

Fostering wind in foreign waters

Governmental roles stimulating export of the Dutch offshore wind sector

By Y.J.J. Nijssse (4086228)

Delft University of Technology

'Complex System Engineering and Management' program

20-12-2017

Abstract

In a rapidly expanding offshore wind market, governments are evaluating their role in the support of the export of their domestic companies. This paper looks at what roles governments utilize in the export domain. Four governmental roles are identified and their prevalence is rated in different stages of the export process. A framework of these is applied to the Dutch offshore wind sector by performing a case study. The study finds that the prevalence of governmental roles varies in different stages of the export process. Prevalence of governmental roles in earlier stages of the export process seems more technology-specific, while prevalence in the later stages of the export process seems generalizable to most export processes. The prevalence of governmental roles should be adjusted to the nature of to-be-exported technology for an effective support of the sector's ability to export its goods and services.

Keywords: *Governmental roles, governance, offshore wind, export, case study*

1. Introduction¹

Increasing interest in the challenges and threats around climate change, future fossil fuel scarcities and volatility in oil prices calls for a transition of the world's current energy system (Scholten & Bosman, 2016) from a fossil fuel based system towards a system largely or fully based on sustainable energy sources. One of the sustainable energy technologies which has recently seen huge reductions in its costs, strongly reducing its reliance on subsidies, is offshore wind (GWEC, 2017; Roland Berger, 2016). Large growth of offshore wind capacity is expected globally, primarily in markets in Europe, Asia Pacific and the USA, with installed capacity expected to increase by at least fivefold in the coming ten years (Bloomberg New Energy Finance, 2017; GWEC, 2017). With tens of billions of Euros being invested in the sector yearly (Dickson, 2017; GWEC, 2017), large international opportunities exist for the primarily European companies which currently are the technological frontrunners of the sector.

Countries hosting these companies also profit from increased exports of the goods and services of these companies, as these can lead to domestic economic development and employment, increased tax revenues and local cost reductions of the exported technologies (Jacobsson & Johnson, 2000; J. Lewis & Wisser, 2005; Lund, 2009). Therefore, the governments of the European countries hosting strong offshore wind industries are looking to support their domestic offshore wind industries to more successfully take advantages of opportunities in foreign offshore wind markets. The roles that governments play in the support of their sector however differ, depending on where and how these governments support their companies in their export processes. Methods and instruments to support domestic industries vary across countries and sectors (J. I. Lewis & Wisser, 2007; Lund, 2009), and consequently the roles that governments take in the organization, regulation and financing of its sector diverge (Hisschemöller, Bode, & van de Kerkhof, 2006; Horner, 2017). However, *how* the prevalences of these governmental roles differ in export processes, and whether specific governmental roles should have prevalence over others in certain stages of the export process for the effective support of export is currently unknown. Therefore, this paper aims to answer the following research question:

"Which roles do governments fulfil to effectively stimulate the export of offshore wind energy goods and services at various stages in the export process?"

¹ This paper is based on a broader study on the stimulation of the Dutch approach to the stimulation of the competitiveness of its offshore wind sector, which was conducted as a Msc. Thesis project by Y.J.J. Nijssse (2017) for Delft University of Technology, to be publicly defended on the 8th of January, 2018.

This paper analyses the prevalences of governmental roles at various stages of the export process. To this end, a framework is constructed which links a range of governmental roles identified in the fields of governance processes, organizational economics and institutional economics, to a novel representation of export processes. This framework is applied to the Dutch offshore wind sector, analysing the prevalence of these governmental roles in different stages of the export process. Note that the roles of the governments in the article are assessed on a ministerial level of government. This affects the instruments and roles considered within the scope of this study and excludes a range of policies on the political level.

This first section of the article has introduced the topic of the article and the research objective. Section two will present and assess the literature on governmental roles and export processes. The third section will present the theoretical framework and methodology of the study. The fourth section will look at the case study on the offshore wind sector of the Netherlands. The fifth section will discuss the results of the study, and finally, the sixth section will present the conclusions to the study.

2. Governmental roles in export

Governmental intervention in the export domain is traditionally associated with mercantilist systems (Acharyya & Kar, 2014; O'Brien & Williams, 2010). As typical mercantilist instruments like import restrictions and export subsidies are increasingly restricted by the World Trade Organization (Czinkota, 2002; World Trade Organization, n.d.), recent literature on international development assesses governmental intervention in the export domain as a form of resolving market failure (Bacchetta, 2007; Belloc & Di Maio, 2011). The applied intervention depends on the form of market failure, with examples of common failures being: Marshallian externalities during the development of a sector (Harrison & Rodrigues-Clare, 2009), information and coordination failures within markets (Subramanian & Lawrence, 1999), failure to identify market opportunities and comparative advantages (Hausmann & Rodrik, 2003) or sub-optimal investment in research and development due to its lack of short-term profitability (Diederich, 2016; Sung & Song, 2013).

Governmental intervention generally encompasses governance processes; “processes of rule applied by governments aimed to affect social or socio-technical systems present in society” (Borrás & Edler, 2014). Bevir (2012) notes that governments are shying away from using highly hierarchical methods using their formal mandate to adopt rules and laws, and increasingly use methods relying on negotiation or financial incentives. This would indicate a switch from a leading government to a more steering government, focused on steering networks or markets. A similar divide between hierarchical and market-based instruments is found in the field of institutional economics (Hazeu, 2000), where some authors use this hierarchy-market divide to construct a categorization of possible governance approaches.

2.1 Between hierarchy and market

Ménard (2012) uses this divide to identify different kinds of organizations which fall between the arrangements based on pure market relations and hierarchical arrangements. He identifies these in-between arrangements as ‘hybrids’, which are various forms of networks or alliances, and arranges them on a hierarchy-to-market scale. More hierarchical hybrids prioritize the use of contractual obligations, while the more market-based hybrids rely on third-party coordination and information exchange. Provan and Kenis (2008) add that the hierarchical nature of these networks also depends on the power-relations in these networks and that the influence and actor can exercise over a network depends on its position within that network.

Hisschemöller (2006) approaches governance options by defining four ‘governance paradigms’, which he defines as “fundamental concepts of viewing the dynamics of society and the way in which governments and/or governance can or cannot give directions to those dynamics” (Hisschemöller et al., 2006). While his governance paradigms primarily relate to the philosophy behind a government’s intervention, they show clear differences in the hierarchical role a government should take in a sector. The ‘governance by government’ paradigm describes a highly active and hierarchical government, the ‘government by policy networking’ describes a facilitating government utilizing networking instruments to steer a sector, the ‘government by cooperate business’ describes a highly market-based governmental approach and lastly the ‘governance by challenge’ primarily describes an active government which bases its approach on the most effective method to accomplish societal change.

While this formerly mentioned literature looks at different approaches for governments to affect a sector, it lacks an approach identifying the to-be-applied instruments. Such an approach is common in the field of innovation policy, where Borrás and Edquist (2013) categorize potential instruments in three categories: Regulatory, financial

and soft instruments. These soft instruments focus on steering actors by means of consensus-forming and information supply and can be considered similar to the networking governance of Hisschemöller (2006).

2.2 Governmental roles

The governmental instruments described by Borrás and Edquist concern instruments which aim to steer societal actors. These however neglect the government’s own ability to perform relevant activities in or for the sector. This phenomenon could be considered a government that operates as a firm itself, which would reside at the most hierarchical end of Ménard’s (2012) spectrum. When looking at sectors in which the boundary between public- and private goods is vague, Horner (2017) notes that governments often assume the role of ‘producer’ or ‘buyer’; something which occurs in for example a government’s involvement in electricity grid systems for offshore wind farms. This role of a government also fits in Hisschemöller’s (2006) ‘governance by government’ paradigm; a role where a government chooses to execute the activities itself instead of trying to steer a sector.

A government can thus take a more hierarchical or more market-based approach to affect a sector, which correlates with its choice of instrumentation. Four governmental roles are identified, range from hierarchical to more market-based, which are respectively: the *executive role* of government, the *regulative role* of government, the *networking role* of government and the *financing role* of government. Based on the nature of their instrumentation, each of these governmental roles has its own theoretical domain on a hierarchy- to market-based spectrum, which is visualized in Figure 1. The governmental roles are further expanded on in the next section.

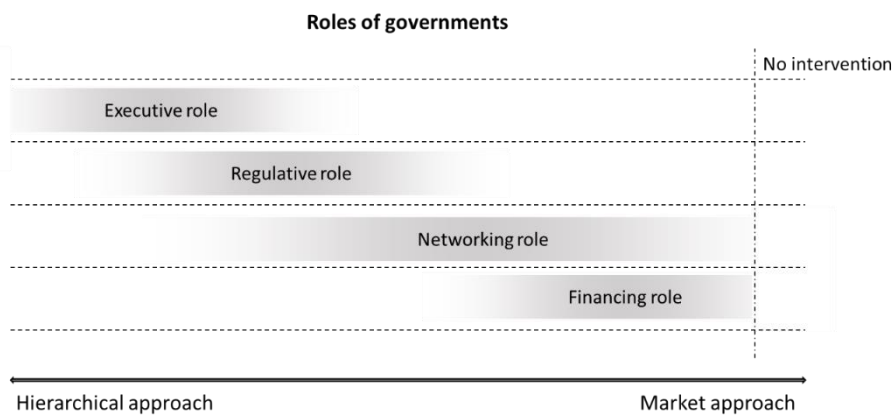


Figure 1: The domain of each governmental role its approach on a spectrum from hierarchical to market-based approaches

2.3 The executive role

In the executive role, a government uses its own internal sources to deliver a good or a service. These internal sources can consist of civil servants working at ministries or executive governmental branches, but can also exist in the form activities performed by state-owned companies. Governments commonly choose to take charge of the provision of a good or service in order to safeguard the public interest. This takes place when the situation concerns the provision of public goods (or services) (Hisschemöller et al., 2006) or when the provision of the activities, goods or services yields too little payoff for private parties, yet has large public benefits (Belloc & Di Maio, 2011).

Examples of the utilization of this role can typically be found in activities performed by governmental agencies, state-owned research organizations and transmission system operators (Badinger & Url, 2013; Horner, 2017). Additionally, aimed at overcoming the barriers of entering foreign markets, governmental agencies in the form of embassies, consulates and other governmentally owned trade promotion organizations offer a range of goods and services aimed at supporting the private sector’s access to foreign markets. Commonly offered services are the organization of trade missions, fairs and shows, export consultation meetings with potential exporters, various forms of information on foreign markets and international branding services or platforms for export-sectors (Barneveld van, 2014; Belloc & Di Maio, 2011; Spence, 2003; Wilkinson & Eliot Brouthers, 2000).

2.4 The regulative role

In the regulative role, a government uses its mandate to form formal laws and rules to restrict or enable the behaviour of the private and non-profit sector. With these rules and laws, governments “define the framework of interactions taking place in the society and in the economy” (Borrás & Edquist, 2013). As within this framework

parties are free to act, the strictness of this framework determines the balance between its hierarchical or market-based nature.

Regulation stimulating a sector's ability to export is typically found in the regulation shaping market conditions for innovation and domestic deployment. For example, by affecting the regulation around the nature of research organizations, allowing them to perform commercial activities (Borrás & Edquist, 2013). Regulatory frameworks around the deployment of domestic test locations and farms can also steer or inhibit a sector. Local content requirements can protect a nation's infant industry, yet their use is strongly discouraged by both the World Trade Organization and European Union (Belloc & Di Maio, 2011; Eikeland, 2011). Lastly, regulation stimulating cross-border technology diffusion such as memorandums of understanding, patent and visa regulation can affect specific sectors (Borrás & Edquist, 2013).

2.5 *The networking role*

In the networking role, a government uses informal processes to affect the organization of and coordination between stakeholders in a sector. The type of networks and the role of the government in these networks determines how hierarchical this approach is. Public-private partnerships with commercial or non-governmental owned organizations are considered within this role as well.

Governmental presence in networks stimulating a sector's ability to export can be found in networks improving cooperation in a sector, and by enhancing a sectors coordination through for example setting common goals for innovation (Smits & Kuhlmann, 2004). Common examples of these are research programs and innovation networks. Governmental involvement in trade- and cluster organizations, branding initiatives and export organizations also stimulates exports (Belloc & Di Maio, 2011; Danish Wind Export Association, n.d.; State of Green, n.d.). Governmental networks in foreign markets, e.g. embassy or consulate networks, further support exporting firms (Barneveld van, 2014).

2.6 *The financing role*

In the financing role, a government uses financial (dis)incentives to steer private parties and non-governmental organizations. Similar to the regulative instruments, a government can utilize a wide range of instrumentation to steer its sector and enhance its ability to export (Borrás & Edquist, 2013). Instruments such as currency controls, import duties, tariff duties and export subsidies on specific goods can be used to stimulate export (Dunn & Mutti, 2004; O'Brien & Williams, 2010), yet are prohibited or discouraged by the World Trade Organization and the European Union (Belloc & Di Maio, 2011; Dunn & Mutti, 2004; Snape, 1988). These high-level instruments thus fall outside the scope of this study.

Typical forms of financial incentives supporting innovation are direct subsidies to projects, tax-reductions on innovative firms and low-interest loans (Belloc & Di Maio, 2011; Borrás & Edquist, 2013; Michaelowa, 2005; Snape, 1988). While direct subsidies for individual companies are uncommon (and in the European Union generally illegal due to state-aid regulation (the European Commission (EC), 2008)) a government can offer general forms of financing like seed- or venture capital and low-interest loans (Belloc & Di Maio, 2011; Czinkota, 2002). Export credit guarantees and other financial products aimed to reduce the risks of exporting are generally supported (or offered) by governments, often in cooperation with commercial companies (Badinger & Url, 2013). Individual activities like the visiting of trade fairs, missions or conferences are also commonly incentivised with (partial) fiscal reimbursements for participating parties (Spence, 2003; Wilkinson & Eliot Brouthers, 2000).

2.7 *The export process*

Governmental support to parts of the sector developing the technology which could later be exported can be considered indirect export promotion (Acharyya & Kar, 2014; Belloc & Di Maio, 2011). Considering the importance of innovation and domestic development in the promotion of export for the offshore wind sector (Diederich, 2016; Lund, 2009; PBL, 2016), these instruments are included inside the scope of this study. Governmental support to the commercialization of a technology strongly differs from governmental support stimulating its diffusion to foreign markets. Given these differences, a theoretical representation of the stages of an export process which require different support has been constructed to better assess *where* the various roles are to be applied.

The innovation and commercialization part of the export process is formed by summarizing Lund (2009) process for the diffusion of energy technologies. This part identifies the *research and development* stage, which encompasses the research and development of new concepts to working prototypes. In the *testing* stage, these

prototypes are upscaled and made ready for the market. In the *domestic market stage*, the technology is applied in the domestic market. After establishing the commercial viability of the technology, firms can start *exploring foreign markets* for new opportunities for their products (Robertson & Wood, 2001). Having found markets with opportunities, they can start looking for partners, financing and knowledge on local regulation to *prepare to enter the market* (Kanda, Mejía-Dugand, & Hjelm, 2015; Sheard, 2014). Lastly, companies can be supported during the *exporting* stage itself by various means of financing or cooperation to lower costs (Badinger & Url, 2013; Lederman, Olarreaga, & Payton, 2010).

The identified stages together form a representation of the export process consisting of six consecutive stages. Each consecutive stage can be supported by instruments from the various governmental roles. This export process is visualized in Figure 2. Note that the domestic market development step can theoretically be skipped by firms developing products solely for foreign markets.

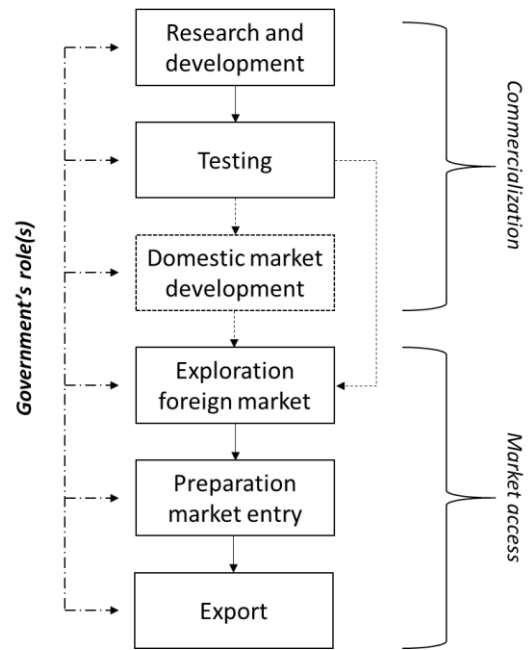


Figure 2: The export process with six consecutive export stages.

3. Theoretical framework and methodology

The theoretically identified governmental roles and stages of the export process are combined into a framework which can be used to analyse a government's prevalence of its utilized roles and instruments in order to stimulate the exports of its offshore wind sector. A visualization of this framework applied to the Dutch case can be found in Appendix 1.

3.1 Prevalence of governmental roles

The utilization of the research framework allows for the instruments a government uses in each export stage to be identified and assigned to a governmental role. To assess the prevalence of the governmental roles in each export stage, a rating is assigned to each governmental role based on the utilization of identified instruments. A pre-defined list of criteria is composed by comparing the used governmental instruments with instruments found in the literature and in prominent offshore wind sectors (e.g. the Netherlands, Germany and Denmark²), which is used to give the governmental roles a rating of *none*, *low*, *medium* or *high* prevalence. These ratings indicate the following:

None: The 'None' level of prevalence is established if the respective governmental role is not found to be utilized in the given category.

Low: The 'Low' level of prevalence is established if the respective governmental role is found sporadically; the role of the government is incidental or relatively unimportant compared to other actors in this segment. This level can also be applied if only instruments not specific to the offshore wind sector have been found, or if found instruments are not (able to be) utilized by the offshore wind sector. Governmental presence in this part of the sector can thus be useful but is generally not necessary.

Medium: The 'Medium' level of prevalence is established if a government is an influential actor in this segment, or plays an important role in this segment, but is neither the most important nor the most influential actor. The governmental policy at this level is consistent, but not of high priority. Without governmental presence, the sector would be able to cope but would face significant difficulties.

High: The 'High' level of prevalence is established if a government utilizes its role as one of the lead actors in the sector. This can be in the form of being a lead actor in a network, a founder and/or manager of a vital program in the sector, one of the main suppliers of financing, or as one of the main suppliers of a part of the sector's value chain.

² The instruments found in the other prominent offshore wind sectors are based on the Msc. Thesis report by Y.J.J. Nijse (2017) which performs an extensive analysis of the Dutch, Danish and German sector.

The exact criteria used per rated domain and the resulting ratings can be found in Appendix 2.

3.2 Methodology

The use of the research framework is evaluated by applying it to the offshore wind sector of a country hosting a leading industry in the current offshore wind market. As the Dutch offshore wind sector has a significant market share in the European market (over 25 percent (Bais, 2015)), large plans for domestic growth (Netherlands Enterprise Agency, 2015) and an active governmental approach to the organization of its sector (Meijer, Zaaijer, & Van Zuijlen, 2015), it is selected as the case for the application of the research framework.

The study utilizes a case study approach to assess the Dutch sector, due to this method's suitability for the answering of normative questions (Yin, 1994) and its ability to process data from various sources (Hinson, 2010). For the data gathered for the case study, a combination of expert interviews and desk research is utilized. The expert interviews comprise of 26 semi-structured expert interviews with experts from various organizations in the offshore wind sector, which are asked to validate a summary of each interview. The desk research uses a range of sources from consultancy agencies, trade- and cluster organizations, NGOs, research organizations and consortia, company and governmental websites and dedicated offshore wind newspapers. The results of the case study are verified by a range of experts in the Dutch trade organizations and ministries involved with offshore wind³.

4. Case study

The Netherlands is a European country bordering the North Sea, which currently hosts the second largest offshore wind industry globally (measured in revenue) (GWEC, 2017). The country is the 8th largest exporting country in the world (OEC, n.d.), and most of the revenues of its offshore wind sector (~60 percent) are from non-domestic projects (Jager, Gastel, & Winkel, 2014). With its broad experience in the export of goods and services and its sizeable offshore wind industry, the Dutch government is expected to provide an excellent example for the promotion of its industry's exports.

The case study will assess the Dutch government's utilization of its instruments, which results in a range of rated prevalences of the governmental roles in each export stage. An overview of all the instruments found in the Dutch case can be found in Appendix 1. The case study is structured by looking at each stage of the export process separately, discussing the utilized instruments and agencies and ending with a general conclusion on the Dutch government's prevalence and utilization of its roles. The descriptions of the roles generally work from the more hierarchical instruments to more the market-based instruments, although some overlap in the instruments can occur.

4.1 Research and development

Dutch governmental ministries and agencies like TenneT (the Dutch state-owned transmission system owner (TSO)) perform some research and development activities, but they primarily do so as an extension of their core activities and only on a small part (the grid and preliminary studies) of the wind farms⁴. Little regulative steering on research and development activities is utilized in Dutch tender procedures or non-governmental research organizations (de Boek & van der Hem, 2016; Kamp, 2017). The Dutch government does play a central role in the organization of its sector's main research consortium and program, respectively 'Topsector Wind op Zee' and 'GROW'⁵. It offers a wide range of subsidies, both specifically for offshore wind and in the form of general subsidies or tax-advantages for research and development activities (Netherlands Enterprise Agency, n.d.-c; TKI Energie, n.d.). The Dutch government is therefore found to primarily utilize its networking and financing role in this stage of the export process.

4.2 Testing

Dutch TSO TenneT also tests grid related concepts, but once again as an extension of its core activities⁶. No governmentally-owned research organizations are active in the Dutch offshore wind sector. The Dutch government prohibits the development of non-preassigned offshore test locations and currently the Netherlands

³ A full list of interviewees, including summaries of the interviews, can be found in the Msc. Thesis by Y.J.J. Nijssse (2017). Relevant interviews are hereafter referenced as personal communication as per APA-guidelines

⁴ TenneT, personal communication, May 17, 2017, and the Dutch Ministry of Economic Affairs, personal communication, May 30, 2017

⁵ Topsector Wind op Zee, June 1, 2017, and NWEA, personal communication, June 19, 2017, and Dutch Ministry of Economic Affairs, personal communication, May 30, 2017

⁶ TenneT, personal communication, May 17, 2017

hosts no wind test farms offshore (de Boek & van der Hem, 2016; Netherlands Enterprise Agency, 2015). The Dutch government has however implemented a tender procedure for a test co-location at its upcoming Borssele offshore wind farm and allows several onshore wind test farms (Kamp, 2016). In addition to its Topsector organization, the Dutch government actively stimulates intra-sectoral cooperation and cross-financing with its ‘Innovatielink’ program⁷. A wide range of subsidies is available, both for electricity generated on test farms and subsidies for demonstration projects (Netherlands Enterprise Agency, n.d.-c; TKI Energie, n.d.). Compared to the research and development stage, the Dutch government again primarily utilizes its networking and financing role. In this stage however, the regulative role is more prevalent.

4.3 *Domestic market development*

Dutch TSO TenneT and the Netherlands Enterprise Agency are respectively responsible for the development of the offshore grid and substations and for the preliminary studies of the offshore wind farms. They however generally do not perform the construction or measurements themselves, but rather perform the role of contractor and manager of the process⁴. The domestic development of offshore wind farms outside near-shore areas is completely regulated by yearly tenders on parcels with predetermined capacities (Kamp, 2017). While the ‘Topsector’ and ‘Innovatielink’ organizations also play a role in this stage of the export process, the core activities of the Topsector organization are primarily focused on research, development and demonstration⁸. The Dutch trade organizations operate separately from the government, but cooperation between these organizations and the government is common⁹. While a large variety of subsidies is available for the sector, the portfolio of subsidies lacks governmentally offered risk-, seed- and venture capital (Netherlands Enterprise Agency, n.d.-c). The Dutch government is therefore found to utilize each role in this export stage, with an emphasis on its regulative role.

4.4 *Foreign market exploration*

The Dutch embassies supply information on foreign markets and their legislative frameworks, perform on-demand market explorations and cooperate in the organization of trade missions (Barneveld van, 2014). Other governmental agencies also organize trade-mission which take along domestic companies to foreign markets⁹. The Dutch ministries work together with the trade organization in public-private export meetings¹⁰. The Dutch government organizes and finances a program for firms interested in exploring foreign markets, called the ‘Starters International Business’ program (Netherlands Enterprise Agency, n.d.-b), and pays for the activities offered by and the upkeep of its embassies (Rijksoverheid, n.d.). With the government being the main organizer and financier of activities promoting foreign market exploration, it is found to highly utilize its executive and financing role. While active in the networking role, cooperation with consultants and other parties in local markets is limited. No examples of the utilization of the regulative role in this export stage have been found.

4.5 *Market entry preparation*

The Dutch embassies also aid companies in contacting foreign partners, perform general business scans and organize trade missions focused on connecting companies (Barneveld van, 2014; Rijksoverheid, n.d.). Business-specific activities and follow-up activities are conducted by the companies itself or by consultants not linked to the embassies¹¹. Governmental involvement in the branding of the offshore wind sector is not found. Some government-to-government cooperation which manifests itself in memorandums of understanding is found, but does not seem to have a high priority concerning the offshore wind sector. Embassy-activities and the ‘Partners in International Business program’ which forms long-term market entry plans are financed (Netherlands Enterprise Agency, n.d.-a), but these activities only cover initial market entry preparation activities. Branding is again not supported. The Dutch government is thus found to be moderately active in every role except for its regulative role.

⁷ Topsector Wind op Zee, personal communication, June 1, 2017

⁸ Topsector Wind op Zee, personal communication, June 1, 2017, and HHWE, personal communication, June 20, 2017

⁹ NWEA, personal communication, June 19, 2017, and HHWE, personal communication, June 20, 2017, and Dutch Ministry of Economic Affairs, personal communication, May 30, 2017

¹⁰ NWEA, personal communication, June 19, 2017, and HHWE, personal communication, June 20, 2017

¹¹ Dutch Embassy in Japan, personal communication, June 20, 2017, and The Netherlands Trade and Investment office in Taiwan, personal communication, July 13, 2017

4.6 Export

Dutch governmental agencies are not found to export their own goods or services to foreign markets, nor does the Dutch government implement regulation to promote or inhibit the export of offshore wind goods and services. In cooperation with the private organization ‘Atradius’ the Dutch government offers its domestic companies the Atradius Dutch State Business line of financial products that reduce financial risks for investors when exporting. The most important of these products are the credit export guarantees (Atradius, n.d.; De Minister van Financiën, 2010). These products were however found to not be utilized by the Dutch companies in the offshore wind sector¹². The Dutch government is thus found to barely utilize any of its roles in the export stage.

The findings of this case study are inserted in the research framework, and the respective prevalences of the governmental roles are rated for the different stages of the export process (in Appendix 2). This leads to the visualization of the findings of the case study in Figure 3.

	Prevalences of governmental roles			
	<i>Executive</i>	<i>Regulative</i>	<i>Networking</i>	<i>Financing</i>
Research and development	<i>Low</i>	<i>Low</i>	<i>High</i>	<i>High</i>
Testing	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>High</i>
Domestic market development	<i>Medium</i>	<i>High</i>	<i>Medium</i>	<i>Medium</i>
Foreign market exploration	<i>High</i>	<i>None</i>	<i>Medium</i>	<i>High</i>
Market entry preparation	<i>Medium</i>	<i>Low</i>	<i>Medium</i>	<i>Medium</i>
Export	<i>None</i>	<i>None</i>	<i>Low</i>	<i>Low</i>

Figure 3: The framework visualizing the prevalence of the governmental roles in the Dutch case study

5. Discussion

The prevalences of governmental roles vary per export stage. While the analysis of only one offshore wind sector does not warrant any conclusive findings for all offshore wind sectors, some remarkable phenomena of the application of the research framework to the Dutch case are highlighted and discussed.

5.1 Executive role

The prevalence of the executive governmental role is low in the earlier stages of the export process, but increases in the latter stages of the process. The low prevalence in the earlier stages could indicate that governments consider research and development a task of companies in the sector. This reasoning is in agreement with the part of the literature that states that innovation generally takes place in the private sector; both in the offshore wind sector and in general (Musiolik & Markard, 2011; Wieczorek et al., 2013). While some variation is found, this finding generally also applies to the Danish and German offshore wind sector (Nijssse, 2017).

Higher executive prevalences in the market access stages (the latter three stages) indicate that governments share activities supporting companies to enter foreign markets under the category of goods or services which yields too little payoff for private parties, yet have large public benefits (Belloc & Di Maio, 2011). The public benefits in this case would be the direct increase of export of a sector, with the earlier mentioned advantages to a country. This finding also seems to be applicable to sectors other than just offshore wind.

5.2 Financing and networking role

Both the networking and the financing role generally have a relatively high prevalence across all the stages of the export process and are especially prevalent in the earlier stages. The high prevalence of the financing role in these earlier stages can be understood by the common conception in the literature that governments should support research and development, offering financial incentives for innovation in their sector (Borrás & Edquist, 2013; Smits & Kuhlmann, 2004). The similarities in the prevalence of the governmental roles in the networking and financing stage suggest a correlation between these roles, something also suggested by Borrás (2013). This ‘correlation’ in the Dutch case is the result of governmental involvement in research and development program through which it funnels its funding. However, it should be noted that this correlation is not found in other sectors (Nijssse, 2017), in which governments generally have a lower utilization of instruments in the networking role.

¹² Atradius, personal communication, August 18, 2017

The last stage of the export however deviates from the earlier findings. In the last stage of the export process, little prevalence of the governmental roles has been found. Few examples of governmental intervention in the literature have been found as well. This could either indicate that governments do not consider supporting companies which are already exporting as a part of their public tasks, or it that offshore wind technologies do not warrant this kind of support in the first place. Note that the low utilization of export credit guarantees by the Dutch offshore wind sector differs from the findings in Germany and Denmark (Nijse, 2017), in which these instruments are commonly used. This is hypothesized to be a result of the nature of companies in the Dutch sector, rather than the availability or suitability of these instruments¹³. The suitability of export credit guarantees to a sector thus relates to the nature of the technology and companies active in a sector, with export credit guarantees generally only being viable for larger projects.

5.3 *Regulative role*

The regulative role shows relatively little prevalence in all stages but the domestic market development stage, which is discussed under the next header. The lack of regulative steering in the innovation stages can be theorized to be a result of offshore wind currently still being subsidy-dependent. Regulative steering of innovation might impede cost-reduction goals, which appear to have priority in current instrumentation. Low government-to-government cooperation specifically for offshore wind might be a result of the relatively minor economic importance of the current Dutch offshore wind industry compared to other Topsectors (Netherlands Enterprise Agency, 2016). If this is the case, this could indicate that the prevalence of this role could increase in the light of substantial growth and related economic importance of the offshore wind sector.

5.4 *Technology-specific prevalences*

The domestic market development stage showcases a relatively high level of prevalence in most governmental roles. Especially in the executive and regulative role, this prevalence seems highly related to the nature of offshore wind technology. Note that the following also applies to the prevalence of the regulative role in the testing stage.

Offshore wind encompasses wind farms which require large areas of sea to be available, and in most (if not all) European countries governments are in charge of the management of these areas. As such, governments are also in charge of determining the regulation around the development of domestic wind farms. The high prevalence of the regulative role in the testing and domestic market development stage can as such be seen as a technology-specific characteristic of offshore wind.

Lastly, a moderate prevalence can be noted in the executive role of the domestic market development stage, largely due to governmental involvement in the development of offshore wind grids and preliminary studies. Governments currently perform these activities primarily because this reduces redundancy in the activities of commercial parties participating in tenders for these farms, as thus leads to lower tender prices and necessary subsidies (Jaarsma, 2017). It can be noted cost-reductions in offshore wind decrease the technology's reliance on subsidies. Once offshore wind stops relying on subsidies, governments could move towards a system which leaves the responsibility (or moves the costs) of these preliminary studies and grid connection to commercial parties, similar to the system applied in the UK (Schittekatte, 2016), decreasing a government's prevalence in the executive role.

5.5 *Generalizability*

Some of the findings of this study are theorized to be generalizable to other sectors. A distinction is made between different forms of generalizability; generalizable for most export processes, generalizable for technologies similar to offshore wind in terms of reliance of subsidies (e.g. other forms of sustainable energy) and generalizable for the offshore wind sector of other countries.

Generalizable for most export processes

When assessing the export process, it is likely that most technologies show similar prevalences of governmental roles in the foreign market exploration and market entry preparation. Instruments found in these stages are large general services which are non-specific to offshore wind.

Generalizable for similar technologies

The governmental prevalences in the research and development and testing stages, except for the regulative role in the testing stage, are likely to be similar to most technologies relying on subsidies. Note that the prevalence of

¹³ Atradius, personal communication, August 18, 2017

the networking role differs across countries (Nijssen, 2017). This could relate to the philosophies described by Hisschemöller (2006) behind the application of governance tools. In the Netherlands, a government adhering to the 'governance by policy networking' paradigm is in that case more prevalent than it is in other offshore wind countries.

Generalizable for offshore wind

The prevalence of the governmental roles in the 'export' stage of the export process seems typical for the offshore wind sector in all but the financing role. In the financing role, similar instruments are likely to be offered, but the utilization of these instruments by the sector differs.

Furthermore, the domestic market development stage's prevalence of roles is strongly affected by the context in which offshore wind operates, and is likely to be similar in most offshore wind sectors.

6. Conclusions

The most effective roles a government can apply in the offshore wind sector are dependent on the context of a sector. Generally, the application of the financing role is likely to be effective especially in the earlier stages of the export process as long as the export process applies to a technology lacking maturity. The executive role should be emphasised in the foreign market exploration and market entry preparation stage, but its prevalence can be reduced in the domestic market development stage once further cost reductions in the offshore wind sector have been reached. The regulative role is of relatively little importance, with the exception of its function in steering domestic growth of installed offshore wind farms. Its prevalence can be increased to steer innovation towards other goals than cost-reduction once offshore wind reaches later stages of maturity and becomes less subsidy-dependent. Lastly, the networking role can be effectively applied in combination with the financing role in the earlier stages of the export process, but its utilization does not seem to be a necessity for the presence of a strongly competitive offshore wind industry.

The application of governmental roles is sometimes technology-specific and sometimes generalizable to most export processes. In the research and development and testing stage, the utilization and prevalence of the governmental roles depend on the necessity to support this technology in its innovation processes, and the philosophy behind a government's involvement in a sector. The application and prevalence of governmental roles in the domestic market development are strongly related to the relation between the development of a technology in the domestic market and a government's mandate to support or restrict this development. In offshore wind's case, the government's ability to determine the deployment of domestic growth of capacity shapes the pattern of prevalences in the domestic market development stage. The pattern of prevalences of the governmental roles in this stage is likely not transferable to other technologies.

Patterns of prevalences that are likely to be generalizable to most export processes appear in the later stages of the export process, particularly in the application of a mix of the executive, networking and financing role in the foreign market exploration and market entry preparation stages. Therefore, the utilization and prevalence of governmental roles in export processes are theorized to be technology-specific for the first three stages of the export process and mostly generalizable to most export processes in the fourth and fifth stage of the export process.

Governments championing offshore wind as a key technology currently employ specific instruments supporting the commercialization of the technology. However, as one of the main goals behind the development of this technology is commonly to increase exports, it would be logical that the championing of such a technology also included instruments in the development of technology specifically for exports, or specialized instruments in the later stages of the export process. While examples of both have been found outside of the Dutch case, in the form of subsidies for the development of high-export potential technology and technology-specific branding initiatives, the author would advise an increased use of such instruments to further emphasise the exportability of offshore wind technology.

6.1 Recommendation for future research

In this article, a research framework has been designed which aims to evaluate export processes in the offshore wind sector. To demonstrate its functioning, the framework has been utilized to evaluate the Dutch offshore wind sector. While this evaluation has led to a number of findings which are used to theorize on governmental intervention in export processes, a single case study is insufficient to validate such theories. Further case studies using the same or a similar framework could be used to validate some of these theories. Case studies on the export process in other sectors can look into whether the prevalence of governmental roles is indeed similar in the later

stages of the export process. Case studies on the offshore wind sector of other countries can look at the validity of the link between technology and the prevalence of governmental roles in the first three stages of the export process. Additionally, a method that links context-variables of a country to the prevalences of governmental roles could serve as a prescriptive approach to governmental intervention in the export domain.

Lastly, the findings of the case study seemed to indicate a correlation between the financing and networking role, which in case studies outside this article is not found. Future research could look into the relation and possible conditions for correlation between these two roles in general export processes.

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Appendix 1: The research framework applied to the Dutch offshore wind sector

Instruments found in the assessment of the government's involvement in the Dutch offshore wind sector				
	<i>Executive</i>	<i>Regulative</i>	<i>Networking</i>	<i>Financing</i>
Research and development	Tennet (NL) researching and developing new grid concepts, Dutch Ministry of Economic Affairs and Netherlands Enterprise Agency designing tender procedures	Innovation design obligations in former wind farms, commercial freedom governmentally funded research organizations	Governmentally founded Topsector policy and involvement in GROW project, Dutch embassies hosting an international Innovation Attaché network	Financing to Topsector management and research projects, funding independent research organizations, MIT, SBIR and WBSO programs
Testing	Tennet (NL) testing grid-connection concepts	Separate tender procedure for offshore wind demonstration site Borssele V, onshore test location permits and access criteria	Innovatielink, Topsector policy	SDE+ for demonstration site, DEI and Hernieuwbare Energy programs
Domestic market development	TenneT (NL) developing offshore wind grid and substations, Netherlands Enterprise Agency managing preliminary studies parcels	(yearly) Tenders for domestic offshore wind farms, no state-level regulation for nearshore or lake areas to develop offshore wind farms	Innovatielink, Topsector policy	SDE+ for domestic offshore wind farms, Borgstelling MKB Kredieten, Garantie Ondernemingsfinanciering, Innovatiekrediet and seed-business angels program, Future InvestNL program
Foreign market exploration	Embassies performing exploratory studies, general information on foreign markets and their regulatory frameworks, organization trade missions by several governmental agencies	-	Public-private export meetings, Policy-level cooperation, pitches for domestic parties, Oranje Missiefonds program	Upkeep embassies ,SIB program
Market entry preparation	Embassies performing business scans, Netherlands Enterprise Agency organizing innovation matchmaking missions, governmental agencies organizing trade missions, Holland Branding	Government-to-government cooperation in the form of memorandums of understanding with China and Taiwan	Innovation attachés and embassies hosting networks connecting domestic parties to international partners, knowledge exchange of tender procedures	Upkeep embassies, PIB program, partial reimbursements trade-missions
Export	-	-	Cooperation with Atradius (NL) for offering export promotion financing	Financing of Atradius' Dutch State Business line of export promotion financing products

Appendix 2: Rating process of prevalence governmental roles

Research and development	Executive	Low
	<i>R&D as core activity and specific to offshore wind sector</i>	Some R&D activities as extension of tasks governmental agencies
	Regulative	Low
	<i>Steering in tenders and commercial freedom research organizations</i>	Little steering in tenders and commercial freedom research organizations
	Networking	High
	<i>Role in organization research programs, cross-sectoral cooperation and innovation networks</i>	Government organizer main research program, hosts international innovation network
Financing	High	
<i>Availability of subsidies for offshore wind R&D projects</i>	Mix of general and offshore specific subsidy programs covering a wide range of R&D activities	

Testing	Executive	Low
	<i>Testing as core activity and specific to offshore wind sector</i>	Some testing activities as extension of tasks governmental agencies
	Regulative	Medium
	<i>Availability and strictness framework test locations</i>	Regulation for future separate test sites but no current offshore test sites
	Networking	High
	<i>Connecting companies through research programs or other means</i>	Governmental research programs and actively connecting SMEs and large companies
Financing	High	
<i>Availability of subsidies for offshore wind test projects</i>	Subsidies for a large range of demonstration and development projects and organizations	

Domestic market development	Executive	Medium
	<i>Government produces or manages part of domestic offshore wind farms</i>	Government is charge of ~25% construction offshore wind farm, primarily managerial activities
	Regulative	High
	<i>Growth determined or steered</i>	Government determines nearly all domestic growth with regulation
	Networking	Medium
	<i>Government involved in main trade organizations, networks in domestic market</i>	No governmental presence in trade organizations, strong governmental presence in networks connecting companies
Financing	Medium	
<i>Available risk- or venture capital, funds for start-ups, financing for domestic wind farms</i>	Subsidies for offshore wind farms available, some funds for growing companies yet (currently) little risk- or venture capital	

Foreign market exploration	Executive	High
	<i>Export activities for market exploration offered, trade missions organized, programs for potential exporters</i>	Large portfolio of instruments offered, trade missions organized and programs for market exploration
	Regulative	None
	<i>Regulation promoting or discouraging foreign market exploration</i>	No relevant regulation found
	Networking	Medium
	<i>Collaboration sector to stimulate exports, programs for international networking, collaboration with local consultancy</i>	Active cooperation with sector, programs for international networking, no collaborations local consultants
Financing	High	
<i>Funding foreign networks, market exploration activities, market exploration programs, activities in foreign markets</i>	Foreign network, and market exploration programs funded, market exploration activities partially or fully funded	

Market entry preparation	Executive	Medium
	<i>Organization of market entry preparation activities and missions</i>	Trade missions organized moderate range of market entry preparation activities
	Regulative	Low
	<i>Governmental cooperation on regulation, formal cooperation documents</i>	Moderate amount of formal cooperation with offshore wind sectors
	Networking	Medium
	<i>Active networks connected with relevant markets and parties, cooperation with local partners, branding activities</i>	Several active foreign networks relevant for the offshore wind sector, no cooperation local consultants, little relevant branding activities
Financing	Medium	
<i>Funding to foreign networks, market entry activities and programs, branding programs</i>	Funding to foreign governmental network, market entry activities funded or partially funded, market entry programs funded, no current funding to branding	

Export	Executive	None
	<i>Governmental agencies exporting or offering goods directly supporting export</i>	No relevant examples found
	Regulative	None
	<i>Governmental regulating restricting or promoting export</i>	No relevant examples found
	Networking	Low
	<i>Governmental cooperation with organizations promoting export activities, linking exporting parties</i>	Public-private cooperation with organization offering export credit guarantees, no governmental influence in networks connecting exporters
Financing	Low	
<i>Offering of products or services promoting the export of offshore wind</i>	Financial products for export promotion offered to sector, yet currently not utilized	