Sizing Geographic of the Shale Gas Supply Chain: A Case of Mexico

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***Abstract*— With enactment of energy reform in Mexico, some activities from energy sector are opened to national and foreign private investment. It is expected that new panorama generates important changes for this sector and thus produce significant positive effects on the economy, especially if national companies associated with its supply chain to insert in the new productive dynamic. To determine its context, this research made possible to typify and quantify Mexican companies engaged in economic activities associated with core business of shale gas, in order to measure the national potential in each link from the supply chain. In addition, this research helps to identify geographically some of main strengths and opportunities that each Mexican State has for insert in this new energy scenario through participation of its local micro and small businesses. This geographical vision contributes to better decision-making around this sector and favours generation of strategies as well as establishment of state and national public policies aimed at promoting the development of this sector through participation of the domestic companies. The results show that in Mexico there are mainly micro and small companies dedicated to the production of goods and services for this sector, supported by conventional resources, with a low possibility of effective integration in the competitive supply chain in cost and quality in relation to international companies with experience in such activities.**

***Keywords*—** *Unconventional hydrocarbons, upstream, midstream, downstream, shale gas core business*

1. Introduction

The hydrocarbons have been a fundamental element for the development of our society, but their transcendency is not restricted to the economic scope, but also it affects in the political, environmental and social area [1]. Nevertheless, the values of their demand worldwide have been modified in the recent years due to, on the one hand, to the maximum values of demand of the conventional petroleum [2], and on the other one, to the growing need to increase the energy efficiency, and to reduce the environmental impact [3].

Natural gas has taken great importance to be regarded as one of the cleanest fossil fuels and economic [4]; also, from a global perspective, the proven reserves of this fuel have been continuously increasing in the last decades [5], [6]; which it is due largely, to the development of new and refined technologies that have made the methods of horizontal drilling and hydraulic fracturing transform the resource extraction of unconventional reserves economically viable [7], [8].

The difference between conventional and unconventional reserves is on the way, easiness and cost of extraction. The first ones consist basically in "free gas" trapped in multiple and small porous zones in various impermeable rock formations which prevent gas from escaping to the surface; while the second ones are characterized by being essentially producers of dry gas contained in geological formations of low permeability rocks and for being scattered over very extensive areas [9].

Among the types of unconventional gas is possible to distinguish the coal bed gas or coal bed methane, tight gas, gas shale or slate, and methane hydrates [10]. The shale gas is a natural gas that is caught in sedimentary rocks known as shales, schists or slates, which are of relatively low permeability and porosity when they are compared with the conventional gas, for what its production requires of the stimulation of the formations of

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shale to increment its permeability and to facilitate the flow of natural gas from the matrix of formation to the well [11], [12].

From the potential of the natural resource, the gas shale is considered to be one of the energetic resources of the future [6], which has allowed to be turning, along to the rapid increase of the energetic needs, into an important source of hydrocarbons [13]. The rapid development that has been experienced by the shale gas markets, has given place to important advantages to the communities economy for the foreign investment [14], and it has awakened the interest of many countries to improve the exploration method and improvement of the extraction processes [15]. In this sense, [14] highlight the importance of constructing models that help to evaluate the influence of the technology, the cost, and the politics of the shale gas industry, so that their results allow to improve the decisions of the governments in this energetic field.

Mexico occupies the place number six in the countries ranking with the major quantity of shale gas resources technically recoverable with a reservation estimated of 545 Tcf. In Mexico, the hydrocarbons have been one of the most important pillars of its economy in the last decades, especially after the beginning of Cantarell's operations in the year of 1979.

Since its creation in 1938, the company Petróleos Mexicanos (PEMEX) has been the manager of realizing the operations of exploration and exploitation of hydrocarbons, for what it possesses a vast experience of field in the development of operative activities associated with conventional terrestrial resources and in shallow waters. However, under the new energetic scene of Mexico in which the conventional resources have been diminished considerably and the demand of hydrocarbons grows constantly, it leads to the Energetic Reform, promulgated in the year 2013.

With this Energetic Reform, several activities related to the production and distribution of energy, before PEMEX's considered exclusive activities, are opened for the private investment so much national as foreigner of big oil corporates for the exploration and extraction of not conventional resources; that although it raises for Mexico big benefits, also brings with it a series of challenges associated with the supply of goods and services highly specialized to give it support and facilitate its development.

To measure the economic activity, strengths and opportunities with the shale gas core business in its supply chain, the following sections of this article bring the national activities of exploration and extraction "upstream", which are grouped in this study in function on his affinity with the help of a group of experts, to finally to determine the quantity, location and size of the companies that could become into potential suppliers of the national supply chain of the shale gas in the short and medium term.

2. Literature Review

The supply chain is understood as a set of coordinated companies with a central company with whom they interact in a coordinated way as a complex and dynamic system by means of relations of collaboration to place the requirements of input in every link of the chain just in time, and to the minor cost [16], [17], [18].

The structure and level of coordination of a supply chain depend on the maturity of its markets, products, customer relationships, in which the coordination level can go from the simple harmonization of internal processes in the only (intra-functional) installation or in several facilities (inter-functionally), up to the most challenging coordination inter-organizational [19],[18].

The hydrocarbon supply chain in particular, it can be defined as special due to its products have a great social and economic importance, which is shaped by a highly complex network of companies that are involved in activities of intensive engineering to develop oil and gas sources [20]. It inserts in an unstable context influenced by geopolitical conflicts, global competition and price volatility [17].

The hydrocarbon supply chain is divided traditionally in two or three of the following segments: upstream, midstream and downstream. For effects of this work, as it is described in [17], the upstream segment comprises all the oil exploration and extraction functions; the midstream segment concerns the petroleum conversion in refined products in the refineries and petrochemicals or the gas treatment; and finally, the downstream segment includes storage, primary and secondary distribution, as well as the sale of refined or treated products. In this chain, especially in the upstream and the midstream is needed a constant and considerable flow of capital goods, materials

and services that go from the routine to the highly specialized and critical.

The projects of the unconventional upstream, they have many unique characteristics that represent operational challenges [21], for example, the location of new projects is mostly in difficult and remote places of the traditional supply bases, that is to say, remote places in absolute terms from any population center, and sometimes, through field that may be environmentally and politically sensitive; in which also, the cumulative impact of multiple projects puts stress the workforce and local supply [22]. Therefore, [23] have defined the unconventional hydrocarbons supply chain, especially shale gas, as a complex network that includes shale sites where wells are drilled and fractured; sections of water management to ensure the supply of this input in the wells and treatment generated during the process; processing facilities to separate different products from shale gas; product warehouses and markets where the products are supplied.

For a better understanding of this supply chain and in order to identify opportunities to develop it, [24] provide a detailed description of the activities associated with supply profile of the shale gas in four stages: 1) exploration and permits; 2) development of the site/drilling ; 3) fracture ; and 4) production/distribution, while, [25] studies the supply chain of the shale gas and petroleum in the United States through five main elements: 1) capital goods; 2) construction/well services; 3) logistics; 4) materials; and 5) professional services. it is also assessed the economic contributions of this industry in terms of employment, labor income, government revenues, gross output of goods and services; it analyzes the national and state results; and examines the incremental levels of construction activity associated with the development of this industry.

Hydraulic fracturing, drilling and completion, waste management, storage and transportation and other activities related to the preparation of the pad, construction equipment, security services, environmental impact assessment, etc., have been identified by [26] as the five major categories of expenditure in the supply chain of gas and unconventional petroleum. [27] examines, through exploration and extraction scenarios, the potential impact of developing an unconventional supply chain based on a supply hub; scenarios that can be performed with and without an attempt to coordinate the supply chain infrastructure and to develop a local knowledge base.

the supply chains of the petroleum and gas (P&G) conventional and non-conventional have attracted the attention of academicians and researchers that often tend to mathematically model them as a set of nodes and arcs in a network with flows of materials, services, resources and information. A multi-objective mathematical model for optimizing a supply chain network of natural gas from a macro-ergonomic perspective is presented by [4]. In [28] is propose a linear programming model fuzzy multi-period and multi-objective to evaluate and optimize a supply chain network of natural gas multi-link. Other mathematical models that consider supply chain of petroleum and gas as a network multi-link were proposed by [29], [30], [31], [32], [33], [34] and [35] who focus on developing mathematical and probabilistic models for the optimal design of the supply chain of hydrocarbon biofuels.

The supply chain of P&G, especially the upstream segment is characterized by having a large number of small and medium enterprises that provide services and technological support to the operations of first level companies of service supplier in the supply chain. The management of these suppliers, as part of the total supply chain, it is of great importance to the effectiveness and efficiency of the total supply chain. [36] evaluate the link between the dimensions of the agile supply chain, competitive objectives and business performance in the P&G upstream industry in the North Sea of England. [18] analyze the cluster role as a strategy for the economic exploitation of the resources of P&G and explore the advantage of the agility, the competitiveness profit, and performance benefits of the cluster members above those who are not.

Most of the scientific works analyzed are orientated to propose alternatives of configuration of the P&G chain supply by means of modeling and mathematical optimization, simulation and statistics. Only the works of [24], [26], [25] and [27] are orientated to do a detailed characterization of the shale gas supply chain from an economic or territorial perspective. On this research line, this article measures the current intervention of Mexican companies that might provide goods or services to the companies of the nonconventional upstream which become established in the North-East region Mexico as a result of the energetic

reform; and the possibilities that these have to become part of the shale gas supply chain , taking into account the own characteristics of the industry and the policies of local content that have been established in the wake of the change of paradigm in the exploration and exploitation of this type of energetic resource

3. Materials and methods

The "environmental criteria guide for the hydrocarbons exploration and extraction contained in shales" published by the Secretariat of the Environment and Natural Resources (SEMARNAT); the perspectives of the national and international energetic sector were elaborated by the Secretariat of Energy (SENER); the procedures and results of the rounds of tenders of areas with hydrocarbons published by the National Commission of Hydrocarbons; the Quinquennial tender plan for the hydrocarbons exploration and extraction 2015-2019 of the SENER; The files with the tendered areas and prospectives of georeferenced hydrocarbons; the North American Industry Classification System (SCIAN); the National Statistical Directory of Economic Units (DENUE) was conducted and published by the National Institute of Statistics and Geography (INEGI); and a geographic information system, they are part of the materials used for the realization of this work. By its objective, the research is exploratory, descriptive, and transverse type, with the intention of identifying the elements that compose the shale gas supply chain, to the present day of this research.

The methodology used for the characterization of the shale gas supply chain consists of the following stages:

1. Characterize the shale gas value chain and associated activities in order to understand the productive process and the operational activities; their risks and benefits; and the Mexican recommendations and regulations around it from a review of secondary sources.
2. Identify the main assets and economic activities of the SCIAN related to shale gas supply chain, its standards and technical specifications through a secondary sources review and interviews with experts.
3. Quantify and locate the national companies associated with economic activities that belong to the shale gas core business which are registered in the DENUE in order to identify strengths and opportunities.
4. Identify the main reserves and exploration prospective projects of P&G Unconventional in Mexico from the georeferenced information provided by the National Hydrocarbons Commission (CNH) in order to identify the federal entities and direct and indirectly municipalities affected by this activity.
5. Identify the private investors who have won the allocation of exploration and exploitation areas of hydrocarbons in Mexico.
6. Characterize the route map of the shale gas supply chain in Mexico.

4. Results

In Mexico hydrocarbons remain the property of the nation, and the opening of this activity to the national and foreign private investment is subject, among others, to the following conditions in order to ensure this premise:

- The areas, fields and blocks of hydrocarbons exploration and exploitation will be offered through tendering rounds on the part of the CNH.
- The national private investors who take part in the tendering processes related to the P&G, they will have to constitute Mexican societies, without there being prohibition or limit as for the participation of foreign investment allowed in the federative entity.
- The SENER defines the contracting model of the deposits, from four contract structures or the combination of these:
    - Service contracts in which the investors receive cash payments, but they are not owners of the petroleum and gas produced;
    - Profit sharing contracts, where the investors receive cash payments considering the profit to be generated;
    - Production sharing contracts , in them, the investors receive volumes of petroleum in kind considering the production volume;
    - License contracts, in which the investors are owners of the extracted hydrocarbons, providing that, in

conformity with the contract terms, be current in the contractual obligations payment in favor of the State. These contractual obligations can be paid with hydrocarbons.

- The fiscal terms of the contracts will be established by the Secretariat of Finance and Public Credit (SHCP).

According to [37] the main unconventional hydrocarbons reservations of Mexico are found in land, and they are extracted by means of hydraulic fracturation and thermal recovery. The Figure 1 describes the upstream, midstream and downstream segments of the shale gas value chain as that of the natural gas in Mexico.

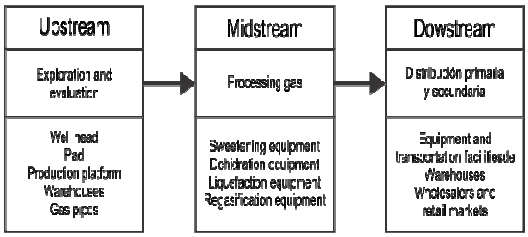

Figure 1. Natural gas value chain. Elaborated by Author

The upstream of resources unconventional in Mexico contemplates four main stages: 1) exploration and evaluation, 2) drilling and completion, 3) extraction or production, and 4) closure and abandonment. The exploration and evaluation stage seeks to obtain a volumetric image to estimate gas accumulations prior to drilling and determine the productive viability of the hydrocarbon deposit. The drilling and completion stage is aimed to confirm the existence of gas reserves and determine their economic viability. The extraction or production stage consist in the commercial exploitation of the deposit and involves the installation of infrastructure for the gas collection in the established area. Finally, the closure and abandonment establishes measures that seek to regenerate or restore the sites; to define measures that favor the equipment recycling and reuse; and propose monitoring strategies of closed wells that will contribute to reduce levels of danger for the population and the environment [38].

The Figure 2 describes the unconventional upstream stages considering in turn a series of sub-processes or activities subject to the standards and trends of the industry; the geological and geophysical characteristics of the deposit; the technical, economic and operative viability of the reservation; the international and national recommendations; and to the fulfillment of the legal dispositions established by the different organs of government.

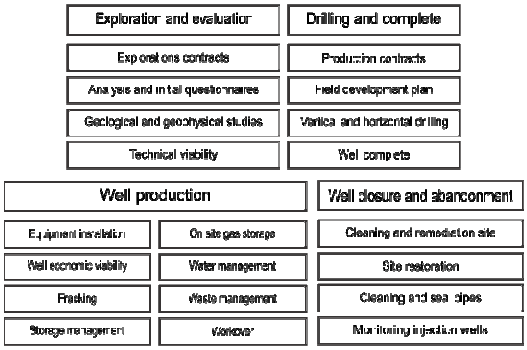

Figure 2. Stages and processes associated with the unconventional upstream subsector. Elaborated by Author

The natural gas midstream described in Figure 3, is made up of three stages depending on the company and the type of contract to be established in the upstream segment: marketing and commercialization of gas which is produced to brokers or customers; processing gas, that is to say, the separation process of water and oil in the associated gas, sweetening (removal of carbon dioxide and sulfuric acid) and the extraction of the corresponding sulfur, dehydration (removal of water vapor), fractionation , liquefaction and regasification, among others; and transportation and storage of natural gas.

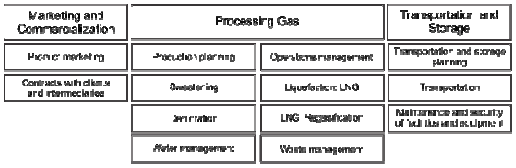

Figure 3. Stages and processes of the natural gas midstream. Elaborated by Author

The storage and distribution stage to wholesalers and service stations can be carried out through roads or the national gas pipeline system that are part of National Integrated Transportation and Storage System (STANI) of natural gas, which is managed and administered by the National Center for Natural Gas Control (CENAGAS). The sale to the final consumers seek to satisfy, among others, the demand of the electricity generators companies, industries, residences, transportation,

and small medium sized enterprises (SMEs), and the petroleum industry itself (Figure 4).

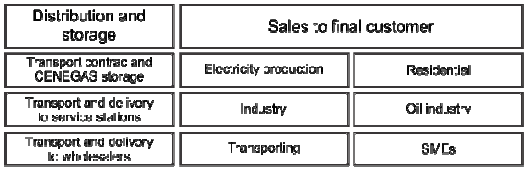

Figure 4. Downstream stages and processes. Elaborated by Author

4.2 Assets and economic activities associated with the shale gas production

Assets acquired along the unconventional supply chain of shale gas can be divided into capital assets and materials [25]. Capital assets put into groups all those assets or property that will be used in the production process, and they will constitute the capital or asset of the company. Such assets include prefabricated structures for construction, tanks or cisterns, access machinery and construction, pumps, compressors, energy generators, boilers, heat exchangers, machines of lifting, loading, unloading and handling, welding, cutting , among others. The materials, on the other hand, put into groups raw materials such as chemicals, lubricants, pipe fittings and steel, minerals, clays, sand, gravel, cement, wiring and fittings electrical, gaskets, valves, water, gears, etc.

Respecting economic activities in Mexico, the DENUE [39] offers identification and location data of the economic activities classified under SCIAN [40], so that activities or sub-processes linked to the unconventional national value chain [41], [25], and [42] served as base for the identification of the economic activities directly related to the shale gas core business. As shown in Table 1, these economic activities were subsequently classified through a series of interviews and surveys of experts in five main groups: 1) specialized, 2) construction and maintenance, 3) waste management, 4) manufacturing and industrial maintenance and 5) support services.

Table 1. *Economic activities associated with shale gas core business in Mexico.* Elaborated by Author based in the activities of the [40]

Group	Economic activities (Key NAICS)
Specialized	Construction of distribution systems for petroleum and gas (237121) Transportation of natural gas through pipelines (486210) Drilling of petroleum and gas wells (213111) Other services related to mining (213119) Geophysical survey services (541360) Mapping services (541370) Construction Supervision of petroleum and Gas works (237123)
Construction and Maintenance	Supervision of construction of other works of civil engineering (237994) Foundation work (238110) Assembly of prefabricated steel structures (238122) Construction of works for treatment, distribution and water supply and drainage (237111) Dams construction (237991)
Waste Management	Hazardous waste management and remediation services in areas damaged by hazardous materials or waste (562111)
Manufacturing and industrial maintenance	Manufacture of concrete (327320) Construction of industrial boilers (332410) Manufacture of tubes and iron and steel poles (331210) Manufacture of other products of iron and steel (331220) Molding casting of iron and steel (331510) Molding casting nonferrous metal parts (331520) Production of metal valves (332910) Manufacture of pumps and pumping systems (333910) Manufacture of machinery and equipment to lift and move (333920) Manufacture of machinery and equipment for the mining industry (333130) Production of metal structures (332310) Manufacture of metal tanks of heavy gauge (332420)
Support	Engineering services (541330) Consultancy services environment (541620) Railroad transport (482110) Community emergency services provided by the private sector (624231) Community emergency services provided by the public sector (624232)

4.3 Quantification and location of companies related to the shale gas core business in Mexico

In the country there are about 9235 companies related to the shale gas core business: 43% related to manufacturing and industrial maintenance; 30% with support; 14% in specialized activities; 11% in construction and maintenance activities; and 2% in waste management. As shown in Figure 6, the

highest concentration of companies of this kind is located in Mexico City, Nuevo Leon, Jalisco, Toluca and Veracruz (Figure 6). It is important to mention, however, that these economic units do not necessarily have the experience, expertise and certifications required for the exploitation of unconventional resources; this may be due largely to the exploration and exploitation of hydrocarbons was considered for years an exclusive activity of the Nation, exercised exclusively by PEMEX and focused primarily on the exploration and exploitation of conventional resources. The Figure 5 describes the geographical distribution of the types of activities associated with the shale gas core business in Mexico.

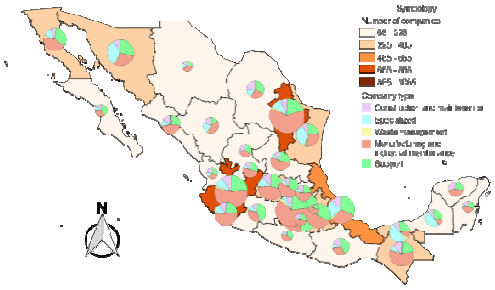

Figure 5. Distribution of activities types associated with the shale gas core business. Elaborated by Author with [39] data.

The highest concentration of companies dedicated to specialized economic activities are concentrated in Mexico City or in the entities with mining or petroleum tradition as Sonora , Nuevo Leon, Tamaulipas, Veracruz and Tabasco, in which 62% of companies are micro, 22% small enterprises, 14% medium sized enterprises, and 3% large companies. Large companies are located in Mexico City and in the federal entities of Campeche, Sonora, Tabasco, Durango, Guanajuato, Hidalgo, Nuevo Leon and Veracruz.

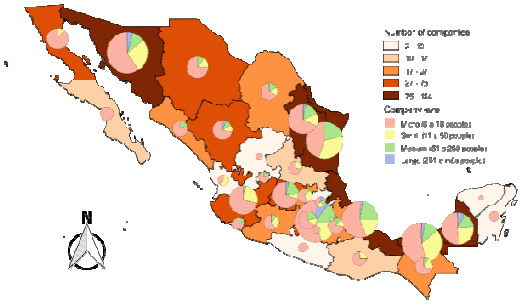

Figure 6. Distribution of companies associated with specialized economic activities. Elaborated by Author with [39] data.

Companies committed to economic activities of support, construction companies and maintenance companies are mostly located in the Mexico City, while the ones dedicated to the activities associated with manufacturing, industrial maintenance, and waste management, are located mainly in the entities of Toluca, Jalisco and Nuevo Leon. Figure 7 describes the geography of Mexico, the distribution of the group of associated companies with shale gas in Mexico.

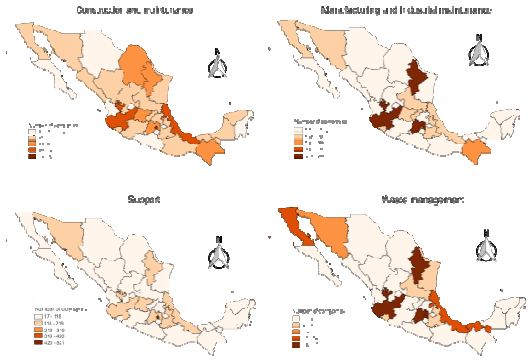

Figure 7. Distribution of groups of associated companies with shale gas in Mexico. Elaborated by Author with [39] data.

4.4 Main reserves and prospective resources of unconventional hydrocarbons

According to the U.S. Energy Information Administration (EIA) in Mexico technically recoverable shale resources are estimated at 545 Trillion cubic feet of natural gas and 13.1 billion barrels of oil condensate [43]. The Table 2 describes the main concentration of these resources are located mainly in the northeast region of the country in the basins: Burgos, Sabinas-Burro Picachos-Tampico-Misantla, and the city of Veracruz.

Table 2. Technically recoverable shale resources. Source: [43]

Basin	Petroleum y condensate (million barrels)	Gas (Tcf)	Crude petroleum (bbl billons equivalents)
Tampico-Misantla	6.5	24.6	11.4
Burgos	6.3	393	85
Sabinas-Burro-Picachos	0	124	24.8
Veracruz	0.3	3.4	0.9
Total	13.1	545	122.1

According to the [37] the Quinquennial Tender Plan of hydrocarbons considers 24 major areas of

exploration of unconventional resources, covering an area of approximately 34.830 km2, with estimated prospective resources of 25.276 millions of barrels of crude oil equivalent (MMboe), distributed mainly in the federal entities of Coahuila, Nuevo Leon, Tamaulipas, San Luis Potosi, Veracruz, Hidalgo, and Puebla (Figure 9).

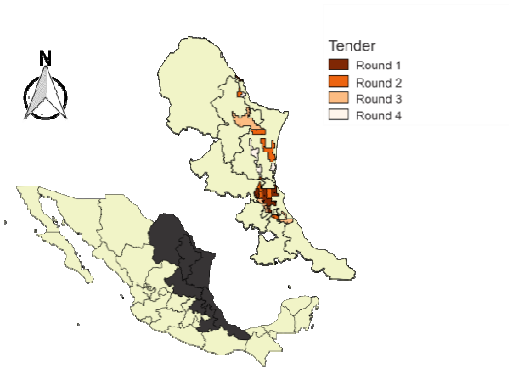

Figure 8. Quinquennial Prospective of tenders rounds 2015 -2019. Elaborated by Author with [37] data.

4.5 The private investors of the Mexican hydrocarbon sector

In accordance with the stipulated in the energy reform, the auction of petroleum fields for exploration and exploitation begins in March 2014. As a result of the first three tenders of round one, twenty-nine different companies have won allocations, either independently or in consortium. As shown in Figure 9, these companies are mostly of Mexican origin, followed by American companies, Canada, Italy, United Kingdom, Holland and shared capital as in the case of a couple of companies with Mexican/Argentinean and American/Argentinean capital.

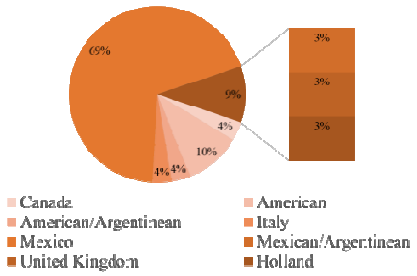

Figure 9. Origin of the capital of the winning companies of the first three tenders for round one. Elaborated by Author with [37] data.

4.6 Characterization of the shale gas route map in Mexico

Given the criticality of the processes associated with the unconventional hydrocarbons supply chain, and operational challenges posed by the management, movement and storage of large quantities of materials, the Mexican shale gas supply chain must take into account the capacity to provide capital goods, materials and services with the quality and the quantity demanded.

The Figure 11 describes in its shale gas supply chain, the number of Mexican companies with economic activities associated to the supply with capital goods, materials and services of the shale gas core business registered in the DENUE; the subprocesses upstream, midstream and downstream; as well as the consumption demand of the national and international market. In this regard it has been identified that over 80% of economic units considered in the different service groups are micro or small enterprises; that the support services and manufacturing and industrial maintenance are the most offered; and that the waste management services are less frequent.

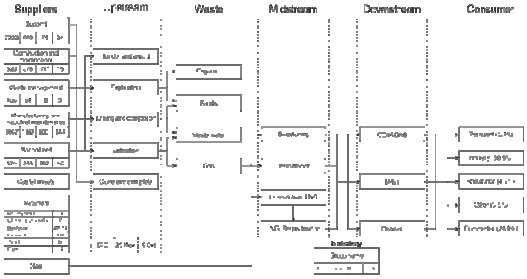

Figure 10. The Mexican shale gas supply chain. Elaborated by Author.

Nowadays, the high quality standards demanded by the mining operations of unconventional hydrocarbons, and the level of competition of such activity of the business sector itself in economic activities of more tradition and less risky or volatility, it does not guarantee by itself its insertion into this supply chain for the simple fact of existing or specialising in conducting this kind of activities. Mexico, however, presents a fortress in the conventional petroleum extraction activity, in which most of the supplier companies of PEMEX do have the experience, quality and certifications required to be inserted into such chain. These companies are mainly specialised in the production of steel, cement and pipes; mining and processing plants of barite, bentonite, and clays are widely used in the shale gas exploration and exploitation; and the production of certain chemicals and drilling fluids.

The Mexican shale gas supply chain also considers the supply of gas, since this will be essential to satisfy the national demand for this energetic product during the early stages of the unconventional upstream development subsector,

as the quinquennial plan of development 2015 - 2019 considers only tenders for exploration of this kind of areas.

5. Conclusions

In this work are described the main capital goods, materials and services that are part of the shale gas core business, with special emphasis on the upstream activities. These capital goods, materials and services are associated and characterized through national economic activity considered by SCIAN, because on the one hand, this classification system will allow standardizing and contrasting the information obtained with that produced in the region of North America and on the other one, because right now Mexico does not have an information base that describes in detail the specific goods and services offered by Mexican companies.

Although during years the activities related to the petroleum sector in Mexico were developed under a unique business model in which PEMEX performed as the biggest and single investor; This centralization of activities, it has not impeded that in Mexico the arising of supply companies of capital goods, materials and services associated with this sector.

The results of this research show that in the DENUE, the level of specificity that is allowed by the SCIAN, there are companies that perform economic activities directly associated with most sub-processes of the shale gas core business. Of course the experience of these companies, as that of PEMEX is more focused on the conventional sector, for what it will be necessary to determine the size of the gap of knowledges having in order to generate specific strategies that enable them to be inserted into the industry unconventional supply chain.

For that it is important to consider, on the one hand, that the companies of this sector achieve high levels of specialization, efficiency, consistency, standardization of production and integration of the supply of operations; on the other hand, the unconventional sector itself poses management challenges, transport and storage of large volumes of materials that they will demand certainly a correct integration of the supply chain to give profitability; and finally, although the proximity of Mexico with the United States of America favors the access to the unconventional service sector, this may represent a competitive disadvantage for the Mexican companies if the knowledge and cost gaps cannot be overcome.

Finally, the management of the waste produced along the shale gas supply chain, especially in the upstream subsector, it is one of the issues that still need to be improved and treated in the short term because of the environmental impact derived of operations in such subsector. In the medium term, it will be necessary to consider the growth in demand for this type of services given the high levels of production of organic waste, solid waste, wastewater and gases produced during the upstream subsector productive process, as well as the services directly associated with the midstream and downstream.

While the experience of the Mexican company in the conventional energy sector is competitive enough; high levels of uncertainty that characterize the process of exploration and extraction of the shale gas, it requires of Mexican companies to try to optimize and integrate its supply chain through the adoption of an adequate logistics to improve the coordination of activities and the flow of materials, services and capital; and to establish strategies that allow to react appropriately to the demand for the services required by the energy sector.

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