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# Shaping strategic arms trade controls: A multivariate approach

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Email: [jg.klomp@mindef.nl](mailto:jg.klomp@mindef.nl)**Abstract**

The objective of this study is to measure the stringency of strategic arms trade controls across countries and explain the variation herein. This regulatory framework is implemented by sovereign states to control the international transfer of military-strategic items that potentially contain a security risk. For the purpose of this study, I apply a two-stage approach. In the first step, I employ factor analysis on more than sixty regulatory indicators related to the rigorousness of and compliance to strategic arms trade controls in a particular country to construct two new measures. The first measure is related to the extent of implementing arms trade laws and legislation, while the second captures the enforcement and control of this kind of regulation. The individual country scores indicate that there exists substantial variation in the extent to which countries implement and enforce strategic trade regulations. Therefore, in the second step, I use the predicted factor scores as a dependent variable in a Bayesian Model Averaging analysis to test several economic and political theories and find the key drivers of the stringency of strategic arms trade regulations and control policies. The general findings of this analysis suggest that the implementation and enforcement of strategic arms trade controls are primarily determined by the trade-off between two competing policy objectives: national security on the one

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hand and domestic economic interests on the other. In particular, the implementation effort of arms trade laws and legislation is mainly explained by economic factors, while the degree of enforcement and control is more associated with political factors.

## 1 | INTRODUCTION

The global transfer of major weapon systems rose considerably over the past decade to the highest peak since the Cold War. The recent rapid proliferation of conventional arms can mainly be attributed to countries from Africa and the Middle East, as they nearly doubled their imports (SIPRI, 2018). This development brought the issue of how to regulate the international arms flow back on the political agenda. The international transfer of sensitive and military-strategic items, including conventional arms, weapons of mass destruction, and dual-use goods, is subject to specific international regimes, arrangements, and treaties. This normative framework is designed to prevent weapon systems, technologies, knowledge, data, and services posing threats to international security from falling into the hands of violent states and non-state actors. At the same time, it should protect the technological edge in the military capacity of arms-producing countries and prohibit cheap copying behaviour. The need for states to exercise effective control over international arms transfers is universally accepted and typically exercised by imposing limitations and non-tariff barriers upon consenting states on the international arms transfers.

Surprisingly, there is only little quantitative research on measuring and explaining differences in strategic arms trade regulations across countries. Even more so, the few existing studies focus primarily on the control of transfers of weapons of mass destruction (WMD) rather than conventional arms (Albright et al., 2018; Cupitt, 2017; Cupitt et al., 2001; Stinnett et al., 2011) or use data that are only indirectly related to arms trade control efforts such as the ratification of international arms control treaties (Brender, 2018). In contrast, the contribution of this research is two-fold. First, this study is the first that comes up with a measure on the stringency of strategic arms trade regulations concerning conventional weapons. Second, this study attempts to reveal the underlying key drivers that explain the differences in the rigorousness of and compliance to arms trade control among countries. For these purposes, I apply a two-stage approach. First, as already suggested by earlier studies, the definition of strategic arms trade control is a multi-faceted concept (e.g., Stinnett et al., 2011). Clearly, it may be hard to capture all aspects of arms trade control in a single indicator. Especially, since nowadays there is much information available on implementation, compliance, and enforcement of these arms trade control regulations around the world. However, the question only is how all this information should be combined? What is the appropriate conceptual framework for measuring the strength of strategic arms trade control? In my attempt to answer these questions, I apply factor analysis on about sixty indicators to come up with my preferred measure (see also Cupitt, 2017). Factor analysis is a statistical data reduction technique used to explain variability among observed random variables in terms of fewer unobserved random variables called factors. The National Transfer Controls (NTC) survey provides me with the necessary information about the cross-country variation in arms trade control efforts, thereby covering more than one hundred countries. The National Transfer Controls (NTC) survey is developed by the Centre for Peace and Reconciliation Studies (CPRS) of the Coventry University. The results of the factor analysis suggest that a two-factor model captures most of the variance of the various arms trade control indicators. The first factor refers to the implementation of arms trade laws and legislation, while the second captures the variation in the degree of enforcement and control of arms trade regulations. These measures can be used in the future for especially two purposes. First, they can be used by policy makers to track the progress on the implication of strategic trade control policies into the national legislation and

benchmark the results internationally. Second, the measures can be used in academic research related to the cause and consequences of controlling the conventional arms trade as *de jure* indicators for the stringency of this kind of regulation.

As the stringency of arms trade control regulations differs considerably across countries, the predicted country scores of the two-factor model are used in the second stage in a Bayesian Model Average analysis (BMA) to find the significant and robust determinants that can explain a state's degree of commitment to these trade controls. This methodology allows me to assess the robustness of all factors that theoretically could explain the degree of arms trade control. To understand the variation in implementation and enforcement of arms trade control among countries, I review the literature to make an inventory of the most important economic and political theories explaining trade control efforts. Theoretically, divergence in the implementation and enforcement of strategic trade controls is mainly the result of differences in foreign policy, geopolitical, or economic considerations. In the next step of the analysis, I operationalize these theories and assess factors that are related to differences in the economic capacities, defense-related industry, political and institutional environment, military influence and power, and security risk. Generally, Bayesian Model Averaging is a fairly neutral means to check the robustness and compare the validity of conflicting findings in empirical research. In essence, the BMA method involves the estimation of the distribution of unknown parameters by using various combinations of control variables. Variables that matter in one empirical model may not be statistically significant in another specification due to the presence of control variables. The basic idea is to permute through combinations of explanatory variables testing whether the variables of interest are significantly and robustly related with strategic arms trade control (see, for instance, Draper, 1995; Hoeting et al., 1999; Leamer, 1978; Raftery et al., 1993). The main findings of the BMA suggest that the implementation and enforcement of arms trade control regulations are primarily determined by the trade-off between two important policy objectives of the government: national security concerns on the one hand and domestic economic interests on the other. In particular, the implementation efforts of arms trade laws and legislation is mainly explained by economic factors, while the degree of enforcement and control is more associated with political factors.

The remainder of the paper is structured as follows. The next section provides a theoretical discussion on strategic arms trade control. Section 3 deals with the question of how to measure the efforts on implementing and enforcing arms trade control regulations using factor analysis, while Section 4 provides an in-depth analysis and discussion about the key factors that explain the variation of this regulatory stringency. The final section offers my conclusions.

## 2 | CONTROLLING THE INTERNATIONAL TRANSFER OF ARMS

The term “strategic arms trade control” generally refers to the policy efforts that states undertake in order to control the international movement of military-strategic goods and dual-use items that might exacerbate an ongoing conflict, contribute to destabilizing weapons build-ups, or be used in violations of human rights. Strategic trade restrictions are often seen as a smart foreign policy instrument as they could avoid costly arms races, which may prove to be counter-productive to national security and future peace. In particular, arms trade control would bring substantial economic benefits by redirecting resources to more productive purposes (Levine & Smith, 2000).

Attempts to control the international arms trade date back as far as the middle ages, when informal understandings among nations regarding the sale of arms were used to limit weapon transfers to potential enemies (De Jong, 2022). Since then, states have adopted a wide range of commitments at the international, multilateral, regional, and national levels to control the trade in arms, with varying degrees of success (Stohl & Grillot, 2009). A critical concern of the current international system of arms trade control is that it combines legally binding international treaties with other less legally binding agreements and voluntary policy guidelines. Meanwhile, the text used in many treaties and agreements is often vague and open to multiple interpretations by signing states. These drawbacks raise serious concerns about the effectiveness of these international instruments as they are converted into national

legislation by individual states to different degrees.<sup>1</sup> As a result, the comprehensive legalistic arms trade control framework is to a certain extent shaped by global norms, principles, and standards of behaviour. It relies on the continuous willingness of member states to abide by the terms to remain effective (Stohl & Grillot, 2009).

Nevertheless, national arms trade control efforts are ultimately the first line of defense in preventing the unchecked spread of conventional arms. However, not all states subscribe to these principles, and—among those that do—economic and political concerns continue to play an essential role in decision-making, leading to cases where standards are ignored or watered-down (Sanjian, 1988). Without strong institutionalized national controls, arms transfers can easily move from the legal to the illicit market or from ally to enemy states. Through their domestic laws, states control the arms trading of corporations within their jurisdiction by regulating the business and supply chain activities related to the development, production, acquisition, trade, financing, and use of weapons. Fundamentally, the regulation of arms trading is structured differently across jurisdictions (Klomp & Beeres, 2022). Despite the need for common practices to harmonize national laws and regulations, national controls have been implemented haphazardly and differ substantially in implementation practices and enforcement. Some national systems fully comply with internationally accepted standards on arms control, while others lack even basic control measures. Based on a review of the existing literature, an effective national arms trade control frameworks should generally address at least the following elements: (1) arms trade legislation to provide a legal basis for regulating arms trade activities covering exports, imports, or brokering; (2) licensing procedures; (3) export criteria and control lists; (3) coordination among relevant agencies and on the international level; (4) customs authority and border controls; (5) verification documentation; (6) penalties and enforcement mechanism; (7) marking and tracing and (8) stockpile management including the collection and destruction of surplus weapons (see for instance Stohl & Grillot, 2009).

### 3 | MEASURING STRATEGIC ARMS TRADE CONTROL

#### 3.1 | Existing literature

The key challenge in monitoring the efforts in arms trade control undertaken by governments worldwide is identifying the appropriate policy variables to observe and track over time. Earlier empirical studies that try to capture the stringency of arms trade regulations rely on different empirical identification strategies. The most commonly and widely used indicator on arms trade control is collected by the Center of International Trade and Security at the University of Georgia. They developed a quantitative methodology for evaluating national export control policies and practices around the world (see, for instance, Beck et al., 2003; Cupitt, 2017; Cupitt & Vecellio, 2020; Cupitt et al., 2001; Seyoum, 2017a, 2017b; Stinnett et al., 2011). The assessment of country trade control regimes is based on the compliance to United Nations Security Council Resolution 1540 by a state and contains ten attributes that carry different weights depending on their significance.

However, one limitation of this data is that it is only focused on trade control concerning weapons of mass destruction (WMD). However, regulating the trade in WMD is likely to be a different policy issue than controlling the international transfers of conventional arms. First, the market structure differs substantially between these weapon systems. In particular, the market structure of WMD can be characterized as a monopoly as there are only a few states that produce nuclear items or provide assistance. In turn, the market for conventional arms is best described as monopolistic competition, where many companies compete, and each producer has only some limited market power. This makes the control of trade in conventional arms much more complicated. In particular, the large number of supplier states creates a weak link phenomenon in that the state that does the least to implement and comply with international standards and principles may be capable of reaping substantial economic benefits. Second,

<sup>1</sup>For instance, states define and interpret the boundaries of 'arms' and 'military equipment' in different ways, and there is a great degree of variance in how states regulate 'dual-use items' that may be used for military or other purposes.

most policy makers agree on the fact that trade in nuclear items for military purposes should be prohibited. This is not necessarily the case with other military-strategic items, as these also typically encompass dual-use items that can be used for civilian purposes. Third, the total value of trade of conventional weapons is substantially larger compared to the value of trade of WMD. This makes the defense-related industry an important business sector in many arms-producing countries, with some considerable political influence gained through campaign contributions or extensive lobbying. The existing theoretical literature suggests that the extent of regulating arms markets mainly depends mainly on the trade-off between two important policy objectives. On the one hand, governments put a certain weight on (inter)national security, and on the other hand, they would like to protect or support the economic interest of the domestic defense-related industry (Seyoum, 2017a, 2017b). The weights placed on these two objectives are most likely to differ between controlling the international transfer of WMD and conventional arms. Typically governments will put considerably more weight on the objective of international security compared to economic interests when controlling the international transfer of nuclear items. In turn, these weights are expected to be reversed in the case of regulating international trade of conventional arms due to the economic importance of high-tech dual-use exports initially based on military technologies (Acosta et al., 2011; Molas-Gallart, 1997).

More recently, Albright et al. (2018) combined data on compliance to United Nations Security Council Resolution 1540 with more general data on, for instance, logistic performance and the policy actions taken to combat money laundering. The so-called Peddling-Peril index ranks about 200 countries, territories, and entities according to their capabilities and demonstrated successes in implementing export controls. The composite score is based on five subcategories, including international commitment, legislation, ability to monitor and detect strategic trade, ability to prevent proliferation financing, and adequate enforcement. One concern of this index is that some of the individual indicators used are recognized as policy-specific outcome variables, while others can be classified more as input indicators.

The second strand of studies uses proxy variables that are, at least theoretically, related to a certain extent with the stringency of arms trade control. One commonly used indicator in this area is the number of arms control agreements and treaties signed or ratified by a country (see, e.g., Brender, 2018; Klomp & Beeres, 2022). In particular, the ratification of an arms control treaty serves as a signal of a country's intention to avoid arms races and wars and combat illicit trade. However, using this data raises new problems. In particular, the success of a treaty depends on the willingness of the signing state how to convert the international agreements into national legislation and, even more important, to what extent. Thus, focussing only on the number of treaties ratified by a country does not provide me with the necessary information on the stringency of arms trade control policies, the degree of compliance or enforcement of them (Müller, 2000; Miller, 1984; Williamson, 2003).

Alternatively, several subsequent studies use measures that are more indirectly related to arms trade regulations and control, i.e., control of corruption, the rule of law, democratic accountability, or transparency (see, e.g., DellaVigna & La Ferrara, 2010). The logic behind using data mainly related to the strength of the political institutions as a proxy is that, for instance, the rule of law and absence of corruption are both tied to levels of governmental competence and critical for the efficient implementation of an effective arms trade control system. Again, it may be questionable whether these indicators are appropriate representatives of the rigorousness of arms trade control as they will suffer from severe measurement errors since they are only loosely related.

### 3.2 | Factor analysis: approach

Understanding the measurement problem—and how to solve it—has been hampered by the absence of reliable data that is readily available for a broad set of countries and a lack of an easily grasped analytic tool to compare states in their implementation of conventional arms trade control. In that regard, composite indices have many attractions for use in international governance as they can make complex state behaviors easier to grasp by policy makers. In practice, global governance indices permit comparisons across states and over time, which allows observers to cluster

states into different categories, detect outliers, identify trends, and focus attention on specific states or measures (see Cupitt, 2017; Cupitt & Vecellio, 2020).

To come up with a better and more direct composite measure on the stringency of conventional arms trade controls for a comprehensive set of countries and to determine whether it has a multidimensional character, I employ a so-called Explanatory Factor Analysis (EFA) on a large number of variables that are related to the stringency of arms trade control regulations and policies in a particular country. The objective of an EFA is to identify what different indicators of a latent variable have in common and to separate common factors from specific factors. Factor analysis is a statistical data reduction technique used to explain variability among observed random variables in terms of fewer unobserved random variables called factors. The observed variables are modeled as linear combinations of the factors plus an error term. The eigenvalue for a given factor measures the variance in all the variables that are accounted for by that particular factor. If a factor has a low eigenvalue, it may be ignored, as other factors are more important in explaining variance (The appendix gives an extensive description of the use of factor analysis).

The data used in the factor analysis is taken from the National Transfer Controls (NTC) database and is supplemented with information from the Arms Trade Treaty Baseline Assessment Project (ATT-BAP) survey, both collected by the Centre for Peace and Reconciliation Studies (CPRS) of the Coventry University. Together these datasets offer an overview of the varying national arms transfer control systems. The data is based on interviews with government officials, policy experts, and close observation of policy making and implementation in the involved countries. The datasets are made up of country profiles on national arms trade regulations, with the aim of facilitating greater awareness and understanding of varying arms transfer control systems around the world. The country profiles contain official information on the different implementation and enforcement practices currently utilized by countries to regulate international arms transfers and prevent the illicit arms trade.

Combined, the two surveys leave me with more than one hundred different open and closed compliance questions related to the wide range of legal obligations, recommendations, and indicators relevant to the effective implementation of the Arms Trade Treaty (ATT). The Arms Trade Treaty (ATT) is an international treaty that regulates the international trade in conventional arms and seeks to prevent and eradicate illicit trade and diversion of conventional arms by establishing international standards governing arms transfers. The treaty came into force in December 2014. Currently, a total of 110 sovereign states have ratified the treaty and a further 32 States have signed, but not yet ratified the treaty.

The surveys cover a total of fifteen thematic areas, including control lists, exports, imports, transit, brokering, prohibitions, risk assessment, diversion, enforcement, transparency, international cooperation, international assistance, and the implementation of the ATT. In constructing my strategic arms trade control variables, I have selected about sixty closed questions (yes/no, classified, do not know). Some of the original survey questions are combined into new questions (see Table 1).<sup>2</sup>

The survey data is collected over the period 2013 to 2016 and covers about 120 countries, mainly countries that are in the process of implementing the Arms Trade Treaty in their national legislation. Although the country sample includes data on the countries that are responsible for more than eighty percent of the international arms transfers, data on several important transition and arms importing countries, such as Saudi Arabia and the United Arab Emirates, is still lacking. Also, data on China is missing from the data set as they have signed the treaty only recently.

In the next step, I restrain the sample on the basis of data availability. One concern is that not every question is answered by the authorities of the participating countries (left blank, do not know, or classified). I only include countries for which I have more than 70% of the data on the arms trade control indicators used. Overall, I have approximately twenty percent missing values.<sup>3</sup> In order not to lose valuable information, I applied the EM algorithm of Dempster et al. (1977) to compute the missing observations. The EM algorithm was suggested by

<sup>2</sup>Completed surveys are public available on the website of the ATT-BAP project ([www.armstrade.info](http://www.armstrade.info)).

<sup>3</sup>In the current analysis, I include 106 countries. For the remaining countries, the data availability is on average less than fifty percent. This implies that when I include them in my dataset, the majority of the data in these countries is based on imputation. This makes the reliability of this data questionable. However, as a robustness test, I have conducted the analysis also on the full dataset. The factor analysis results do not change dramatically. These results are available upon request.

**TABLE 1** Factor analysis of strategic arms trade control indicators

Question nr.	Survey question	Factor 1: Arms trade laws and legislation (1)	Factor 2: Enforcement and control (2)	Variance explained (3)
<b>ARMS BROKERING REGULATIONS</b>				
Q1	Is the regulation of arms brokering established in national legislation?	0.778	0.287	0.69
Q2	Does your State take measures to regulate brokering taking place under your jurisdiction?	0.842	0.263	0.78
Q3	Definition of broker and/or brokering in national legislation and/or regulations.	0.784	0.258	0.68
Q4	The national system regulates brokers and/or brokering activities: Registration of brokers	0.764	0.224	0.63
Q5	The national system regulates brokers and/or brokering activities: Authorization to conduct brokering.	0.793	0.270	0.70
Q6	The national system regulates brokers and/or brokering activities: Two-stage process of registration of brokering and authorization for brokering.	0.842	0.241	0.77
Q7	The national control system permits brokering of conventional arms (a) without a license or authorization or (b) under simplified procedures under certain circumstances.	−0.923	−0.248	0.91
Q8	The State maintains a register of brokers.	0.746	0.258	0.62
Q9	Regulation of activities closely associated with brokering.	0.785	0.110	0.63
<b>ENFORCEMENT</b>				
Q10	The State takes measures to enforce national laws and regulations.	0.159	0.758	0.60
Q11	Criminal offense to trade conventional arms without a license or authorization.	0.253	0.815	0.73
<b>EXPORT CONTROLS</b>				
Q12	There is an authorization or licensing system to control the export of conventional arms.	0.925	0.152	0.88
Q13	The national control system permits exports of conventional arms (a) without a license or authorization or (b) under simplified procedures under certain circumstances.	−0.750	0.282	0.64
Q14	Does the State maintain records of export authorizations?	0.841	0.218	0.75
Q15	Does the State maintain records of actual exports?	0.852	0.209	0.77
Q16	Is the control of arms exports established in national legislation?	0.807	0.107	0.66
Q17	Does your State take measures to ensure that all authorizations are detailed and issued prior to export?	0.911	0.264	0.90

TABLE 1 (Continued)

Question nr.	Survey question	Factor 1: Arms trade laws and legislation (1)	Factor 2: Enforcement and control (2)	Variance explained (3)
Q18	Can your State reassess an authorization if your State becomes aware of new and relevant information?	0.761	0.223	0.63
<b>IMPORT REGULATIONS</b>				
Q19	There is an authorization or licensing system to regulate the import of conventional arms.	0.747	0.126	0.57
Q20	The national control system permits imports of conventional arms (a) without a license or authorization or (b) under simplified procedures under certain circumstances.	−0.738	0.210	0.59
Q21	Does the State maintains records of actual imports?	0.872	0.147	0.78
Q22	Is the regulation of arms imports established in national legislation?	0.702	0.294	0.58
Q23	What measures does your State take to regulate imports?	0.815	0.227	0.72
Q24	Does your State have measures in place to ensure that appropriate and relevant information is available to exporting States as part of their export assessment process?	0.926	0.104	0.87
<b>INTERNATIONAL COOPERATION</b>				
Q25	Is your State currently involved in: Exchange of information on conventional arms transfers?	0.444	0.291	0.28
Q26	Is your State currently involved in: Cooperative measures to prevent diversion?	0.371	0.279	0.22
Q27	Is your State currently involved in: Widest measures of assistance in investigations, prosecutions and judicial proceedings?	0.261	0.335	0.18
Q28	Is your State currently involved in: Measures to prevent corruption?	0.361	0.237	0.19
Q29	Is your State currently involved in: Development of best practices and lessons learned?	0.248	0.296	0.15
Q30	Does your State intend to pursue cooperation in: Exchange of information on conventional arms transfers?	0.218	0.253	0.11
<b>MEASURES TO ADDRESS DIVERSION</b>				
Q31	Does your State take preventative measures to mitigate the risk of diversion?	0.306	0.853	0.82
Q32	Does your State cooperate and exchange information with States to mitigate the risk of diversion?	0.283	0.793	0.71
Q33	Does your State take appropriate measures when it detects a diversion of transferred conventional arms?	0.366	0.746	0.69
Q34	Re-export of conventional arms is permitted only when there is prior approval or notification.	0.365	0.858	0.87

(Continues)



TABLE 1 (Continued)

Question nr.	Survey question	Factor 1: Arms trade laws and legislation (1)	Factor 2: Enforcement and control (2)	Variance explained (3)
Q35	Does the State take appropriate measures when a diversion has been identified?	0.357	0.870	0.88
<b>NATIONAL CONTROL SYSTEM</b>				
Q36	Legislation, regulations, or administrative procedures provide for control over exports of conventional arms, including conventional arms and ammunition?	0.880	0.286	0.86
Q37	Legislation, regulations, or administrative procedures provide for measures to regulate imports of conventional arms, including conventional arms and ammunition?	0.809	0.410	0.82
Q38	Legislation, regulations, or administrative procedures provide for measures to regulate transit/transshipment of conventional arms, including conventional arms and ammunition?	0.791	0.352	0.75
Q39	Legislation, regulations, or administrative procedures provide for measures to regulate brokers/brokering of conventional arms, including conventional arms and ammunition?	0.840	0.399	0.86
Q40	National control list of conventional arms subject to transfer controls.	0.808	0.274	0.73
Q41	Is/are your national control list(s) publicly available?	0.750	0.246	0.62
Q42	Are the controlled items defined?	0.711	0.236	0.56
<b>PROHIBITIONS AND RISK ASSESSMENT</b>				
Q43	Does your State prohibit transfers of conventional arms: If the transfer would violate obligations under measures adopted by the United Nations Security Council acting under Chapter VII, in particular arms embargoes?	0.261	0.878	0.84
Q44	Does your State prohibit transfers of conventional arms: If the transfer would violate relevant international obligations under international agreements to which you are a party, in particular those relating to the transfer of, or illicit trafficking in, conventional arms?	0.249	0.761	0.64
Q45	Does your State prohibit transfers of conventional arms: If you have knowledge at the time of authorization that the arms or items covered by your State's legislation would be used in the commission of genocide, crimes against humanity, grave breaches of the Geneva Conventions of 1949, attacks directed against civilian objects or civilians protected as such, or other war crimes as defined by international agreements to which you are a party?	0.241	0.731	0.59

TABLE 1 (Continued)

Question nr.	Survey question	Factor 1: Arms trade laws and legislation (1)	Factor 2: Enforcement and control (2)	Variance explained (3)
Q46	A risk assessment is conducted before issuing an export authorization	0.233	0.722	0.58
Q47	Risk mitigation measures that could be undertaken to mitigate identified risks	0.381	0.900	0.96
Q48	Does your State consider risk mitigation measures as part of its authorizations process?	0.366	0.846	0.85
<b>TRANSIT/TRANSSHIPMENT REGULATIONS</b>				
Q49	Is the regulation of transit and/or transshipment established in national legislation?	0.931	0.208	0.91
Q50	Does your State take measures to regulate transit and/or transshipment under its jurisdiction?	0.738	0.380	0.69
Q51	Does your State maintain records of arms that are authorized to transit and/or transship territory under its jurisdiction?	0.701	0.375	0.63
Q52	Definition of transit and/or transshipment in national legislation and/or regulations	0.796	0.366	0.77
Q53	The national system regulates the transit/transshipment of conventional arms by land, sea, and/or air	0.895	0.259	0.87
Q54	The national control system permits transit/transshipment of conventional arms (a) without a license or authorization or (b) under simplified procedures under certain circumstances	0.787	0.275	0.70
Q55	State maintains records of transit/transshipment authorizations	0.746	0.224	0.61
<b>TRANSPARENCY</b>				
Q56	Does the State make information publicly available on the national system to control/regulate international arms transfers?	0.432	0.354	0.31
Q57	Does your State produce an annual report on: Authorized arms trade?	0.231	0.277	0.13
Q58	Does your State produce an annual report on: Actual arms trade?	0.393	0.294	0.24
Q59	Can your State report on measures taken to address the diversion of transferred conventional arms?	0.294	0.436	0.28
	<i>h</i> -squared	0.596		
	Goodness-of-fit (p-value)	0.000		
	Bai and Ng Information criterion test (p-value)	0.000		
	Kaiser-Meyer-Olkin	0.702		
	Bartlett test of sphericity (p-value)	0.000		

Dempster et al. (1977) to solve maximum likelihood problems with missing data. It is an iterative method where the expectation step involves forming a log-likelihood function for the latent data as if they were observed and taking its expectation, while in the maximization step, the resulting expected log-likelihood is maximized. My remaining sample consists of more than one hundred developed and developing countries (see for the complete list of countries Table A1 in the appendix).

### 3.3 | Factor analysis: results

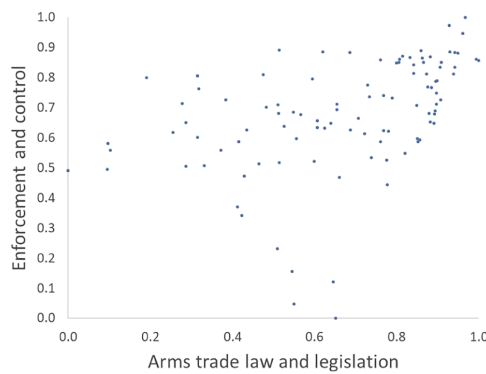
The first step in my analysis is to check whether the data used is suitable for an EFA using the Kaiser-Meyer-Olkin measure of sampling adequacy, testing whether the partial correlation among variables is low. A test statistic that is higher than 0.6 indicates that the data is suitable for an EFA (Kaiser, 1970). An alternative test is Bartlett's test of sphericity, which checks whether the correlation matrix is an identity matrix, in which case the factor model is inappropriate. Both tests indicate that the data used in the present study is suitable for an EFA (Lattin et al., 2003). Therefore, I consider the various questions as imperfect measures of strategic arms trade control efforts as they contain different information about these controls.

The next step is to decide on the number of factors to represent strategic arms trade control. There is no 'optimal' criterion for deciding on the proper number of factors. According to the so-called Kaiser criterion, all factors with eigenvalues exceeding unity should be retained (Kaiser & Dickman, 1959). Alternatively, the Cattell scree test, which is a graphical method in which the eigenvalues are plotted on the vertical axis and the factors on the horizontal axis, can be used. This test suggests selecting the number of factors that correspond to the point after which the remaining factors decline in approximately a linear fashion and to retain only the factors above the elbow. Finally, information criteria, such as the information criterion proposed by Bai and Ng (2002), can be used.

According to the Kaiser rule, more than ten factors should be identified (see Figure A1 in the appendix). However, this is probably a so-called Heywood (1931) case where some solutions of the unique variances of the indicators are smaller than zero. If instead the elbow criterion is used, strategic arms trade control can be represented as a two-dimensional construct. Both models were compared using a likelihood ratio test. In this case, the multiple-factor model does not fit the data significantly better than the two-factor model. The test-statistic of the two-factor model goodness-of-fit test is highly significant at the five percent significance level, also suggesting that the two-factor model is appropriate. This result is again confirmed by the p-value of the Bai and Ng Information test, which is highly significant. Therefore, I decided that the two-factor model is appropriate to represent the stringency of the strategic arms trade regulations and control.

After deciding on the number of factors, I rotate the factor loadings to yield a solution that is easier to interpret because the matrix has a simpler structure. Ideally, each indicator is correlated with as few factors as possible. For this purpose, I use the Oblimin rotation, which allows for correlation among the factors and minimizes the correlation of the columns of the factor loadings matrix. The oblimin rotation identifies the extent to which each of the factors is correlated to each other. As a result, a typical indicator will have high factor loadings on one factor, while it has low loadings on the other factors (Harris & Kaiser, 1964).

Table 1 presents the factor loading of the various indicators (Columns (1) and (2)) and the variance of each indicator explained by the two factors (Column (3)). Based on these results, I can label these factors. In the first factor, variables related to the implementation of regulations associated with imports and exports of arms score high, so I call this factor "arms trade laws and legislation". In the second factor, variables related to enforcement, diversion, and risk management are well explained, so I label this factor "enforcement and control". In total, about sixty percent of the variance is explained by the two factors, while thirty percent of the total variance is unique, meaning that this part is unexplained.



**FIGURE 1** Correlation standardized factors *Note:* This scatterplot shows the correlation between the factor scores of the laws and legislation dimension and the enforcement and control dimension [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

### 3.4 | Comparative analysis

My findings of the factor analysis support earlier evidence of Stinnett et al. (2011), Grillot and Grillot (1998), and Beck et al. (2003) related to the trade regulations of weapons of mass destruction. These studies argue that compliance to export control is mainly based on three components: (i) national legal basis, (ii) enforcing state institutions, and (iii) implementation of policies.

Using the factor scores, I have constructed two new measures of strategic arms trade control. To make the interpretation of the factor scores easier, I have standardized them on the interval between zero and one.<sup>4</sup> In Figure 1, I plot the standardized factor scores of the two dimensions against each other. The graph indicates that the two dimensions are almost uncorrelated, illustrating that the two factors measure different elements of arms trade regulations and control and are therefore complements instead of substitutes. This implies that the adoption of laws, regulations, and policies made by states to implement international commitments generally have a positive effect in fostering improved implementation when coupled with strong efforts to engage states politically with enforcement and assistance.

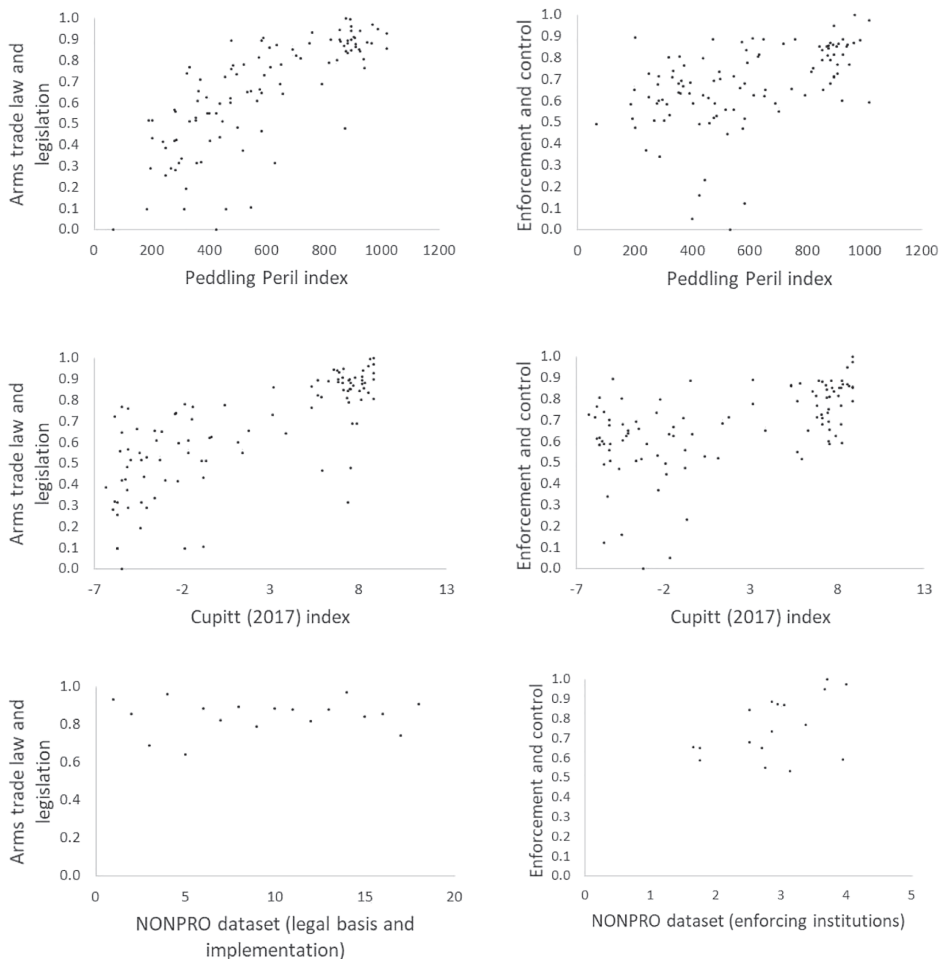
Moreover, the indices created can be used mainly for two purposes. First, policy makers can monitor the progress of implementing a national arms trade control framework and benchmark the compliance to international obligations across countries. Second, the indices can be used as proxies for the stringency of arms trade control policies in empirical research in order to explore the causes and consequences of these policies.

Additionally, I compare my standardized factor scores with three other related composite indices suggested in the literature on strategic trade. First, I compare my indices with the factor scores reported by Cupitt (2017) on chemical strategic trade controls. This latter index is based on information reported by the UNSC 1540 committee on implementing an effective strategic trade control framework, including data on the legal framework, enforcement, control lists, outreach to the industry, and licensing. The results in the top part of Figure 2 indicate that although the correlation between the law and legislation dimension is significantly positive ( $r = 0.54$ ), the correlation between the indices composed by Cupitt (2017) and the enforcement and control dimension is remarkable lower ( $r = 0.29$ ).

<sup>4</sup>I have standardized the factor scores using the following formula  $score'_i = \frac{score_i - \overline{score}}{\max(score) - \min(score)}$ . Where  $score_i$  is the factor score in country  $i$ ,  $\overline{score}$  is the average factor score in the sample, while “min” and “max” are respectively the maximum and minimum score in the dataset. As a result, the factor scores are normalized between zero and one. However, one major drawback of the method of standardization is that it causes some interpretation problems. This method implicitly assumes that the country with the highest factor score cannot improve anymore as it is at the top boundary and receive the score one. In turn, countries with a standardized score of zero cannot score lower. However, based on the raw data used in the factor analysis, none of the countries included have a perfect score on all questions rec-orded in the baseline survey. This implies that there is still room for improvement.

Likewise, in the middle part of Figure 2, I compare my indices with the Peddling-Peril index as described above. Again, a similar pattern arises. I find a relatively strong correlation between this index with my law and legislation dimension and a lower correlation with the enforcement and control dimension. Finally, the bottom part of Figure 2 provides the partial correlations of my standardized factor scores with the nonproliferation compliance scores taken from the NONPRO dataset (Jones, 2006; Stinnett et al., 2011). The nonproliferation compliance score utilizes a five-point scale to measure specific aspects of compliant behavior to UNSC1540. In particular, a score of zero indicates the absence of meaningful laws, institutions, or implementation, and a score of four identifies the gold standard. A gold standard score indicates that a state's development in a particular area is in line with export control best practices. The graph indicates that while there is a positive relationship between my enforcement and control dimension with the nonproliferation compliance score on enforcing institutions, there is no correlation between my arms law and legislation dimension with the average nonproliferation compliance score related to the legal basis and implementation of export control policies.

Based on this comparative analysis, I can draw two preliminary conclusions. First, the scatterplots support my view that regulating and controlling conventional arms is a different political and legal issue compared to regulating



**FIGURE 2** Graphical comparative analysis These graphs show the correlation between the standardized factor scores from my two-factor model and three commonly used measures on strategic trade control suggested in the literature (Peddling Peril index, Cupitt, 2017 and the NONPRO index)

the trade in nuclear or chemical weapons. Especially, the enforcement element differs substantially. One explanation for the latter finding might be originated in the differences in economic incentives in regulating WMD and conventional arms. Second, the efforts made on the legal basis and implementation of strategic trade policies differ in many countries from their enforcement practices. This latter issue is of particular importance since the outcome of a strategic trade control framework is recognized ultimately to be the product of rigorous implementation and effective monitoring and enforcement. Meaning, countries should score high on both dimensions to have an effective arms trade control framework.

Based on the country ranking shown in Table A1 in the appendix, one can argue that highly industrialized countries have the most stringent arms trade control regulations, while developing countries take the positions at the bottom. One possible explanation is that industrial countries have stronger political institutions, i.e., a high degree of democratic accountability and the rule of law, low levels of corruption, and a more effective government. This might enhance the incentive of the government to implement and enforce more effective and efficient arms trade policies. Arguably, as factor scores and the corresponding ranking are not that informative without any further analysis, they should not aim to generate conclusions, but instead, create benchmarks for starting discussions. Therefore, I try in the remaining of this study to explain the variation in the factor scores more formally using Bayesian Model Averaging.

## 4 | DRIVERS OF STRATEGIC ARMS TRADE CONTROL

### 4.1 | Theoretical foundation

What determines a state's effort and commitment to combat illicit arms transfers through arms trade legislation and controls? This question is especially relevant from a policy perspective as understanding the reasons why some states implement very stringent strategic trade controls, while others do not is critical for designing an effective regulatory framework. Combating proliferation through strategic trade controls shares many of the characteristics of a collective action problem. First, it can be economically or politically costly. Implementing and administering strategic trade controls will impose serious financial costs on the industry due to administrative burdens (Cupitt et al., 2001) and lost market share for exports (Beck & Gahlaut, 2003; Sanjian, 1988). Restricting the transfer of sensitive technology can also hinder the pursuit of foreign policy goals by some states (Fuhrmann, 2007). Second, the security benefits of combating proliferation are not excludable; states can benefit from nonproliferation efforts even when they do not contribute. This is further complicated because the benefits of fighting proliferation are not evenly shared. Some states that export proliferation-sensitive goods may be far removed from their recipients or unlikely targets of the weapons programs to which they are contributing (Stinnett et al., 2011). As a result, states may be tempted to free-ride in order to achieve strategic goals or maintain export markets while letting others shoulder the burden of addressing global security. Thus, the benefits to some states of allowing trade in strategic items can outweigh the negative security externalities this trade generates.

Generally, the stringency of the arms trade legislation is based on the trade-off between two competing policy objectives: national security on the one hand and domestic economic interests on the other (Seyoum, 2017b; Stinnett et al., 2011). The starting point of most theoretical models is that further liberalization of arms trade may threaten national security goals by putting sensitive products into the hands of potential adversaries (Seyoum, 2017a, 2017b). The main question is which position the government should take on this trade-off as policy makers may place different weights on the objectives of national security and economic interests. Formalizing this policy decision, Seyoum (2017b) comes up with several paradigms where the stringency of arms trade control is shaped by the interaction between the perceptions of security threats and the political influence of companies and corporate stakeholders on government policies. In general, the expected policy outcome from this framework entails that when a government must deal with serious security risks, it will be more inclined to implement and enforce

stringent arms trade legislation. In turn, when the defense or dual-use industry is an important economic sector with substantial political influence, the government favours more lenient arms trade legislation as this will improve the international competitiveness of the domestic industry.

The existing literature builds on various theoretical perspectives that try to explain the extent of strategic arms trade control (e.g., Cupitt et al., 2001; Seyoum, 2017a, 2017b; Stinnett et al., 2011). These theories come up with different key determinants of this sort of trade regulations. In the remainder of this section, the most important theories will be briefly reviewed and discussed one-by-one.

#### 4.1.1 | Military interest theory

The military interest theory asserts that the efforts of implementation, enforcement, and compliance to arms trade laws come from the distribution of military power around the globe (Downs et al., 1996; Sanjian, 1991). Leaders of superpowers or declining powers have no incentives to take policy measures that will limit their ability to expand or reduce their offensive weapons arsenals, because it would weaken their position and eventually lead to a situation where they lose the bargaining power vis-à-vis other states (Brender, 2018; Fearon, 1995). In turn, the export of military-strategic items raises serious security concerns, particularly for powerful countries. Powerful states have, therefore, large incentives to prevent the spread of conventional weapons by and to the rest of the world in order to preserve their military dominance stemming from their conventional capabilities (Kroenig, 2009a, 2009b). Thus, major military powers are more likely to implement more rigorous arms trade control policies that will not retain their own ability, but prevent other powers from outgrowing themselves.

#### 4.1.2 | Economic interest theory

The second theory to be discussed is the economic interest theory. The costs of implementing, complying, and enforcing arms trade legislation are greater for richer economies. When countries become more prosperous, they generally become more likely to act in a dual role of producer and buyer. In particular, weapons and other military items are predominantly produced in countries with a high income per head, and imported, to a certain extent, by countries with low income per head. Arms trade controls can deny or hinder trading opportunities for a state's exporters. Implementing restrictive trade measures can be quite costly in a competitive arms market as it may deprive current and future orders of intended buyers. Therefore, senders implement only trade measures that are the most beneficial and least costly to them (Beck & Gahlaut, 2003). Additionally, restricting defense export can place domestic firms at a serious competitive cost disadvantage. As a result, economic interests should limit the incentive to implement rigorous strategic trade controls by states.

#### 4.1.3 | External pressure theory

Officials of major powers repeatedly stress that their countries adopt stringent arms trade controls to demonstrate their position of being a responsible member of the international community and respect international law (Cupitt et al., 2001; Stinnett et al., 2011). That is, influential states try to impose their norms and principles on less powerful states. Countries at the core of the international system tend to be established democracies. They are more likely to support humanitarian law and arms control, either because of ethical considerations or because they benefit from the strategic effects of arms control. Less powerful countries may perceive the necessity to follow these norms to secure and preserve good economic relationships, for instance, through international trade or foreign aid. Besides, maintaining good ties with other members of the community on trade controls can generate diffuse benefits in other

aspects of international affairs such as participating in rule-making international bodies, such as the United Nations, World Bank, IMF, or World Trade Organization, and especially when it reflects on issues of reputation, prestige, and trust. Thus, the decision to implement strong strategic trade control regulations and policies and comply with certain arms trade standards and principles comes from the external pressure to combat proliferation and illicit transfers of conventional arms, rather than the immediate preferences of the state itself (Goldsmith & Posner, 2005).

#### 4.1.4 | Collective action theory

The large number of international suppliers creates a weak link phenomenon in that the state that does the least to implement, comply and enforce arms trade controls may be capable of reaping substantial economic benefits. Thus, arms trade controls have many of the characteristics of a collective action problem. According to this view, governments are less likely to implement and enforce rigorous strategic trade controls in more competitive arms markets as a matter of promoting or protecting their own arms industries. This effect is further reinforced since the defense-related industry is an important employer and business sector in many arms-producing countries and has some significant political influence. In many arms-producing countries, there is a revolving where former top managers in the defense industry have secured key government positions or vice versa. This illustrates the tight relationship between politicians and the defense industry, also often referred to as the military-industrial complex (see Eisenhower, 1961; Luechinger & Moser, 2014). Defense-related companies use corporate political activity, such as lobbying, to influence government policy in their favour. For instance, in the United States, the defense-related industry is among the top ten of industries that spent the most on presidential election campaign contributions. In return, the president might provide some political favours to this industry, for instance, through more lenient export regulations. Foreign demand is essential in the defense industry since the domestic demand is typically too low to cover the high R&D costs of defense firms.

#### 4.1.5 | Security risk theory

One difficulty of controlling the international transfer of strategic military items is that the security benefits of combating unwanted arms trade are not excludable and shared equally. States can benefit from arms trade control efforts even when they do not contribute themselves. Thus, the benefits of fighting illicit trade are not evenly shared (Stinnett et al., 2011). As all countries face the same incentives, no government will stop the proliferation. This mainly implies that trade control efforts might, to a large extent, depend on the current and past security situation of a country. For instance, states that have to deal with serious internal and external security threats or armed conflict will, on the one hand, benefit from more stringent (global) export control policies. In particular, exporting strategic items to a current ally or friendly nation might cause some security issues in the future when the trading partner turns into an enemy or foe. But on the other hand, more rigorous arms trade control measures will also restrain the own ability of a state to acquire military equipment abroad for self-defense purposes. Thus, countries that are subject to severe security risks are likely to be reluctant to prohibit arms imports and more likely to stop the arms exports to actual and potential enemies.

#### 4.1.6 | State capacity theory

The final theory on which my empirical approach later on builds and that explains the variations among countries in their efforts of committing or complying with arms trade control regulations is based on the capacity of the state to enforce rules and regulations. This explanation emphasizes that limitations in the technical and bureaucratic



capacities of governments as a central reason why states do not meet their legal obligations (Chayes & Chayes, 1993). In this view, states may have the political will to comply with their obligations, but lack the regulatory capacity, resources, or ability to impose effective export control policies (Fuhrmann, 2007). For instance, DellaVigna and La Ferrara (2010) find that the intensity of a conflict during an embargo period creates some upward pressure on the stock prices of weapon-making companies as many of them are trading illegally and violating the embargo. This effect is, in particular, visible for companies that have their headquarters located in countries with high corruption and low transparency in arms trade, as in these countries are the legal and reputational costs the lowest. Specifically, the effectiveness of arms trade legislation is the product of imposition and enforcement. Implementing new legislation is often a complex undertaking requiring a substantial technical or regulatory capacity to enforce customs restrictions. For instance, trade controls are highly technical policy instruments, requiring detailed legal measures, efficient institutions, and trained personnel. The quality of a state's bureaucratic capacity can thus constrain its ability to meet its ability to comply. In particular, implementing strategic trade controls requires an established customs bureaucracy, a body to issue export licenses, and law enforcement bodies to detect, investigate, and prosecute violations. Thus, the effectiveness of strategic trade controls depends greatly on swift comprehensive implementation and rigorous enforcement. For example, Kroenig (2009a,b) argues that arms proliferation is less of a concern for weaker states because proliferation robs strong states of their ability to use conventional military superiority to deter or coerce other states.

From a broader perspective, the issue of state capacity is also related to the economic capacities of a country. More prosperous states simply have more resources to spend on establishing new regulatory bodies, reforming existing institutions, and training personnel in new areas of expertise than do poorer states (Fuhrmann, 2007).

To empirically test whether the theories discussed above are supported by the data, I have identified and selected more than sixty indicators that correspond to one or more of the theories discussed above. To find the key determinants of the stringency of strategic trade controls, I have classified these variables into five broad categories (economic capacities, defense-related industry, political and institutional environment, military influence and power, and security risk). All variables and their sources are listed in Table A2 in the appendix. Table 2 summarizes the predicted direction of the different theories on the stringency of strategic trade control regulations and policies.

## 4.2 | Bayesian Model Averaging: Methodology

In this section, I employ a so-called Bayesian Model Averaging (BMA) to evaluate which explanatory variables are robust drivers of the strength of strategic arms trade control (see Draper, 1995; Hoeting et al., 1999; Leamer, 1978; Raftery et al., 1993). The central difficulty in empirical research is that several different models may all seem reasonable and plausible given the theory and data, but yield different conclusions about the parameters of interest as they sometimes differ substantially in their significance or even in direction. The purpose of BMA is to validate the statistical significance of the effect of a potential explanatory variable in the presence of different combinations of other control variables. Thus, I do not merely check the significance of a variable's coefficient from one specific specification—instead, I keep track of its coefficient in all possible specifications with additional control variables and focus on the probability distribution over the space of possible models. It averages the posterior distribution for the parameters under all possible models, where the weights are the posterior model probabilities. To evaluate the posterior model probability, the BMA uses the Bayesian Information Criterion to approximate the Bayes factors that are needed to compute the posterior model probability. The sample information contained in the likelihood function for a particular model is combined with relative model weights or posterior model probabilities to estimate the distribution of unknown parameters across models.

Formally, the BMA specification used can be formulated as follows.

$$Y_i = \alpha + \beta F_i + \gamma Z_i + u_i \quad (1)$$

TABLE 2 Summary of theory and empirics

Variable category	Theoretical prediction		Empirical finding	
	Theory tested	direction	Factor 1 Arms trade laws and legislation	Factor 2 Enforcement and control
Military influence and power	Military interest theory	+/-	Military in politics (-);Major military powers (+);	Military in politics (-);Major military powers (-).
	External pressure theory	-	NATO membership dummy (+).	
Economic capacities	Economic interest theory	-	Real GDP per capita (+);	Real GDP per capita (+);
	External pressure theory	-		
Defense-related industry	Collective action theory	-	Major arms-producing country dummy (-);Number of major defense firms (-);Arms exports (-);	Number of major defense firms (-);Arms exports (-);
			Economic freedom (-).	
Security situation	Security risk theory	+/-	Armed conflicts (+)	
Political institutional environment	State capacity theory	+	Level of democracy (+);Membership dummy	Level of democracy (+);Control of corruption (+);Regulatory quality (+);Rule of law (+)Legal structure and security of property rights (+).
			Wassenaar arrangement (+).	

Note: This table summarizes the theoretical predictions and empirical findings on the impact of the different theories tested and operationalized by the different variables.

where  $Y_i$  represents the standardized factor scores on the two indicators related to the stringency of arms trade control in the country  $i$  taken from the factor analysis in the previous section. The statistical framework includes two sets of explanatory variables. First, a set of so-called focus regressors  $F$  that are included in every model and consists of the standard explanatory variables suggested by the early literature on arms trade control regulations. Second, the vector of auxiliary regressors  $Z$  contains the variables to operationalize the abovementioned theories. Finally, parameters  $\alpha$  and  $u_p$  are, respectively, the constant and the error term.

BMA addresses model uncertainty related to the choice of the auxiliary regressors by estimating models for all possible combinations and taking a weighted average over all models. It attaches prior probabilities to the different models and averages them based on derived posterior probabilities. The probability that model  $M_j$  is the “true” model given the data  $y$  is defined as

$$p(M_j|y) = \frac{p(y|M_j)p(M_j)}{\sum_{i=1}^{2^k} p(y|M_i)} \quad (2)$$

where  $P(M_j)$  is the marginal likelihood of model  $M_j$  given data  $y$  and  $p(M_j)$  is the prior model probability. The weight for a given model is normalized by the sum of the weights of all models, represented in the denominator in Equation 2.<sup>5</sup> I employ the Bayesian estimator as implemented by Magnus et al. (2010), which uses conventional non-informative priors on the focus regressors and the error variance, and a multivariate Gaussian prior on the auxiliary regressors. Thus, the ultimate aim of the analysis is to evaluate whether the variables are robustly related to arms trade control dimensions found above. To reduce any simultaneity concerns with the dependent variable and to smooth out extreme values from a single year, the data for the control variables are taken as an average over the period 2005 to 2013.

So far, the literature on explaining the variation in arms trade control among countries is somewhat limited and inconclusive. Nevertheless, one variable that remains significant in most studies is real GDP per capita as this variable is closely tied with both the economic and institutional capacities of a state (see Brender, 2018; Cupitt et al., 2001; Fuhrmann, 2007; Stinnett et al., 2011).

As a response, I include real GDP per capita in the vector  $F$  of standard variables that are included in every regression. Additionally, I include the standardized factor scores on the other dimension as a control variable in the vector  $F$  to explore the interrelatedness of both strategic arms trade control dimensions.

### 4.3 | Bayesian Model Averaging: Empirical results

The results for the BMA models are presented in Table 3. Because my measures for strategic arms trade control are constructed using factor analysis and since the number of observations differs substantially between the regressions due to the availability of control variables, I use the bootstrap estimator with 1,000 replicators to obtain consistent and robust standard errors. Columns (1) and (4) give the average coefficient estimate overall regressions of the coefficient of the posterior distribution, while columns (2) and (5) provide the corresponding average standard error. Finally, columns (3) and (6) report the posterior inclusion probability (PiP). It is the sum of the posterior model probability for all models wherein a regressor was included and can be interpreted as the likelihood that a regressor is included in the true model.

Based on the BMA results, I can draw several conclusions. First, the two dimensions of arms trade control are identified as complements since the two dimensions are not significantly related to each other. At the top of Table 3, I first discuss the results obtained from the variables related to economic capacities. As can be seen from the table,

<sup>5</sup>Given the number of auxiliary regressors  $k$ , the total number of models amounts to  $2^k$ .

**TABLE 3** BMA results on the determinants of strategic arms trade control

	Arms trade laws and legislation			Enforcement and control		
	Avg. Beta (1)	Avg. SE (2)	PiP (3)	Avg. Beta (4)	Avg. SE (5)	PiP (6)
Enforcement and control	0.171	0.119	0.27			
Arms trade laws and legislation				0.223	0.127	0.21
<b><i>Economic capacities:</i></b>						
Real GDP per capita	0.052	0.01	0.91	0.104	0.03	0.92
Real GDP total	0.087	0.08	0.05	0.111	0.13	0.05
Growth rate of real GDP per capita	0.070	0.12	0.27	0.090	0.07	0.21
Trade openness	−0.146	0.27	0.31	−0.120	0.14	0.27
Foreign aid assistance	−0.128	0.10	0.41	−0.091	0.16	0.46
Change in the real exchange rate	−0.086	0.08	0.31	−0.064	0.04	0.39
Total population	0.139	0.09	0.18	0.125	0.09	0.44
Post-Soviet country dummy	−0.069	0.11	0.53	−0.104	0.07	0.04
OECD country	0.105	0.15	0.22	0.112	0.11	0.15
LDC country	−0.097	0.16	0.47	−0.119	0.10	0.06
<b><i>Defense-related industry:</i></b>						
Arms producing country dummy	−0.135	0.09	0.39	−0.137	0.11	0.34
Major arms producing country dummy	−0.115	0.03	0.96	−0.089	0.09	0.06
Industrial sector	0.115	0.16	0.18	0.101	0.11	0.37
Number of major defence firms	−0.068	0.04	0.96	−0.109	0.13	0.35
Military exports	−0.133	0.06	0.93	−0.144	0.13	0.12
Military imports	0.135	0.18	0.51	0.110	0.11	0.46
Economic freedom	−0.066	0.04	0.92	−0.062	0.05	0.16
<b><i>Political institutional environment:</i></b>						
Level of democracy	0.068	0.04	0.91	0.096	0.03	0.95
Government ideology	−0.052	0.05	0.07	−0.061	0.07	0.30
Control of corruption	0.118	0.08	0.24	0.109	0.07	0.97
Government effectiveness	0.052	0.06	0.22	0.073	0.06	0.30
Regulatory quality	0.080	0.10	0.11	0.087	0.04	0.95
Voice and accountability	0.145	0.14	0.52	0.145	0.12	0.12
Rule of law	0.092	0.08	0.12	0.113	0.07	0.90
Political Stability and Absence of Violence	0.142	0.18	0.16	0.148	0.21	0.29
Legal structure and security of property rights	0.060	0.04	0.46	0.052	0.03	0.91
Number of arms trade control treaties signed	0.104	0.09	0.47	0.089	0.10	0.47
Number of arms trade control treaties ratified	0.112	0.15	0.14	0.111	0.11	0.44
Membership dummy Wassenaar arrangement	0.063	0.04	0.93	0.144	0.21	0.51
Membership dummy Nuclear Suppliers Group	0.126	0.10	0.34	0.068	0.05	0.26
Membership dummy Australia Group	0.085	0.10	0.05	0.083	0.06	0.33

(Continues)

TABLE 3 (Continued)

	Arms trade laws and legislation			Enforcement and control		
	Avg. Beta (1)	Avg. SE (2)	PiP (3)	Avg. Beta (4)	Avg. SE (5)	PiP (6)
Membership dummy Missile Technology Control Regime	0.118	0.08	0.46	0.146	0.27	0.11
Membership dummy Zangger group	0.138	0.12	0.29	0.127	0.18	0.33
UN security council member dummy	0.051	0.04	0.22	0.069	0.10	0.51
<b>Military influence and power:</b>						
Military career of chief executive	0.074	0.06	0.04	0.055	0.05	0.09
Military career of minister of defence	−0.134	0.10	0.22	−0.120	0.13	0.10
Military in politics	−0.116	0.07	0.97	−0.088	0.10	0.15
Number of peace organisations	0.142	0.22	0.51	0.139	0.13	0.11
Military expenditures	0.112	0.11	0.41	0.067	0.05	0.51
Nuclear power dummy	−0.102	0.07	0.47	−0.055	0.05	0.37
Heavy material index	0.119	0.10	0.33	−0.058	0.05	0.14
Major military power dummy	0.115	0.06	0.92	−0.077	0.05	0.98
Military personnel	−0.111	0.19	0.34	−0.129	0.18	0.37
Alliance with US	0.106	0.11	0.14	0.081	0.08	0.48
NATO member dummy	0.140	0.08	0.95	0.147	0.11	0.23
Participation in peacekeeping operations dummy	0.107	0.10	0.42	0.133	0.15	0.47
Participation in military interventions dummy	−0.087	0.10	0.51	−0.098	0.10	0.41
<b>Security situation:</b>						
Armed conflict dummy	0.114	0.15	0.17	−0.052	0.08	0.23
Armed conflict in neighbouring country	0.077	0.12	0.13	0.072	0.05	0.48
Total number of military conflicts involved since 1950	0.101	0.08	0.51	0.135	0.10	0.44
Number of terroristic attacks	−0.121	0.14	0.34	−0.137	0.12	0.24
Assassinations dummy	−0.109	0.12	0.42	−0.062	0.11	0.38
Purges dummy	−0.081	0.07	0.47	−0.091	0.18	0.42
Guerrilla warfare dummy	−0.142	0.17	0.09	−0.118	0.13	0.43
Internal conflict	−0.116	0.21	0.08	−0.108	0.10	0.04
External conflict	−0.113	0.10	0.10	−0.092	0.13	0.11
Ethnic tension	−0.128	0.13	0.10	−0.145	0.21	0.27
Religious tension	−0.072	0.11	0.30	−0.137	0.10	0.23

Note: The columns 'Avg. Beta' and 'Avg. SE' report the unweighted average coefficient and standard error, respectively. 'PiP' is the posterior inclusion probability.

real GDP per capita is clearly a robust determinant of both dimensions of strategic arms trade control, with a PiP being close to one. Based on this finding, one can argue that an increase in the level of income per head of a country will lead to more rigorous arms trade controls. As already mentioned above, the real GDP per capita is likely not only capturing the economic capacities of countries, but is also closely related to other capacities such as the level of democracy or the rule of law. Alternatively, more developed countries might try to establish norms in trade control

that should be followed by the other countries. This supports earlier evidence on compliance with export control of WMD (Cupitt et al., 2001; Fuhrmann, 2007; Stinnett et al., 2011). Moreover, the insignificant effect of trade openness might be attributed to two contradictory effects. On the one hand, the bureaucratic costs of trade controls may discourage states from complying. On the other hand, more stringent trade controls might help promote exports as the costs related to trade control can be seen as a membership fee for access to the world's liberal economic community and signals that a state is a responsible trading partner (see, e.g., Cupitt et al., 2001).

Moreover, in the second set of variables, I explore the impact of the defense-related industry on the extent of strategic trade control as formulated in the collective action theory. First, there is a negative relationship between the number of defense firms in a country and the implementation of arms trade law and legislation. One possible explanation is that when the number of firms starts to increase, they will gain political power and put some considerable pressure on the government to relax regulations as this will, in turn, improve the international competitiveness of domestic companies. This finding is strengthened since arms producing or exporting countries have more lenient arms control laws and regulations. However, there is only one concern related to these latter results, as it merely indicates a correlation, the causality could also run in the opposite direction, indicating that more stringent control policies reduce export performance.

Moreover, countries with a high level of economic freedom have more lenient arms trade control laws and legislation. This result is in line with a more general finding in the economics literature arguing that economic freedom is positively related with less bureaucratic regulations that stimulate trade (see, e.g., Berggren, 2003; Depken & Sonora, 2005; Gwartney et al., 1999). Surprisingly, while the United States has been generally active in promoting foreign trade control development, I do not find any evidence that it was able to use its alliance relationships to convince or compel allied states to adopt more stringent trade controls than non-allies.

Surprisingly, I find no significant impact of arms imports on both dimensions of strategic trade controls. One explanation is that defense markets are mainly regulated from the supply side as handling the demand side is quite challenging and much complicated, for instance, by the right of self-defence of sovereign states. Also, governments favour regulations that increase international security through regulating the supply side as they have an aversion to policy measures that potentially restrain their own ability to purchase arms internationally.

Next, I turn to the variables included in the category political institutional environment to test the state capacity theory. The findings indicate that particularly the dimension related to the enforcement and control of arms trade regulation is affected by the strength of the political institutions present. One explanation is that *de jure* policies should be enforced by strong political institutions (such as the rule of law, democracy, etc.) to make them *de facto* effective. The rather insignificant effect of institutional capacity variables on the dimension related to the implementation of trade laws and legislation is explained by the fact that adopting a new law is relatively low institutional cost, while enforcing a law is much more determined by the institutional quality.

Furthermore, I examine the impact of a set of variables related to the military influence and power on the stringency of strategic trade regulations on strategic trade controls. Countries where the influence of the military is considerable on government decisions and domestic politics usually have more lenient strategic arms trade controls. One rational explanation of this finding is that countries, where the non-elected elite has a high influence on policy decisions, are typically undemocratic countries. Moreover, I find that major military powers have an ambiguous effect on strategic trade controls. On the one hand, major powers have more strict arms trade laws and legislation to preserve their military power. On the other hand, military powers intend to have more lenient enforcement of arms trade control measures as many major powers are arms producers themselves. This finding perfectly illustrates the trade-off between the policy objectives of (inter)national security and the economic interests of the defense industry. It also indicates that military powers might use strategic trade policies only as a norm signaling device as there is a discrepancy between *de jure* and *de facto* strategic trade controls.

Moreover, the signing or ratification of other agreements and treaties has no statistical effect. This indicates that just counting the number of treaties signed or ratified does provide the appropriate information to work as a proxy for the stringency of implementation and enforcing arms trade control. Treaties need to be converted into national

**TABLE 4** Preferred model on the determinants of strategic arms trade control

	Arms trade laws and legislation (1)	Enforcement and control (2)
Other dimension of strategic control	0.112 (0.143)	0.209 (0.153)
Real GDP per capita	0.156** (0.077)	0.093** (0.042)
Major arms-producing country dummy	−0.074 (0.059)	
Number of major defense firms	−0.086* (0.045)	
Military exports	−0.083* (0.050)	
Economic freedom	−0.073* (0.043)	
Level of democracy	0.047* (0.028)	0.097** (0.040)
Control of corruption		0.101* (0.052)
Regulatory quality		0.072** (0.025)
Rule of law		0.095** (0.028)
Legal structure and security of property rights		0.086 (0.058)
Membership dummy Wassenaar arrangement	0.097* (0.054)	
Military in politics	−0.091* (0.048)	−0.107* (0.064)
Major military power dummy	0.058* (0.032)	−0.174* (0.103)
NATO member dummy	0.080 (0.062)	
Armed conflict dummy	0.058** (0.024)	
Number of observations	106	
R-squared	0.374	

Note: \*\*/\* Indicating significance levels of respectively 5 and 10%. Bootstrapped standard errors are shown between brackets. The model is estimated using the SUR estimator.

law, and as already argued above, this is done to different degrees by states. This clearly indicates that there is a difference between de jure commitment to arms control and de facto.

Additionally, the findings indicate that members of NATO or countries that are members of the Wassenaar arrangement have implemented more strict strategic trade laws and regulations. This shows that the degree of regulating the arms trade is likely to be a product of international cooperation and coordination (see also Brender, 2018).

Finally I tested whether the stringency of strategic trade controls is affected by the security situation within a country. On the one hand, countries that are subject to security threats are expected to have a preference for more stringent arms trade control policies that hinders the foreign acquisition of arms by current and future enemies. On the other hand, when all countries implement more rigorous arms trade regulations, it will also hamper the opportunity of countries dealing with security threats in their ability to purchase arms abroad. Apparently, the first effect dominates the second as countries that suffered from armed conflicts in the past have more stringent arms trade control policies.

To conclude, the summary of the BMA results presented in the right part of Table 2 generally indicates that the variation in arms trade laws and legislation rigorousness across countries is mainly explained by variables related to economic capabilities. In turn, the degree of enforcement and control of arms trade regulation is much more driven by the institutional capacity of a country and international coordination. These results strengthen the idea that the two dimensions of arms trade control regulations are actually complementary rather than substitutes as they have different determinants and that the effectiveness of strategic trade legislation is the product of proper implementation and rigorous enforcement.

As a final step in my empirical analysis, I try to validate the BMA results by including all variables that emerge as robust in the BMA model into a single model specification. The cut-off point for a variable to be considered robustly linked to my dependent variable is a PiP value of 0.9 or higher. For this purpose, I estimate a system to two simultaneous equations using the SUR estimator. The results of this overall preferred model are presented in Table 4. The results mainly confirm the findings from the BMA analysis. The only differences are that the NATO membership dummy and the major arms-producing country dummy in the arms trade laws and legislation specification that turn out to be insignificant. Also, the effect of the legal structure and security of property rights on the enforcement and control dimension appears to be negligible. However, all these variables were also only weakly significant in the BMA analysis.

## 5 | CONCLUSION

The term “strategic arms trade control” generally refers to the policy efforts that states undertake in order to control the international movement of military-strategic items that might exacerbate an ongoing conflict, contribute to destabilizing weapons build-ups, or be used in violations of human rights. The need for states to exercise effective control over international arms transfers is universally accepted. Arms trade control is typically exercised through imposing limitations and barriers upon consenting states on the international transfers. The objective of this study is twofold. The first aim to come up with measures for the stringency of arms trade control related to conventional weaponry. Based on the outcomes of the factor analysis, I construct two new conventional arms trade control measures. The first one refers to arms trade laws and legislation, while the second is associated with the stringency of enforcement and control. The second aim of this study is to explain the variation in the stringency of arms trade control among countries. For this purpose, I use the predicted country scores obtained from the factor analysis as my dependent variable in a Bayesian Model Averaging to find the robust drivers of arms trade control policies. These results indicate that the two dimensions of arms trade control regulations are actually complementary rather than substitutes as they have different determinants. In particular, the main findings of this analysis suggest that the stringency of arms trade control is determined by mainly economic factors, while the degree of enforcement and control is more associated with the strength of the political institutions in place. The general conclusion of this study suggests that the implementation and enforcement of arms trade control policies are mainly determined by the trade-off between two important policy objectives of the government: national security concerns on the one hand and domestic economic interests on the other.

As the results indicate that a large part of the efforts to implement and enforce a national trade control system is driven by national interests. International spillover effects for national security are often neglected. This latter concern gives rise to the idea to establish and design an international governing body to assist and monitor the implementation of a national trade control system and corresponding policies and regulations. This institution should be independent of any country or government to reduce political rent-seeking behaviour.

One limitation of my analysis is that it's based on a cross-sectional dataset rather than on a panel dataset due to a lack of time-varying trade control data. As a consequence, the results merely indicate correlation rather than causality. Additionally, although I consider a large global data panel, there still exists the risk that my results are partly driven by a sample selection as the data is collected from a baseline survey, including only countries that have signed the Arms Trade Treaty. Finally, the factor scores on the stringency of strategic trade control are mainly based on legal indicators. However, it is well-known from the existing literature that there might be a difference between the *de jure* implementation of laws and the *de facto* practice of the law, especially in low-income countries that have fewer checks and balances to achieve democratic accountability.

## DATA AVAILABILITY STATEMENT

The dataset on the strategic trade control scores is available in the online appendix.



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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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