

**The profitability of transnational energy infrastructure: A comparative analysis
of the Greenstream and Galsi gas pipelines**

Roberto Cardinale

The Bartlett Faculty of the Built Environment, University College London

1-19 Torrington Place, Fitzrovia, London WC1E 7HB

Roberto.cardinale.14@ucl.ac.uk

Abstract

This paper explores how the profitability of European transnational gas infrastructure is affected by (i) alternative ways to organize the gas supply chain; and (ii) different forms of energy diplomacy. In particular, through a case study, the paper analyses how these factors determined the realisation and success of the Greenstream pipeline and the stalemate of the Galsi pipeline, despite the potential for both projects to be profitable. The issue is important in view of the full transition to the EU Single Market, of which unbundling and privatisation are policy pillars. In fact, before the transition, vertical integration in the foreign upstream and energy diplomacy were key elements for infrastructure profitability. The paper argues that these elements are still important, as constraints to gas procurement and binding contractual relations with producers have not changed substantially. Nevertheless, securing those advantages within the EU Single Market framework requires significant innovations. In particular, the paper suggests forms of EU energy diplomacy, based on bilateral trade deals, which could achieve forms of vertical integration for energy firms as well as help EU and non-EU counterparts align their interests. This paper may prove particularly relevant for the recent debate on how to shape EU energy diplomacy.

Keywords

Transnational gas infrastructure profitability; vertical integration; unbundling; energy diplomacy; EU Single Market; energy security.

1. Introduction

This paper explores how the profitability of European transnational gas infrastructure is affected by (i) alternative ways to organize the supply chain of gas production and transport and (ii) different forms of diplomatic support in the negotiation with non-EU producing

countries. This is done by analysing the transformations generated by the EU-led gas market liberalization, which started in the 1990s as an attempt to decrease the market power of national monopolists and increase market competition. However, it has been shown that liberalisation and privatisation did not fully succeed in bringing the expected improvements in terms of market efficiency, firms' performances and consumers' welfare (Davies and Waddams, 2007; van Witteloostuijn et al., 2007; Jamasb et al., 2008; Florio, 2013).

This paper explores the implications of the EU-led liberalisation by focussing on the external dimension of the European energy market. The external dimension is important as Europe currently imports around two thirds of the gas it consumes. In addition, the gas imported in Europe is still largely subjected to binding contractual relations with producing countries, although some studies have shown a slight improvement in this respect thanks to recent technological and regulatory changes (Hirschhausen and Neumann, 2008). Therefore, the context in which European gas procurement occurs still poses challenges in terms of energy security and domestic market competition. The paper argues that supply chain unbundling and changes to the approach to energy diplomacy¹, which were brought about by the EU-led liberalisation, may affect traditional mechanisms of interest alignment between EU and non-EU producing countries. This, in turn, can have negative implications for the profitability of transnational gas deals and import infrastructure².

Two strands of literature are particularly relevant to address this issue. One strand studies how the development of transnational gas infrastructure is affected by cross-country relations. Contributions in this strand concur that reconciliation of interests between producing

¹ A debate on EU energy diplomacy has recently emerged, following the EU's difficulties in developing a unified and effective strategy of energy procurement from neighbouring countries. The effectiveness of the EU approach has also been questioned because of the stalemates in the negotiations of major infrastructure projects for the import of gas, such as Galsi and Nabucco. The debate on EU energy diplomacy is taking place both at the academic (Herranz-Surrallés, 2016) and policy level, as shown by the adoption of the "EU Energy Diplomacy Action Plan" (2015) by the Foreign Affairs Council.

² This hypothesis is based on the current European context of gas procurement (as described above); it does not consider potential future scenarios of large-scale domestic production (e.g. shale gas) or the emergence of viable alternatives to procurement through pipelines (e.g. Liquefied Natural Gas).

and consuming countries is a key element for success (Pandian, 2005; Victor, Jaffe and Hayes, 2006; Ericson, 2009; Bilgin, 2009; Kardas, 2011; Boussena and Locatelli, 2013; Omonbude, 2013; Van de Graaf and Sovacool, 2014; Yorucu and Mehmet, 2018, Cardinale, 2017; 2019b). The other strand studies the energy supply chain through the lens of Transaction Cost Economics (TCE) (see Williamson 1981). These studies suggest that different degrees of vertical integration may be more or less appropriate in different contexts, depending on the extent to which energy firms are locked into binding contractual relations in different phases of the supply chain (Joskow, 1985; 1990; DeCanio and Frech, 1993; Dahl and Matson, 1998; Saussier, 2000; Hirschhausen and Neumann, 2008; Hautesclocque and Glachant, 2009; Glachant and Hallack, 2009; Signorini et al., 2015). This paper aims to bridge both strands, as understanding the profitability of European transnational gas infrastructure requires integrating insights on the supply chain and on the reconciliation of political interests among countries.

The paper approaches the problem through a comparative case study of transnational gas infrastructure, and specifically of two undersea pipelines: “Greenstream”, which connects Libyan gas reserves to the Italian gas network across the Mediterranean Sea; and “Galsi”, which was supposed to connect Algeria to Italy, but has been in a stalemate since the late 2000s. The paper shows that both projects are potentially profitable in terms of production and transport costs. It then shows that the profitability of Greenstream and the stalemate of Galsi depend on differences in the supply chain and in the energy diplomacy framework in which they were conceived. In particular, the paper shows that Greenstream’s profitability was enhanced by the diplomatic relations between Italy and Libya, which made it possible for the Italian Eni to secure favourable concessions in the Libyan upstream and to vertically integrate through equal joint ventures with the Libyan National Oil Corporation (NOC); this allowed the

two firms to align their interests³. Such an interest alignment did not occur in the supply chain of Galsi, due to its unbundled structure⁴ and the lack of well-established EU-Algeria relations. In fact, Galsi was penalised by the EU approach to energy diplomacy, which was not systematic and did not suit the Algerian interests. The paper will show that EU energy diplomacy ultimately prevented European firms from securing licences in the Algerian upstream, which made it impossible for them to vertically integrate. The involvement of Algerian and European firms in different supply chain phases caused prolonged disputes for the price of gas to be imported by the European firms and for the partition of Galsi's financing⁵.

The case study shows that energy diplomacy can play a key role in aligning the interests of European energy firms and NOCs, thus reducing transaction costs. The paper argues that gas and infrastructure deals should be negotiated within trade agreements that also consider the interests of producing countries. In fact, most producing countries use their energy resources for political leverage and are therefore unwilling to grant unconditional access to foreign energy firms to exploit domestic resources. A systematic and pragmatic EU approach to energy diplomacy would also help pursue the EU objectives of market competition and energy security. For example, it would help new entrants (i.e. those with the lowest bargaining power vis-à-vis NOCs) to vertically integrate in the foreign upstream and create alternative routes from those managed by former monopolists, which usually retain full control over gas imports. This could increase competition in EU domestic markets. Furthermore, vertical integration and

³ The gas flowing through Greenstream is sold to Eni's competitors in the Italian downstream, following the European Commission's provisions on market competition. Despite that, the paper considers Greenstream as vertically integrated (from Eni's perspective). In fact, internalising the upstream and midstream is much more strategically important than internalising the downstream, at least in the European context, as upstream and midstream show a higher level of 'asset-specificity' (see the TCE analysis in section 6 for a detailed explanation).

⁴ Although the European firms involved in Galsi are vertically integrated from midstream to downstream, they lack a production phase in the Algerian upstream. Therefore, following the logic explained in the note above, this paper considers Galsi as unbundled, as its vertical integration does not include the strategic upstream phase.

⁵ Other external factors have also influenced the profitability of the two projects. For instance, Greenstream was conceived in a phase of rising gas demand in Europe. In contrast, whilst Galsi was also conceived when gas price was still high, the project was negatively affected by increased competition from other import infrastructure.

recourse to energy diplomacy would help decrease contractual frictions and increase infrastructure profitability, which is key for energy security.

The paper is structured as follows. Section 2 explains the rationale for adopting the comparative case study methodology. Section 3 analyses the EU-led gas market liberalisation through the lens of the Advocacy Coalition Framework and the implications for Greenstream and Galsi. Section 4 explores Greenstream's potential profitability in terms of production and transport costs, and how profitability was enhanced by the diplomatic relations between Italy and Libya. Section 5 shows that, despite Galsi was potentially profitable in terms of production and transport costs, diplomatic relations between the EU and Algeria contributed to make the pipeline unprofitable, and ultimately prevented its realisation. Section 6 explores Greenstream and Galsi's (un)profitability through the lens of TCE, and outlines how this case study might lead to an enhanced TCE framework that includes energy diplomacy. Section 7 concludes the paper and provides policy suggestions to reconcile the Single Market framework with the specificities of the European gas sector, including recommendations for EU energy diplomacy.

2. The comparative case study: methodological framework

The comparative case study methodology is particularly well suited for this paper, because it makes it possible to analyse the variables under investigation by highlighting the main differences between selected cases, whilst at the same time controlling for other variables that are not under investigation (Collier, 1993; Dion, 2003; Flick, 2006; Yin, 2009). In particular, the differences between Greenstream and Galsi provide important insights on how gas market liberalisation may affect transnational infrastructure profitability. In fact, Greenstream was not greatly affected by the liberalization policy because the project started in 1996, when the policy had not yet influenced the energy market. Moreover, Greenstream still preserves vertical integration in strategic phases (upstream and midstream) and was negotiated

in the context of trade agreements between Italy and Libya. The negotiations for Galsi instead started in 2003, when the Italian energy market was already open to national and foreign competitors.

Therefore, the influence of market liberalization policy in Galsi's governance is evident in different aspects, such as the lack of both horizontal and vertical integration, brought about by unbundling and market opening, and the lack of systematic diplomatic efforts in the EU negotiations with the Algerian counterparts. The comparison makes it possible to control for gas demand, which was increasing between the late 1990s and early 2000s, when the projects were conceived⁶. It also makes it possible to control for technical and logistical factors affecting the costs of production in the upstream of each project⁷. Finally, Libya and Algeria have similar approaches to negotiating energy deals, which stem from common aspects of their political culture and the training of energy managers⁸.

The paper relies on both primary and secondary sources. The primary sources consist of semi-structured interviews to experts, EU legislation, annual reports, press releases, and data extracted from databases. The interviews were conducted with current and former managers of the main shareholders and subcontractors of the infrastructure projects analysed in the case study, as well as with EU and Italian policy-makers. The interviewees were chosen for their high-ranking roles in companies and governments, with a direct involvement in decision-making concerning Greenstream and Galsi. Legislation and press releases of EU institutions made it possible to explore the process of liberalization and the policy dispute with

⁶ However, Galsi faced increased competition from other European projects of gas import, as noted above.

⁷ The Algerian and Libyan wells and transport routes display several technical and logistical differences that might affect the price at the respective borders. Nonetheless, various estimates (John Gault S.A., 2004; Aissaoui, 2016) suggest that, in the period considered in this paper, the gas at the Libyan and Algerian borders would be sold at similar prices to the respective pipeline companies (i.e. Greenstream BV and Galsi S.p.A).

⁸ Libya and Algeria share elements of their political views, based on anti-colonialism and the use of energy resources for political emancipation; they also structure Exploration and Production Sharing Agreement with International Oil Companies (IOCs) in a similar way. In addition, a former board member of Eni and Snam (see Personal Interview 1), has stressed that the similarities in the management style between Libyan and Algerian NOCs occur because many among their managers were trained in Eni's school.

the Italian State industry. Additional primary sources consist of data extracted from databases, annual reports, and press releases of the energy firms involved in the projects. Such press releases provide relevant data on the costs of developing the projects as well as on the financial performance of both firms and projects. The secondary sources consist of academic literature on the historical, political and economic context in which the projects have been developed, as well as reports from public bodies, consultancies and industry journals that provide estimates on costs, gas prices, and other details of the projects.

3. The transition from the national to the EU model of energy governance

3.1. The EU vs. State industry dispute in an Advocacy Coalition Framework

After World War II, the Italian State intervention in the energy sector was comprehensive and pivotal for economic development, and it was implemented through State Owned Enterprises (SOEs) (Toninelli, 2011). Their monopolistic nature (horizontal and vertical integration) allowed for investment coordination and fixed cost minimisation. State ownership made it possible to (i) use diplomatic action to reach favourable deals of energy provision with producing countries; and (ii) achieve a form of domestic political accountability over energy provision, because such provision was subject to pressure in terms of quality and price affordability on the part of households and industrial consumers (Cardinale, 2017; 2019b). In short, the ‘national’ model of energy governance just outlined was characterised by public ownership, vertical integration and monopolistic market structure.

Since the 1990s, the ‘national model was challenged by the EU-led process of liberalisation, which aimed to create a EU Single Market of gas. In the EU vision, opening national gas markets would allow the most efficient European energy firms to increase their scale of production, thus reducing the market power of former monopolists. Unbundling the supply chain, and particularly the national grid of gas transmission, was seen as crucial for

market opening as it would grant access to new entrants, thus increasing competition in energy provision from abroad as well as distribution to consumers. Privatisation had the function to decrease political interference, avoiding market distortions (Florio, 2013). In short, private ownership of energy firms, supply chain unbundling, and market opening were the pillars of the emerging model of ‘EU’ energy governance.

However, the EU-led liberalisation seems to have encountered the resistance of some State bodies⁹, for reasons related to loss of political power or to the presumed ineffectiveness of the EU energy model, or both. To interpret the policy dispute that occurred between the key players in Italian energy policy, namely Italian State industry and the European Commission (EC), I adopt the Advocacy Coalition Framework (ACF), which is designed to interpret policy disputes among rival coalitions of interests and their outcomes (Sabatier, 1998; Jenkins-Smith, et al., 2014). The analysis aims to explore the origins of the ‘national’ and ‘EU’ models (including their hybrid aspects), which in this paper are represented by Greenstream and Galsi, respectively.

The ACF explains policy processes as a consequence of competing coalitions of interests. The theory conceives of policy change as a long-term process (usually one or two decades), which is shaped by the ability of opposing coalitions to influence decision-making to achieve their own goals (Jenkins-Smith et al., 2014). On this view, the dispute between coalitions does not concern only opposing interests but also opposed values and belief systems (Sabatier, 1998). The theory takes into consideration three levels at which the belief systems are structured, namely the ‘deep core’ beliefs, the ‘policy core’ beliefs and the ‘secondary’ beliefs. The ‘deep core’ beliefs correspond to values shared by all groups in society, such as the desirability of economic development; such beliefs are usually not disputed by the opposing

⁹ This point emerged from personal interviews with a former board member of Eni and Snam (Personal Interview 1), a former manager of Enel (Personal Interview 2), and a former manager of EDF (Personal Interview 3). See Baldassarri et al. (1997) for further details.

coalitions. The ‘policy core’ beliefs are the normative ground on which the coalitions differ; they often concern the priority of certain issues over others in the policy agenda and the general approach to State intervention (e.g. direct intervention vs. regulation). The ‘secondary’ beliefs concern specific policies and the design of institutional arrangements to deal with the normative issues supported by the coalitions (e.g. State-Owned Enterprises vs. independent regulatory authorities).

In relation to the Italian gas market liberalisation, the opposed coalitions can be identified as the (EC) and the State bodies supporting the Italian State industry, while the regulation of strategic markets and their infrastructure can be seen as the object of the dispute. These markets have been historically monopolized by the State industry, and specifically Eni in the Italian oil and gas sectors, due to the private sector’s technological backwardness and shortage of capital. However, when the European economy approached a more mature stage of development in the 1980s, the private sector became able to play a major role (Cardinale, 2019a). This justified the EC’s advocacy of State industry privatization and economic liberalization (European Commission, 2001; 2005). However, the State industry coalition rejected such a normative principle, restating the relevance of public assets in sensitive markets such as energy, in which public interests are at stake, and which cannot therefore be managed only through a logic of allocative efficiency. In addition, the State industry coalition claimed that higher competition in capital intensive sectors could entail lower levels of efficiency because of the reduced scale of production and lack of coordination between the different phases of the supply chain¹⁰. Therefore, despite a shared ‘deep core’ belief based on economic development, the opposed coalitions contrasted over the ‘policy core’ beliefs: the EU coalition advocated economic liberalization while the State industry coalition supported retention of

¹⁰ This argument was supported by former managers of Eni and Enel (see Personal Interview 1, and 2) in the interviews cited above. They argued that vertical integration and market power are necessary to compete in global energy markets.

public assets. This opposition also entailed substantial differences in the ‘secondary beliefs’: the EU coalition favoured the establishment of ‘Regulatory Authorities’ in charge of monitoring against dominant market positions¹¹, while the State industry coalition advocated the retention of government assets, either directly through the Ministry of Finance, or indirectly through the Italian Sovereign Wealth Fund (“Cassa Depositi e Prestiti”) (Baldassarri et al., 1997).

3.2. *The outcome of the dispute: evidence from Greenstream and Galsi*

In the last 30 years the EU coalition seems to have prevailed, as shown by the extent of liberalisation and the establishment of National Regulatory Authorities (NRAs). The specific policy tools through which the EU could put pressure on Member States were introduced since the early 1990s. For example, the Maastricht Treaty envisioned privatisation as the most feasible measure to reduce public debt in a short time (Bortolotti et al., 2004). Of great importance were also specific EU directives of the 1990s and 2000s addressed to market opening and unbundling¹². However, the opposition of the State industry gave rise to a compromise between the two opposing policy instances (Brutschin, 2016). In the case of the gas sector, the policy outcome was partial privatisation of former monopolists, unbundling of the national grid from the upstream and downstream phases, and a gradual market opening to national and European competitors. As a consequence of this compromise, the main players in the Italian gas market are currently characterised by different degrees of state ownership, vertical integration and market power. This led to the emergence of hybrids models also in the

¹¹ See the first (98/30/EC) and second (2003/55/EC) European Parliament and Council directives, which respectively suggest and require to set up national energy regulators. See also Wallace, Pollack and Young (2010) on this topic.

¹² See also the third (2009/73/EC) directive on gas market liberalisation, in addition to the first and second directives cited above.

governance of transnational supply chains, which reconcile elements of the national and EU models to different extents.

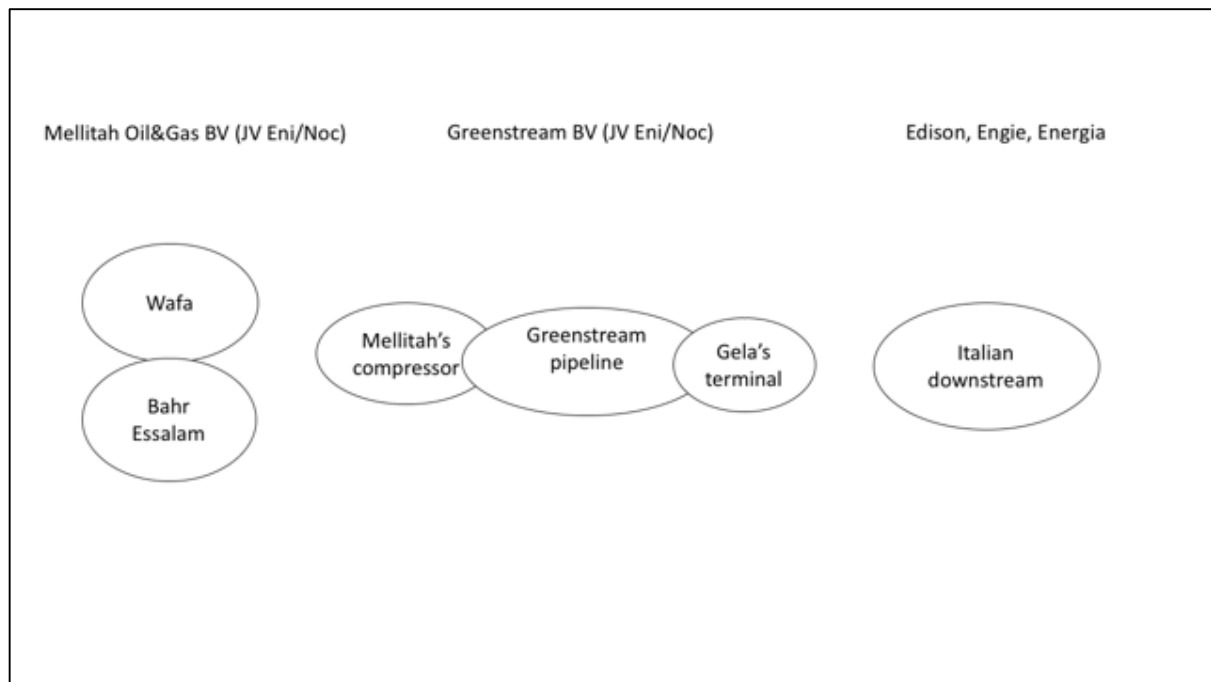
For instance, Greenstream retains a vertically integrated supply chain, but only in the more strategic phases, i.e. upstream and midstream. In addition, it benefited from well-established diplomatic relations between Italy and Libya and their cooperation in various political and economic sectors. In contrast, Galsi is vertically integrated in the less strategic midstream and downstream phases, as the project is managed by new entrants in the Italian gas market who lack long-term relations with Algeria. Furthermore, Galsi was conceived in the framework of the EU energy policy, which does not envision an active approach to energy diplomacy as much as some Member States do.

To summarise, the dispute between the two coalitions brought to a partial liberalisation of the gas market. This is shown by the key elements of energy governance, namely ownership of energy firms, organisation of the supply chain, and market structure. For what concerns transnational gas projects, partial liberalisation brought to the emergence of two hybrid models. One is represented by Greenstream's supply chain, which retains key elements of the 'national' model such as vertical integration and energy diplomacy, in addition to new elements introduced by the EU model (e.g. Eni's private management). The other is represented by Galsi's supply chain, in which elements of the EU model prevail (i.e., unbundling and lack of energy diplomacy), in addition to elements of the national model such as State shares in energy firms.

4. Greenstream's profitability: a successful mix of traditional and innovative elements of governance

Greenstream B.V. is an equal joint venture between Eni North Africa B.V.¹³ and the Libyan NOC. Greenstream strategically contributes to the Italian energy security thanks its capacity to supply 8 bcm per year¹⁴. The joint venture's main assets include the offshore pipeline Greenstream, Mellitah's compressor in the Libyan coast, and Gela's receiving terminal in Italy (Greenstream B.V., 2008). Mellitah's compressor is supplied with natural gas extracted from the Bahr Essalam and Wafa wells in the Libyan upstream. The wells are owned and operated by Mellitah Oil & Gas B.V., another equal joint venture between Eni North Africa B.V. and NOC, established with the purpose of managing their common upstream assets. The gas shipped to Gela's terminal is then inserted into the Italian national grid and sold through long-term contracts to Eni's competitors in the downstream, following the EC provision on market liberalisation. Figure 1 provides for an overview of Greenstream's supply chain.

Figure 1. Greenstream's supply chain



¹³ Eni North Africa B.V. is a subsidiary of Eni.

¹⁴ Although Greenstream's capacity has been recently expanded to 11 bcm per year, the paper will only consider the initial capacity of 8 bcm, on the basis of which the investment decision was made.

Source: Own elaboration based on information provided by Greenstream BV

Several elements suggest that Greenstream's supply chain¹⁵ is profitable. For example, the financial statements for the years 2008-2017 show Greenstream BV's positive profit margin ranging from 15% to 20% and a solvency ratio ranging from 20% to 36%¹⁶ (see Table 1).

Table 1. Greenstream's indicators of profitability (2008-2017)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Net Income (Thousand €)	n.a.	9,053	17,587	-52,065	1,697	-5,229	2,444	13,166	16,246	15,983
Profit Margin (%)	n.a.	16.79	17.15	n.a.	3.32	-3.33	2.17	11.31	15.25	20.46
Solvency ratio (asset based) (%)	36.35	28.87	24.83	23.21	20.15	19.82	18.19	25.39	21.77	19.58

Source: Amadeus database

The proximity to the sizeable Italian market is certainly an important factor for Greenstream's supply chain profitability. However, according to Eni's management¹⁷, a primary determinant is the low production cost in the upstream. The latter has been as low as \$1 per barrel in the case of oil (equivalent to \$0.2/MMBtu), due to the geological features of Libyan wells (see EIA, 2002). However, considering the greenfield nature of the investment to realise Greenstream, its cost per unit is likely to be higher. In fact, the total investment, which

¹⁵ Although Greenstream is the name of the offshore pipeline, in this paper I refer to Greenstream's supply chain as the whole process of gas production and export to Italy.

¹⁶ Note that in some years, and especially in 2011, some indicators show a negative (or below-average) performance because of particularly intense clashes in the Libyan civil war, which caused disruptions to the main facilities of Greenstream.

¹⁷ Based on interviews conducted with a former board member of Eni and Snam (Personal Interview 1) and a former CEO of Eni and Enel (Personal Interview 4).

consisted in developing the wells and constructing production and transport facilities, amounted to around €5.6bn (Townsend, 2002). Some reports indicate that, in 2004, the price range at the Libyan border was \$3 - 3.25/MMBtu; the price at the Italian border, which includes the transport costs of the offshore section, was estimated to range between \$3.5 - 3.85/MMBtu (John Gault S.A., 2004). By comparing these prices to the estimates of costs, there appears to be a substantial margin of profit¹⁸.

While geological, geographical and market factors seem to provide favourable conditions, the contractual terms between Eni and NOC played a key role in enhancing profitability. The contractual terms were in turn shaped by political and economic factors, especially the critical situation of Libya's international relations and the Italian interests in Libya's energy resources. In fact, the UN sanctions imposed on Libya in the 1990s posed increasing problems to its economy, which relied on the historical relations with Italy to maintain a sufficient level of energy export as well as to negotiate softer conditions with the international community (Ronzitti, 2009; Varvelli, 2009). The Italian diplomatic activism helped Libya slowly open its economy and slightly overcome international isolation. The intensification of diplomatic commitment since the mid-1990s is evident in the establishment of an Italian-Libyan Commission to increase bilateral cooperation in key political and economic areas. Although official State visits started in 1999, the Italian diplomatic effort had already been intensified since 1996, when Eni and NOC signed the Addendum of Agreement for their cooperation in the Libyan upstream and the realisation of Greenstream. From the Italian State viewpoint, Greenstream was functional to improve Italy's energy security¹⁹.

¹⁸ This statement is supported by a personal consideration of a former board member of Eni and Snam (Personal Interview 1). See Table 2 for a more detailed exposition of costs and benefits in different phases of Greenstream's supply chain.

¹⁹ In the same interview, and on the basis of his experience as former minister of industry, Interviewee 1 stressed that the Italian State has historically given primary importance to energy security in its diplomatic action. This was also the case in the mid and late 1990s, when the negotiations for Greenstream took place. On this issue, see also Coralluzzo (2010).

Cooperation with Libya in a range of political and economic domains such as terrorism, immigration and trade created the conditions for obtaining favourable deals in other sectors of cooperation, especially energy²⁰.

In short, Greenstream's deals were shaped by two interconnected political factors: Libyan international isolation and the Italian diplomatic activism to help Libya overcome it. The former brought Libya to award favourable Exploration and Production Sharing Agreements (EPSAs) to International Oil Companies (IOCs). However, only Eni could actually secure contracts at such favourable conditions, and that was due to Italian diplomatic effort. In fact, other IOCs were not allowed to operate in Libya by their respective governments, due to the ongoing sanctions.

The deals envisaged the creation of joint ventures along the supply chain, with the purpose of sharing risks and returns equally. The equal share in the joint ventures allowed Eni to halve the financial burden of the €5.6bn total investment, whilst helping NOC participate in the production process and benefit from the revenues of the export²¹. In addition, the deals envisaged an overall government take of 65%. This greatly helped Eni North Africa B.V.'s profitability, as government take in other producing countries amounted to 89% on average (Johnston, 2005).

In addition to the relations between Italy and Libya, Eni was able to take advantage of its partial privatization by setting a successful mix between public and private interests in the company. In fact, partial privatization helped Eni shift from public to private management, thus maintaining or further increasing performance (Wolf and Pollitt, 2008). This in turn had

²⁰ In Personal interview 1, the interviewee emphasizes the importance of the political relations between Italy and Libya for the profitability of their energy deals, although he can't provide specific details on the deals, due to the confidential nature of the information. He adds that although the diplomatic action has been essential to create favourable conditions of context, the deals have been negotiated by the firms, without heavy interference from the respective States (especially in the Italian case).

²¹ This information is based on an interview with a manager of Rosetti Marino S.p.A (Personal Interview 5). He stressed the importance of creating equal joint ventures between NOCs and IOCs to ensure the success of transnational energy projects. In his view, equal joint ventures ensure a balanced governance and the possibility to align mutual interests and maximize synergies between counterparts.

positive implications for the firms' reputation towards investors as well as Italian citizens, who changed their previous perception of Eni as a political tool for short-sighted policies. In addition, the residual 30% government share allowed Eni to still benefit from the government's support in crucial negotiations, as in the case of Greenstream, but without heavy government interference in corporate management²².

In short, the nature of diplomatic relations between Italy and Libya in the 1990s, and particularly the Italian approach to energy diplomacy, were crucial for the concessions in the Libyan upstream and to avoid frictions between Eni and NOC. They contributed to the profitability of Greenstream, in addition to other factors such as the relatively low cost of production in Libya, the increasing demand in the Italian gas market, and Eni's private management. Therefore, the coexistence of traditional elements (energy diplomacy) and innovative elements (private management), in such a form and extent, seems to provide particular strength to Eni's governance and therefore to Greenstream.

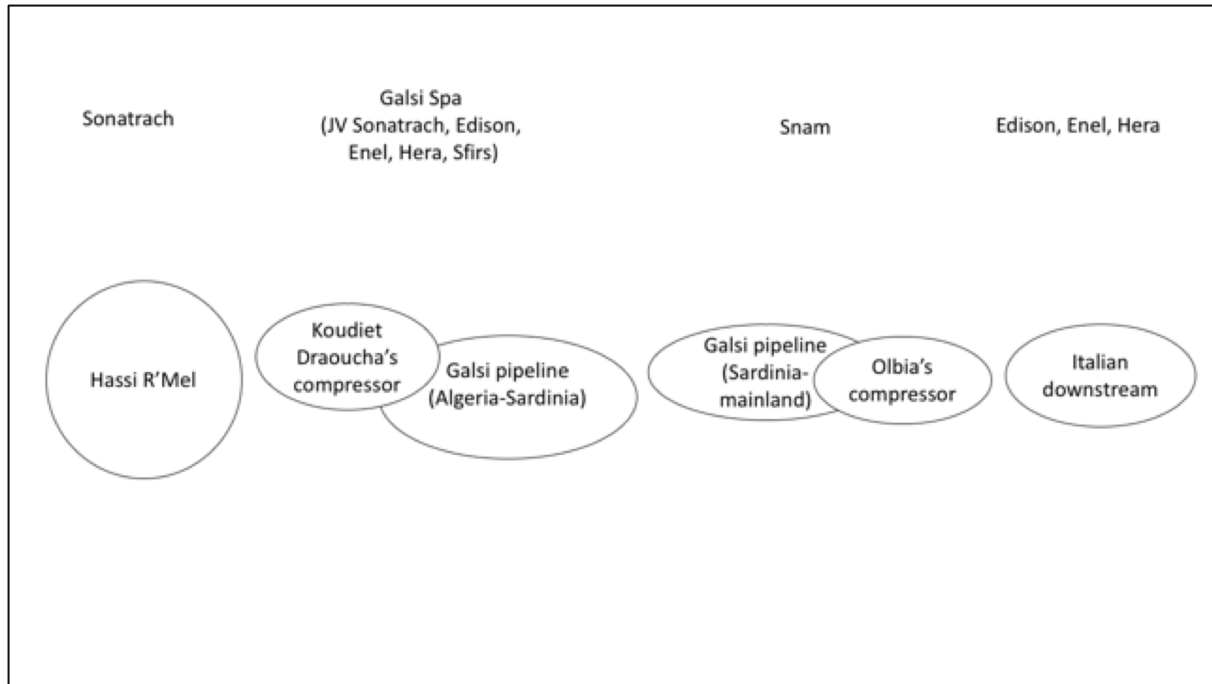
5. Galsi's unprofitability: the lack of a diplomatic strategy

Galsi is a planned but not yet realised gas pipeline which should connect the Algerian gas wells in Hassi R'Mel to Sardinia (Italy) and provide 8 bcm of natural gas per year. The pipeline would cross the Sardinian island, supplying the gas needed to the region, and reach the Italian mainland by crossing the Tyrrhenian Sea through another offshore segment. Whereas Hassi R'Mel production in the upstream is fully owned and operated by the Algerian State-Owned Sonatrach, the ownership of the international section of the pipeline is shared by Sonatrach (41.6%), Edison (20.8%), Enel (15.6%), Sfirs (11.6%), and Hera Trading (10.4%), most of which operate in the Italian downstream (Galsi, 2009a). Unlike the Algeria-Sardinia

²² This was stressed by both a former board member of Eni and Snam (Personal Interview 1) and a former CEO of Eni and Enel (Personal Interview 4). Interviewee 1 added that the lack of State interference in Eni's management is also important to ensure Eni's credibility towards investors and Italian citizens.

offshore segment, the onshore and offshore segments in the Italian territory will be financed, owned and operated by the national grid company Snam (Galsi and Snam Rete Gas, 2008). See figure 2 for an overview of firms involved in Galsi's supply chain.

Figure 2. Galsi's supply chain



Source: Own elaboration based on publicly available information provided by Galsi S.p.A.

Galsi has been in a stalemate since 2003, and is now likely to be abandoned (Coats, 2013). And yet, several elements suggest that Galsi could potentially be profitable. A key element is the low wellhead production cost at Hassi R'Mel, which is estimated to be \$0.5/MMBtu (Aissaoui, 2016)²³. Moreover, extraction and production facilities are already in operation in Hassi R'Mel, and this suggests that this price is unlikely to increase considerably, although the field's maturity has recently required increasing investment for maintenance. As a result, Galsi would require investments mainly for the onshore and offshore transport phases,

²³ For comparison, estimated production cost for Russian gas, which is considered to be among the cheapest sources for Europe, is almost \$2/MMBtu at wellhead and almost \$4/MMBtu when domestic and transnational transport costs are included (Rogers, 2015).

which are estimated to reach a total amount of €2bn. Table 2 compares the main indicators of cost and potential profitability in Greenstream's and Galsi's supply chains.

Table 2. Greenstream and Galsi's supply chains (own estimates are indicated in brackets)

	Greenstream		Galsi	
	Upstream	Midstream	Upstream	Midstream
Ownership	Mellitah Oil&Gas B.V. (Eni/NOC)	Greenstream B.V. (Eni/NOC)	Sonatrach	Galsi S.p.A. (Sonatrach, Edison, Enel, Hera, Sfers)
Est. production/transport cost (\$/MMBtu)²⁴	0.2	0.5 - 0.6	0.5	(0.5)
Sale price (\$)²⁵	3 - 3.25	3.5 - 3.85	3 - 3.5	3.5 - 4
Mark-up (\$/MMBtu)²⁶	(2.8 - 3.05)	n.a.	(2.5 - 3)	n.a.
Capex (€bn)²⁷	4.6	1	(Very low)	(0.8)
Rate of return (%)²⁸	n.a.	7.5	n.a.	(7.5)
Capacity (bcm/year)²⁹	10	8	76	8

²⁴ Upstream production costs in Libya and Algeria are estimated by EIA (2002) and Aissaoui (2016), respectively. The cost for Libya does not include Greenstream's upstream capex. In fact, the data is reported by EIA (2002) with reference to the production cost of oil in Libya. This cost can be used as a proxy for the production cost of gas, as capital expenditure for exploration and production of oil and gas does not differ substantially. The low cost to produce gas in Libya was also confirmed by a former board member of Eni and Snam (Personal Interview 1), and by Abd al-Hafiz Zleitni, NOC's former chairman, as reported by Townsend (2002). Transport cost for Greenstream was estimated by John Gault S.A. (2004). Transport cost for Galsi's international section was estimated to be similar to the transport cost for Transmed (see John Gault S.A., 2004), an existing gas pipeline connecting Algeria to Italy via a similar route as Galsi.

²⁵ Estimates are made by John Gault S.A. (2004) and refer to 2004.

²⁶ Estimates for the upstream are based on production costs and sale prices as reported above. Estimates for the midstream cannot be calculated because the operating cost is not known. In any case, they are not crucial for the decision to build the pipeline, as such decision depends on the profitability of the whole supply chain.

²⁷ See Townsend (2002) for Greenstream's capex. Galsi's capex refers to the international (offshore) section connecting Algeria to Sardinia, which corresponds to about 1/3 (285km) of the total route (865km). As a result, the €0.8bn cost corresponds to slightly more than 1/3 of the €2bn total cost, considering the higher cost of offshore pipe laying. The capex of Galsi's upstream is indicated as "very low" because it does not require substantial investments (at least not as much as for greenfield investments), as Hassi R'Mel wells are already in operation to fill other pipelines.

²⁸ Greenstream BV's rate of return is based on assessments made by John Gault S.A. (2004). Galsi S.p.A.'s rate of return is estimated to range on similar values as those of Greenstream, considering the similar sale prices assumed and the similar capital expenditure on the pipeline, and assuming that it would work at the same capacity as Greenstream. Note that rate of return of the pipelines, which are estimated to be similar, obviously do not depend on the production cost and capital expenditure of the upstream, which differ substantially across the two supply chains.

²⁹ The remaining 2 bcm/year produced in the wells that fill Greenstream (Wafa and Bahr Essalam) are used for Libyan domestic consumption, whilst the Algerian supergiant well Hassi R'Mel, which should fill Galsi, already supplies most of the country's export infrastructure with the remaining 68 bcm/year.

Despite these conditions for profitability, Galsi's commercial value is undermined by important factors, most of which have political roots. A primary factor is the Algerian depletion risk³⁰, evident in the decline of gas production and exports of 10 and 25 bcm respectively, in the period between the mid-2000s and the mid-2010s (Aussaoui, 2016). The lack of significant discoveries in the Algerian upstream during the early 2000s' rounds is the main cause of the depletion risk (Darbouche, 2011). In turn, this was generated by the unattractive contractual terms offered to IOCs, which followed from Sonatrach's attempt to increase fiscal revenues and further assert its control over gas resources.

However, it can be argued that the failure of European firms to secure contracts in the Algerian upstream also stems from the approach to energy diplomacy adopted by the EC in negotiations with the Algerian counterparts. In particular, two main aspects of the EC's energy diplomacy are central for understanding such an outcome. The first aspect is related to the conventional wisdom within the EC that the political and economic spheres should be kept separate to avoid market distortions and resources misallocation³¹. This brought to a lack of diplomatic activism in the negotiations with the Algerian authorities, which is shown by the fact that only two official meetings between EC and Algerian officials for the discussion of energy issues took place in the 2000s (Weber, 2014). The other aspect concerns the content of the negotiations, and particularly the nature of the agreement proposed by the EC. In fact, rather than negotiating specific energy deals, EC officials have mainly advocated for Algeria to adopt a liberalised energy model³² (Weber, 2014). This was an ambitious diplomatic target, which would have allowed European firms to increase market power in the Algerian energy sector.

³⁰ This was stressed by a former CEO of Eni and Enel (Personal Interview 4).

³¹ A Head of Division of the European Investment Bank (Personal Interview 6) suggests that the EC approach contemplates the need to reconcile (i) principles of market competition and limited interference in the market; and (ii) objectives such as energy security, which require greater policy action due to market failures.

³² On this issue see also the *Mémoire d'entente sur l'établissement d'un Partenariat Stratégique entre l'Union européenne et la République algérienne démocratique et populaire dans le domaine de l'énergie*, signed in Algiers on 7th July 2013 by the EC President Manuel Barroso and the Algerian Prime Minister Abdelmalek Sellal.

However, the liberalisation of the Algerian energy sector would have neutralised the Algerian ruling elites' main lever of economic policy³³. This suggests that EC requests were not politically feasible. The widely different stances of Algeria and the EU left no room for negotiating traditional yet important aspects such as concessions for Exploration & Production (E&P), thus jeopardising the European energy firms' interests in the Algerian upstream.

The lack of an upstream phase for the European firms has not only contributed to the depletion risk, which negatively affects the interests in Galsi of both the Algerian and European stakeholders; it is also a major factor for European firms' unprofitability, because of the mark-up in price associated with Sonatrach's monopoly in the upstream. More generally, the involvement of Algerian and European stakeholders in separate phases of the supply chain – i.e. the lack of vertical integration – has made it impossible for them to align their interests. This has emerged in several occasions, causing prolonged contractual disputes.

The disputes concerned mainly the prices for the gas imports³⁴, as well as the partition of the financing of the different sections of Galsi. The price dispute was exacerbated by the deep fluctuations of the European hub gas prices, which ranged from \$10 to \$7.5/MMBtu in 2008-2010, reaching \$14/MMBtu in 2013 and falling to \$5/MMBtu and less a couple of years later.

The dispute over Galsi's financing emerged as a consequence of Sonatrach's demand to only be committed to the international offshore section and just for its 41.6% share, with the rest of the routes towards the Italian mainland to be financed by Snam³⁵. As a result of changing circumstances in the gas market (fluctuating gas prices and increasing competition from other

³³ This point is emphasized by a former manager of Enel (Personal Interview 2). Interviewee 2 stresses that the energy sector is extremely important in Algerian domestic politics, and hence that European political and corporate stakeholders must consider this aspect in the negotiations.

³⁴ This information on the disputes, provided by the trade journal *Hydrocarbons Technology*, is available at <https://www.hydrocarbons-technology.com/projects/algeria-sardinia-italy-gas-pipeline-galsi/>

³⁵ A former CEO of Eni and Enel (Personal Interview 4) identified the dispute over the financing of Galsi's different sections as one of the key elements for Galsi's stalemate. The dispute was eventually solved through an agreement between Galsi S.p.A. and Snam.

infrastructure), the bargaining power of the Algerian and European counterparts changed accordingly over time. This made it difficult to reconcile their different stances and align their interests.

Strictly political factors have also had a negative influence on the realisation of Galsi. The Italian government has initially stated its support to the project for several reasons. First, to prevent potential supply shortages from critical areas such as Libya and Ukraine. Second, to further contribute to make Italy the European hub for gas (Galsi, 2009b). Third, to comply with the EC's pressure to break Eni's monopoly over the Italian gas import infrastructure (Sartori, 2013). However, the merger of Edison with the French State-Owned EDF in 2008 contributed to turn the attention of the Italian government towards other projects, Eni-Gazprom's South Stream above all³⁶ (Prontera, 2017).

The EC initially included Galsi among the Projects of Common Interest (PCI), allocating €120m (European Commission, 2009). The pipeline contributes to two EU energy policy objectives, namely to break Eni's monopoly over the Italian gas import infrastructure and to improve European energy security³⁷. However, the project would contribute to the EC's priority of decreasing the European dependence on Russian gas only to a limited extent (Sartori, 2013). Furthermore, Galsi does not contribute to diversify the existing energy supply, because Algeria is already among the main suppliers.

As a result of commercial and political disputes, the initial conditions of profitability, which made Galsi an attractive investment and a PCI for the EC, ceased to exist. By June 2017, Galsi was considered not profitable from the viewpoint of capital expenditure by the Italian National Regulatory Authority (NRA), although it was still seen as socially desirable (ACER,

³⁶ However, a former manager of EDF (Personal Interview 3) states that EDF's merger with Edison cannot be fully ascribed to a political dispute between Italy and France, as the merger with Edison was launched by the EDF management without a formal consultation with the French government and concerned a privately-owned firm.

³⁷ On this point, a Head of Division of the European Investment Bank (Personal Interview 6) notes that projects that enhance market competition and energy security at the same time receive particular attention from the EC, as these two objectives are not always easy to reconcile in a single project.

2017). For this reason, NRA recommended to discard Galsi from the list of PCIs. The prolonged disputes and subsequent delays in the project schedule played a major role in raising costs. This made the project unfeasible when, in the 2010s, market conditions worsened because of a fall in demand and an increase in supply from competing projects.

To conclude, unbundling and lack of energy diplomacy were primary causes of Galsi's disputes and its subsequent stalemate. This suggests that the EU model of energy governance must be rethought to some extent, in order to ensure interest alignment between commercial and political stakeholders in European and exporting countries.

6. National vs EU energy governance from a Transaction Costs Economics perspective

The Transaction Costs Economics (TCE) approach provides a powerful lens to interpret the case studies' findings, and to draw policy implications. TCE conceives of firms' structure as the result of their advantages to internalize or outsource the different production phases (see Williamson, 1981 for a systematic exposition; see also Coase, 1937; Williamson, 1975, 2002, 2008, 2013; David and Han, 2004; Joskow, 1985, 2010, 2013). The internalization or outsourcing is based on the opportunity cost to 'buy or make', depending on whether the cost of a certain input is lower or higher in the market than if produced internally.

A fundamental aspect influencing the relation between transaction costs and governance structure is asset specificity. According to Williamson (1981), asset specificity is given mainly by (i) site specificity, which occurs when an asset cannot be moved and used in other geographic areas (e.g. gas pipelines); (ii) physical asset specificity, which arises when certain assets are project-tailored (e.g. offshore gas platforms); (iii) human asset specificity, which derives from investments in human skills that cannot be used in other production phases; and (iv) dedicated assets, which are conceived for supplying a specific customer.

Because it is impossible to exploit the asset differently from how it was initially conceived, there are limited options both for the buyer and the seller to exchange the commercial counterpart. This encourages the emergence of binding contractual relations, in which counterparts are locked-in with different bargaining power (Joskow, 2010). In a context of high specificity, the opportunity to internalise production (i.e. vertically integrate) stems from both the need to reduce the ‘production cost’ of a certain input by overcoming the counterpart’s market power, and from the potential ‘governance costs’ (e.g. negotiating disputes) arising in long-term contractual relations.

Gas in Europe can be considered as a specific asset in the sense described above. In fact, gas procurement in Europe is constrained by the availability of gas in foreign countries and by the economic and technical difficulties of importing it. Investments in E&P and transnational infrastructure are high and risky. Even more importantly, they are devoted to specific geographic areas (site specificity), project-tailored (physical asset specificity), and conceived to serve one or few specific customers; therefore, they cannot be employed for alternative uses (they are dedicated assets). As a result, the counterparts are locked-in once the investments are launched; this is especially true for the counterpart that is more exposed financially. This implies that the internalisation of upstream and midstream (i.e. vertical integration) is often³⁸ advantageous for European energy firms who have the financial and technical capability to afford it. Furthermore, vertical integration decreases the costs of being locked in with upstream producers and avoids the cost of frictions arising throughout the time of the contractual relation³⁹.

³⁸ The assumption is that gas prices are high, which is a structural feature of European gas markets. Therefore, the reasoning does not consider scenarios such as (i) extreme fluctuations in energy prices; or (ii) hypothetical future structural changes, such as large-scale domestic production of renewable energy or a significant fall in the price of gas imported through Liquefied Natural Gas, which would reduce the advantage of participating in the upstream.

³⁹ Although frictions may also occur between the different parts of a firm (Cyert and March, 1963), in situations of asset specificity these frictions are likely to be much less important than those arising in the market (Joskow, 2010).

However, full vertical integration is not always possible. In such cases, certain contractual arrangements might act as a partial substitute of vertical integration and help reduce both production and governance costs. For instance, joint ventures make it possible to ensure shared production in all phases of the supply chain, thus potentially mitigating the effects of the producing country's market power⁴⁰. Joint ventures also contribute to decrease contractual uncertainty and potential opportunistic behaviour of the counterpart with lower exposure to risk (Kogut, 1988; Hennart, 1991; Chang, Chung and Moon, 2013).

In the case of Greenstream, full vertical integration was not possible for Eni because the upstream is located in Libya, which, as every sovereign State, has full control over its natural resources. In contrast, the Libyan NOC could not vertically integrate from its upstream to the Italian downstream for financial and technical reasons. As a consequence, the creation of joint ventures between Eni and NOC, both in the upstream and midstream, ensured the internalisation of upstream production to Eni, lowering production costs⁴¹. In addition, the joint venture made it possible to reduce potential opportunistic behaviour of the NOC, which was initially less exposed in terms of upfront costs (e.g. investments in E&P). NOC's commitment to the project stems from its direct interest as a major shareholder, which entails access to Eni's technology and revenues deriving from exports.

In the case of Galsi, the lack of joint ventures in the upstream has prevented European firms from vertically integrating. This would result in greater production costs for European firms, as gas is supplied by Sonatrach at a higher cost than if produced internally. Furthermore, it caused price disputes among stakeholders, which were not mitigated by the adoption of long-term contracts, despite the fact that the latter are often seen as a partial substitute of vertical

⁴⁰ However, profitability also depends on the firm's ability to negotiate favourable terms with the producing country (e.g. overall government take and taxation).

⁴¹ In the aforementioned interviews, a former board member of Eni and Snam (Personal Interview 1) and a former manager of Enel (Personal Interview 2) emphasized the importance of vertical integration to lower production costs, whilst a manager of Rosetti Marino S.p.A. (Personal Interview 5) stressed the positive role of joint ventures to align interests and therefore to minimise governance costs.

integration, though to more a limited extent than joint ventures (Joskow, 1985). In fact, long-term contracts are effective in hedging risk against gas market fluctuations and ensure returns to infrastructure investments (Joskow, 1985; 1987; Neumann and Hirschhausen, 2008; Hauteclouque and Glachant, 2009). The returns from infrastructure investments are guaranteed by the importer's commitment to buy certain amounts of gas annually at a fixed price for a long period. However, as the case of Galsi shows, in certain cases long-term contracts cannot reduce transaction costs, as the interests of counterparts (exporters and importers) tend to diverge as a result of their involvement in different phases of the supply chain. In this context, changes in external variables such as gas price would shift the bargaining power, potentially exposing either counterpart to opportunistic behaviour⁴². As a result, the case of Galsi shows that the EC stance on unbundling, particularly in the context of trans-European supply chains, runs counter to the insights provided by TCE.

In addition, this paper shows that the adoption of TCE's contractual perspective helps shed light on another relevant factor affecting the profitability of energy deals: the role of energy diplomacy. The paper argues that energy diplomacy plays a decisive role in reducing energy firms' production costs as it helps them negotiate favourable deals to access the foreign upstream, making it possible to vertically integrate. A systematic diplomatic effort also helps reduce governance costs, by establishing long-term governance mechanisms among political and economic actors, thus increasing trust and mutual benefits. This was evident in the extremely advantageous EPSA granted to Eni thanks to the Italian cooperation in other political-economic sectors, which in turn have contributed to the profitability of Greenstream. Diplomatic activism, in addition to pre-existent strong diplomatic ties, ensured smooth

⁴² When Galsi was conceived in the early 2000s, Sonatrach had great bargaining power, as the gas price was relatively high and global supply was relatively low. Subsequently, Sonatrach's bargaining power decreased for different reasons: a decrease in global gas prices, Sonatrach's major investments in Galsi's domestic sections, Algerian gas wells' depletion risk and, to a certain extent, the EU diversification strategy.

negotiations between Eni and NOC both during project realisation and after completion, namely when the project was in the operational phase.

In this sense, Galsi's unprofitability too shows the importance of reliance on energy diplomacy. From a 'production cost' perspective, the lack of well-established diplomatic relations has prevented European firms from operating in the Algerian upstream with favourable terms. In fact, EU diplomacy did not offer attractive compensations to the Algerian counterparts (see section 5). From a 'governance cost' perspective, the lack of such political-economic mechanisms has opened the way for enduring disputes and frictions among the stakeholders, which have brought the project to the current stalemate.

In conclusion, the paper suggests that reliance on energy diplomacy, whether at national or supranational level, is a powerful factor that can help shape both 'production' and 'governance' costs, not only because the commercial deals involve different political entities, but also because the diplomatic element acts as a powerful tool to reduce transaction costs in binding contractual relations. The effectiveness of energy diplomacy stems from the possibility to offer attractive deals in a wide range of economic and political domains in return for energy deals, thus aligning interests between importing and exporting energy firms. In particular, it incentivizes vertical integration and helps reduce potential frictions in both the *ex-ante* (negotiation and construction phases) and *ex-post* (operation phases) relations. Seen in this light, energy diplomacy represents a partial substitute to vertical integration when the latter is not possible, for instance because specific production phases (i.e. upstream) are located abroad and their exploitation is subjected to foreign political authorities. The contribution of energy diplomacy to mitigate transaction costs can work in combination with contractual arrangements, such as joint ventures, which are usually adopted for this purpose. This combination would arguably reach results close to those which can be achieved by full vertical integration when asset specificity acts as a constraint. The foregoing considerations, based on

empirical evidence of Greenstream's and Galsi's (un)profitability, leads to envision the importance of enhancing the theoretical apparatus of TCE to include diplomatic aspects.

7. Conclusions and policy implications

The policy dispute over the gas sector between the Italian State industry and the European Commission (EC) has led to two hybrid models of transnational gas governance: a national model characterised by a vertically integrated public monopolist, but with some innovations, represented by Greenstream; and a EU-inspired model characterised by unbundled private firms in competition with each other, but with some traditional aspects, represented by Galsi. The innovations in the respective models, namely Eni's partial privatisation (Greenstream) and the persistence of State shares in the European firms (Galsi), seem to be the result of a compromise between the EU's push towards privatization and the Italian state industry's effort to retain strategic public assets. However, the mix of public and private assets has generated different outcomes in the governance of two projects: whereas Greenstream has benefited from the efficiency deriving from Eni's private management, Galsi has suffered from the coexistence of public ownership of different countries with different political objectives. This shows that projects' profitability depends not only on factors such as production costs, but also on how interests are reconciled in the supply chain. Galsi, for example, despite needing a substantially lower capital expenditure than Greenstream, has suffered from prolonged disputes that contributed to its commercial unviability.

The paper argues that vertical integration is an essential element for interest alignment, and has played an important role for the (un)profitability of Greenstream and Galsi. This was shown by adopting the lens of TCE, which suggests that, in case of asset specificity, vertical integration is desirable to reduce transaction costs. The specificity of gas in Europe is evident in European firms' binding contractual relations with non-EU producers, as assets dedicated to

production and provision of gas in the foreign upstream and international midstream are ‘transaction-specific’ and cannot be used for alternative purposes. This explains why European firms tend to internalise production, both to avoid high costs of import and to minimise frictions in the relation with producing countries.

Eni’s joint ventures with the Libyan NOC in the production and transport phases allowed Eni to vertically integrate, thus contributing to Greenstream’s profitability. In contrast, the lack of vertical integration in the Algerian upstream raised concerns over the profitability of the energy deals, hence on the opportunity to finance Galsi. The failure to internalise production entailed higher costs of imports and frequent price disputes with the Algerian upstream producer Sonatrach. The decision to stipulate long-term contracts between European firms and Sonatrach, which are usually effective in hedging the risk of infrastructure investments, did not prevent governance frictions. Joint ventures can be more effective for this purpose, as they make it possible for the European and North African counterparts to share the same interests in all supply chain phases when market conditions change (e.g. gas price or supply from competing infrastructure).

The analysis suggests that energy diplomacy is another key element for profitability in transnational energy deals. In the case of Greenstream, Italy’s diplomatic effort secured very advantageous concessions for Eni in the Libyan upstream and smooth contractual relations. By contrast, the fragmented framework of European political interests in Galsi, the lack of systematic diplomatic commitment, and the nature of deals proposed by the EC have produced disadvantageous contractual conditions for the European energy firms. It is true that in the case of Galsi the EU diplomacy could not leverage on factors such as international isolation, as had been the case for Italian diplomacy vis-à-vis Libya. However, it could have arguably taken advantage of several strengths characterising the EU, such as its economic power and its appealing position as a trade partner.

The analysis above suggests the need to extend the TCE theoretical framework to include diplomatic aspects. In particular, in the same way as the internalization of production stages requiring asset-specific investments decreases transaction costs, the internalization of energy diplomacy might lead to a similar outcome. In particular, energy diplomacy helps domestic firms secure favourable energy deals; it also contributes to reduce potential frictions in both *ex-ante* and *ex-post* contractual relations. The reduction of transaction costs stems from the potential to align mutual interests by offering deals in other sectors of the economy and fields of political cooperation. As a result, the internalisation of energy diplomacy can act as a partial substitute to vertical integration, in addition to contractual arrangements (e.g. joint ventures) that are usually adopted for this purpose, thus minimising transaction costs as much as full vertical integration would do.

The internalisation of energy diplomacy was evident in the ‘national’ model, as State ownership of energy firms entailed the involvement of State officials and diplomats at different managerial levels. This implied also a smoother coordination with diplomatic bodies external to the firm, maximising the synergies between corporate and State diplomacy. In contrast, the ‘EU’ model does not (in principle) contemplate the internalization of energy diplomacy in the strict sense (i.e. public ownership). However, it could envision the adoption of an approach to energy diplomacy that is externalised from the firm but generates similar effects. For example, it could work on the creation of diplomatic platforms for the negotiation of energy deals between EU and non-EU firms.

Negotiating energy deals on the basis of trade agreements could be crucial for reconciling the diverging approaches to negotiation of EU and non-EU producing countries. In fact, whereas the EU’s approach focuses on mutual liberalisation of energy markets and trade, producing countries tend to maintain political control on the energy sector. So far, the EU energy diplomacy has instead ranged from the absence of intervention to overly ambitious

targets such as the request of energy market liberalisation to non-EU counterparts (beside Galsi, see the case of the Nabucco pipeline). The latter approach, although being probably the most suitable for European interests, was often rejected by non-EU counterparts as it deprives them of their bargaining power. The stalemate of Galsi and other projects (e.g. Nabucco) shows that obtaining direct access to non-EU energy resources requires a major commitment to political-economic cooperation, as was the case in the ‘national’ energy model.

In conclusion, the negotiation of energy deals within EU trade agreements, and the creation of a EU energy diplomacy that also suits the interests of non-EU producing countries, can greatly contribute to reconcile energy security and domestic market competition in the energy sector, in line with the EU Single Market policy. In fact, this approach would help new entrants vertically integrate by acquiring shares of production in the foreign upstream. This would be crucial for increasing their competitiveness vis-à-vis the vertically integrated domestic incumbents (i.e. the former monopolists), as it would grant them direct access to foreign gas resources without depending on incumbents’ imports. Therefore, the existence of competing vertically integrated supply chains could represent the starting point to increase market competition in Europe, but also to diversify the sources of gas procurement through profitable transnational infrastructure, which is essential for energy security.

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Personal interviews

1. Interview with former minister of industry and former board member of Eni and Snam, 15 July 2015, Bologna.
2. Interview with a former manager of Enel, 30 September 2015, Rome.
3. Telephone interview with a former manager of EDF, 1 February 2018, London-Paris.
4. Interview with a former CEO of Eni and Enel, 8 June 2016, Cambridge UK.
5. Interview with a former manager of Rosetti Marino S.p.A., 21 July 2015, Bologna.
6. Interview with a Head of Division of the European Investment Bank, 31 January 2018, London.

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