 Edition*. Tokyo: Foreign Press Center.

Jornada, Helena. 2008. *Índia e China:* Cooperação e Conflito no Sudeste Asiático. Trabalho de Conclusão de Curso (Graduação em Relações Internacionais) — Universidade Federal do Rio Grande do Sul. https://www.lume.ufrgs.br/bitstream/handle/10183/16010/000685587.pdf?sequence=1.

Miller, Chris. 2022. *Chip War:* The Fight for the World's Most Critical Technology. New York: Simon and Schuster.

Nikolaidou, Eftychia. 2016. "The role of military expenditure and arms imports in the Greek debt crisis". *The Economics of Peace and Security Journal* 11, no. 1: 18–27.

Ruttan, V. 2006. *Is War Necessary for Economic Growth?* Military Procurement and Technology Development. New York: Oxford University Press.

Simpson, John, and Edmund Weiner (Eds.). 2010. *The Oxford English Dictionary*. Oxford: Oxford University Press.

Sipri. 2022. *About Sipri*. https://www.sipri.org/about.

Sipri. 2022. *Sipri Databases*. https://www.sipri.org/databases.

Sipri. *Sources and methods*. https://www.sipri.org/databases/armstransfers/sources-and-methods.

Tripp, Charles. 2003. *História do Iraque ou do nascimento e estado de uma nação*. 2. ed. Lisboa: Mem Martins Editora.

THE EVOLUTION OF GLOBAL MISSILE TRANSACTIONS BETWEEN THE 1950S AND 2010S

ABSTRACT

Since they emerged as modern weapons, missiles have been consolidated as an important defense product, with high technological potential and increasingly widespread use. Aiming to better understand its dynamics of consolidation and diffusion, this article proposes to carry out a comprehensive exploratory data analysis of the evolution of global missile transactions in the period from the 1950s to the 2010s. The results attest 1) to the expressive growth of the international transfers of missiles about the other categories of defense products, jumping from the seventh position in the 1950s to consolidate as the third most prominent transferred weapon category in the 2010s, 2) to the high market concentration at the level of missile suppliers, with only three countries — United States, Soviet Union/Russia, and France — concentrating average exports of 84.6% of the total flows over the decades, and 3) to the relatively less stable pattern at the level of acquisition, with substantial changes in the classification among the largest missile importers from the decisive influence motivated by geopolitical events.

Keywords: Missiles; International Arms Transfers; Major Conventional Weapons; Defense Products.

RESUMO

Desde que emergiram como armas modernas, os mísseis se consolidaram como importantes produtos de defesa, com elevado potencial tecnológico e uso cada vez mais difundido. Com o objetivo de melhor compreender sua dinâmica de consolidação e difusão, este artigo propõe realizar uma abrangente análise exploratória de dados acerca da evolução das transações globais de mísseis no período entre as décadas de 1950 a 2010. Os resultados atestam: 1) o crescimento expressivo das transferências internacionais de mísseis em relação às demais categorias de produtos de defesa, saltando da sétima posição, na década de 1950, para consolidar-se como a terceira categoria de armas mais transferida na década de 2010; 2) a alta concentração de mercado no nível dos fornecedores de mísseis, com apenas três países — Estados Unidos, União Soviética/Rússia e França — concentrando exportações médias equivalentes a 84,6% dos fluxos totais ao longo destas décadas; e 3) o padrão relativamente menos estável no âmbito da aquisição, com alterações substanciais na classificação entre os maiores importadores de mísseis devido à influência decisiva motivada por eventos geopolíticos.

Palavras-chave: Mísseis; Transferências Internacionais de Armas; Principais Armas Convencionais; Produtos de Defesa.

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