

Chapter 12

Contract-Boundary-Spanning Governance Initiatives in the International Defense Supply Chain of the F-35 Program



Tom De Schryver and Gert Demmink

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Abstract International cooperation in the American-led F-35 program inherently triggers national security concerns. Consequently, the multiple exports in the supply chain are subject to intricate licensing and export controls. Drawing on insights from governance and contract theory we introduce a theoretical lens that highlights some important trade compliance challenges in supply chain networks. In this chapter, contract-boundary-spanning governance mechanisms are defined as increasingly sophisticated hard or soft governance mechanisms in the private law

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sphere that can be deployed by any public or private stakeholder to govern international supply chains. We find contract-boundary-spanning governance initiatives by state and private stakeholders in the defense supply chain of the F-35 program. At the same time, we argue that while serious efforts have been made by various state actors and legislators to reduce the burden in trade compliance requirements in the F-35 program, the industry is still facing a considerable number of compliance challenges. We argue that more contract-boundary-spanning initiatives by the private parties in defense supply chain network are needed if these challenges are to be successfully overcome.

Keywords Global value chains · governance mechanism · contract theory · boundary spanning · duty of care · Memorandum of Understanding · security cooperation · technology transfer · export controls · F-35 · JSF

12.1 Introduction

The export of technology that is earmarked as being sensitive by the United States (US), is subject to intricate licensing and export controls. It concerns, for one, traditional exports in which controlled technology crosses a land border. Due to the extra territoriality feature of the American export controls, different national export controls may simultaneously apply when this technology crosses a land border outside of the US. It also involves deemed exports in which American knowledge is being transferred to a foreigner or a dual-nationality citizen. Deemed exports can take place without the technology having to cross a land border. All these types of exports are subject to strong and complex regulations. Failure to correctly observe these regulations can have serious business and legal consequences.

All these kinds of exports occur frequently in the F-35 program, in which national Departments of Defense (DOD) and defense companies from several friendly states participate.¹ Since the original aim in the nineties of the F-35 program was to achieve significant advances in the military capability, the program contains a lot of highly sensitive technology.² There has also been constant political pressure to develop this high-tech platform at affordable costs. Due to the extreme degree of product differentiation and technological complexity in the F-35 program, it was felt that no single company could manage this program successfully. Instead, the best resources had to be bundled across companies and across national borders.

In 2001, the contract for the development and the production of the F-35 has been awarded to the Lockheed Martin/Pratt & Whitney consortium. As Lockheed Martin is the ultimate system integrator in the F-35 program, it has outsourced certain areas of design and manufacture and has bought in many services, assemblies, components and parts. It has resulted in a complex US-led international operation, with

¹ Chapman 2019; Gertler 2020; Vucetic 2013; Vucetic and Nossal 2013.

² Gertler 2020.

approximately 2,000 partners involved over ten countries.³ Clearly, the regulation of (re-)exports of goods, services and technology in the F-35 program is an important point of attention. These (re-)exports are addressed in a Memorandum of Understanding (MOU) framework between friendly states.⁴ While this MOU framework allows the export of US-controlled technology in the F-35 program as efficiently as possible and in accordance with all international export laws and regulations, irregularities or compliance issues have regularly occurred in the past.

A real-life example, in which the names of the companies involved have been anonymized, illustrates the complex export control challenges in the F-35 program. A Dutch company has sent at a certain moment in time, a metallurgical component that needed to be produced according to very precise specifications, to a renowned laboratory in the Netherlands for calibration tests. The problem was that this Dutch laboratory was not known by the American system integrator. When the Dutch company subsequently sent the component and the calibration report that it had received from the laboratory to the US, the system integrator observed that an export control violation had occurred and reported it to the US authorities. This report has stress-tested the relationship between the American integrator and the Dutch counterpart. The system integrator has reacted by imposing a cordon sanitaire on the Dutch company until it was able to demonstrate the proper functioning of its internal compliance program.

In sum, the international cooperation in the F-35 program is fraught with multiple forms of complexity. Firstly, from a management and technology perspective, it is an enormous challenge to co-create the F-35s.⁵ Secondly, there are national security concerns in all participating countries that make international cooperation even more demanding.⁶ Conflicts of interest between business interest and national security concerns can create tensions in the value chain of the F-35 program. We will investigate in this contribution how the export control laws and regulations are embedded in the governance structure of the F-35 program.

The structure of the chapter is as follows. In the next section we introduce the most relevant theoretical insights for analyzing global supply chain governance. Thereafter, the theoretical framework is applied to the F-35 context. To this end, we will make use of interview data collected by Moore et al. about the collaboration between UK and US partners in the F-35 program.⁷ We will also analyze one of the phase MOUs in the F-35 program. The chapter ends with conclusions and implications for future research.

³ Service Logistics Forum 2020.

⁴ Vucetic and Nossal 2013.

⁵ Gertler 2020.

⁶ Moore et al. 2011.

⁷ Moore et al. 2011.

12.2 Theory

The innovative international cooperation in the F-35 program has led to new governance issues that we will map on contemporary business models and contract literature. More specifically, we draw on the taxonomy of Gereffi et al. to describe the governance practices at the level of transactions between network parties in a value chain.⁸ This taxonomy will offer us a useful business perspective on micro governance practices in global value chains. We also draw on the concept of *contract-boundary-spanning governance mechanisms*, by which the imbalance between opportunities of international chain cooperation and threats of limited legal liability of the entire value chain can be addressed.⁹ Whereas the business lens focuses on the transactions in a value chain, the legal lens will focus on the supply chain level. These two theoretical insights are first introduced and then combined into a theoretical framework.

12.2.1 Transaction Level: Governance as Bilateral Linking

There are different ways to regulate business transactions between network partners in a global value chain. Gereffi et al. have developed a taxonomy that orders the governance practices in global value chains along a dimension that reflects the power asymmetry between suppliers and system integrators. They argue that the choice for a governance type ought to depend on three contingencies. Firstly, it depends on the complexity of the technological information that is involved in a transaction between partners. Secondly, it depends on the extent to which this technology information can be codified in a transaction between parties. Thirdly, it depends on the importance of the required capabilities of any suppliers in the design or production of components. These three contingencies determine the power relations between network partners and the governance type. When there are extreme power asymmetries between suppliers and system integrator, the system integrator will dictate who gets involved or it can determine unilaterally which information is being shared in the network. The higher the power asymmetries the more likely that a captive governance mechanism applies. When the power is evenly distributed, like in a relational governance type, each party brings in unique and important competences. Therefore, suppliers and system integrator engage in a close dialogue.¹⁰

Although their model is intuitively appealing, we have to bear in mind that many different transactions are needed to design, build and deliver a technological complex product. While it is possible that certain types of governance mechanism are more frequently present in a particular value chain, we have to acknowledge the possibility that there will be different kinds of governance practices between network partners

⁸ Gereffi et al. 2005.

⁹ Salminen 2016.

¹⁰ Gereffi et al. 2005.

in a global value chain. As such the typology of Gereffi et al. is a particular useful lens to be used at the level of the transaction; but it can become theoretically challenging to apply the taxonomy at the level of the global value chain.¹¹ Since we need to acknowledge that different kinds of governance types can coexist at the same time in a global value chain, we will assume that a global value chain consists of a series of transactions with business partners that are governed in different ways. This chain of interrelated business transaction is an attempt to orchestrate resources in a complex program.¹²

12.2.2 Chain Level: Contract-Boundary-Spanning Governance Mechanisms

Modeling a global value chain as a series of linked bilateral contracts is consistent with Salminen's approach. Salminen notes that "supply chain actors have subscribed their individual contracts to the logic of the supply chain as a whole".¹³ From this perspective, we can infer that some degree of rapport between network parties can be implied. To a certain extent, network partners will thus take into account the stakes of the accompanying network partners. Yet, it can also elicit defensive, boundary enforcing behavior.¹⁴ Put differently, it cannot be assumed that a good working governance mechanism at the chain level, that automatically activates a duty of care in the chain, is present. Hence, the risk exists that not all network partners feel liable for any negative externality that may arise. As such these compliance risks cannot be quickly contained. So, whereas resource orchestration and governance theories focus on the most positive scenario of collaboration, we need a different perspective for analyzing (latent) problems in chain collaboration.

Salminen has researched solutions aimed at tackling the weak liability in clothing, automotive and nuclear plant construction supply chains.¹⁵ He has selected these value chains because there exist initiatives in which network parties commit themselves to reduce the impact of compliance risks more quickly. He calls these initiatives *Contract-Boundary-Spanning Governance Mechanisms* (CBSGM) and defines them as "increasingly sophisticated mechanisms that are used by private actors to govern chains or networks of contracts".¹⁶ Two dimensions are central to this new concept. Firstly, it concerns initiatives that are initiated in the private-law sphere. Secondly, it concerns initiatives that go beyond the bilateral contracts between contract partners and are thus "increasingly sophisticated".

¹¹ Ponte and Sturgeon 2014.

¹² Gong et al. 2018.

¹³ Salminen 2016, p. 737.

¹⁴ Faraj and Yan 2009; Kwan 2019.

¹⁵ Salminen 2016; 2018.

¹⁶ Salminen 2016, p. 710.

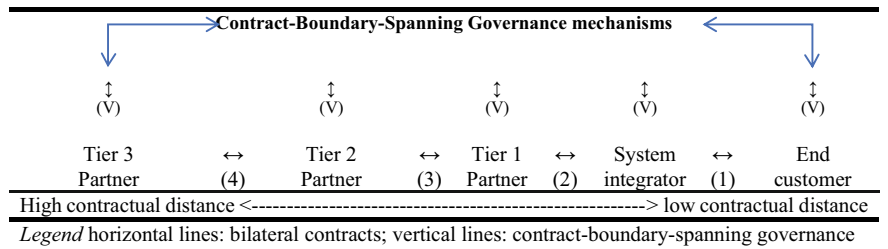


Fig. 12.1 Theoretical framework. *Source* De Schryver and Demmink 2021

Salminen has found two forms of CBSGMs. The first form consists of a dedicated governance contract signed by all private actors on top of the underlying chain of contracts. As such, the extra contract connects directly the two ends of a supply chain. The first form of CBSGM is based on the power of hard controls, because the extra contract can trigger for example audits and even court cases against network partners. The second form of CBSGM “blends in” the chain of contractual relations.¹⁷ The second form of CBSGM focusses more on awareness-raising. Network partners are mainly approached in a positive way to assume their own responsibility. A high degree of trust and transparency and a lot of multilateral consultation between the parties are assumed in this blended form. We therefore argue that the second form relies more on the power of soft controls.

CBSGMs are no panacea. The effectiveness of the hard form of CBSGM depends on whether there is a willingness to take joint responsibility. Even though an overarching contractual layer exists, the risk of blurring liabilities remains due to a conflict of contracts. Network partners in the value chain might be tempted to take advantage of the confusion between the two layers of contracts to disclaim responsibility. The danger of the blended form of CBSGM is that it results in noncommittal diplomacy. CBSGMs should therefore be seen as a sensitizing concept; and not yet as a fixed concept with clearly defined antecedents and outcomes.

12.2.3 Theoretical Framework

We combine the insights of Gereffi et al. and Salminen into a theoretical framework (see Fig. 12.1). Because our unit of analysis is the complete value chain level, we limit the description of the value chain to a sequence of linked transactions arranged through bilateral contracts between different network parties. Given the fact that this is already a simplified representation of a value chain, we sort these bilateral contracts according to the distance to the end customer. We label it contractual distance.

The framework starts with an end customer signing a contract with a system integrator for the production of a technologically complex product; (1) in Fig. 12.1

¹⁷ Salminen 2018, p. 425.

represents this transaction. There is no contractual distance between the two parties. The system integrator also maintains various bilateral contacts with Tier 1 partners for the execution of the initial contract. These transactions are represented by (2) in Fig. 12.1. There is a small contractual distance between the Tier 1 partner and the end customer because the Tier 1 partner has no direct contractual relationship with the end customer. If there would be any direct communication between the Tier 1 partner and the end customer, the contract with the system integrator will always be taken into account. It can further be assumed that these Tier 1 partners themselves must also start new contractual relationships with other partners; e.g. extra employment relationships or new investment relationships. When these partners enter the value chain, we refer to them as Tier 2 partners because of the increased distance to the end customer. They have no direct bilateral relationship with neither the system integrator nor the end customer. They are involved in the project by the grace of the Tier 1 partner. We represent these transactions by (3) in Fig. 12.1. In practice, this process can repeat itself indefinitely and give rise to many more ramifications. For conceptual clarity of the theoretical framework, we limit the representation in Fig. 12.1 to three Tier partners with four layers of transactions. The Tier 3 partners therefore maintain a contractual relationship with the Tier 2 partners; (4) in Fig. 12.1. There is contractual distance with the end customer, the system integrator and the Tier 1 partner.

All horizontal lines—(1) till (4)—in Fig. 12.1 represent the bilateral contracts that have been signed in order to deliver the high-tech product. There is rarely a central oversight of all contract relationships without central governance. And if there were, the oversight becomes more difficult for the system integrator and the end customer to maintain as the contractual distance increases. This was clearly the case in the example presented earlier. The laboratory was involved in the value process without the involvement of the system integrator. Hence there was contractual distance. Although initially the Dutch supplier benefited from signing a contractual relationship with the laboratory to get the calibration report, this contract, represented by (3) in Fig. 12.2, has raised trade compliance issues in the value chain. The US

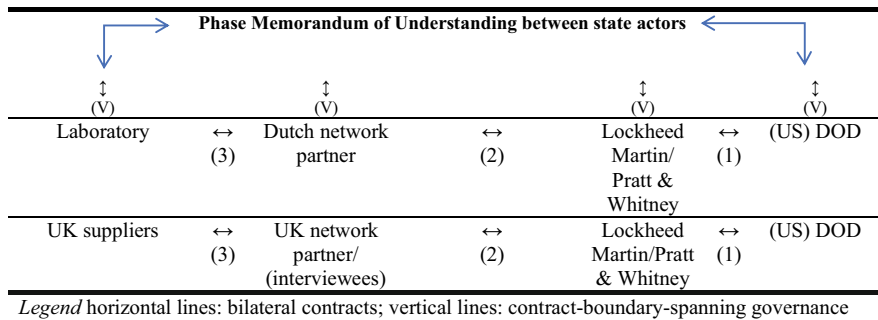


Fig. 12.2 Theoretical framework applied to the F-35 program. *Source* De Schryver and Demmink 2021

administration and system integrator were not aware about the involvement of the laboratory and observed a security risk. It is clear from Fig. 12.2 that the distance from the laboratory to the system integrator and the end customer could have been shortened. Since there is a need for a better overview, CBSGM can be introduced. This is shown in Figs. 12.1 and 12.2 by adding an extra layer on top of the linked bilateral contracts. We represent these CBSGMs by the vertical (V) lines in Figs. 12.1 and 12.2.

Salminen has introduced CBSGMs because the different partners in the value chain are only loosely coupled. Loose coupling does not usually cause any problems if everything goes well in win-win situations; but is extremely fragile in case of problems or zero-sum games. Again, the practical example outlined in Sect. 12.1 of this chapter serves as a useful illustration. After they became aware of the compliance issue, the bilateral relationship between the Dutch supplier and the US system integrator came under pressure. The relationship was even temporarily frozen until the Dutch company had demonstrated to be in control again. Such breaches in the bilateral contracts are expressions of market power that provide local solutions at the transaction level. They are not to be considered as good system solutions for all stakeholders involved. There is a risk that in the event of negative externalities, each party will want to limit its own liability and abstain its responsibility. However, the damage from negative externality has occurred and may persist.

In the next section, we apply this theoretical framework to the F-35 program. In contrast to the previous research of Salminen where it was clear from the onset that CBSGM were present, the contract-boundary-spanning governance in the F-35 program has yet to be identified. Because there is a linked chain of bilateral contracts, we consider it likely that CBSGMs are to be identified. More specifically, we investigate which ones are (or should be) present in the F-35 program.

12.3 Methodology

Our analysis consists of two parts. Firstly, we have analyzed the perceptions of some suppliers in the F-35 program. Secondly, we conducted a text analysis of the phase MOUs.

In order to get a better understanding of the governance mechanisms in the F-35 program by means of the theoretical framework, we draw on Moore et al. who have provided us with a unique insight on the working relationships between international network partners in the F-35 program. Nine semi-structured interviews with UK industry representatives and seven interviews with UK government representatives on various topics related to working relationships between suppliers and the system integrator were held by the researchers. Moore et al. have intensively used quotes in their reporting of the findings as a respondent validation technique. These quotes are interesting because they often entail concrete examples of certain business transactions and metaphors about the context of these transactions. Even though the quotes are not verbatim due to anonymity editing, we decided to reinterpret these quotes in

the light of the theoretical framework of this chapter. In particular, we retained 26 quotes—based on perceived relevance—of the 16 interviewees. Three quotes from the UK government representatives were retained; the 23 other quotes are from the UK industry representatives. It is unfortunately not possible to give more details about the authorship of the quote since Moore et al. have disclosed only whether an industry representative or government representative is being cited.¹⁸

For the reinterpretation of the data, we applied deductive coding techniques. To each quote we assigned multiple codes in different pre-existing theoretical categories. We assigned codes when there was evidence of interlinked contracts, complexity of transactions, codification of transactions, supplier capabilities, market power, and hard or blended CBSGMs. We also created a unique identifier for each quote. The identifier combines the page number in Moore et al. with a code whether it was a government or industry representative. This combination is both unique and meaningful for each quote. Once each quote has been coded, we have made data matrices that link the quotes to the theoretical constructs of our model. Out of these data matrices, excerpts have been included in this chapter that according to us best highlight the extent to which the quote can be matched with the theoretical constructs. Since we are primarily geared towards understanding the case, our main focus is how these quotes manifest themselves to the theoretical framework. Therefore, we summarize by giving our interpretation about the patterns found in the columns of the data matrices.

12.4 Results

12.4.1 *Perceived Supply Chain Governance*

Salminen introduced CBSGM because there are governance weaknesses in the chain of interlinked contracts of global value chains.¹⁹ We therefore first describe whether the UK representatives also frame the context of their working relations in the F-35 as a chain of interlinked contracts. As indicated from three different excerpts in Table 12.1, this is the case. The UK representatives clearly frame the supply network as a chain of interlinked contracts. The excerpts also show that their context is perceived as ‘a complication’ or a difficult situation.

As the first contingency in the Gereffi et al. taxonomy is the complexity of transactions, the next step was to assess the extent to which information and knowledge transfer is needed in order to contribute to the design and production of a part of the F-35.²⁰ The four excerpts in Table 12.2 illustrate that the interviewees perceive the transactions to be technologically complex. They need very precise

¹⁸ Moore et al. 2011.

¹⁹ Salminen 2016.

²⁰ Gereffi et al. 2005.

Table 12.1 Evidence of the chain of interlinked contracts

Identifier ^a	Excerpt
I.5p1.p18	The added complication is that the UK firm has to make the request to Washington through the US firm with which it is working on the JSF. So the UK firm is hindered in numerous ways from getting the best suppliers
I.11p28	When the UK firm works through a US firm and has a novel proposal which necessitates some sharing of information, the US firm is responsible for getting that approval from Washington
G.26p69	Within JSF ^b , it is important to ask what Lockheed Martin as the prime contractor actually has done with any ITAR requests from UK firms. What exactly will Lockheed have proposed to the US government for approval?

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

Table 12.2 Evidence of HIGHLY PERCEIVED complexity of transactions

Identifier ^a	Excerpt
I.9p27	However, it is not possible to design a component in isolation, and it is necessary to obtain large amounts of relevant data. ITAR made it impossible to obtain this data, such as on operating margins and operating temperatures, so it was not possible to design the component in the most efficient way possible
I.10p27	Ultimately, the UK firm had to design around the US modified part, without knowing all the details. This generated difficulties with regard to testing the complete unit as well as how the entire system would operate, particularly with regard to certain performance scenarios. As a result, the solution was to send the whole system from the UK to the US for testing, and then return it to the UK. The interviewee's comment was that getting to 100% of the specified requirement was possible, but it took more time and effort, with additional design work necessary due to the barriers imposed by ITAR
I.12p28	While there were contractual provisions which addressed sharing of information, there were instances in which there were misinterpretations and errors which blocked exchanges of information
I.21p45	The firm has worked on JSF ^b under an arrangement that assumes it will not get source code access. This certainly generates difficulties resulting in the UK firm having to find complicated "workarounds" or simply having US firms do the work

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

product specifications in order to fulfill the demands. The industry representatives argue that intense information exchange about product specifications is a necessary condition for successful business transactions between network partners. Hence, we can infer that it involves complex transactions from an engineering and management perspective. The excerpts also show that the necessary technology information is not easily shared; which complicates the working relations. This is to us an indication of institutional complexity due to competing logics: network partners have to balance

Table 12.3 Evidence of MODERATE possibilities of codification in a transaction

Identifier ^a	Excerpt
I.9p27	ITAR made it impossible to obtain this data, such as on operating margins and operating temperatures [...] this was not a restriction of information due to intellectual property rights (IPR), but restrictions imposed by ITAR
I.10p27	the UK firm was not authorized to know about any additions or modifications undertaken by a US firm to a particular JSF ^b component
I.12p28	There were instances in which there were misinterpretations and errors which blocked exchanges of information. However, there also were numerous instances where exchanges were completely blocked due to US requirements
I.22p45	The UK firm was never allowed near anything associated with the software, which has not helped the UK firm in understanding how the systems work
I.25p49	And sometimes the US puts in provisos that the company did not expect, or at times does not even know about. Much depends on the license, and a well-drafted broad scope in the license gives the firm the required flexibility. On issues such as hardware or technical data, the license may be silent, so the company has to work to find a solution

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

between information hoarding due to security concerns and information sharing due to resource orchestration. This balancing act leads to extra process steps complicating any transaction. Therefore, we argue that the complexity of the transactions is high.

The excerpts in Table 12.3 complement the previous analysis. It is not straightforward to meet contractual obligations without a minimal degree of information exchange between network partners. The excerpts in Table 12.3 highlight some of the attributions by the interviewees why codified information is not always shared. In particular, the excerpts illustrate their awareness of regulatory constraints to codify information. Hence while it is feasible from a practical point of view to codify and exchange technology information between network partners, the codification efforts of the technology owners are not leading to information exchange due to regulatory constraints. As a result, we conclude that the ability to codify necessary technology information in a transaction is only moderate.

Next, Table 12.4 clearly shows that both in and out the F-35 program capable suppliers can be identified by the interviewees who can contribute to the production and design of parts for the F-35. From these excerpts, we infer that not every supplier has the same set of unique competences. Instead, they have competences that are rare, valuable and difficult to replicate. The high level of supplier capabilities is perhaps best illustrated in the excerpts by their concerns over the protection of their intellectual property rights. Also, the apparent playfulness to redesign components without full technological information is according to us a clear indication that the capabilities of the network partners are high. The excerpts in Table 12.4 again show that technical competence is not a sufficient condition to be included in the F-35 program.

Table 12.4 Evidence of HIGH capabilities of suppliers

Identifier ^a	Excerpt
I.8p.25	The UK firm believed that a company from another European country was capable of filling a particular role on JSF ^b . Unfortunately, it took a significant amount of time and effort to get US approval to bring in that company
I.10p.27-28	The UK firm was not authorized to know about any additions or modifications undertaken by a US firm to a particular JSF component. The UK firm then had to produce items in which that component was used. Ultimately, the UK firm had to design around the US modified part, without knowing all the details. This generated difficulties with regard to testing the complete unit, as well as how the entire system would operate, particularly with regard to certain performance scenarios. As a result, the solution was to send the whole system from the UK to the US for testing, and then return it to the UK. The interviewee's comment was that getting to 100% of the specified requirement was possible, but it took more time and effort, with additional design work necessary due to the barriers imposed by ITAR
G.15p.33	While firms want to work on a major project like JSF, they are concerned about protecting their IPR
G.18p.36	The UK feels that UK technology is being "stolen" by the US under ITAR. Two examples are LED screen technology and night-vision goggles. If there is co-development and technology sharing with the US, the US then slaps on ITAR restrictions, and the UK cannot freely use the technology. However, added the interviewee, it is not clear if this is a result of a deliberate US policy or the lack of joined-up government in the US regarding ITAR

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

Based on the analysis of three contingencies, it is already possible to rule out the two classical governance types. It is clear that not every supplier in the institutional field is eligible to work on the F-35 program. There are other selection criteria besides price information. Hence the market typology of governance does not apply here. Nor does the hierarchical governance type apply to the F-35 program as the system integrator does not have all competences in place. Instead, the three contingency factors seem to suggest that a relational governance type, due to the highly perceived technological complexity, to the high capability base of the supplier's network and to the innate high possibilities to codify the information between network partners, could fit.²¹ But we still need to take the power element in our analysis into account.

Since both network partners involved in a transaction have their own sources of power, we have presented the power sources by the suppliers and by the US system integrator in two different tables. Table 12.5 summons the perceived power sources of the UK industry. Table 12.6 lists the perceived power sources of the US system integrator. As the excerpts in Tables 12.5 and 12.6 illustrate, there are many forms of market power leading to substantial barriers to mobility. Regulation is an acknowledged barrier to mobility in strategic management literature.²² The American

²¹ Gereffi et al. 2005.

²² Caves and Porter 1977.

Table 12.5 Evidence of LOW perceived market power by UK suppliers

Identifier ^a	Excerpt
I.4p17	Bearings for a component of the JSF ^b are made by one US firm. They could be acquired from a European firm at a lower cost and with a more secure supply chain. However, ITAR makes it easier to stay with the existing supply chain and deters any effort to drive down costs and obtain greater security
I.5 p1.p18	the UK firm is hindered in numerous ways from getting the best suppliers. As a result, the firm simply falls back on using old, approved suppliers, as it is difficult to conduct competitive tendering [...] A fire at one of its suppliers made it impossible to get supplies, but the firm determined it was better to wait for the company to rebuild the facility, rather than seek clearance for a new supplier from the US
G.15p33	These concerns have led to difficulties with regard to integrating technology onto the JSF, as European partners have been reluctant to share information on METEOR or ASRAAM with the US
I.17p36	ITAR is like “one drop of cyanide in a bucket of water. Once you’ve put the smallest drop in, everything becomes contaminated.” It makes it hard for the UK company because it may want to find other uses for its products. To cite one example, the individual noted that a civilian product that goes to the US and has something added that is ITAR-related (like special paint) becomes an ITAR-controlled item. A firm wants to avoid having to produce two lines of items, so the company would not go to the US and risk ITAR “contamination” for the whole product line. These are illogical decisions, and have no consistency on what is military and non-military. If a product is developed and applied on a civil project, there would be no problems whatsoever. But as soon as it is put on a military project, it becomes ITAR controlled

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

export regulation makes it hard for UK partners to get into the F-35 program; as it is hard to get out of the program. This is not as comfortable as it may seem for the UK partners, because the excerpts highlight that they perceive high market power asymmetry between them and the US system integrator. While UK network partners seem to have the power to rise prices and to determine their level of involvement—as for instance indicated in their efforts to protect some of their intellectual assets—there is no evidence from the interviews that the suppliers are aiming to scale up or to integrate forward. Hence, much of the incidences of power of UK network partners are a defensive tactical response to other more dominant forces. The bargaining power of the UK network partners is therefore relatively low.

It is clear from the excerpts in Table 12.6 that strongest power imbalance is in favor of the US side. According to the interviews, the system integrator might have used its US citizenship to create information asymmetries and to rationalize certain business decisions. As such they are able to control any potential switching costs. While the capabilities of the UK suppliers are high, their competences are substitutable and the system integrator has market power because there are enough suppliers worldwide to choose from. Hence, we conclude that market power asymmetry is high.

Table 12.6 Evidence of HIGHLY perceived market power by the US system integrator

Identifier ^a	Excerpt
I.11p.28	When the UK firm works through a US firm and has a novel proposal which necessitates some sharing of information, the US firm is responsible for getting that approval from Washington. The immediate response on the US side often is to simply reject the UK initiative, rather than undertake that onerous process
I.18p.36	If there is co-development and technology sharing with the US, the US then slaps on ITAR restrictions, and the UK cannot freely use the technology
I.19p.37	the US company it is working with on JSF ^b used the ITAR as an excuse to defend a particular decision. The example involved software developed for use in the JSF. The UK firm was informed by the US company that it was excluded from this work on the basis of security concerns, but never received a clear response from the US government or the US company. It was offered work on other systems, which it accepted, but the perception in the UK firm was that the US company appeared to have used ITAR to cover a business decision, and the UK firm could not challenge the outcome
I.20p.37-p.38	The US company eventually responded that the US government would not give access to the UK firm to work in those areas. However, it again was not clear about the rationale behind that US government decision, merely stating that for “reasons of affordability,” it would be handled as a responsibility of the US company. The interviewee stated that, as there was no transparency in the process, it is not clear if that outcome was genuinely due to a decision by Washington, or if the US company was looking for an excuse to capture work in a strategic area and to change an informal agreement that the UK firm would have that line of work
I.21p.45	The firm has worked on JSF under an arrangement that assumes it will not get source code access
G.26p.69	Within JSF, it is important to ask what Lockheed Martin as the prime contractor actually has done with any ITAR requests from UK firms. What exactly will Lockheed have proposed to the US government for approval?

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

The perception of market power asymmetry is an important indicator in the Gereffi et al. model.²³ The higher the power asymmetries the more likely that a captive governance mechanism applies. The more even power is distributed, the more likely a relational governance type is suitable. Thus, while the analysis from the three contingencies suggests that a relational governance type would be the most appropriate governance form in the F-35 program, the extreme degree of power asymmetry seems to indicate that a captive governance type is—based on the interviews—a better classification of the actual governance type in the F-35 program.

The discrepancy between the desired and the actual governance type stresses the theoretical importance of CBSGM. In order to repair some of the misfit, namely a

²³ Gereffi et al. 2005.

Table 12.7 Evidence of blended contract-boundary-spanning governance activity

Identifier ^a	Excerpt
I.6p22	Compliance with US regulations is the third most important factor for the firm regarding JSF ^b participation (after production rate and affordability of the aircraft). That is indicated in the extensive training process undertaken in the firm for employees working on JSF
I.23p49	He has regular contact with US government officials on JSF, and there have been no major problems. [...] The firm's personnel in the US have a good relationship with US counterparts. Certainly there are restrictions on UK personnel, but as they have been in the US for a long time, the arrangement works well. The working environment has developed over a lengthy period of time and, certainly in the JSF development phase, US regulations have not been an insurmountable impediment. [...] Basically, US behavior is geared to helping the UK firm despite US regulations. But the UK will need to push the US for more dialogue
I.24p49	While agreeing that resolution of problems comes down to personal relationships, stated that when the firm works directly with Washington, things can get difficult. To a degree, the firm has reasonable relationships with US officials, and generally those individuals have been knowledgeable. The firm works with the JSF project office to resolve problems and issues

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35

Source Moore et al. 2011

lack of communication, we expect to find some additional blended forms of contract-boundary-spanning governance initiatives.

The excerpts in Table 12.7 give clear manifestations of blended forms of contract-boundary-spanning activity. The UK representatives clearly engage in communication with the US administration (I.23p49; I.24p49) in an effort to comply to export regulations. The contract-boundary-spanning activities are also evident from their efforts to comply with the ITAR by means of training and tone at the top (I.6p22). These excerpts illustrate that the blended form of CBSGMs is present in the F-35 program.

We also suspect that UK and US network partners adjust their working relations because of fear the risk of (civil) penalties. While there is contract-boundary-spanning governance activity, it is not the result of a hard CBSGM as there is no contract that enforces them to do. Instead, the ITAR-frame of the UK representatives substitutes the contractual form of hard CSGGM. The fear arises from the fact that the US administration might impose sanctions.

These findings have potentially important implications for the theoretical framework of Salminen. Firstly, it suggests that hard contract-boundary-spanning activity do not have to be formalized in a contract between private network partners. In the next section, we will explain that contractual agreements that imply CBSGM exist at another level. Secondly, the analysis of the quotes indicates that not all network partners participate equally in the contract-boundary-spanning governance activities. From the excerpts in Tables 12.7 and 12.8, it seems that the system inte-

Table 12.8 Evidence of hard contract-boundary-spanning governance activity

Identifier ^a	Excerpt
I.13p30	At some JSF ^b meetings, non-US citizens were told to leave at certain points. In one instance, that meant that the firm had one US national remaining in the room while the rest of the UK team was asked to leave
I.24p49	In the early stages, however, the firm got little instruction on the regulations, and the US response was “just go read the ITAR.”

^aLegend: I = UK industry representative, G = UK Government representative; ^bJSF stands for Joint Strike Fighter, and is the previous name of the F-35
Source Moore et al. 2011

grator has been sidestepped in some of these contract-boundary-spanning governance initiatives. UK representatives invest directly in good relationships with the US governments. Much of the attributions by the interviewees, refer to regulatory contract-boundary-spanning governance efforts. Thirdly, it shows that contract-boundary-spanning governance activities do not always have positive effects. Due to the deterrence effect of export regulations, communication problems can paradoxically increase. One can also observe that the US administration and UK firms try to solve these problems once certain thresholds of mutual trust and familiarity have been reached. As a result, the US administration, with their outreach activities play a proactive role in promoting blended contract-boundary-spanning governance activity in defense supply chains.

12.4.2 An Interpretation of the Memoranda of Understanding

While the reinterpretation of the interview data at Moore et al. did only reveal implicit framing of contract-boundary-spanning governance initiatives, we argue that CBSGMs do exist in other areas of the F-35 program. In international law, it is common to use a Memorandum of Understanding (MOU) framework to set out the details of the development, testing, production, and delivery phase. A phase MOU expresses a convergence of will towards an intended line of action in each phase of the F-35 program. Since MOUs do not have the same legal status as international treaties, they can be put into effect without time-consuming legislative approval by national bodies. As such an MOU can be framed as a contractual agreement between state actors in a complex regulatory context. We will argue in this section that these phase MOUs contain features of CBSGMs.

In the context of export control and trade compliance, a raft of enforceable export regulations applies.²⁴ Security cooperation between states is regulated by a multitude of international agreements, treaties, national laws, regulations, and policies. Most

²⁴ Aubin and Idiart 2016.

governments, bound by these international treaties, also impose stringent security requirements on defense companies operating under their jurisdiction. In this highly regulated context, the ministries of defense of all the partner countries in the F-35 program have signed different phase MOUs to support the F-35 program.²⁵ For example, the DODs of Australia, Canada, Denmark, Italy, The Netherlands, Norway, Turkey, the UK and the US have signed a Production, Sustainment, and Follow-on Development MOU (PSFD MOU) concerning their intent to produce, and sustain the F-35 at Washington, Oslo, and Copenhagen between November 2006 and February 2007.²⁶ This MOU has entered into force on 31 December 2006 and is at the time of writing still in effect. In this PSFD MOU, these state actors express their desire to cooperate in the design, production and acquisition of the F-35 seeking to capitalize on the lessons learned from their previous experience in the previous phases of the F-35 program.

While the main aim of for signing a phase MOUs is to coordinate efforts to develop mutual defense capabilities of the state actors through international industrial collaboration, some articles in the phase MOUs also take into account national security concerns. We argue that in particular the articles in the phase MOUs that directly try to monitor any business transaction of private network partners in the defense supply chain could be considered as a CBSGM, even though the phase MOUs are signed by state actors. In order to support our argument, we need to revisit the two central dimensions in the definition of a CBSGM, namely the fact that it is an initiative taken by private partners and that it is a sophisticated governance mechanism.

12.4.2.1 First Dimension: “Used by Private Actors”

The phase MOUs of the F-35 are essentially contracts signed by the DODs of all states participating in the program. Since the DODs represent their states, they are more public actors than private actors. However, due to the fact that the MOUs qualify more as a soft law than as a legally binding enforceable law, such as the US International Traffic in Arms Regulation (ITAR) or the EC Directive 2009/43/EC (implemented in the Netherlands through the *Besluit Strategische Goederen*), we argue that state actors also make use of private contracts to govern supply chains.

12.4.2.2 Second Dimension: “Increasingly Sophisticated Mechanisms”

To show that the phase MOUs entail an increasingly degree of sophistication in the governance of value chains, we have included the most relevant articles of the PSFD MOU in an appendix (Sect. 12.6). While we restrict the analysis here on the most

²⁵ Chapman 2019; Gertler 2020; Vucetic and Nossal 2013; <https://english.rekenkamer.nl/topics/joint-strike-fighter/the-netherlands-as-a-partner/the-international-jsf-programme/the-phases-of-the-jsf-programme>.

²⁶ Source: purl.fdlp.gov/GPO/gpo36486.

recent phase MOU in the F-35 program, it equally applies to previous phase MOUs as well.

According to Section 6.8 of the PSFD MOU, state actors agree to take a pioneering role in the governance of compliance risks in the value chain. This is not restricted to their own responsibility. They also engage to sway network partners into compliance efforts. This is evident from the advisory and disciplining roles that state actors are expected to take towards private network partners in the F-35 program. It is important to emphasize that the MOU are not signed by these private partners. Nor does a MOU substitute the national laws and international regulations regarding export control, which obviously remain in effect to all parties concerned. Hence the MOU supplements both the existing regulatory framework and the chain of bilateral contracts; and, as such, is already indicative of a certain degree of sophistication.

In order to fulfill their contractual obligations, state actors resort to both types of CBSGMs. Articles 6.10 and 6.11 in the PSFD MOU are manifestations of hard CBSGMs that state actors are expected to implement. State actors are urged to use their existing legal and licensing power to make sure that the required technology information for business transactions is restricted to its intended end-use and registered end-user and otherwise kept confidential. These articles reveal a reason why some of the extreme knowledge hoarding activities have been observed between UK and US network partners in the Moore et al. study. On the contrary, in Article 7:5 we clearly find the spirit of blended CBSGM. By means of this article, state actors are encouraged to raise compliance awareness among network parties. This awareness-raising information may relate to information regarding generally accepted standards for the design of internal trade compliance programs.

All the articles in the PSFD MOU indicate that it concerns a best-efforts obligation, not a results obligation for the state actors. How the states act upon these articles, is left to the individual states. In practice, the effort obligation has resulted in numerous initiatives to promote compliance in the value chain. For one, it has resulted in what the program participants have come to know as the 'contractual flow-down' in an attempt of participants to call upon the network partners to show proactive behavior. It has also resulted in many outreach activities. For example, the Nederlandse Industrie voor Defensie en Veiligheid (NIDV) and the Netherlands Aerospace Group (NAG) have organized seminars and workshops since 2007. This was done on the basis of an industry-led need for more information. Topics like industrial espionage, intellectual property, export controls, contracting and security have been covered in these workshops. These efforts have led to greater levels of awareness within the Dutch defense industry regarding the aforementioned themes. This required actively seeking out those parties and this was supported by NIDV and NAG with courses, presentations with invitations also being sent to US government officials, from the Commerce Department/BIS. NIDV also has representation (larger companies by Thales and smaller companies by an NIDV representative) on the export control committee of the Brussels-based ASD (European Aeronautics, Space, Defence and Security Industries), to which US government officers were also regularly invited. Feedback with respect to all this information—likewise between the ASD participants themselves—was shared with the Dutch defence industry.

In sum, by signing MOUs state partners commit themselves to take multiple initiatives towards achieving trade compliance in the supply chain. Instead of using laws, state actors resort to contracts to regulate trade compliance in the value chain. As a result, our analysis suggests a new dimension to CBSGMs. Not only private stakeholders or parties who are not directly involved with the development and production process can take on contract-boundary-spanning governance initiatives. State actors also make use of the two forms identified by Salminen. First, state actors can force private partners in the value chain to take on their trade compliance responsibility through contractual obligations and hard controls. They also can make use of soft controls via outreach activities. Therefore, in our opinion, the definition of CBGSM should be adapted to increasingly sophisticated hard or soft governance mechanisms in the private law sphere that can be deployed by any public or private stakeholder to govern value chains or networks of contracts.

The extension of the definition of CBSGM to public stakeholders is meaningful because state actors should be better able to set aside business interests and deal with the management of negative externalities.²⁷ It is therefore important to recognize that the initiative to regulate the duty of care does not have to lie in the chain itself. Instead, state actors can use their private instruments to govern value chains. At the same time, it raises questions about the contexts in which governments consider it appropriate to work with legislation instead of CBSGMs, and vice versa. In particular, it would be interesting to further investigate the enforcement effects of these CBSGMs.

In this chapter, we have only focused on the signing of the MOUs but we have not dealt with the actions of state actors when a business partner is falling short of expectations. The initial example in this chapter has indicated that the system integrator has taken corrective actions towards the Dutch supplier; but it is unclear whether the Dutch state has also been informed and, if so, what actions has been taken. Nor do the interviews in Moore et al. contain attributions for contract-boundary-spanning governance initiatives that are geared towards the phase MOUs. The focus is on the ITAR instead. While these attributions make sense from a business perspective because the phase MOUs do not address enforceable rules to companies, it remains to be seen how state actors will monitor whether the MOUs will be followed up in practice. Earlier on in this chapter, we already raised concerns about the effectiveness of CBSGMs. It is appropriate to repeat these concerns in this context, as state actors are only sporadically involved in the primary production processes of value chains.

12.5 Conclusions and Discussion

In this section we highlight the theoretical and practical contributions. In order to explain trade compliance governance in global value chains of the defense industry, we have combined governance theories with private contract theories. The fairly new theoretical concept of CBSGM, which indicates the extra efforts of private partners

²⁷ Heidenkamp et al. 2013.

in value chains to activate the duty of care across contract boundaries, was given the floor.²⁸ Based on our analysis, we have tweaked the definition of this new concept to: increasingly sophisticated hard or soft governance mechanisms in the private law sphere that can be deployed by any public or private stakeholder to govern value chains or networks of contracts. We have applied these theoretical insights to the F-35 program where, under strong regulatory pressure, network parties in the value chain commit to combatting inappropriate technology transfer. Moreover, from the analysis of the phase MOUs we have observed that also public parties engage in CBSGMs in order to pay more attention to compliance issues in the supply chain. Notwithstanding these contract-boundary-spanning governance initiatives, we argue that the F-35 program and by extension the defense industry is still facing a considerable number of compliance challenges. We argue that coordination by the private parties in the supply chain network itself is needed in order to successfully overcome these trade compliance challenges.

This chapter is only a start. More theoretical and empirical research needs to be performed on the impact of CBSGM in defense supply chains. This analysis, based on existing sources, should be seen as a first step. There are a number of limitations that are related to the use of secondary data. We had no control over how the interview data in Moore et al. was collected, nor can we engage in any respondent validation of our findings. Moreover, the interviews of Moore et al. served other purposes than ours. Since Moore et al. were mainly interested in the UK perceptions on the working relationships with the US in the F-35 program, no systematic data from the own compliance efforts by UK companies were collected. There was only sporadic evidence in the interviews of certain elements of an internal compliance programs in the UK firms, mostly related to compliance training and tone at the top. Although the research questions are different from ours, we share a common interest in explaining barriers in international collaboration. Also, the perspective in Moore et al. is restricted to the UK and is confined to the early stages of collaboration. Hence the data may not be indicative for the perceptions of all stakeholders involved, nor can it be assumed that the UK perceptions have remained the same over time. Finally, it is not clear from Moore et al. how the sample of industry and government interviewees were selected. Given that there are more than 1900 suppliers in 10 different countries, we cannot easily generalize findings from the interview data.

Despite these methodological limitations and even possible issues with the trustworthiness, the main findings of Moore et al. are consistent with other reports that have tackled the issue of production delays and cost overruns in the F-35 program (see for example various US GAO reports monitoring the progress in the F-35 program.²⁹ Hence, the data is a good start for an analysis. An advantage of our approach is that our source data, namely the quotes in Moore et al., are open-access. It allows anyone to replicate our analysis. Obviously, we clearly promote future research that includes a more diverse set of secondary sources and encourage collecting own data to test or apply the theoretical framework more rigorously.

²⁸ Salminen 2016.

²⁹ United States Government Accountability Office 2014, 2019, 2020.

Research on boundary spanning governance is clearly an emerging field.³⁰ The theoretical contribution of this chapter is that the new concept of CBSGM is applied to a new and relevant setting. If we compare the defense supply chain with the cases from Salminen, the F-35 supply chain combines features of the automotive and nuclear value chain. It has in common with the automotive value chain that in both cases chains were striving for efficiency gains through performance contracts. The value chain of the F-35 has in common with that of the nuclear plant that the government puts very strong regulatory pressure on the production processes and that the product is a specially designed, complex product.

It has also become clear that more theory development around CBSGM needs to be done. An interesting option is to combine the two forms of CBSGMs with the contingency factors from the Gereffi et al. model. For example, if the value chain is already familiar with codifying transactions, such as in a modular or captive governance structure, then it probably takes little effort to implement the hard form of CBSGM. On the other hand, if the value chain cannot simply codify transactions without consultation, such as in a relational or hierarchical governance structure, then the blended form of CBSGM will probably fit. A larger pool of network partners should be invited for exchanging experiences and engaging into discussions. According to this logic, fit is achieved when the CBSGM matches the existing governance structures. Although it can be easy to add an extra layer of governance in this way, this approach raises questions about the effectiveness of CBSGMs. It is unclear whether having more of the same is also better.

An alternative reasoning is to look for complementarity between the CBSGM and the primary governance mechanisms. Although it will be more difficult to achieve, the missing link in captive and modular governance mechanisms is the lack of consultation between network partners. After all, quite a lot has already been contractually determined and codified in such a context. The value chain needs multilateral consultation. Conversely, a hard CBSGM in a relational supply chain could be the perfect carrot-and-stick approach. In other words, in this line of research it would be appropriate to look at the combination of primary and more sophisticated governance mechanisms together in order to achieve more balance. Inspired by the levers of control framework,³¹ it seems necessary to conduct research about these configurations in times of crisis situations in which negative externalities actually occur; and in calm periods of going concern, because the degree to which various governance mechanisms reinforce each other is significantly different in these two situations.

³⁰ van Meerkerk and Edelenbos 2018.

³¹ Simons 1994.

12.6 Appendix: Export-Related Articles from the PSFD MOU

6.8 “Contracting Officers will insert into prospective Contracts (and require its Contractors to insert in subcontracts) provisions to satisfy the requirements of this MOU, including Section VII (Industrial Participation), Section IX (Disclosure and Use of Project Information), Section X (Controlled Unclassified Information), Section XII (Security), Section XIII (Third Party Sales and Transfers), and Section XIX (Amendment, Withdrawal, Termination, Entry into Effect, and Duration), including the export control provisions in accordance with this MOU, in particular paras 6.10 and 6.11 of this Section. During the Contracting process, Contracting Officers will advise Prospective Contractors of their responsibility to immediately notify the Contracting Agency, before Contract award, if they are subject to any license or agreement that will restrict their freedom to disclose Information or permit its use. Contracting Officers will also advise Prospective Contractors to employ their best efforts not to enter into any new agreement or arrangement that will result in restrictions.”

6.10 “Each Participant will legally bind its Contractors to a requirement that the Contractor will not retransfer or otherwise use export-controlled Information furnished by another Participant for any purpose other than the purposes authorized under this MOU. The Contractor will also be legally bound not to retransfer the export-controlled Information to another Contractor or subcontractor unless that Contractor or subcontractor has been legally bound to limit use of the Information to the purposes authorized under this MOU. Information furnished by one Participant under this MOU may only be retransferred by another Participant to its Contractors if the legal arrangements required by this paragraph have been established.”

6.11 “Each Participant will legally bind its Prospective Contractors to a requirement that the Prospective Contractor will not retransfer or otherwise use export-controlled Information furnished by another Participant for any purpose other than responding to a solicitation issued in furtherance of the purposes authorized under this MOU. Prospective Contractors will not be authorized use for any other purpose if they are not awarded a Contract. The Prospective Contractors will also be legally bound not to retransfer the export-controlled Information to a prospective subcontractor unless that prospective subcontractor has been legally bound to limit use of the export-controlled Information for the purpose of responding to the solicitation. Export-controlled Information furnished by one Participant under this MOU may only be retransferred by another Participant to its Prospective Contractors if the legal arrangements required by this paragraph have been established. Upon request by the furnishing Participant, the receiving Participant will identify its Prospective Contractors and prospective subcontractors receiving such export-controlled Information.”

7.5 “In order to ensure that industrial opportunities are open to industry in all of the Participants’ nations, the Participants will use their best efforts and encourage their Contractors to use their best efforts, to address export control issues in a timely

manner that promotes the maximum degree of industrial cooperation among the Participants' nations, consistent with their national laws and regulations."³²

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³² Source: [purl.fdlp.gov/GPO/gpo36486](https://www.fdlp.gov/GPO/gpo36486).

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