



ENERGY INTERDEPENDENCE. THE LINKAGE OF THE POLITICAL ECONOMY OF ALGERIA'S NATURAL GAS WITH THAT OF THE WESTERN MEDITERRANEAN REGION. A METHODOLOGICAL APPROACH

Roger Albinyana, Aurèlia Mañé-Estrada ¹

University of Barcelona

Abstract:

There is a chronological parallelism between the surge of the natural gas sector in the Western Mediterranean and the setting up of the post-colonial Algerian economy in the early 1970s, which has led to the accretion of a series of cross-border and regional relationships of dependency. Because of Algeria's overwhelming financial dependence on hydrocarbon resources (via economic rents), any attempt to modify the power relationship within its regional gas chain would immediately alter the way its political economy functions. This article presents a first outline of a methodological proposal aimed at analysing how the integration of the Algerian gas sector into regional gas chains in the Western Mediterranean affects the internal functioning of a rentier economy such as Algeria. By exploring the literature that helps capturing the relational effect between the Algerian domestic economy and the regional gas & oil structure of governance, the article suggests some analytical tools with the aim to evaluate the capacity of power and influence of each of the agents involved in the energy chain, from both Algeria and the other countries in the region.

Keywords: Algeria, Western Mediterranean, natural gas, energy, regional integration, global value chain, global commodity chain, rentier state

Título en Castellano: *Interdependencia energética: el nexo de la economía política del gas natural de Argelia con el Mediterráneo occidental. Un enfoque metodológico*

Resumen:

Existe un paralelismo cronológico entre el surgimiento del sector del gas natural en el Mediterráneo Occidental y el establecimiento de una economía poscolonial argelina a principios de los setenta, que ha llevado a la acumulación de una serie de relaciones de dependencia transfronterizas y regionales. Debido a la abrumadora dependencia financiera de Argelia de los recursos de hidrocarburos (a través de rentas económicas), cualquier intento de modificar la relación de poder dentro de su cadena regional de gas alteraría inmediatamente la forma en que funciona su economía política. Este documento presenta un primer esbozo de una propuesta metodológica destinada a analizar cómo la integración del sector del gas argelino en las cadenas de gas regionales en el Mediterráneo occidental afecta el funcionamiento interno de una economía rentista como la argelina. Al explorar la literatura que ayuda a capturar el efecto relacional entre la economía interna de Argelia y la estructura regional de gas y petróleo de gobierno, el documento sugiere algunas herramientas analíticas con el objetivo de evaluar la capacidad de poder e influencia de cada uno de los agentes involucrados en la cadena de energía, tanto de Argelia como de otros países de la región.

Palabras Clave: Argelia, Mediterráneo occidental, gas natural, energía, integración regional, cadena de valor, Estado rentista.

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¹Roger Albinyana is a Ph.D. candidate, Faculty of Economics, University of Barcelona. Director of Euro-Med Policies Department, IEMED, E-mail: roger.albinyana@economistes.com. Aurèlia Mañé-Estrada is professor at the Faculty of Economics, University of Barcelona & University of East-Anglia. E-mail: amimanager@ub.edu DOI: <http://dx.doi.org/10.31439/UNISCI-2>



1. Introduction²

This article presents a first outline of a methodological proposal aimed to analyse how the integration of the Algerian gas sector into regional gas chains in the Western Mediterranean³ affects the internal functioning of a rentier economy such as Algeria. This article intends to contribute to the analysis of the political economy of energy in North Africa, in particular of Algeria, by connecting the exploitation of its gas fields with the transportation and commercialization of natural gas to the final markets in Southern Europe.

Whereas Algeria's overwhelming financial dependence on hydrocarbon resources (via economic rents) is directly linked to its decision-making capacity within the regional gas chain, the article aims at offering tools to assess how any attempt to modify the power relationships within its regional gas chain will immediately alter the way its political economy functions. Hence, to demonstrate theoretically that the relational nature of the domestic dimension of the political economy of the Algerian gas vis-à-vis the political economy of gas in the Western Mediterranean region as a whole is meaningful.

The article also explores the literature that helps to catch up the relational effect between the Algerian domestic economy and the regional gas & oil structure of governance. To this end, we aim at conceptualizing a methodology that underpins the literature on development economics, rentier states and international political economy, and how the latter can be applied to the examination of the natural gas value chain and production network in the Western Mediterranean (from the gas fields in Algeria to the final consumers in the north western Mediterranean countries). We will couple it with analytical frameworks such as the Global Commodity Chain (GCC), Global Value Chain (GVC) and Global Production Network (GPN) that place at its core focus the concern with regionally inter-organisational relationships that underpin the power and value dynamics therein.

Based on this methodology the article suggests two complementary analytical tools, one qualitative and one quantitative, with the aim to evaluate the capacity of power and influence of each of the agents involved in the energy chain (companies and governments of the countries where the gas value chain's activity takes place). The resulting outcome may prove to be robust and consistent enough as to determine how the existing linkage between the domestic and the regional sides help to explain Algeria's political economy and why researchers need to consider this relational nature when trying to understand the past, present and future decisions of that country.

More broadly, we defend that these analytical tools could also be useful as to underscore the nature of integration (symmetrical or asymmetrical) that takes place between different companies that participate in regional value chains and between the latter and governments of

² The contribution of Aurèlia Mañé-Estrada is the result of the R&D projects "The international dimension of political transformations in the Arab-Islamic world", (CSO2014-52998-C3-3-P), and "Crisis and regional change processes in North Africa. Implications for Spain" (CSO2017-84949-C3-3-P) funded by the Ministry of Economy, Industry and Competitiveness (MINECO), the State Research Agency (AEI) and the European Regional Development Fund (FEDER).

³ From an institutional standpoint, the geopolitical term "Western Mediterranean" brings together ten countries, five from the north Western and five from the south-Western Mediterranean. For the purposes of this paper, the term "Western Mediterranean" refers to a regional *geo-energy* limited space built upon transnational and cross-border natural gas transport projects and significant LNG trade flows, which have led to a set of energy relationships and physical interconnections amongst different public and private agents from Algeria, France, Italy, Morocco, Portugal, Spain and Tunisia.



those territories across which natural gas flows from producers to consumers. At this point, we assume that the more symmetrical and entangled a *geo-energy space* becomes, the more stable and therefore secure these relations will be; while if asymmetry emerges, the greater the possibility will be of conflict among them, due to the antagonism of interests.

The article is structured in three sections. First, we briefly review the surge of the natural gas sector in the Western Mediterranean countries, and how there is a chronological parallelism between the emergence of the gas sector in the Western Mediterranean and the setting up of the post-colonial Algerian economy in the early 1970s, which is both undeveloped and rentier, being heavily dependent on the rents accrued from exploiting the country's natural gas and oil. Likewise, since the 1970s southern European countries started relying on multiple sources to meet their gas consumption requirements, most notably from Algeria, which prompted the emergence of a *geo-energy space* in the gas sector among the Western Mediterranean countries, leading to the accretion of a series of cross-border and transnational relationships of dependency.

Secondly, the article aims to assess the main features of the Algerian political economy in order to show that most of the explanations about the functioning of the Algerian economy, especially those related to its rentier behaviour and the 'resource curse', are not comprehensive enough because they do not catch the relational factor, which is the one that GCC/GVC/GPN approaches provide.

Thirdly, the article reviews the literature of these approaches to relate it to the case of the gas chain in the Western Mediterranean. Last, but not least, in this section the article proposes two innovative analytical tools.

2. Historical and relational nature of Algeria's geo-energy space

2.1 The surge of a natural gas sector in the Western Mediterranean countries

In the case of north Western Mediterranean countries (Italy, France, Spain and Portugal) dependency on imported natural gas has been even higher than the average European countries, in spite of domestic consumption of natural gas grew slowly through the 1960s and 1970s, remaining below 20 bcm⁴ per year until 1974⁵, as reflected in Figure 1. The EU-28 energy dependency rate reached 69,3% in 2015, whereas for Spain reached 96,9%, for Italy 90,3% and for France 98,7%⁶.

Italy and France that are the highest natural gas importers and consumers in the region are not countries well endowed with domestic primary energy resources. In the aftermath of the Second World War period both countries followed the rest of Western Europe in switching from a coal to a petroleum-based energy system, with the significant caveat that Italy would take an early lead in utilising gas resources⁷. Unlike Italy, the first oil crisis of 1973, prompted France to embark on a major nuclear power programme to ensure its energy independence, whereas Italy made significant gas discoveries in the Po Valley of northern Italy, which

⁴ Billion cubic metres

⁵ Data available in *BP Statistical Review of World Energy*, at <http://www.bp.com>

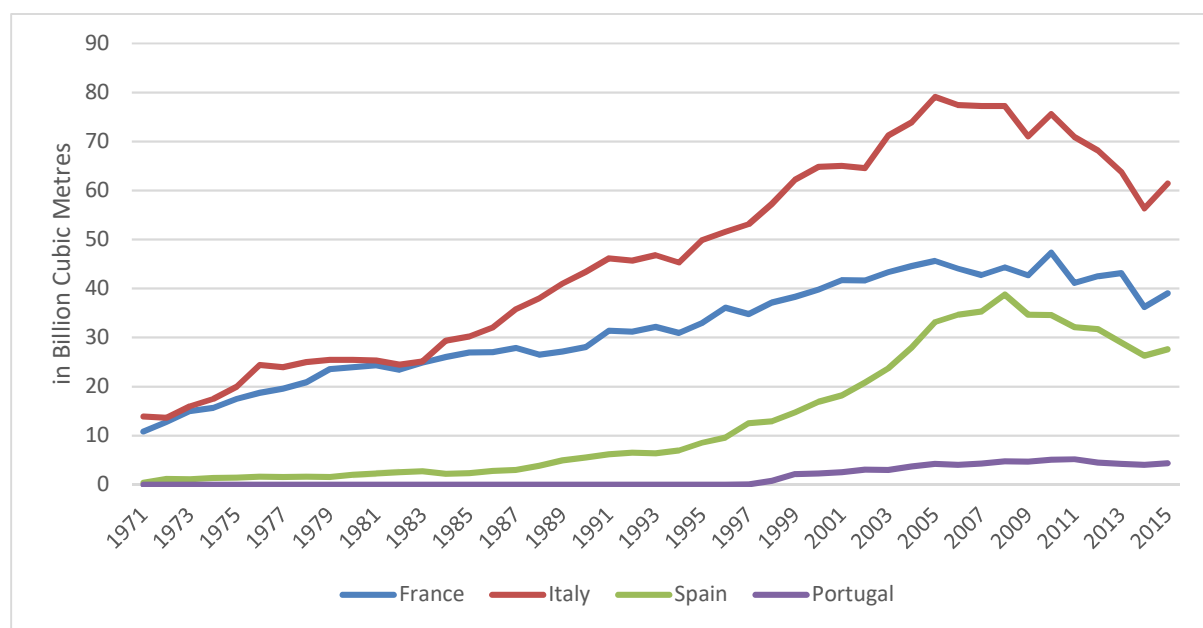
⁶ According to the statistical office of the European Union (Eurostat) (2018), in <http://ec.europa.eu/eurostat/>

⁷ Darmstadter, Joel *et al.* (1971): *Energy in the world economy: a statistical review of trends in output, trade and consumption since 1925*, Baltimore, John Hopkins Press.

propelled major Italian firms into a virtuous circle of growth by exploiting natural gas resources⁸.

In contrast, Spain and Portugal followed a different path, despite not being endowed with plentiful domestic energy resources like France and Italy. Transition from coal to hydrocarbon-based energy model came very late during the 1960s at a time in which oil prices were quite low. In 1975, an agreement between Enagas and Sontrach was signed for the delivery, from 1979 and for a period of 20 years, of a volume of LNG which exceeded the needs of the Spanish economy in the midst of a deep economic crisis⁹. Disagreement over the quantities, price and supply conditions of Liquefied Natural Gas (LNG) was one of the central issues in Spanish-Algerian relations and contaminated the bilateral agenda during the period of 1982-1985¹⁰ and it was not until the beginning of the 1990s that thanks to the opening of the Spanish gas and electric power markets spurred new investment, particularly in the new gas-fired power generation¹¹. The improvement of bilateral relations with North Africa also stimulated a burgeoning gas market and the building of new interconnections along the Maghreb countries; infrastructure that Italy had built at a much earlier stage. In its turn, Portugal has never relied too intensively on gas resources as reflected in Figure 1.

Figure 1. Consumption of natural gas in the north Western Mediterranean (1971-2015)



Sources: Own elaboration from BP and IEA (2016)

Precisely because the north Western Mediterranean countries, in particular Italy, France and Spain were seeking to expand natural gas consumption, whilst massive proven gas reserves

⁸ Pozzi, Daniele: “Techno-Managerial Competences in Enrico Mattei’s AGIP: A Prolonged Accumulation Process in an International Network, 1935-1965”, *Business and Economic History*, vol. 1 (January 2003)

⁹ Portillo, Juan María (2000): *El papel del gas natural en las relaciones hispano-argelinas: 1970-1985*, Madrid, UNISCI.

¹⁰ Hernando de Larramendi, Miguel y Mañé-Estrada, Aurèlia (2012): “Las relaciones hispano-argelinas durante los gobiernos de Felipe González (1982-1996)”, en Marquina, Antonio (ed.): *Las relaciones hispano-argelinas. Contexto histórico, desafíos y proyectos comunes*, Madrid, Foro Hispano-Argelino, pp. 42-68.

¹¹ Mañé Estrada, Aurèlia: “L’intégration du gaz algérien dans le système énergétique espagnol”, *Confluences Méditerranées*, Vol. 71 (Automne 2009), pp. 135-152.



were found in Algeria, projects to import gas from the latter via pipeline or by ship were proposed and discussed at the highest levels of government and in state-owned energy companies during the second half of the 1970s. For different purposes that we will assess later on, Italy and France managed to succeed at quite early stage, whereas Spain and Portugal did not tap their opportunities until 1990s. Table 1 shows trade volumes of natural gas between Algeria and the four countries in the north Western Mediterranean area in 2006 and in 2016. During these ten years span, trade volumes have remained quite stable with a relatively weak decline in demand as result of diversification of imports amongst the observed EU countries and the lower production capacity of natural gas offered by Algeria.

Table 1. Natural gas trade volumes from Algeria (in bcm)

		2006	2016
Italy	By pipeline	24,46	17,2
	LNG	3	0,1
France	By pipeline	-	-
	LNG	7,35	6,2
Spain	By pipeline	8,62	11,8
	LNG	2,8	2,9
Portugal	By pipeline	2,1	1
	LNG	-	0,25
Rest of Europe	By pipeline	0,44	2,5
	LNG	5,8	0,9
Rest of the world	By pipeline	1,3	4,6
	LNG	5,73	5,5

Sources: Own elaboration from BP and Eurostat

2.2 The surge of the natural gas sector in Algeria

Major gas discoveries in Algeria date back to the period between 1954 and 1959 during the times of French colonial rule. In 1961 Hassi R'Mel field commenced production, initially to supply the cities of Algiers and Oran¹². After a long war against the colonial ruler France, Algeria achieved independence in July 1962. Within eighteen months the first state enterprise, the *Société Nationale pour le Transport et la Commercialisation des Hydrocarbures* (Sonatrach) was founded to engage in the oil and gas businesses.

The world's first commercial gas liquefaction plant was developed in Arzew (north of Algeria) in 1964, with the Algerian company CAMEL (Compagnie Algerienne de Methane Liquide) shipping LNG to the UK and later to France¹³. Sonatrach would later assume control of the operation and contract. The liquefaction of natural gas is completely dependent on export markets and was, until the building of the first gas interconnection pipelines, the only option to export gas. Gas exports quickly became a focus of the Algerian government as the latter increased its control over the country's oil and gas resources, although in 1980, they represented

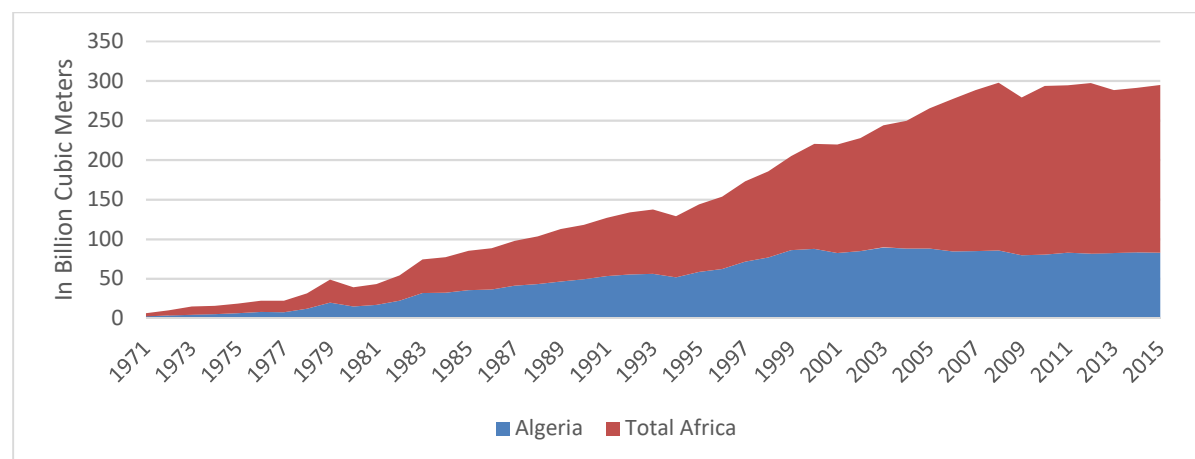
¹² Aïssaoui, Ali (2001): *Algeria: The political economy of gas and oil*, Oxford, Oxford University Press

¹³ Aïssaoui, *op. cit.*, pp. 154-156.



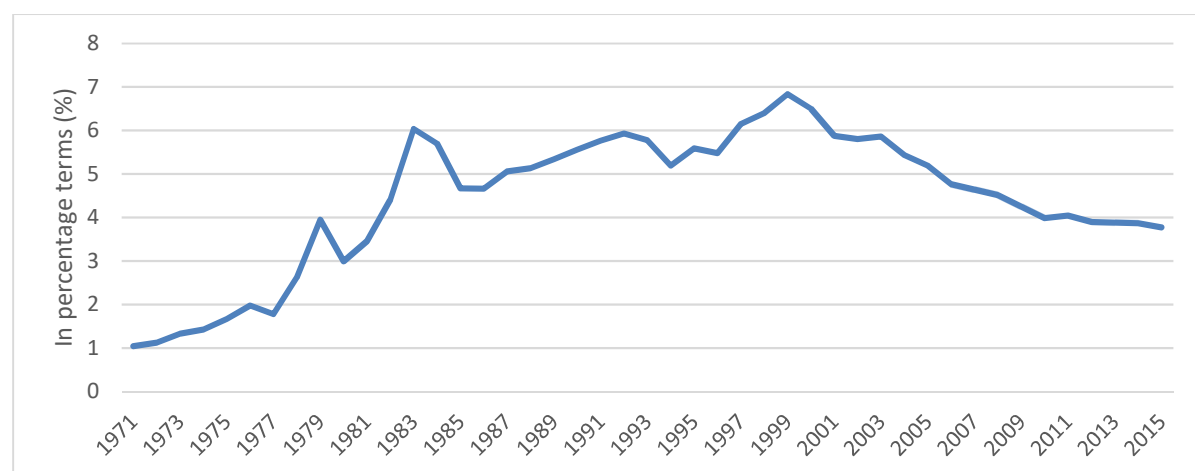
only 12.88%¹⁴ of the country's total hydrocarbon exports, and it was not until the turn of the century that it surpassed oil as an export item.

Figure 2. Production of natural gas in Algeria and total in the African continent (1971-2015)



Source: BP (2016)

Figure 3. Share of Algeria's natural gas production in world production excluding the two main producers (Russian Federation¹⁵ and the US)



Source: own elaboration from BP (2016)

As shown in Figures 2 and 3, during the 1960s and most of the 1970s Algeria was mainly focused on the exploitation of the oil industry in spite of Algeria's modest potential as producer in comparison with gas. The development of the country's comparatively abundant gas resources would only be given full consideration in the second half of the 1970s when the corresponding policies were incorporated into the 1976 National Charter and marked the shift from oil to natural gas as the main focus of energy policy. The accession of Algeria into the OPEC in 1969, the late coming demand of natural gas from southern European markets, as well as the failed attempt to export big amounts of LNG to the United States (contracts signed with

¹⁴ Ministère d'Énergie et Mines de l'Algérie, at <http://www.energy.gov.dz/francais/>.

¹⁵ Before 1985, the data comes from the USSR



Tenneco and El Paso Natural Gas Company II that were never approved by the US administration and failed to come into force¹⁶) delayed the required massive capital investments to properly exploit and process the available natural gas resources.

Foreign events also favoured this radical shift in gas export policy. Rising OPEC power and the aftermath of the Iranian Revolution resulted in sky-rocketing oil prices. The volumes of Algerian oil exports remained relatively constant, but surging prices created overflowing exports revenues. The mind-set among hydrocarbon exporters was that greater export revenues could be generated from higher prices than from higher export volumes¹⁷. In this context, the Algerian and Sonatrach leadership saw the opportunity to push for price increases for its gas exports in line with the high oil prices.

A few years earlier, from 1965 until 1969 under the presidency of Hourari Boumediene, Algeria pursued state control of all strategic assets in the country, including the hydrocarbon industry. This led to bitter negotiations with the former colonial ruler France, which tainted relations for decades to come.

Energy cooperation between Algeria and France prior to 1971 was underpinned by the Evian Accord (1962), which ruled the transition from the independence war to statehood and established new principles for the exploitation of Algeria's hydrocarbon resources, and by the Franco-Algerian Agreement (1965), which introduced a more balanced framework for co-operation in the hydrocarbon sector. Yet for Algeria, profound disputes with France over oil prices and the tax regime prevailed during the implementation of the 1965 Agreement. The latter, coupled with Algeria's membership into the OPEC that offered Algeria diplomatic backing during its disputes with France, as well as an increasing nationalist narrative fuelled by president Boumedine and his government, created in 1971 a perfect storm for nationalisation to be decided upon. By 1971 the government had assumed control over the hydrocarbon industry, Sonatrach assured complete control over gas production and transmission in a context characterised by a nationalist energy policy¹⁸ as nationalisation was defined as "an act of liberation of great political significance"¹⁹. Therefore, since then, Algeria's political fortunes have been tied to that of its hydrocarbon sector.

Whereas gas trade cooperation between Algeria and the countries in the Iberian Peninsula was almost non-existent²⁰ in those years, Italy that was the largest gas producer and consumer in Western Europe in the 1960s²¹ and whose authorities had promoted courtship with the insurgent FLN²² in Algeria, managed to secure a first contract in 1973 to supply Algerian gas to Italy²³. Nonetheless, it was not until 1979 that the construction of the first sub-sea gas

¹⁶ Aït Laoussine, Nordine Ait: "LNG Exports, a Contribution to World Energy Supplies in the Decades to Come", *OPEC Review* (October 1977), pp. 21-35,

¹⁷ Aïssaoui, *op. cit.*

¹⁸ See Mañé, *op. cit.*

¹⁹ *Charte Nationale Algerienne*, at https://www.joradp.dz/JO8499/1986/007/F_Pag.htm, p.131

²⁰ The Spanish gas utilities company *Catalana de Gas*, under the bright leadership of Pere Duran Farell, succeeded in bringing a first LNG carrier in Barcelona in 1969. See Mañé, *op. cit.*; and Thieux, Laurence and Jordá, Almudena: "Estudios de caso de la política exterior española hacia el Mundo Árabe y Musulmán: Argelia", *Revista de Estudios Internacionales del Mediterráneo (REIM)*, nº 12 (2012), pp. 69-86

²¹ See Darmstadter, J. et al., *op. cit.*

²² Front de Libération Nationale. Political movement established in 1954 to liberate Algeria from colonial ruler France, and which has dominated the country's institutions since independence in 1962

²³ The contract was signed by the Italian hydrocarbon utilities company Ente Nazionale Idrocarburi (ENI) and the Algerian Sonatrach for 11.25 bcm of gas per year over 25 years



pipeline between Algeria and a foreign country (Italy via Tunisia) did not begin, the known Transmed project, which could not start operating until 1983 after a lengthy renegotiation of the gas prices, which did also have impact on the LNG import prices for France. Similarly, but at a much later stage in 1996, the Gaz Maghreb Europe pipeline was finally built, spanning Morocco and passing under the Strait of Gibraltar to bring Algerian gas to Spain and from there to Portugal. In addition, a third under-sea pipeline directly connecting Algeria and Spain was inaugurated in 2011.

Hence, the year 1971 earmarks a shifting point in the development course of Algeria's hydrocarbon sector, because this was the year when SONATRACH and the hydrocarbon sector became the source of the political power in Algeria, and one of the main elements that formed the post-colonial Algerian Social Contract. Therefore, SONATRACH, being the National Oil Company (NOC)²⁴ became the main *instrument of political intervention*²⁵.

Therefore, from an energy cooperation standpoint, as well as others, there is little doubt that the 1971 nationalisation process of the gas and oil industries in the country has more implications than the 1965 independence process in defining the type of relations that Algerian NOC would be forging with its Western Mediterranean counterparts IOCs²⁶ in the pathway toward energy cooperation.

We cannot speak of the latter by then, but we can set in 1971 a starting point from which different agents –public and private- from different countries in the Western Mediterranean are in operation to progressively build up an architecture of institutions and processes –formal and informal, public and private-, which will contribute to the formation of a new *geo-energy space*^{27,28}, which shaped the regional power relations between Algeria and its Western partners. That is why, considering the specific elements that conform the political economy of Algeria, by forging this relational community, one can no longer address the domestic dimension of the gas industry without properly incorporating the regional and external dimension therein.

If we look at the recent evolution in the production of Algeria's natural gas, one will conclude that it has maintained a rather stable trend, in spite of the last financial and economic crisis, in comparison with the world's largest producers. In Figure 4, we can assess the evolution of production of gas for the main world producers since the year 2000, including Algeria's which ranks number nine.

²⁴ National Oil Company (NOC) is a commonly used term to refer to state-owned upstream companies, which might also engage in midstream activity, and which serve as an instrument of national, public intervention with the main objective of generating as much national income as possible for the producing country. With the passing of the time, some of these companies have become transnational, and thus have been used as instruments to gain power on the regional or international stage, see The World Bank Group: "The Petroleum Sector Value Chain", (June 2009), Washington DC.

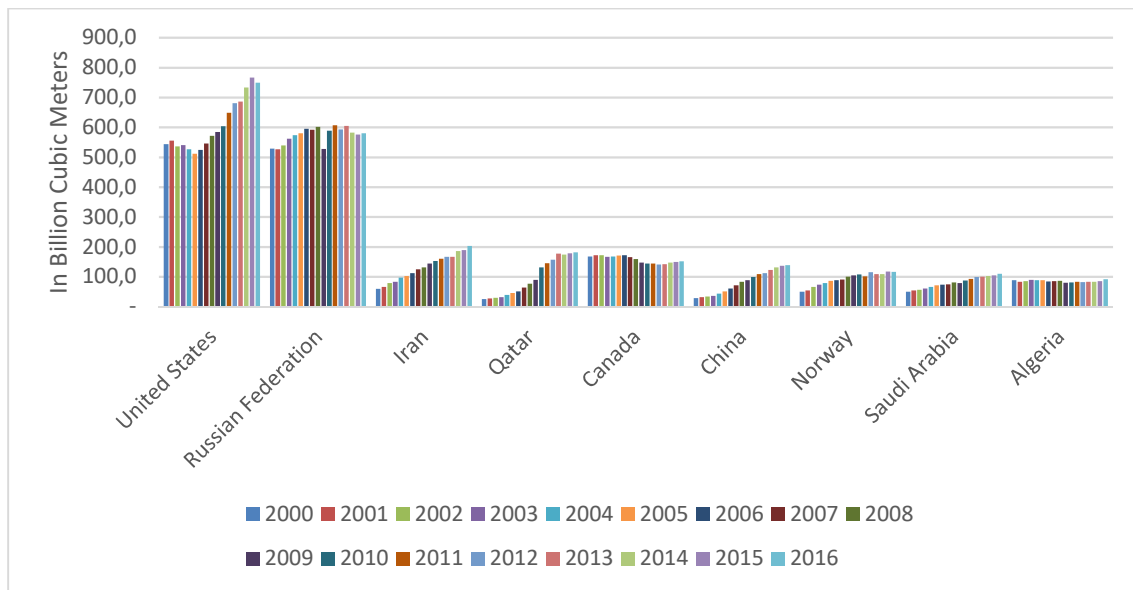
²⁵ See SEEP (2014): *Rapport Général. Second Plan Quadriennal, 1974–77*, Alger, p. 49

²⁶ International Oil Company (IOC) or Private Oil Company (POC) are commonly used terms to refer to large, integrated, private and transnational energy companies that are clustered around the International Energy Agency (IEA). Their main objective, like most of private companies, is to obtain as much profit as possible, see The World Bank Group: "The Petroleum Sector Value Chain", (June 2009), Washington DC.

²⁷ A geographical space where a precise set of relationships take place, among different agents, be them *producer states, enterprises and consumer governments*, who are active within it (see further reference in section 3.3)

²⁸ Mañé-Estrada, Aurèlia: "European energy security: Towards the creation of the *geo-energy space*", *Energy Policy*, Vol. 34, nº18 (December 2006), pp. 3773-3786.

Figure 4. Production of natural gas of the world's largest producers (2000-2016)



Source: own elaboration from BP (2016)

During the last decades, the emergence of a *geo-energy space* in the Western Mediterranean has placed Algeria at the heart of the model. Even regional rivalries (i.e. between Morocco and Algeria) or domestic instability (Algerian civil war) did not prevent the sector to develop itself throughout the area. The regional market has been dominated by IOCs from Southern Europe, together with local monopolies from the Maghreb and managed through Long-Term Contracts, which are at the same time an incentive for investors on the basis of stability, and a barrier for innovation, productivity... due to the stable nature of the contracts.

In this regard, most of the applied methodologies that aim at analysing the development trends of Algeria on the basis of the expansion and consolidation of its oil and gas industry miss the relational linkage through which production is organised via inter-firm networks that exceed the boundaries of the nation state. As we have reviewed in the present section, in the case of the natural gas market, these networks are shaped in the form of vertical micro-economic integration across the Western Mediterranean region. That is the reason why in the next section we will be revisiting the theoretical basis that help us understand the political economy of Algeria's natural gas by looking into the literature on development economics, rentier states and international political economy. This is a necessary step before in section 3 we look at methodologies to integrate the Algerian gas sector into regional gas chains in the Western Mediterranean.

3.Reviewing the theoretical basis as to assess the political economy of Algeria's gas

In this section we aim at conducting a brief theoretical and methodology literature review that will enable us to frame the domestic problem that we intend to deal with: by revising the literature that covers the problem of hydrocarbon-rich economies and development, we aim at better understanding Algeria as an underdeveloped rentier economy, which is heavily dependent on the rents accrued from exploiting the country's natural gas and oil, and to what extent Algerian gas' regional dimension gives ground to that reality.



There is a large body of research literature that tries to cover and better understand the impact of extractive (non-renewable) resource industry on an economy. In fact, the impact of natural resources has long attracted interest from a variety of angles and sources of development economics. Before the oil shocks of the 1970s, the focus was given to primary products generally, but after that, attention was extended subsequently to the impact on oil and other extractive industries' exporters such as gas²⁹.

The case for resource extraction as an engine for national/regional development was first underpinned by the classical theory of comparative advantage in international trade, which assumed that countries should focus on developing commodities in areas where they are relatively abundant. More specifically, the potential limits of resource extraction as a vehicle for development was first theorised by economic historian H. Innis in the 1920s who concluded that "specialisation around raw material extraction", observing the case of Canada, "did not drive economic diversification but produced a dependent form of development". He named it "staples trap". On a different scale, neoclassical economics asserted that extractive resources are capital assets the value of which can be realised only when they are extracted and exported. Only then a "virtuous circle of economic upgrading" can be initiated³⁰.

In addition, oil and gas developments are also often motivated by reference to specific theories of modernisation, such as the "big push" whereby in order for poor countries to be developed, the latter must break "the vicious circle of poverty" or must invest in large infrastructure projects³¹. In this line, others were of the opinion that development is constrained by low levels of investment, the so-called "capital fundamentalism" views that so widely dominated during the 1960s³². Indeed, Rostow states that capital accumulation is required in order to move a society from the beginning of take-off to maturity.

Hence, those same views defended that large amount of revenues accruing to an economy from extractive resource projects could generate the required "push" if capital was then mobilised accordingly. It then provides opportunities for a lead sector that creates a number of spill-overs, which drive economic expansion, moving the economy from "one equilibrium characterised by low level of development into a new equilibrium characterised by higher levels of socio-economic well-being"³³.

More specifically, the "industrialising industries" concept of De Bernis (1967), which inspired some of the policies enacted in Algeria during the era of president Boumediene, stemmed from his analysis on power relations and the existing asymmetries within an economy. Based upon the previous works of François Perroux on "growth poles" (1955) and the impact of strong input-output linkages associated with the industry of certain territories, De Bernis defended that certain heavy industries have more chances to stimulate economic growth than the export-oriented industry. Therefore, he believed that the most rapid route to industrialisation was through import substitution and the most obvious vehicle to that end was the re-investment

²⁹ Stevens, Paul: "Resource impact – curse or blessing? A literature survey", *Journal of Energy Literature*, vol. IX (March 2003), pp. 3-42

³⁰ Hotelling, Harold: "The economics of exhaustible resources", *Journal of Political Economy*, Vol. 39, n°2 (April 1931), pp. 137-175.

³¹ Ross, Michael L.: "The political economy of the resource course", *World Politics*, Vol. 51, n° 2 (1999), pp. 297-322.

³² Rostow, Walt Whitman (1960): *The stages of economic growth*, Cambridge, Cambridge University Press

³³ Gunton, Thomas: "Natural Resources and Regional Development: An Assessment of Dependency and Comparative Advantage Paradigms", *Economic Geography*, Vol. 79, n°1 (2003).



of revenues accruing from extractive resource projects, so that the agricultural sector could be modernised and reformed, while the economic base of the country diversified in the long run.

This model, which inspired some of the policies enacted in Algeria during the president Boumediene's era in the 1970s, stemmed from the belief that national development would come from an auto-centric view and not from foreign dependency. He pursued a programme of rapid industrialisation, financed by dramatic increases in hydrocarbon exports (Plan Valhyd) and austerity measures that curtailed domestic consumption. The expansion of gas export infrastructures absorbed much of the bulk of domestic consumption, and hence heavy industries received most of the attention. Since agriculture was underfinanced, Algeria turned into a food importer by the end of the era of president Boumediene, a strategy that some authors believe that it was drastically modified upon the arrival of president Benjedid, who succeeded Boumediene, and who abandoned this strategy in favour of the immediate needs of agriculture and education³⁴.

In this line, as a consequence of the increase of national income for oil-exporting countries prompted by the first oil shock, the attempts by Algeria and other non-aligned countries to instore a New International Economic Order after the UN General Assembly of 1974 falls under this very same conception of development economics, reassertion of national sovereignty and control over natural resource extraction and exploitation. Raising OPEC power in the late 1970s and the aftermath of the Iranian Revolution resulted in a rapid increase of oil prices, which prompted overflowing export revenues in Algeria. Producing countries were seeking a large share of rents for their resource exports.

Nonetheless, evidence for many years has suggested that those cases where resource extraction has generated national or regional development should be considered as remarkable exceptions rather than the general rule. The latter has been assessed when comparing data from many countries and concluding that many resource rich countries appear to have experienced a worse performance in terms of economic development and poverty reduction than many other resource poor countries³⁵. The view that resource abundant countries created somewhat negative implications for national/regional development and turned these economies into something like "bizarre" in development economics had been defended previously by other authors³⁶. However, others sought to argue that primary products could foster growth.

One of these core debates is commonly known as the "resource curse" thesis used for the first time by Richard M. Auty in 1993, and which tries to establish a negative relationship between resource abundance and poor economic performance.

The aftermath of the first oil shock in the 1970s gave ground to speculations that large windfall revenues from hydrocarbons could entail bad news for the development prospects of this type of exporting countries. Amidst such situation, a literature devoted to hydrocarbons began to emerge. Likewise, the experience of The Netherlands following the newly found North Sea gas revenues gave rise to the commonly known notion of "Dutch disease"³⁷, de-

³⁴ See Aïssaoui, *op. cit.*

³⁵ See, for instance, Sachs, Jeffrey D. and Warner, Andrew M.: "Natural resource intensity and economic growth", *European Economic Review*, Vol. 45 (2001), pp. 827-838; and Ross, *op. cit.*

³⁶ See, for instance, Humphreys, Macartan; Sachs, Jeffrey; and Stiglitz, Joseph E.(2007): *Escaping the Resource Curse*, Columbia University Press.

³⁷ Corden, W. Max. and Neary, J. Peter: "Booming sector and de-industrialization in a small open economy", *Economic Journal*, Vol. 92, nº 368 (Diciembre 1982), pp. 825-848.



industrialisation as a result of a real appreciation of the exchange rate following the gas export boom, which caused inflation and brought reductions in competitiveness.

The resource curse also draws arguments on the crowding out effects that take place when a big hydrocarbon project captures most of the resources of an economy at the expense of other sectors that find it difficult to secure the factors needed to develop. Others motivate the resource curse as a phenomenon related to the role of the government. Given that in most countries, hydrocarbon resources belong to the state, these authors believe that the curse occurs when bad governance or wrong decision-making³⁸ take shape, including in the form of widespread corruption³⁹. Indeed, it was not until the 1990s that the impact of hydrocarbon revenues on government behaviour became the focus of attention when large scale revenues from such projects appear to change the way in which governments behave, causing damage to both growth and development prospects. Many schools of thought argued that government involvement in the allocation of rents would inevitably lead to their misallocation.

Against this backdrop, there is a large and growing literature that explains why the role of rent seeking is greater in countries with large hydrocarbon revenues⁴⁰, and this could also be considered as an argument for the resource curse as it concerns how people in these economies compete for “artificially contrived transfers”⁴¹. The result is that government expenditure creates no social value and can subsequently distort markets and the way economy operates. This rent-seeking behaviour is more widespread in hydrocarbon rich economies as a consequence of wealth being concentrated in the public sector and possibly in a small number of companies⁴². A bureaucratic elite, a majority of whom can be members of a politically dominant group, is tasked with the channelling of the rents and block much needed economic reforms, along extremely powerful lobby groups that emerge as guarantors of the rent-allocating system.

The foregoing analysis has mentioned rentierism as one of the evidences that countries might suffer “resource curse”, and as a common feature in hydrocarbon rich territories when an agreement exists for the collection and allocation of the national income. This term was firstly used by Mahdavi (1970), whilst Beblawi offered a very revealing definition of a rentier economy as the one where “the creation of wealth is centred on a small fraction of the society; the rest of the society is only engaged in the distribution and the utilisation of this wealth”⁴³. This particular evidence of “resource curse” is relevant as it has often been applied at different degrees to Arab hydrocarbon producing states, including Algeria, due to Algeria’s dependence on hydrocarbons since independence. Therefore, one cannot explain the institutional, political and socio-economic developments in the country without properly assessing the role that rents accrued from the exploitation of the hydrocarbon industry have played in the context of a wider regional geo-energy space.

³⁸ Mahdavi, Hossein: “The Pattern and Problems of Economic Development in Rentier States”, in Cook, M.A. (ed.) (1970): *Studies in the Economic Theory of the Middle East*, London, Oxford University Press, pp. 428-467.

³⁹ Auty, Richard M. (1998): *Resource abundance and economic development: improving the performance of resource-rich countries*, Helsinki, The United Nations University World Institute for Development Economics.

⁴⁰ See Mahdavi, *op. cit.*

⁴¹ Tollison, Robert D.: “Rent seeking: a survey”, *International Review for Social Sciences*, Vol. 35, nº 4 (November 1982), p. 576.

⁴² See Auty, *op. cit.*

⁴³ Beblawi, Hazem and Luciani, Giacomo (1987): *The Rentier State*, London, Croom Helm, p. 51



Mañé and de la Cámara⁴⁴ offer a twofold analysis of the patterns unveiled in a rentier economy. On the one hand, a macroeconomic approach, whose theoretical foundation is supported by Mahdavi, Abdel-Fadil and Amuzegar. These authors believe that a hydrocarbon rich economy is rentier when the share of hydrocarbons in the GDP, exports, and tax revenues are very high, and when the GDP is elastic in relation with the evolution of the hydrocarbon prices. On the other hand, these authors⁴⁵ also offer a political approach that is supported by Luciani and Lal when a country's elite enacts and employs certain instruments of public intervention. These instruments pursue the obtaining of the maximum possible national income able to be distributed to the population as a whole, according to national legitimation strategies, by utilising the NOC with the primary goal of collecting (through property income or taxation) at the expense of other criterion such as maximising profits, establishing suitable distributing institutions.

Other recent literature has shown that the existence of rentier states not only impedes long-term economic growth and development⁴⁶, but also serves as a strong impediment to democratic rule⁴⁷, which prompts failures that are seen to lead to violence and civil war.

An OPEC founding member, Kuwait, has been classified by various authors as the most extreme rentier economy⁴⁸ and autonomous state⁴⁹ in the sense that the state does not rely on 'domestic taxation' to function. Alternatively, the state relies on oil taxation, which is obtained thanks to an activity that is valued abroad, but which does not depend on the work of the local population. From this point of view, figure 5 shows the share of taxes in total state revenues for a time span of eleven years, excluding state hydrocarbon rents. Data shows that Tunisia and Morocco have followed a similar trend than the average of OECD countries where total taxes amount to well over 90% of state revenues; whereas the case of Kuwait is paradigmatic in this example because non-oil tax revenues are almost inexistent in the total state revenues, and the case of Algeria is somehow in between.

In fact, Mañé and de la Cámara⁵⁰ assert that rentierism is not a condition that is reached as the volume of hydrocarbons in an economy increases, but instead when the income generated by the hydrocarbon sector is distributed over the time. From that standpoint, one would argue that Algeria, albeit considered a rentier economy, is less rent allocator than other OPEC members. In this context, the case of Kuwait is certainly the most extreme one.

⁴⁴ Mañé-Estrada, Aurèlia and Cámara Arilla, Carmen: "Is Russia Drifting Toward an Oil-Rentier Economy?", *Eastern European Economics*, Vol. 43, nº5 (2005), pp. 46-75

⁴⁵ See Mañé-Estrada, A. *et al.*, *op. cit.*

⁴⁶ See Mahdavi, *op. cit.* and Auty, *op. cit.*

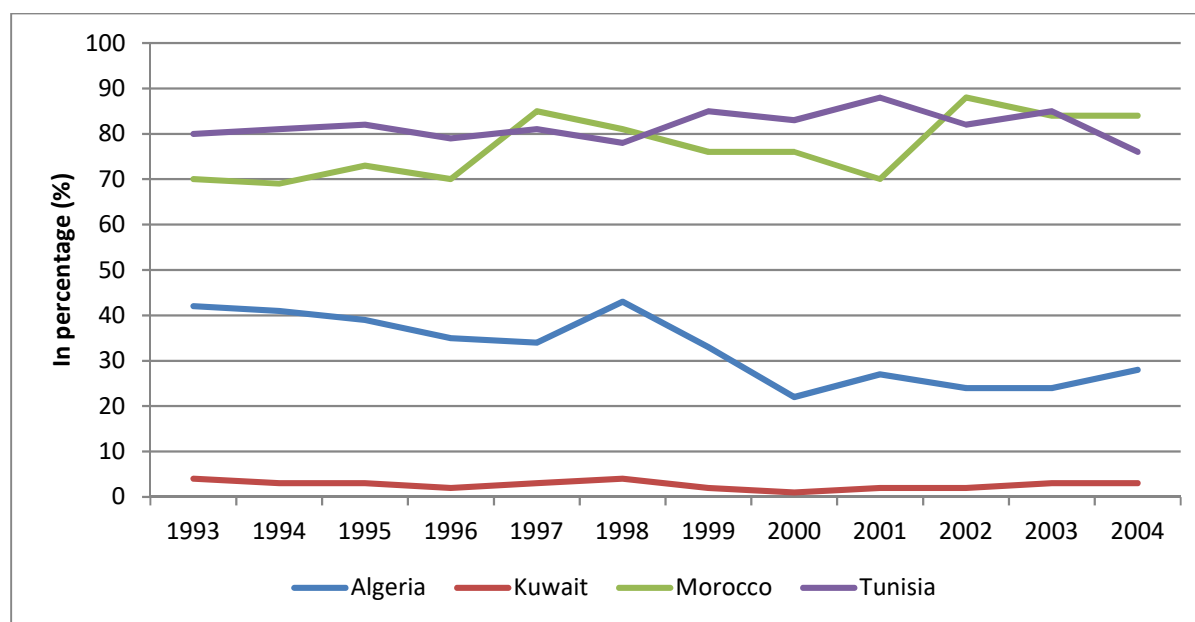
⁴⁷ See Ross, *op. cit.*

⁴⁸ See Beblawi, *op. cit.*

⁴⁹ See Auty, *op. cit.*

⁵⁰ See Mañé-Estrada, A. *et al.*, *op. cit.*

Figure 5. Share of taxes in total state revenues (1993-2004), excluding hydrocarbon taxes



Source: Own elaboration from data of Schwarz (2008)

Beyond those listed views that have questioned the “resource curse” in its various forms, one of the most robust attempts to provide an alternative perspective to the “resource curse” is the Manchester School’s approach of Global Production Networks (GPN) applied to the extractive sector⁵¹. Henderson et al.⁵² define global production networks as the “globally organised nexus of interconnected functions and operations by firms and non-firm institutions through which goods and services are produced and distributed”. The concept has many predecessors, ranging from global commodity chains (GCC) to global value chains (GVC), and the literature will be reviewed later.

Gavin Bridge argues⁵³ that there seems to exist an undisputed consensus on the fact that cases of underperformance in hydrocarbon abundant economies are due primarily to state failure or inadequate governmental management. Hence, state’s institutional capacities and effectiveness provide an adequate measure on whether these economies work or not in favour general development⁵⁴. Bridge believes that what is missing from the current debate on hydrocarbon abundant economies and development is a sense of “the relational way in which production is organised via inter-firm networks and massively exceed the boundaries of the nation state, and a mode of analysis, which is time and space sensitive”.

As the foregoing analysis sustained by the literature on development economics is not properly embedded with a reality whereby a set of inter-firm networks exceed the boundaries of Algeria across the Western Mediterranean region, in the next section, we intend to offer some methodological approaches that aim at integrating the Algerian gas sector into regional gas chains. The result of this exercise will determine the degree to which Algeria’s internal

⁵¹ Bridge, Gavin: “Global production networks and the extractive sector: Governing resource based development”, *Journal of Economic Geography*, Vol. 8, n°1 (May 2008), pp. 389-419.

⁵² Henderson, Jeffrey, Dicken, Peter et al.: “Global production networks and the analysis of economic development”, *Review of International Political Economy*, vol. 9, n°3 (2002), pp. 436-464.

⁵³ See Bridge, *op. cit.*

⁵⁴ Swyngedouw, E.: “Impossible Sustainability and the Postpolitical Condition” in Krueger, Rob and Gibbs, David (eds.) (2007): *The Sustainable Development Paradox. Urban political economy in the US and Europe*, New York, Guilford Press, pp. 13-40



functioning is affected as a rentier economy. To that end, the next section is also offering some qualitative and quantitative methodologies to assess the level of interdependence between Algeria and the rest of the countries in the region.

4. Methodologies to establish the linkage between the domestic and regional dimensions in the case of Algeria's gas market: The global value chains and production networks

Energy relations are an important intersection between politics, economy, history, law and geography, shaped by a combination of economic policy goals, geopolitical and geo-economic shifts in power along history, and environmental objectives.

As we have previously seen, there is a significant body of work in the literature on the challenges of extractive based forms of development. During the end of the second half of the 20th century the changing nature of the international economy has triggered profound alterations in the business structure of many economic sectors. Hydrocarbon industries, and in particular natural gas, have not escaped this pattern through a surge of LNG trade, accompanied by a deeper process of integration associated with cross-border production chains and networks for making, selling, and transporting natural gas, what is commonly referred to as the gas supply chain. This process has transcended the boundaries of the nation-state and has become regional, and even global with the evolutionary dynamics of the LNG sector.

Therefore, this article proposes to use a framework approach that can make a meaningful contribution to the analysis of the political economy of energy in the countries concerned, in particular Algeria, by means of combining the internal (domestic) dimension of Algerian gas market with the relational external dimension (regional) of the gas market.

Amidst the potential frameworks to be used, some have placed at its core focus the concern with globally inter-organisational relationships that underpin the production of goods and the power and value dynamics therein, like the Global Commodity Chain (GCC), the Global Value Chain (GVN) or the Global Production Network (GPN) intellectual projects. To date, nevertheless, one must admit that none of the three have been commonly used as to explain the hydrocarbon industries⁵⁵. That is also the reason why we propose to apply in a quite unprecedented contribution in the case of Algeria and the surrounding region, albeit other literature has addressed it to explain the gas industry in some other parts of the world⁵⁶.

In this relational dynamic of industries and territories, it is worth mentioning the primary notion of *filières*, understood as a series of stages in manufacturing linked by the flow of trade (trade between suppliers and customers, or when these are integrated, the transfer of products between affiliates). Perroux⁵⁷ was one of the first economists to apply this concept to industrial networks, whose different agents relate to each other asymmetrically, with some agents able to lead, thus exerting influence on the structure and operations over the rest of the *filière*. This basic concept was later re-introduced in the GCC framework.

In order to understand the dynamics of industrial organisation, international trade and regional development in accordance with the proposed approaches, the concepts of the value chain and commodity chain provide a valid starting point, in the sense that it has been

⁵⁵ See Bridge, *op. cit.*

⁵⁶ See i.e. Bridge, *op. cit.*; Steen and Underthun, *op. cit.*; Mañé et al., *op. cit.*; Bouzarovski, Stefan et al.: "Making territory through infrastructure: The governance of natural gas transit in Europe", *Geoforum*, Vol. 64 (August 2015), pp. 217-228; Bridge and Bradshaw, *op. cit.*

⁵⁷ Perroux, François (1951): *Le Capitalisme*, Paris, Presses Universitaires de France.



documented as far back as the 1960s in the context of development paths for extractive exporting economies. However, in the 1980s the term was commonly used in the business literature thanks to the works of Michael Porter. While his contributions provided limited utility in the analysis of socioeconomic dynamics and development, they provided many of the theoretical foundations for the value chain today⁵⁸. In this context, the new institutionalism⁵⁹ has also helped explain the relationship that exists between the different components of the chain.

This concept was also transposed into economic geography by integrating value chains into a territorial context and was followed by a large body of literature on transnational corporations and regional development. Furthermore, with the consolidation of value chain efforts, the definition of value chains found in the literature has been very consistent over the past two decades and is defined as “a full range of activities that are required to bring a product or service from conception, through different phases of production, delivery to final consumers and final disposal after use”⁶⁰. It is noteworthy to recall that, in the context of globalisation, the activities that constitute a value chain have generally been carried out in inter-firm networks on a global scale.

Furthermore, the concept of commodity chain was defined as “a network of labour and production processes whose end result is a finished commodity”⁶¹. The attention is given to the roles observed within the chain and how a fast-moving network of relations constantly reproduces a basic order that permits the endless accumulation of capital.

A turning point in the literature was the concept underpinning of GCC as “sets of inter-organisational networks around one commodity or product, linking households, enterprises and states to one another within the global economy”⁶². The latter very much stems from the previous works of Wallerstein, and it reformulates conceptual categories in order to analyse patterns of change and global organisation. Governance in the GCC is characterised as either *producer-driven* or *buyer-driven*, and it acknowledged the significant influence that leading firms exert on the structure and operations of the rest of the chain⁶³. In this regard, Gereffi asserts that a *producer-driven* chain makes it easier for producers to control the chain due to the high barriers to entry, whilst a *buyer-driven* chain places a greater role to commercialisation, design and innovation in relation to the final product due to the fewer barriers to entering the productive sector.

Since then, studies that have used the GCC framework have provided insights into a wide range of issues, including upgrading market expansion, trade patterns, as well as several industries, also for the hydrocarbon industry.

Akin to the GCC concept, the GVC framework⁶⁴ allows one to better understand how global industries are organised by examining the structure and dynamics of different actors

⁵⁸ See Henderson et al., *op. cit.*

⁵⁹ Williamson, Oliver E. (1985): *The Economic Institutions of Capitalism*, New York, Free Press.

⁶⁰ Kaplinsky, Raphael and Morris, Mike (2002): *A Handbook for Value Chain Research*, Institute of Development Studies.

⁶¹ Hopkins, Terrence and Wallerstein, Immanuel: “Commodity Chains: Construct and Research” in Gereffi, Gary and Korzeniewicz, Miguel (eds.) (1994): *Commodity Chains and Global Capitalism*, Praeger, pp. 17-20, 48-50.

⁶² See Henderson et al., *op. cit.*

⁶³ See Kaplinsky et al., *op. cit.*

⁶⁴ *Ibid.*



involved along the chain of a given industry. The GVC analysis is built upon the previous GCC approach but extending it to non-commodity goods and widening some of its conceptualisations and analytical constructions as to make it more universally applicable. Hence, six basic dimensions are explored by the GVC, some of which are based upon the previous GCC: (1) input-output structure of a GVC; (2) geographic scope; (3) governance structure: lead firms and industry organisation; (4) upgrading; (5) local institutional context; (6) industry stakeholders.

Unlike the GCC/GVC approaches, the GPN concept becomes deliberately broader⁶⁵. Indeed, all three frameworks intend to better assess the understanding of political economy of globalisation by examining how spatially distributed economic activity is functionally coordinated, but some stem from studies of international trade and take the commodity as their analytical unit (GCC); others emerge from industry studies and focus on issues of value chain management, innovation and sectoral management (GVC); while others highlight the dialectical interplay of territorial and network coherence, and allow for a broad range of actors beyond the firm (GPN)⁶⁶.

GPN is defined as “the globally organised nexus of interconnected functions and operations by firms and non-firm institutions through which goods and services are produced and distributed”⁶⁷. The concept has been developed and refined by a number of scholars from the Manchester School (Coe, Dicken, Henderson, Hess, Yeung...) and is the most inclusive framework of the three for the following reasons: (1) due to the explicit consideration of extra-firm networks by necessarily encompassing the broad range of non-firm organisations (i.e. supranational institutions, trade unions and consumer groups) that may shape firm activities; (2) GPN is innately multilevel, thus embedding the interactions between all spatial scales from the local, to the regional and to the global; (3) it moves beyond the limitation of the “chain” notion and avoids a linear interpretation of how production systems operate and generate value; (4) the governance structure in the GPN is taken to be much more complex and variable over time than the one suggested by the other two frameworks; (5) the GPN analysis does not consider the network as an abstract object, but it rather focuses on the dynamic developmental impacts that result for both firms and territories that they interconnect.

GPN has not escaped controversy either. Sunley suggests that this view of networks often includes everything and lacks analytical boundaries and clarity, while it makes it difficult to validate empirical findings. In addition, Bair also questions whether GPN empirical studies have been that different from GCC research.

In general terms, GPN analyses have tended to focus on agriculture, manufacturing and, to a certain extent, service sectors, at the expense of extractive industries. Nonetheless, recent work on the oil and gas industries⁶⁸ demonstrates that there is considerable potential unexploited under the lens of the GPN framework.

The use of such frameworks (GCC/GVC/GPN) will become a useful mechanism as to assess the relational nature of the domestic dimension of the political economy of the Algerian gas vis-à-vis the political economy of gas in the Western Mediterranean region as a whole.

⁶⁵ See Henderson *et al.*, *op. cit.*

⁶⁶ Bridge, Gavin and Bradshaw, Michael: “Making a Global Gas Market: Territoriality and Production Networks in LNG”, *Economic Geography*, Vol. 93, n° 3 (March 2017).

⁶⁷ See Henderson *et al.*, *op. cit.*

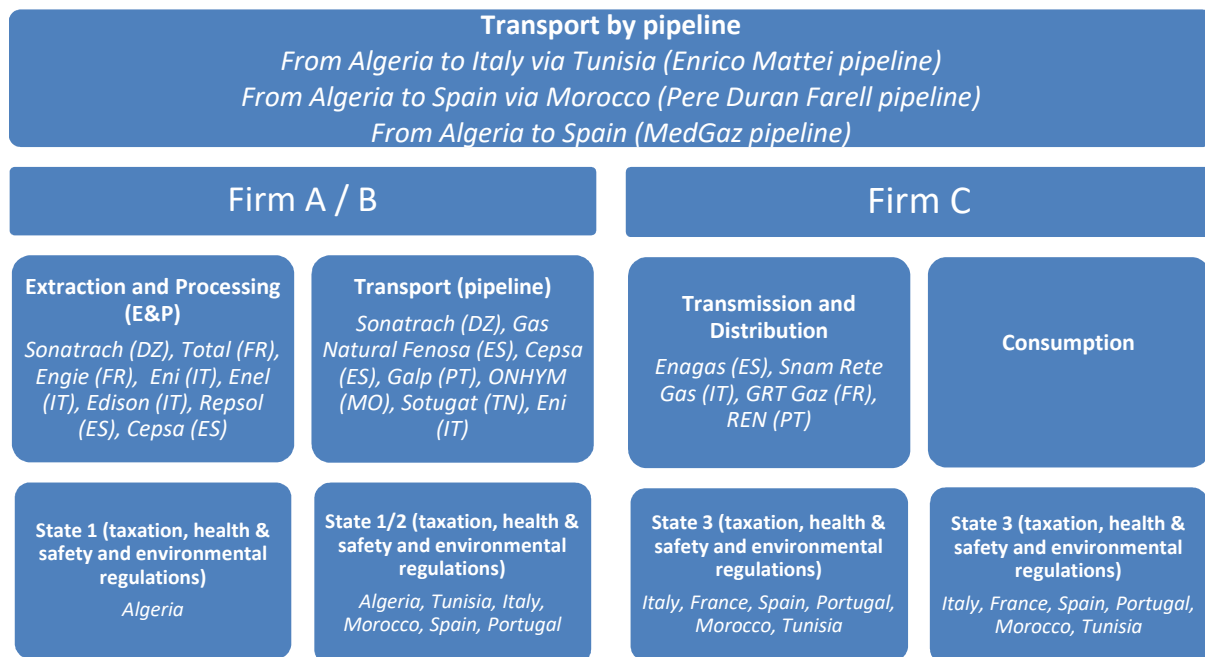
⁶⁸ See Bridge, *op. cit.*



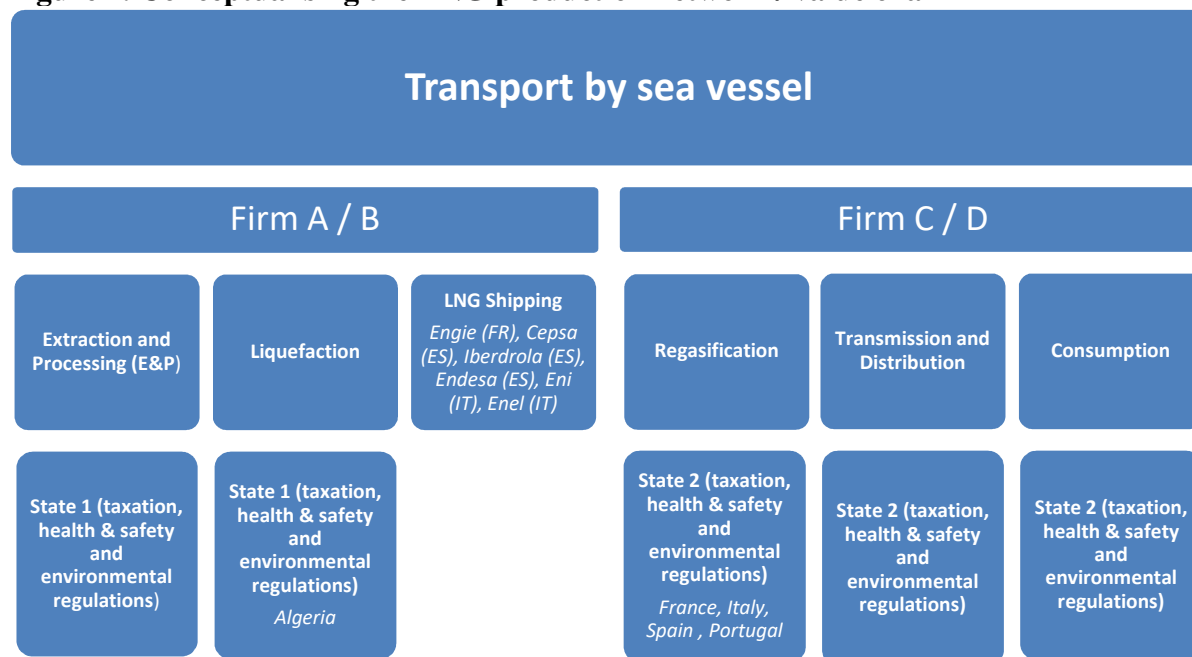
In the value chains involving energy products it is possible to distinguish between three productive stages: *upstream*, *midstream* and *downstream*. The upstream includes activities of exploitation, development and production of the primary energy source (in the case of natural gas, for example, this would include the search for gas fields, initial explorations, engineering projects, etc., and especially the extraction of natural gas). The midstream refers to all infrastructure related to the transportation and storage of the resource until it reaches the processing facilities, be it via physical interconnections (gas pipelines) or liquefied gas shipped in seagoing vessels. Finally, the downstream covers those activities required to transform the natural gas into the final energy product, as well as the activities linked to its commercialization.

Figures 5 and 6 show how the production network and value chain are structured around the flow of natural gas from the upstream, midstream and downstream phases as part of an overall value creation process. Specifically, Figure 6 reflects the chain for natural gas transported by pipeline, whereas Figure 7 reflects the chain for LNG production. Likewise, the two figures include the main agents and countries that are active within each of the phases of the gas chain for the Western Mediterranean case, in which Algeria holds a central role as the only producing country.

Figure 6. Conceptualising the natural gas production network / value chain



Source: Own elaboration from The Petroleum sector Value Chain (WB, 2009) and BMI Research (2018)

Figure 7. Conceptualising the LNG production network / value chain⁶⁹


Source: Own elaboration from The Petroleum sector Value Chain (WB, 2009) and BMI Research (2018)

The value chains of energy products are becoming increasingly complex and include a greater number of links (or productive stages), with the companies involved also having different interests. Furthermore, the relationship between the different stakeholders in the value chain of energy products are not symmetrical, and not all stakeholders are able to exert the same influence over the chain as a whole. By using the above proposed methodologies, it is possible to observe how economic activity within the chain is coordinated and to identify which links (upstream, midstream and downstream) and which stakeholders (lead firms) have the greatest capacity to control the chain. A large part of the contribution to a territory's development and of the interrelations between different territories depends on how energy value chains are structured and on the 'power' of the stakeholders located in different countries. Hence, the value is not only captured by analogous firms, but also amongst firms and non-firms entities such as state agencies, supranational institutions... The understanding of how this rent is captured along the network of agents that intervenes in the sector will help determine the roles that each of these agents play in the natural gas value chain, as well as the terms and conditions in which integration occurs.

At this point, we propose two approaches with the aim to assess the value captured by each of the agents, both private and public. The first one is qualitative by definition, and seeks to determine the relational nature of the different companies involved in the energy chain, whilst the second one is quantitative, and attempts to determine an index that quantifies the potential strength for each country involved in the energy chain. By this, one can infer about the degree of existing symmetry in the energy cooperation scheme, and in the objective for this article, assess the degree (or quality) of integration of Algeria with the rest of the region. A symmetrical energy cooperation scheme might facilitate higher degrees of integration at the macro level by prompting regulatory and institutional convergence leading to the enhancement of an energy community, what could be framed as a Western Mediterranean energy community.

⁶⁹ Companies and countries identified in Figure 6 can be equally reflected in Figure 7 for the phases of Extraction and Processing, Transmission and Distribution, as well as Consumption.



4.1 A qualitative methodology

The starting point for this methodology is that in the context of international energy chains, companies may be of two types: private (IOCs) or national (NOCs). As the motivation of these two types of companies will not be the same there is a significant difference with respect to non-energy value chains, whereby companies seek to achieve governance of the chain with a single objective: attaining as much as possible of the economic surplus generated by the chain. In the energy context, however, while the main objective of IOCs is to obtain the maximum possible profit (as much surplus as possible) from the value chain, the priority objective of NOCs will be defined in terms of the country's 'general interests'.

There is also the case which we define as hybrid (see Table 1), which is usually a private company that the government uses as if it were an NOC. Additionally, in the case of natural gas, we add a new typology of company that are regional companies, which we will call Regional Oil Companies (ROC), in line with the 'usual' nomenclature, but which are normally companies focused on gas activity -although in some cases not exclusively- and whose main activity is regional, even if they could be active elsewhere in the world.

More specifically, we believe that the potential motivations of companies involved in energy value chains are to attain as much as possible of the surplus, which may be turned into national income or profit; to ensure a safe and constant supply of energy for 'their' economy; and to achieve greater influence as a stakeholder on the international stage.

Methodologically, the analysis of these two questions (i.e. that there are two types of stakeholder and that these may have up to three objectives, ranging from the micro level (more profit for the company) to the global level (being an important or hegemonic regional or global stakeholder) is favoured within the GCC/GVC/GPN approaches, since the latter integrate both micro/meso and macroeconomic aspects.

As a result of the particular characteristics described above it is necessary to redefine the *producer-driven* and *buyer-driven* categories of the energy GCC, although the need for such a redefinition in no way invalidates the use of the rest of the conceptual framework implicit within these categories. In particular, the concept of *lead firm* will be highly useful for our analysis of regional power. Indeed, in the case that concerns us here we consider that the type of governance which prevails in the chain (i.e. producer or buyer driven) depends, principally, on the type of company that establishes itself as the lead firm. For energy products the lead firm determines not only 'what' is produced, and 'how', but also 'for whom' and 'for where' the final product is destined.

These considerations are reflected in the classification of companies shown in Table 2. The categorization is based on the case of hydrocarbons (oil and gas).



Table 2: Categorization of energy companies (oil and gas)

NOCs	State-owned national oil or gas companies
<p><u>'Old' NOCs</u></p> <p>If the lead firm is an 'old' NOC the value chain is usually characterized by producer-driven behaviour.</p>	<p>These are upstream companies, some of which will also engage in midstream activity, that serve as an instrument of national, public intervention, their main objective being to generate as much <u>national income</u> as possible for the <i>producing country</i>. Secondary objectives include helping to ensure a stable supply of energy and being a relevant stakeholder on the international stage.</p>
<p><u>'New' NOCs</u></p> <p>If the lead firm is a 'new' NOC the value chain may be characterized by producer-driven or buyer-driven behaviour.</p>	<p>These are integrated companies with a broad scope (they act upstream, midstream and downstream) and are commonly found in what are known as <i>emerging economies</i>. They serve as an instrument of national, public intervention. The objective of 'new' NOCs is not always the same and, depending on the nature of national requirements, it is not always clear which is the primary objective. In general, some of these companies will have an objective similar to that of 'old' NOCs (<u>national income</u>), while the objective of others will be to ensure the <u>final supply</u> of energy to the country. In both these cases what 'new' NOCs have in common is that they are used as instruments to gain <u>power on the regional or international stage</u>.</p>
IOCs	Integrated, private and transnational energy companies
<p><u>'Western' IOCs</u></p> <p>If the lead firm is a 'Western' IOC the value chain is generally characterized by buyer-driven behaviour, although depending on the company's profit maximizing strategies it may be producer driven.</p>	<p>These are the large, integrated, private and transnational energy companies that have been established in the Western countries of the OECD and which are clustered around the IEA. The majority of the most important ones are direct descendants of the 'Seven Sisters'. These companies are associated with what are known as <i>consumer countries</i>, although their objective is that of private firms, i.e. to maximize profits in the value chain as a whole. Depending on the circumstances they may act more as extractors/producers or as demand/consumer companies. In both cases their objective is to obtain <u>as much profit</u> as possible.</p>
<p><u>'Hybrid' IOCs</u></p> <p>With the exception of Russian companies, if the lead firm is a 'hybrid' IOC the value chain is generally characterized by buyer-driven behaviour.</p>	<p>These are integrated energy companies, generally in the East or in emerging economies, that are privately owned but which directly serve the interests of the government of their respective country. In this regard, and <u>as in the case of 'new' NOCs</u>, their objectives will depend on national priorities. However, <u>unlike</u> the 'new' NOCs hybrid companies are not usually strong enough to become significant <u>regional or international stakeholders</u>.</p>
ROCs	Non Integrated, regional energy companies
<p><u>'Transit ROCs'</u></p> <p>There is no case in which a transit company is a 'lead firm', but they have great influence because they control the transit of oil or gas.</p>	<p>Depending on the cases, its objective may be purely fiscal, but in others it could serve to achieve an oil or gas supply on favourable terms. Both cases respond to national rather than private interests.</p>
<p><u>'Western or Hybrid ROCs'</u></p> <p>If the lead firm is a 'Western' ROC the value chain usually is characterized by buyer-driven behaviour.</p>	<p>These are public or private companies, whose regional activity is fundamentally focused on one or two phases of the chain (upstream, midstream and downstream). Although they may have investments elsewhere in the world, the bulk of their activity is carried out at regional level. In general, the business goal of these companies, such as those of the 'Western IOC', with whom they often have alliances, is linked with that of <i>consumer countries</i>.</p>

Source: Mañé Estrada, Aurèlia *et al.*, *op.cit.*, 2012



We start by assuming that the degree of power a company has in the context of international energy relations does not depend on whether it is a NOC, a ROC or an IOC, but rather on how integrated it is (the more stages it is involved in the more influence it will have), on the number of territories in which it is present and on the amount of product (primary, secondary or final energy) it controls.

Thus, it is assumed that when a company forms part of a value chain it is more likely to become the lead firm if: a) it is an integrated company (i.e. its acts upstream, midstream and downstream); b) it operates in different countries (i.e. it is transnational, and therefore its raw material sites and/or markets are located in different places around the world); and c) it is among the world’s top-ranked companies in one or more of the three stages. Conversely, a company is unlikely to be the lead firm in the energy chain if: a) it is only present in one of the three stages; b) its sphere of activity is national; and c) it is not among the top-ranked companies for any of the three stages.

Thus, in general terms, the six kind of stakeholders defined above can be classified, as shown in Table 3, according to the amount of power they would have within regional or global energy chains.

Table 3: Possibility of being the lead firm among energy companies, according to category

	Integrated	Transnational	Top-ranked	Power in regional/global chain	Possibility of being the lead firm
‘Old’ NOCs	No	No	Yes (upstream)	Medium to low	Weak
‘New’ NOCs	Yes	Yes	Yes (up-, mid- or downstream)	High	Strong
‘Western’ IOCs	Yes	Yes	Yes (mid- or downstream)	High	Strong
‘Hybrid’ IOCs	Yes	No	No	Low to medium	Very weak
‘Transit ROCs’	No	No	No	Medium to low	None
‘Western ROCs’	No	Yes	Yes (up-mid or downstream)	Medium	Strong

Source: own elaboration from Mañé Estrada, A. et al., 2012

Given that our case study is centered on the geo-energy space in the Western Mediterranean the only possible scenarios are those set out in Table 4. For the analysis of the energy chain in the natural gas the scenario involves a ‘new’ NOC⁷⁰ becoming integrated in chains formed by other types of company, even if Sonatrach's function within the country is still that of an 'old NOC'. However, at the regional, level, different type of companies are involved in the Western

⁷⁰ The case refers to the integration of Algerian company Sonatrach with several other (private but also public owned) companies from Italy, Spain, France, Portugal, Morocco and Tunisia. State-owned Sonatrach is the largest oil and gas company in Algeria and Africa. The company operates in exploration, production, pipeline transportation and marketing of hydrocarbons and by-products. As part of a diversification strategy, Sonatrach stepped up investments in power generation, new and renewable energies, water desalination, and mining exploration and exploitation. The international strategy of the company includes operations in several parts of the world namely: in Africa (Mali, Niger, Libya, Egypt), in Europe (Spain, Italy, Portugal, UK), in Latin America (Peru) and in the US. As well as being the world's 11th-biggest oil producer, Sonatrach is also the fourth-biggest global LNG exporter, the third-largest LPG exporter and the sixth biggest gas exporter. For all the above reasons, in this research paper we consider Sonatrach as a ‘new’ NOC, rather than an ‘old’ NOC, very much aware of the fact that in precise terms the company would stand somewhat in between what an ‘old’ NOC and a ‘new’ NOC are.



Mediterranean gas value chain, as can be deduced from Figures 6 and 7 and is reflected in Table 4.

Table 4: Who can be the lead firm in a value chain?

If a 'new' NOC becomes integrated in a chain with:	'Old' NOC	'New' NOC	'Western' IOC	'Hybrid' IOC	'Transit ROC'	'Western ROC'
Firms in the Western Mediterranean Gas Value Chain		Sonatrach	Eni, Total, Repsol, Cepsa, Galp	None	Onhym, Sotugat	The others in Figure 6
'New' NOC	I1: Lead firm is the 'new' NOC	I2: Outcome unclear. Different objectives?	I3: Outcome unclear. Different objectives?	I4: Lead firm is the 'new' NOC	I5: Lead firm is the 'new' NOC	I6: Outcome unclear. Different objectives?

Source: own elaboration from methodology established by Mañé Estrada, A. et al., 2012

Having established this kind of power relations among companies operating in the energy value chain, the incorporation of the geographical component into the analysis means that the following hypotheses can be proposed:

a) In scenarios I2, I3 and I6, relationships within the governance structure are more symmetrical. The conditions under which the stakeholders become integrated within the energy value chain are more equitable and, therefore, their capacity to influence the institutional structure of the geo-energy space will be more similar. Thus, one can expect relations to be more cooperative, or extremely conflictive. In this case, the centre of the geo-energy space will be more diffuse and widely spread. With the passing of the time, this apparent symmetry in power relations might turn into more asymmetrical, depending on the degree of interdependence, the contracting terms among the various agents, the price evolutions, relation between demand and supply, the energy governance... This is the power relation that one can expect between companies like the Algerian Sonatrach with others that intervene in the value chain such as the Italian Eni and Enel, the Spanish Gas Natural and Cepsa, the French Engie, the Portuguese Galp,.

b) In the event of scenarios I1 and I5, the governance structure and relations are asymmetrical. The natural resources or stakeholders from the territory of the 'old' NOC or 'transit' become integrated in a 'position of inferiority' and, therefore, have limited decision-making capacity within the institutional structure that develops in their geo-energy space. This is the power relation that one can expect between companies like Algerian Sonatrach with others that intervene in the value chain such as the Moroccan ONHYM or the Tunisian ETAP.

4.2. A quantitative methodology

The aim of this quantitative methodology is to attempt to measure the potential strength exerted by each country represented along the natural gas value chain through a synthetic index that we have entitled "INPSG", regional index on the national potential strength for the natural gas (INPSG), which varies from 0 to 1.

Traditionally, the analysis of energy relations have been underpinned using a *dichotomous energy paradigm*, in which energy relations are dependent to different degrees, conflictive, antagonistic and developed between two type of countries: *consumers* and *producers*. The latter has led to the belief that producer countries were strong and consumer



countries weak in the power relationship. This paradigm does not take into account that national companies owned by the producing countries become stakeholders on the international energy stage, or even private companies from consumer countries become involved in the upstream phases of the energy extraction and production, thus discarding this paradigm and look for an approach that is able to better describe current energy relations.

From this perspective, if one includes a geographical component, then the producing territories, from a geo-energy point of view, are becoming integrated within larger energy spaces that do not always coincide with their immediate physical borders. Hence, one cannot always define energy relations as dependent, but rather inter-dependent, in which the agents that operate are not only producer and consumer countries, but also national companies –public and private-, as well as transnational companies –generally private.

To consider all the agents that intervene along a global or regional energy chain leads you to a fairly more complex model than the one depicted by the *dichotomous energy paradigm*. Therefore, attempting to assess the power relationship along this energy chain will be more complex too.

Based upon the GCC/GVC/GPN approaches, this synthetic regional index entails the construction of a country-based indicator made up by the aggregation of elementary variables. Attribution of weights to each elementary variable has followed a subjective approach, opting at this preliminary stage for the same weight for each of them.

In order to select the various elementary variables, we have followed the GCC/GVC/GPN approaches, in which different agents that intervene along the energy chain are identified:

- a) Exporting countries
- b) Importing countries
- c) Transit countries
- d) Companies

We assume that this index works in a regional natural gas space, in which at least one exporting country and one importing country are included, and whereby a set of energy relationships and physical interconnections exist. We have also assumed that the concept “national” encompasses all variables within that particular country, which are companies, consumers, pipelines, consumers...

Likewise, we have also assumed that the interdependence between exporting and importing countries is reflected upon two variables: the dependence on the hydrocarbon rent for the first ones and the energy consumption for the second ones.

A detailed description on the process leading to the definition and calculation of the “INPSG” can be found in Annex I.

The resulting synthetic index captures the strength that a country with all its heterogenic set of assets (companies, production, demand, consumption, hydrocarbon taxation, imports dependence...) features in the context of a geo-energy space. If a group of countries within a defined geo-energy space perform similarly in their respective indexes, one can infer that power relationship exerted by its different agents is leaning towards symmetry. Whilst if the respective



indexes show significant differences amongst them, one can conclude that this power relationship is leaning towards asymmetry.

The symmetrical nature of the power relationship among countries entangled in a regional natural gas chain is a relevant feature when assessing the conditions for which integration at the micro and mezzo levels along a series of cross-border and transnational relationships of dependency and physical integration could eventually lead to an integration process at the macro level through a shared energy governance. The more asymmetrical power relationships become, the less favourable spill over effects will emerge to progressively advance in the formation of an integrated energy region. Consequently, with less integration, the linkages between the domestic and the external dimensions of a country will remain weaker, whereas with a stronger integration, interdependence will also perform higher, thus showing more intense linkages between the domestic and the external dimensions of a country in the field where integration occurs.

4.2.1. A practical case: the INPSG applied to the gas value chain between Algeria and Spain

As the quantitative methodology outlined in section 3.2 (and Annexe I) of the present article is yet at a development phase, we have attempted to present some preliminary results when applying the INPSG to the particular case of the natural gas value chain between Algeria and Spain for the year 2016. In the current set of relations between these two countries the necessary conditions in order to apply the INPSG are met: there is one exporting country (Algeria) and one importing country (Spain), there is an abundant flow of trade of natural gas from Algeria to Spain through physical interconnections (two offshore pipelines, one direct and one via Morocco), as well as through sea vessels (LNG).

A calculation of the Index “INPSG” for Algeria and Spain in 2016 can be found in Annex II.

The results obtained when calculating the Index “INPSG” for Algeria (value of 0,77) and Spain (value of 1) in the year 2016 show a rather symmetrical power relationship along the natural gas chain involving the two countries, even if the index results show that Spain is a stronger partner in the energy chain.

If we look at the result of the first elementary index, which omits those variables that measure the potential strength of companies that operate in the gas chain, the index result shows an almost perfect symmetry. This is because both countries, Algeria and Spain, are very interdependent between them: in the year 2016 a significant portion of the gas exports from Algeria was sold to Spain, whilst a significant part of the natural gas that Spain imported came from Algeria. This symmetry is also expressed in how each country separately has developed strong domestic dependency patterns with the passing of the time, which ends up weakening the power capacity within the energy chain. Indeed, Algeria is highly dependent to function as a country on the economic rents accrued from the exploitation of the hydrocarbon sector, whereas Spain is still very dependent on energy imports, in spite of the very diversified country’s energy mix.

Secondly, if we look at the result of the second elementary index, which mainly captures the potential strength of companies operating in the energy chain, the result is more asymmetrical. In spite of the relative and apparent strength of the Algerian NOC Sonatrach,



which is the largest hydrocarbon company in Africa, Spanish companies are more integrated in the energy chain and are decisively present in the three phases of the chain. Spanish companies are not as big as Sonatrach, but they have better integrated in the chain, and thus they exert a higher control on the regional industry.

Thirdly, this result is consistent with the qualitative methodology featured in section 3.1 of the present paper, in which relationships within the governance structure are more symmetrical in the event that a 'new' NOC becomes integrated in a chain with 'Western' IOCs and 'Western' ROCs (identified as scenarios I3 and I6 in Table 4). Precisely these are the two scenarios faced in this case study. The evolution of the energy cooperation in the region will considerably depend on whether the Algerian company Sonatrach asserts its position as a 'new' NOC by distancing from the characteristics depicted by an 'old' NOC, in which case asymmetry would widen in the energy chain; and also, it will very depend on how the 'Western' ROCs operating in the energy chain end up using in the future this additional power conferred in the current state of play.

5. Conclusions

Algeria is an underdeveloped rentier economy, which is heavily dependent on the rents accrued from exploiting the country's natural gas and oil. Since the 1970s southern European countries have relied on multiple sources to meet their gas consumption requirements, most notably from Algeria, which has shaped the emergence of a geo-energy space in the gas sector among the Western Mediterranean countries, leading to the accretion of a series of cross-border and transnational relationships of dependency.

This article has featured a methodology that underpins the relational nature of the political economy of Algeria's natural gas vis-à-vis the political economy of natural gas in the Western Mediterranean countries. Whereas Algeria's overwhelming financial dependence on hydrocarbon resources (via economic rents) is directly linked to its decision-making capacity within the regional gas chain, this article has offered both qualitative and quantitative tools with the aim to catch up the relational effect between the Algerian domestic economy and the regional gas structure of governance.

To this end, the article has reviewed the literature that helps us better understand the political economy of Algeria, namely the the underlying problem of hydrocarbon-rich economies and their development. Secondly, the article has revised those existing methodological approaches that facilitate the establishment of a linkage between the Algerian domestic political economy of gas with the latter's capacity of controlling and managing its own revenues and exports to the rest of the countries in the region concerned. In this regard, the introduction of methodological frameworks such as GCC/GVC/GPN provides us ground not only to assess the degree (or quality) of integration of Algeria with the rest of the *geo-energy space* but also of the future prospects for Algeria to remain a rentier economy.

Finally, the article has proposed two methodologies as to specifically assess the characteristics of the micro-integration process taking place along the natural gas regional energy chain, while inferring about the potential for macro or institutional integration. The first one is qualitative and has seek to determine the relational nature of the different companies involved in the energy chain, whilst the second one is quantitative, and has attempted to determine an index that quantifies the potential strength for each country involved in the energy chain. By this, one can infer about the degree of existing symmetrical patterns in the energy cooperation scheme, and in the objective for this article, assess the degree (or quality) of



integration of Algeria with the rest of the region. A symmetrical energy cooperation scheme might facilitate higher degrees of integration at the macro level by prompting regulatory and institutional convergence leading to the enhancement of an energy community, what could be framed as a Western Mediterranean energy community.

In this regard, the article concludes that the traditional analysis of rentier economies applicable to Algeria does not take sufficient account the interdependence between Algerian and other Western Mediterranean agents in the regional gas chain, a scenario that clearly limits the decision-making capacity of the Algerian agents within the institutional structure that develops in their *geo-energy space*.



ANNEX I: DESCRIPTION OF THE REGIONAL INDEX “INPSG”

We assume that index “INPSG” works in a regional natural gas space, in which at least one exporting country and one importing country are included, and whereby a set of energy relationships and physical interconnections exist. We have also assumed that the concept “national” encompasses all variables within that particular country, which are companies, consumers, pipelines, consumers...

Likewise, we have also assumed that the interdependence between exporting and importing countries is reflected upon two variables: the dependence on the hydrocarbon rent for the first ones and the energy consumption for the second ones.

Considering all those, we have defined the following elementary variables and variables:

1. Exporting countries (E): variable to measure the potential strength of exporting countries. This variable will be conditioned by the dependence of the producing country on the rents accrued from exploiting the country’s natural gas
 - 1.1. Variable (E_{res}): ratio of own natural gas reserves to world’s proven gas reserves
 - 1.2. Variable (E_{xp}): ratio of own natural gas regional exports to the world’s natural gas exports
 - 1.3. Variable (E_{rent}): ratio of State’s rent accrued from the exploitation of natural gas to the Gross Domestic Product

2. Importing countries (I): variable to measure the potential strength of importing countries. This variable will be conditioned by the dependence of the importing country on the natural gas imports
 - 2.1. Variable (I_{mp}): ratio of own regional imports of natural gas to the overall consumed natural gas
 - 2.2. Variable (I_{mix}): ratio of own natural gas consumption to the general country’s energy mix
 - 2.3. Variable (I_{pen}): index on the penetration of natural gas in the country as compared to other importing countries in the region. If the penetration is higher than 30 clients per 100 inhabitants then the index shall be 1; if the penetration is between 20 and 30 clients per 100 inhabitants then the index shall be 0,66; if it is between 10 and 20 clients per 100 inhabitants, it shall be 0,33; and finally if it is between 0 and 10 inhabitants, it shall be 0

3. Transit countries (T): variable to measure the potential strength of transit countries
 - 3.1. Variable (T_{int}): capacity to strategically interrupt the flow of natural gas across the region, be it “1” should the country have the capacity or “0” if the country does not have it
 - 3.2. Variable (T_{rans}): ratio of volume of natural gas to the country’s energy mix
 - 3.3. Variable (T_{dep}): ratio of State’s rent accrued from the exploitation of natural gas transit across the country to the Gross Domestic Product



4. Companies (C): variable to measure the potential strength of companies that operate along the energy chain and whose fiscal residence belongs to one of the countries of the region
 - 4.1. Companies from exporting countries
 - 4.1.1. Variable (C_{expas}): company's total assets
 - 4.1.2. Variable (α): share of company in natural gas upstream projects
 - 4.2. Companies operating in transit countries
 - 4.2.1. Variable ($C_{transas}$): company's total assets
 - 4.2.2. Variable (β): share of company in transport (by pipeline or LNG) of natural gas in the region weighted by total volume of transit
 - 4.3. Companies from importing countries
 - 4.3.1. Variable (C_{impas}): company's total assets
 - 4.3.2. Variable (ω): market share of each company within the gas market of the importing country

The procedure for calculating the regional index on the national potential strength for the natural gas (INPSG), which varies from 0 to 1, comprises three steps:

- (i) obtain a first elementary index ($I1_p$), which captures the strength of individual countries in the gas industry without encompassing the effects of operating companies in the natural gas value chain;
- (ii) obtain a second elementary index ($I2_p$), which captures the strength of individual countries in the natural gas value chain based on its operating companies;
- (iii) obtain the resulting index (INPSG) by calculating the mean of the two previous indexes.

To calculate the first of the elementary indexes $I1_p$, the following function is needed:

$$I1p' = (Eres) + \left(\frac{1}{Exp}\right) + \left(\frac{1}{Erent}\right) + \left(\frac{1}{Imp}\right) + (Imix) + (Ipen) + (Tint) + \left(\frac{1}{Trans}\right) + \left(\frac{1}{Tdep}\right)$$

Where $I1_p'$ is the raw data value for each country in the region. To make the data comparable across countries in the region, each variable is rescaled from 0 to 1 with 0 denoting the lowest value and 1 the highest. The raw data value for each country needs to be indexed as follows:

$$I1p = \frac{I1p' - \min(I1p')}{\max(I1p') - \min(I1p')}$$

Where *Max/min* denotes the bounds for best and worst performance for the group of countries in the region.

As to obtain the other elementary index ($I2_p$) the following function is needed:



$$I2p' = \sum \{(\alpha1 \times Cexpas1), (\alpha2 \times Cexpas2) \dots (\alpha n \times Cexpasn)\}, \{(\beta1 \times Ctransas1), (\beta2 \times Ctransas2) \dots (\beta n \times Ctransasn)\}, \{(\omega1 \times Cimpas1), (\omega2 \times Cimpas2) \dots (\omega n \times Cimpasn)\}$$

Where $I2p'$ is the raw data value for each country in the region. To make the data comparable across countries in the region, each variable is rescaled from 0 to 1 with 0 denoting the lowest value and 1 the highest. The raw data value for each country needs to be indexed as follows:

$$I2p = \frac{I2p' - \min(I2p')}{\max(I2p') - \min(I2p')}$$

Hence, the synthetic index INPSG is obtained by calculating the mean of the two previous indexes:

$$INPSG = \frac{I1p + I2p}{2}$$



ANNEX II: CALCULATION OF THE INDEX “INPSG” FOR SPAIN AND ALGERIA IN 2016

On the one hand in Tables 5 and 6, we have calculated the two elementary indexes for Algeria and Spain in 2016 based on the methodology outlined in Annex I.

Table 5. Calculation of the elementary index “I1p” (in ratio and index values)

Variables	Algeria	Spain
1.1. E _{res}	0,024	-
1.2. E _{xp}	0,7254	-
1.3. E _{rent}	1,18	-
2.1. I _{mp}	-	0,55
2.2. I _{mix}	-	0,162
2.3. I _{pen}	-	0,33
3.1. T _{int}	-	-
3.2. T _{rans}	-	-
3.3. T _{dep}	-	-
Aggregation (I1p')	2,25	2,31
I1p	0,97	1

Source: Own elaboration based on data extracted from BMI Research (2018), IMF (2018), CNMC (2018), OPEC and BP (2018)

Table 6. Calculation of the elementary index “I2p” (in raw and index values)

Natural gas chain	4.1. Upstream	4.2. Midstream	4.3. Downstream	Aggregation (I2p')	I2p
Algeria	43.277.520.000	16.327.398.844	-	59.604.918.844	0,56
Spain	15.058.117.300	55.769.874.000	34.666.304.929	105.494.296.229	1

Source: Own elaboration based on data extracted from BMI Research (2018), AMADEUS database (2018) and Sonatrach (2018)

Finally, in Table 7, we have calculated the Index “INPSG” for Algeria and Spain in 2016 following the methodology outlined in Annexe I.

Table 7. Calculation of the index “INPSG” for Algeria and Spain (2016)

	I1p	I2p	INPSG
Algeria	0,97	0,56	0,77
Spain	1	1	1

Source: Own elaboration



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