



Case Report

Sadyt: A Successful Business Case 1995–2019

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Abstract: This paper seeks to explain the internationalization process of Sadyt from 1995 (date of foundation) to the present day. This company, belonging to the Sacyr de Vallehermoso group, began its international expansion in markets such as Algeria, Tunisia, and Australia. Carrying out this case study focused on one of the companies is justified by its substantial improvement in the global ranking of desalination companies. The history of this case of business success is relevant because ten of the twenty companies that lead the global desalination market are Spanish and this fact is completely unknown outside of the sector. We will analyze in detail the main elements of the company such as its customers, strategies, suppliers, and the theories that explain the internationalization of Sadyt.

Keywords: internationalization; Sadyt; desalination

1. Introduction

The scarcity of water resources that affects Spain in general, and the Mediterranean arc and the Spanish islands in particular, has obliged and continues to oblige the design of a complex framework in order to ensure the provision of sufficient water for productive activity. (In addition to the use of ground water resources, in Spain it has been necessary to recur to transfers between water basins, the treatment and reuse of wastewater, the extraction of underground waters and desalination.) This situation has not been exclusive to Spain, although in 1995 the world desalination capacity was 20 million cubic meters per day, in 2019, this now exceeds 90 million cubic meters per day [1]. Each year, the global capacity increases. The greatest increases in global capacity in recent years occurred between the years 2007 and 2010 [1]. If we look for an origin in the time that made the desalination sector in Spain begin to grow, that origin is the A.G.U.A. (Spanish acronym for Actions for the Management and Use of Water) Programme, in which a good part of the country's water shortage was alleviated with the construction of desalination plants. This programme, of which we can see a diagram in Figure 1, meant a massive demand and also meant the exhaustion of the local demand for the following years, so that the internationalization of the companies in the sector is the only alternative to continue within the desalination market.

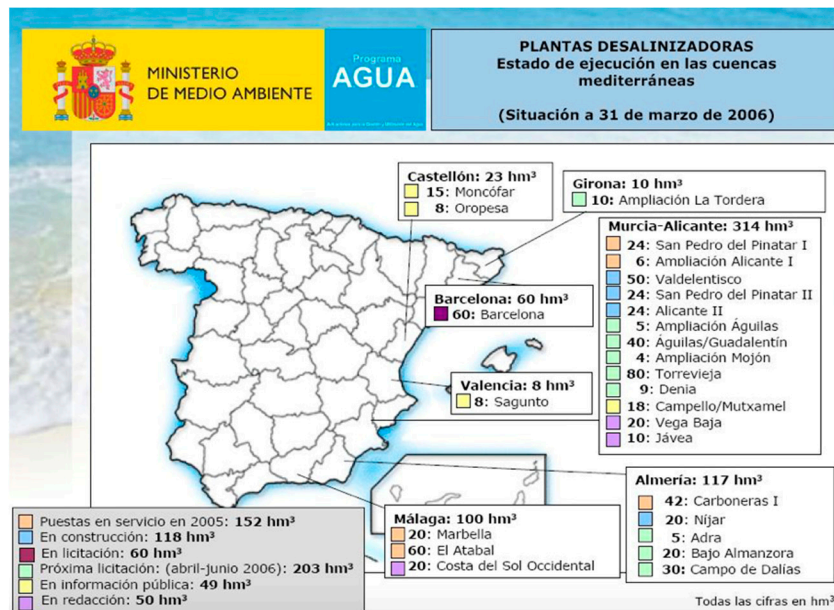


Figure 1. A.G.U.A. Programme. Source: Spanish Ministry of the Environment (currently called Ministry of Ecological Transition).

At present, if we look at the ranking of the “best” companies in the world in Figure 2, we see that there are many Spanish companies. I put the word best in quotation marks because in the sector this qualifier is usually used, but what is really being measured is the total capacity of each company.

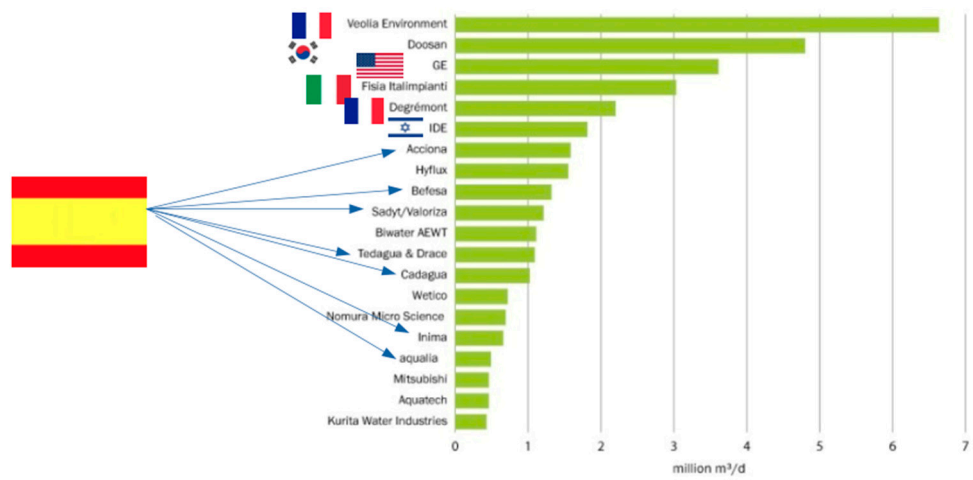


Figure 2. Companies with the largest installed capacity. Source: Own elaboration from International Desalination Association (IDA), (2019).

Spanish desalination companies originate from the construction sector and are dedicated to water purification, management, and desalination. However, abroad it is only the desalination sector in which they are competitive since no country is willing to leave management and purification in the hands of foreign companies. The companies carry out both turnkey projects and projects in which they are responsible for construction and operation. For the reader who is not familiar with this technology, desalination using membrane techniques (reverse osmosis being the technology in which Spain is particularly competitive) consists of passing the water under pressure through membranes that generate two by-products: desalinated water and brine.

Research efforts, investment, and continuous social debates to obtain access to water in all parts of Spain have generated a positive externality. We have acquired a strong know-how and companies

specialized in the design, construction, and exploitation of desalination and treatment plants have emerged. (Companies which, having generated employment and wealth within Spain's borders, have begun a dynamic internationalization process.) The history of Sadyt sets this company apart from the others in the sector because it began as a comparatively small company with respect to its competitors, but was able to win a large number of contracts making a skillful use of its comparative advantages. An example of how Sadyt has turned its weaknesses into strengths can be found in the Australian market. In this country, Sadyt was a finalist against Acciona Agua (another much larger Spanish company with more plants in operation at that time). Aware of its diseconomies of scale, the strategy of Sadyt was based on flexibility, adapting the plant to the specificities preferred by the client. In this way it was able to beat the company Acciona, capable of offering lower costs and a greater number of references (in the trade, they call references the plants already in operation, and they are fundamental in the contracting processes as they are the best proof of the company's capabilities).

The aim of the study we are going to carry out is to analyze what leads these Spanish companies, and in particular Sadyt, to their internationalization. The aim is to find out how they have carried out this process. To this end, we ask ourselves the following questions: What are the reasons that have led Sadyt to embark on an internationalization process? What are the key elements in this process? The following hypothesis emerges from the answer that we can give to these questions before preparing the study. The reason for this company to begin an internationalization process is that the only way to continue growing is to expand its business to other countries as once the unsatisfied demand for water resources has been covered, the only possible way to continue growing without changing the product offered is to establish new plants in geographical areas with water shortages. (Currently, Spanish desalination and reuse companies are expanding towards Arabic countries and Australia) [2,3]. It is very important for Spain to have a group of companies that are considered the best in the world in this sector because water scarcity is set to increase in the coming years [4,5]. Based on population growth and GDP per capita forecasts in various countries, it is logical to think that the demand for desalinated water will increase over the next few years (as is already happening year after year).

2. Evolution of Desalination on an International Scale

In Spain, the desalination sector has shown significant growth in response to the increasing scarcity of water resources. This fact has placed Spanish companies in the sector in a competitive position due to their accumulation of experience and the public entities determination to encourage this activity [6]. However, the demand for desalinated water in Spain is not enough to sustain the development and increase in supply, so companies in the sector have found internationalization is the best way to increase their turnover thanks to the knowledge and experience acquired in Spanish desalination plants. This lack of demand from Spanish citizens is mainly due to the lack of awareness of cost recovery for this type of activity [7,8]. Therefore, making citizens aware of the advantages of desalination regarding guaranteed supply and environmental benefits and the need to correctly finance environmental activities would be appropriate [9]. Therefore, the suppliers of desalinated water in Spain have pursued business opportunities in other countries with the aim of increasing their turnover, already limited in the domestic market.

On the other hand, demand in the international market is necessary to carry out an internationalization strategy. In the current context, there are several countries that suffer from great shortages and need to develop their non-conventional water sources, but do not have the capacity of the pioneering countries in this activity [10,11]. Thus, companies in the desalination sector from countries committed to it can carry out an internationalization strategy as they have comparative advantages that allow them to increase their turnover through projects in other countries [6,11]. In particular, a fundamental advantage of companies established in the sector is the capacity to develop the activity with lower costs than companies with less experience [12]. In this way, and according to data from Global Water Intelligence (GWI), countries such as Turkey, Thailand, Algeria or those in the Persian Gulf, primarily Saudi Arabia, among others, have become major demanders in the

desalination market in order to cover their water resource needs [13]. Likewise, it is expected that in the future the demand for water from these and other countries will continue to increase due to climate change, population growth, urban development, and the industrialization of new regions, which brings about the possibility of participating in new projects [14]. In this sense, an increase in the demand for desalinated water can be expected as a way of complementing the rest of water sources with the aim of satisfying the growing needs for water [11].

As a result of the presence of offerors and demanders in the market, and according to the data from Global Water Intelligence [1], the development of the water desalination market began in the 1960s, which has since seen an increase in installed capacity. Unfortunately, the financial crisis that began in 2008 was a major obstacle to the contracting of new projects, which had reached its peak in 2007 with the contracting of 7 million cubic meters per day of capacity. However, this is expected to be a temporary issue given the fundamental nature of water supply and the environmental benefits of desalination. Furthermore, taking into account that it was a product in full growth before the recession, it is expected that investment will return when the economic situation of the demanding countries stabilizes. Specifically, the countries of East Asia and especially those of North Africa and the Middle East were strong demanders until the recession, and, in spite of it, they have maintained a certain volume of new contracts throughout the period, so it is to be expected that the business will offer new opportunities in the future. The companies already established in the sector have increasing experience, knowledge, and technology, so their ability to minimize costs is a significant competitive advantage in the current context of recovery of activity after the recession. Companies such as Veolia, General Electric Water, Doosan, Ide Technologies, or Suez Environment, which have contracted capacity of more than 2 million cubic meters per day from 2006 to 2015, as well as others such as Hyflux or Sadyt, which are close to 2 million, have a great business opportunity in countries that require external companies for the construction and management of desalination plants. In any case, a key aspect that would allow these companies to be differentiated would be to adapt each project to the country's situation, as each country and region has unique characteristics that entail the need for adaptation [15]. The combination of this factor with the minimization of costs and growing experience in the sector can provide a great advantage when competing for projects in the requesting countries, which can be increased if their economic evolution is favorable.

3. Brief History of Sadyt 1995–2019

Sadyt is a limited company with its head office in the Paseo de La Castellana in Madrid. The company was founded on 15 February 1995. To date, Sadyt has not been listed on the stock exchange. The company is engaged in the purification and treatment of drinking and waste water. Until 2008 (the final year in the period analyzed in this study), the company had two shareholders and 19 holdings. (In 2008, the company's board of directors was composed of Jose Antonio Sánchez Vega (Chairman, Antonio Dorado (Managing Director), Jose Carlos Rubio (Director of National Development), Juan Pablo Batanero (Director of International Development), Carlos Madrid (Director of National Production), Vidal Martín (Director of International Production), Domingo Zarzo (Technical and R&D&I Director), and Almudena Rodríguez (Administrative-Financial Director).) Currently (2019), the chairman is Pablo Abril-Martorell Hernández, the Managing Director is José Antonio Membiela and the Administration Director is Inmaculada Martínez Álvarez. In 1996, the company began to work with ten employees. The workforce remained at this level until the year 2002 when it had fifteen workers. After this date it began to grow exponentially, with 28 employees in 2003 and 89 in 2006. Sadyt's debt ratio was 86% points in 1995. This figure diminished until it dropped to its minimum point in 1999 with 66.30% points, and subsequently it rose until the year 2006 when a debt ratio of 99.31% was reached. (Due to the type of activity developed by Sadyt, some years it has a positive result and others a negative result because of the large investments that it makes. However, the company is continuously growing and has to make large investments each time it constructs a plant.) Its operating income amounted to almost four million euros in 1995 and in 2006 this figure was close to 36 million

euros. (Source: Spanish Institute for Foreign Trade (ICEX)). The Spanish company Sadyt began an important internationalization process, making an appropriate use of its competitive advantages. When the company has encountered weaknesses, it has known how to minimize them with strategies such as collaborating with other companies [16,17]; for example, when it created a consortium called GEIDA formed by Sadyt, Cobra, and Befesa. The GEIDA consortium, which can be seen in Figure 3, took part in (and won) the tender for the operating of a Treatment Plant in Macao for which it also collaborated with AGS Macao. In 2006 and 2007, the international expansion of Sadyt represented 39% and 58% respectively of the total turnover for those years, with an international portfolio of 556 million euros with respect to the total portfolio of 663 (Source: ICEX). In 2004, the GEIDA consortium, made up of Befesa and Codesa, both owned by Abengoa; Cobra-Tedagua of ACS; and Sadyt of Sacyr Vallehermoso was awarded with the contract for constructing and exploiting two desalination plants in Algeria in Skikda and Beni Saf for 25 years (under concession). Additionally, in Algeria, specifically in Oran, GEIDA has won the contract to design, construct, and operate a desalination plant with a capacity of 150,000 cubic meters per day, which will supply 750,000 inhabitants. The budget for this facility is 130 million dollars (GEIDA is a consortium of which Sadyt forms a part). In this project, the consortium collaborated with two Algerian companies, the Algerian energy company AEC and the Algerian water company ADE GEIDA contributed 70% of the capital of the concessionary company, AEC and ADE contributed the remaining 30%.

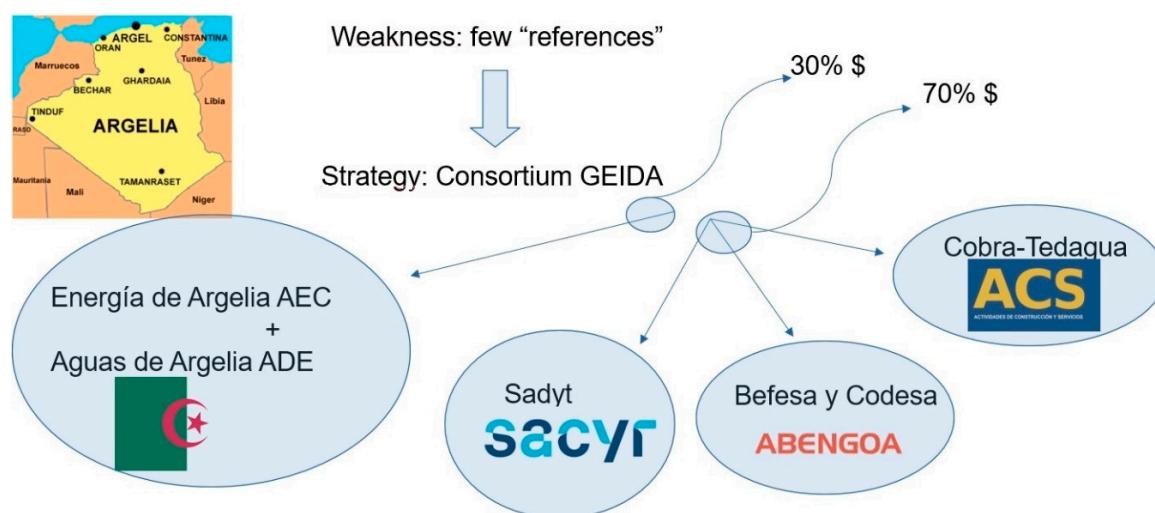


Figure 3. GEIDA consortium. Source: Own elaboration.

4. Basic Elements that Form the Competitiveness of Sadyt

4.1. Analysis of Sadyt's Main Clients

Sadyt has a large number of clients, both in Spain and abroad. We are particularly interested in its foreign clients, but in order to be able to understand the process of internationalization we will first have to study the local clients. Initially, Sadyt constructed desalination plants and Wastewater Treatment Stations (EDARs) in Spain for irrigation communities, private companies, and the public sector. (SADYT has basically two types of client: public and private. With respect to its public sector clients, SADYT participates in public bidding processes within the water sector, including desalination, water treatment, water purification, tertiary treatment plants, etc., including the construction and exploitation or operation and maintenance. Some of these clients (national, regional, provincial, etc.) have been the Ministry of the Environment (Desalination plant of Alcodia), Acuamed (desalination plant of Aguilas), Regional Department of Water of Murcia (EDAR Beniel), Canal de Isabel II (EDAR Reguera), Water Institute of Aragon, Provincial Government of Alicante (desalination plant of Calpe), etc. With respect to the private sector, Sadyt has worked for many sectors: agriculture, tourism, leisure,

electrical, and food industries.) Sadyt has worked for the agricultural sector with the construction of many desalination plants for Irrigation Communities or smaller facilities for SAT. For the tourism sector, Sadyt has constructed plants for golf courses; for the industrial sector it has constructed ultrapure water plants; for the electrical sector it has constructed thermal and biomass plants; EDARs for the food industry, etc. Sadyt has constructed water treatment plants for different leisure companies such as Terra Mítica or the new zoo in Valencia (bioparc). Sadyt began its internationalization process with contracts such as those it obtained to construct and exploit three desalination plants in Algeria for twenty-five years: Teclém-Hounaine (200,000 m³/day), Skikda (100,000 m³/day), and Beni Saf (200,000 m³/day) [18]. In these three desalination plants, the client was the Algerian government. Sadyt participated in them within the Geida consortium (formed by Sadyt, Befesa, and Cobra), in which Sadyt participated with different percentages between 25% and 33%. In turn, Sadyt won the bidding process of the “Southern seawater desalination plant” in Perth, Australia, for “Water Corporation”. This plant was put out for international tender and after short-listing four, two finalists were selected (Acciona Agua and Sadyt), which had to develop the project there with their own technical teams for six months. After the projects were presented, it was decided that Sadyt would construct and exploit the plant for 25 years. (The losing company received 2.5 million euros for the cost of the project.) On the other hand, it also constructed a small plant in Djerba, Tunisia (5000 m³/day).

In general terms, the company stands out for the volume of contracts from important clients in the sector in countries in the Middle East, North Africa, Eastern Asia, and to a lesser extent, North America and Latin America. However, other countries such as Spain or Australia have also generated a high level of demand.

Currently (2019), the main desalination plants (of sea or brackish water, ordered by capacity in decreasing order) of Sadyt in operation are:

1. Ashdod, Israel. Commissioned in 2014; 384,000 m³/day
2. Binningup. Australia Commissioned in 2011; 306,000 m³/day
3. Águilas. Spain. Commissioned in 2011; 210,000 m³/day
4. Teclém, Algeria. Commissioned in 2010; 200,000 m³/day
5. Skikda, Algeria. Commissioned in 2009; 100,000 m³/day
6. Fuengirola. Spain. (The source does not provide the year) 60,000 m³/day
7. Cuevas de Almanzora. Spain. Commissioned in 2003; 25,000 m³/day
8. Newman. Australia Commissioned in 2016; 16,500 m³/day
9. Aguilas. Spain. Commissioned in 2004; 16,000 m³/day
10. Alcudia. Spain. Commissioned in 2010; 14,000 m³/day
11. Pulpí. Spain. Commissioned in 2003; 13,500 m³/day
12. Mazarrón. Spain. Commissioned in 1996; 13,500 m³/day
13. Copiapó. Chile. Commissioned in 2014; 12,000 m³/day
14. San Pedro del Pinatar. Spain. 1998; 6000 m³/day

4.2. Analysis of Sadyt's Main Suppliers

It is complex to determine who Sadyt's suppliers are because, being an engineering company that designs and constructs facilities, it buys all the materials of which they are composed and subcontracts their assembly. In a water treatment plant, there may be a large number of suppliers and for each component there are three or four with which it has a closer relationship. (By way of example, a desalination plant of Sadyt has the following suppliers: Membranes: Toray, Hydranautics, Dow Chemical, and Koch; High pressure pumps: IDP and Sulzer; Membrane pressure tubes: Codeline and Bekaert.) However, there are two elements that undoubtedly determine the competitiveness of the companies of the sector, including Sadyt, in relation to suppliers:

- Sadyt and the rest of the companies have a low dependency on suppliers given that several companies compete in each of the components which the plant needs. Therefore, the negotiating power of the suppliers is low, which is positive for the companies that construct desalination plants.
- Sadyt and the companies in the sector in general only have commercial ties with their suppliers. Therefore, a technological innovation emerging from one supplier will be taken advantage of by all of the companies equally.

From the foregoing analysis we can deduce a threat and an opportunity for the near future of the sector of the construction and exploitation of desalination plants. The threat would be that a supplier of one of the components acquired strong market power and was able to diminish the profit margins of the company. In fact, this is the case in the majority of countries, given that a high value input for a plant is the energy supply. Indeed, many plants in Spain were planned for a certain cost per cubic meter, but with the increase in energy prices this cost has ended up rising substantially [19].

4.3. Analysis of Sadyt's Main Competitors

Currently, the water treatment sector in Spain is in the hands of companies (with some exceptions) that belong to construction groups. There are very few large engineering companies such as Sadyt (with a similar level of contracting and experience); in fact, there are less than ten. The most important are (with the group in brackets): Acciona Agua (Acciona), Befesa (Abengoa), Inima (OHL), Cobra/Tedagua (of ACS), Cadagua (Ferrovial), Drace (Dragados), Degremont, Veolia, and IDE. Within the national market and particularly in the early years of the expansion of the sector, these companies constituted Sadyt's main competition. In Spain, a political controversy arose in which the political parties positioned themselves in favor of desalination or water transfer. However, a transfer is not exactly a substitute for desalination. A transfer depends on the water from another basin (in another place) which is, in general, close, which means that in the case of severe drought, the transfer basin has no water to transfer. Desalination, on the other hand, takes seawater, which has a much higher level of guarantee, provided that there is energy.

If we analyze the international market and the position of Sadyt in it, we can see that in the period 2000–2007, Sadyt held the eleventh position in the world ranking based on total installed capacity. In this period, the companies leading this ranking were (in descending order in terms of total contracted capacity): Veolia Environment, Fisia Italmimpianti, Doosan, General Electric Water, Suez Environment, Befesa Agua, ACS (Cobra), Hyflux, Acciona Agua, and IDE Technologies. These were the principal competitors of Sadyt in the period 2000–2007. Focusing on the period 2006–2015, Sadyt has become the seventh-ranked company in terms of constructed capacity, which shows that it is relatively improving with respect to its competition. Therefore, it is no coincidence that this study analyzes this company. Ahead of Sadyt, the companies that lead the sector were (in descending order in terms of total capacity): Veolia, General Electric Water, Doosan, IDE Technologies, Suez Environment, and Hyflux.

4.4. The Internationalization of Sadyt

The foreign markets in which Sadyt has the largest presence are Australia, Algeria, and Tunisia. The company has a presence in very different countries. However, the form of entry into each of these countries is very similar. On the whole, water is considered as a good of strategic interest. No country is willing to allow foreign companies to privately exploit water. Water resources in a country are a basic good without which the population could not survive. However, national companies often do not have sufficient knowledge to develop hydraulic works as large as a desalination plant. This is why the public sector tends to assign the construction and exploitation of desalination plants through public tender, controlling the activity through contractual agreements.

As a summary, Table 1 shows the SWOT analysis for the company Sadyt. Thus, it can be determined that Sadyt's main strength is that, thanks to its recent flexible strategies, it has gained experience in recent years, which is of great value in the sector. In addition, it shows potential for carrying out a vertical integration strategy, as well as competing to be selected to meet future demand. On the other

hand, Sadyt's small size plays against it, as there is a certain tendency to accumulate and the competition includes large companies, both Spanish and foreign. Finally, competition between Spanish companies may limit the Sadyt's ability to meet foreign demand in comparison to cooperation strategies.

Table 1. SWOT analysis for the company Sadyt.

SWOT	Strengths	Weaknesses
Internal analysis	Important experience gained in recent years Ability to adapt to demand needs	It is a smaller and less experienced company than its competitors
	Opportunities	Threats
External analysis	It has the potential to implement a vertical integration strategy and to better exploit the advantages of improved technology. Demand for new desalination plants is expected to increase	There is a tendency to accumulate in the market, which plays against small companies. Other countries have larger companies that can concentrate a high turnover. Competition between Spanish companies is strong, which could limit the ability to meet international demand compared to a strategy based on cooperation.

Source: Own elaboration.

5. Internationalization Theories that Adapt to the Sadyt Case

In the case of the activity carried out by Sadyt, exporting is not an entry method in foreign countries because desalinated water produced in Spain cannot be transported to another country at a competitive sales price. Moreover, machinery and technology owned by Sadyt are not exported either, as desalination technology is highly standardized. For Sadyt, it is only possible to export small-sized equipment, such as transportable plants or similar. However, it does not usually do this. Usually, in larger works, it is logical that the civil work is performed locally and the teams are taken from Spain, except when there are teams that can be hired more cheaply in the country (provided that they are reliable). Rather than exporting, Sadyt's function consists in participating in international projects, usually including part of the financing of the works, or integrating human and material teams with those of the country where the work is to be carried out. Another system through which companies internationalize is through foreign direct investment. (In the case of desalination and in general in everything related to the water market, countries do not allow the intervention of the private sector without strict supervision. Specifically, projects for the construction and/or exploitation of desalination plants are awarded through public tender processes.) [20,21]. Therefore, contractual agreements are the usual method through which Sadyt enters into the markets of foreign countries. Currently, Sadyt has a presence in many countries, including Israel, Australia, Algeria (with the Geida consortium) and Tunisia (where it has carried out contractual agreements with the government through the participating company SONEDE).

There are different theories that explain the reasons for which a company might internationalize [22]. We will analyze some of them that best explain the case of Sadyt and the companies of the sector. First, we will study the Vernon model [23–25]. According to this model, the foreign expansion of a company is a process with several stages. The first is the "product introduction stage", which comprises the creation of a new product, the desalination plants, which, in this case, were not new, but the price at which the resource could be obtained was exceptional. Initially, the sale of this product was carried out in Spain, which is the market where this innovation had been generated. With these first plants, the desalination plants were in the product introduction stage. According to the Vernon theory, in the early phases of production, companies target the local market as the production process is still not standardized and changes in the design, marketing, or production processes may need to be made which require contact with specialists. (In accordance with Vernon's theory, Sadyt had advantages to construct its first desalination plants in Spain as this market was closer than others.) Once plants

had been constructed in Spain, highly valuable know-how and experience was acquired. Sadyt's first desalination plants in Spain were able to capture part of the demand for water resources, given the beginning of the product growth stage. However, over time, the elasticity of demand grew due to the existence of greater competition. (The competition between companies that construct and exploit desalination plants is special, as it is not so much the desalinated water of one company that competes with the desalinated water of another company, rather the different companies have to compete in the process of the awarding of projects.) Faced with this situation, Sadyt had to compete to be awarded ambitious projects in Spain, and it became more and more difficult as it had to present projects that were better than those of its competitors, with lower profit margins, a lower environmental impact, etc. The Vernon model refers to this stage as the "product growth stage". In the product growth stage, assuming the product is known by consumers, companies consider exporting the product to foreign countries in order to exploit economies of scale in production (however, this is not so simple with desalination companies, due to the high transport costs). It is practically unthinkable that a company would execute a desalination process in Spain and export the resulting water to a foreign country due to the very high costs of transporting the water. (However, we do not have to go very far to find another case of transporting water for occasional emergencies. In Spain, water was sent from the desalination plant of Carboneras (Andalusia) to Catalonia. The cost of this operation was very high but carrying out this type of operation was justified by extreme need.) Therefore, as indicated by Vernon, Sadyt internationalized in the product growth stage through contractual agreements. Vernon explains that contractual agreements are undertaken when this method is more effective given the comparative cost analysis with the other options. Both Sadyt and other Spanish desalination companies have internationalized through contractual agreements in countries where there is a scarcity of water resources, such as Algeria, Iran, United Arab Emirates, or Australia. The main system that they use to enter new countries is participating in public tenders carried out by these countries to see which company is able to undertake the project, subject to different contractual arrangements. In Spain, desalinated water as a product has reached its "final" or "mature stage". (The product is now standardized, offering all the companies the same system of desalination and practically the same costs. According to Vernon's theory, in this stage, companies expand internationally to countries where the technology is inferior, because their product is competitive. This would be the strategy followed in Algeria and Tunisia.)

In conclusion, Vernon's product life cycle theory (1966) explains Sadyt's internationalization process. The way of selecting the country where Sadyt is located has depended on the scarcity of water in that country. Vernon's explanation of the product cycle is interesting to understand the internationalization process of both Sadyt and Acciona and the rest of the competitors. The desalinated water as a product has gone through different cycles in Spain. Currently, the product is in a mature stage [23].

Another theory that explains the internationalization of companies and seems to be coherent with the case of Sadyt is Hymer's theory [26,27]. We will analyze which elements of the internationalization of desalination companies are explained by Hymer's theory and which are not. Hymer defended that, in order to understand direct investment, we need to understand a key concept which was not considered in the theory of portfolio investment. This concept was that of control, as in the case where the interest rates were higher in a foreign country than in the home country, this would motivate an investor to lend money in the foreign country. (However, according to the theory of portfolio investment, there would be no incentive to control the company which is invested in. This is why it is necessary to explain control in order to explain direct investment.) The first reason Hymer uses to explain control is that when a company invests abroad, it seeks to control the foreign country in order to eliminate the competition between itself and the companies in other countries. In this way, it may appropriate part of the return on the investment. (In other words, if several companies can be controlled in different countries by only one company, competition between them can be avoided

and the joint profit can be increased.) In this respect, Sadyt participated in the Tunisian company SONEDE [28].

The second reason why an investment company abroad may be interested in this investment is to diversify [21]. In this respect, when Sadyt entered the markets of Algeria, Australia, or Tunisia, it was diversifying its markets and clients as the contexts in the different countries are very different. (What leads these companies to diversify is that often the profits in a line of activity are inversely related to the profits of another line of activity.) The principal desalination plants are operated by the public sector. So, the state is the principal client, and this represents a high risk for companies that construct and exploit desalination plants. This is why a presence in several countries enables them to diversify, not so much in the activity which is the same, but in the geographical area and the clients with which they operate. In some way, diversification explains the internationalization strategy of some Spanish companies engaged in the construction and exploitation of desalination plants. (If we analyze how Sadyt has internationalized, we cannot say that it is diversifying as in all of the countries it is engaged in the same activity. However, if we analyze the Sacyr de Vallehermoso group to which it belongs, we can observe that Sadyt is a company that was created by Sacyr de Vallemorso (engaged in construction) in order to diversify.)

The second key concept in Hymer's theory refers to the causes that generate investment. According to Hymer, companies internationalize because they have certain advantages with respect to the companies in the other country. Let us analyze these advantages:

- The first refers to economies of scale. In this respect, Sadyt has an advantage, because as it operates a large number of plants both in Spain and in the rest of the world, it has lower costs. Sadyt's designs and projects are better than those developed by the local companies in the countries where they are located as it has specialized personnel with solid training who work for all of its plants. (On the other hand, the price at which Sadyt accesses the components necessary for construction the plants is lower as they purchase large volumes.)
- The second advantage is product differentiation. Currently, all of the companies that construct desalination plants practically offer the same technology, so the product, in physical terms, is not very differentiated. This is why the processes for selecting the company that is going to undertake the construction and/or exploitation of a plant are complex. (If a company can differentiate its product based on technology or marketing, it will be able to obtain monopolistic profits and the higher the differentiation the higher these profits will be.) Given that the technology is practically the same in all companies, the way in which Sadyt and its competitors differentiate their product is through design as depending on how the plant is designed it will have higher or lower investment, exploitation, environmental costs, etc.
- The final advantage indicated by Hymer is the absolute cost advantage. This advantage explains that in certain countries in which Spanish desalination firms are constructing plants or in those where the construction of plants is planned, the competition has been scarce. When Sadyt competes in a country to build its desalination plants, the local companies have few or no plants in operation. In other words, they are companies that are entering the market. The average costs of the entering company are generally higher than those of established companies, which constitutes an advantage for Sadyt when entering a foreign country. However, the way in which Sadyt competes for new contracts abroad is through public tender processes. (Although it is true that Spanish desalination companies tend to have absolute cost advantages in foreign countries, the public sector of the foreign country often prefers to opt to award the construction to a domestic company in spite of having higher costs.)

In conclusion, it is true that Sadyt has economies of scale, even though they are not as high as in sectors where production can be centralized in a single plant. With respect to the product differentiation, technology has not generated competitive advantages as once a technological advancement has been discovered, the rest of the desalination companies also use it (see Section 4.3—Johnson's theory.)

The last advantage is the absolute cost advantage, which Sadyt has, although in this sector it is not always determinant, as the awarding of public tenders also take into consideration variables other than costs [26].

On the other hand, Johnson's theory also seems to explain certain aspects of this internationalization process [29]. In his theory, Johnson coincides with Hymer with respect to the advantages of the companies considered as being determinant for their internationalization. However, the concept about the public good nature of technology introduced by Johnson is interesting, as it is an important aspect when explaining the internationalization of desalination companies. A company that constructs and exploits desalination plants can obtain technological innovation, but this is not easily reflected in a competitive advantage. (This is due to the fact that once the technological innovation has been created, its use by a company does not exclude its use by others.) It may seem as though this does not have to be this way, but if we analyze the structure of the sector we will understand the reason. There are two types of innovation that can appear in one of the components or the engineering of the plant. The innovations in the components arise in the companies that manufacture membranes, pumps, or other components; these are suppliers of the companies that construct and exploit the desalination plants. Therefore, an innovation in a component would benefit both Sadyt and its competitors. On the other hand, innovations in engineering are not easy to patent, as they metaphorically refer to the way in which the parts are assembled. (Some innovations in engineering have been made such as that made by Aqualyng which was not possible to exploit economically.) In general, technological innovations in desalination arise from the producers of membranes and machinery for desalination plants, but once a company that produces machinery for desalination plants generates an advancement, all the companies that construct and exploit the plants benefit from the innovation. This situation constitutes an opportunity for Sadyt and its competitors, given that if Sadyt generated a component able to increase efficiency, it could exploit this innovation through a patent.

In conclusion, Johnson's theory explains the fact that all of the desalination companies offer the same technology, as we have seen, technological innovations do not arise so much from the construction companies but from their suppliers. Johnson's theory shows a way through which Sadyt could export, generating a technological innovation. To do so it would need to vertically integrate, participating in one of its suppliers [29].

Another theory that explains the internationalization of companies and which seems to adapt quite well to the reality of the sector is Caves's theory [30,31]. According to this theory, companies have incentives to carry out horizontal Foreign Direct Investment (FDI) when they have a special public good asset. (In this respect, it is worth highlighting that Sadyt's international expansion has not been carried out through horizontal FDI and that water is a strategic good.) Caves points out that vertical FDI serves to avoid oligopolistic uncertainty and to create barriers to entry for new rivals which require the same input. (In this respect, although it does not constitute FDI, Sadyt has invested in the construction of a pilot plant of the University of Alicante. The technical innovations that may arise from the research of this pilot plant could be exploited by Sadyt in a preferential way as it would be able to establish higher barriers to entry for new companies or competitors. This same operation could be carried out in a university abroad.) In conclusion, it would be interesting for Sadyt to expand through horizontal FDI, taking advantage of having assets that reduce its costs. However, this is not usually permitted by governments. Sadyt is not carrying out vertical FDI but doing so would help it to avoid oligopolistic uncertainty as indicated by Caves. In this sense, it would be interesting for them to hold a share of one of its suppliers [30].

On the other hand, the theory that maybe best explains the internationalization process of companies such as Sadyt is the theory of oligopoly behavior [32]. The theory of oligopoly behavior is perhaps that which best explains the FDI carried out by Sadyt and its competitors. As this theory indicates, companies that construct and exploit desalination plants make up a small group, within which each has a relative position in the market. (In this respect, when business opportunities arise in Australia, Tunisia, or Algeria, among others, all the companies that form this oligopoly compete to

win the contracts.) The fact that the desalination companies form an oligopoly is justified by the large investment costs that have to be made to construct a plant. These costs are difficult to bear for a new company. (If Sadyt had not participated when the business opportunities had arisen in Algeria, it would have lost an important part of its market. This, most probably, would have given rise to a defeat in the tender in Australia where they were currently finalists, as one of the principal factors that has been taken into account in this tender is previous accumulated experience.) The theory of oligopoly behavior distinguishes between two cases. The first is when the product offered is differentiated and the second case is when there is no product differentiation. The product offered by Sadyt and its competitors is not really a differentiated product. The final product offered by them all is the same, desalinated water; the processes to obtain it and the technologies are also the same; inverse osmosis; however, each company designs a project with slight differences regarding issues such as the way in which the pouring is carried out or the basic components but it cannot be considered as product differentiation. When the oligopoly is formed by companies offering a non-differentiated product, if one of the companies grows, it may represent a threat for the rest of the rival companies in the sector. This obliges rival companies to grow too, as not doing so will lose them market share. (To better understand the case, we will assume that there are only two companies, Sadyt and Acciona, which have the same market share and only operate in Spain. If Acciona decides to internationalize through a contractual agreement in Algeria and Sadyt stays in the Spanish market, this would be a threat for Sadyt as Acciona could benefit from locational advantages in Algeria and gain competitiveness and a higher share of the demand. With these profits obtained in Algeria, Acciona could increase its marketing efforts. On the other hand, one of the factors most valued when awarding the contract to construct a desalination plant to one firm or another is previous experience.) If Acciona had entered the Algerian market and Sadyt had not, this would have meant that when a new opportunity in Australia arose, if Sadyt and Acciona decided to bid for the tender to construct a plant, it would be more probable that Acciona were chosen as it would have acquired more experience thanks to its work in Algeria [33,34]. We will illustrate this situation through game theory. In the game that we are going to analyze there are two players, Sadyt and Acciona, which have to decide if they are going to enter the Algerian market or not. On the other hand, we are going to assume that a business opportunity exists in two countries, Algeria and Australia. However, both opportunities do not arise at the same time. Initially, the opportunity of constructing desalination plants in Algeria arises and then in Australia. When entering the Algerian market, we will assume that Sadyt and Acciona are on a level playing field; however, the situation in Australia is different, as to enter this market previous experience is valued. This implies that, if only one of the two companies decides to enter the Algerian market, it will be this company that carries out the project in Australia. However, if the two companies decide to enter Algeria, they will have to compete in the Australian market. Entering the Algerian market or not is a decision taken by the two companies simultaneously. Therefore neither of them knows what the other company will do a priori. The starting situation is an oligopoly. This would be maintained in the case where both companies participate in the two markets, so the payment related to this situation would be α . On the other hand, if only one of the two companies decides to enter the Algerian market, this company would carry out the project in Australia, which would imply the receipt of a payment of β for this company, where β is greater than α , as in our model, the payment of α corresponds to a company in an oligopoly and the payment of β corresponds to a monopolistic company. (In reality, the consequences of not participating in Algeria are not as conclusive as those in our model. However, we are assuming that not participating in Algeria implies the practical expulsion of the company from the market in order to illustrate the situation in a more simplified way.) When one of the companies becomes a monopoly, the other is expelled from the market, obtaining a payment of 0, where 0 is lower than the parameters β and α . In Figure 4, we can see how the game would end up extensively for the Algerian market and strategically for the Australian market. (Where: (1) $\beta > \alpha > 0$; (2) $N = (\text{Acciona}; \text{Sadyt})$; (3) $s_{\text{acciona}} = (\text{enter}, \text{enter}); (\text{enter}, \text{not enter}); (\text{not enter}, \text{enter}); (\text{not enter})$; (4) $s_{\text{sadyt}} = (\text{enter}, \text{enter}); (\text{enter}, \text{not enter}); (\text{not enter}, \text{enter}); (\text{not enter})$).

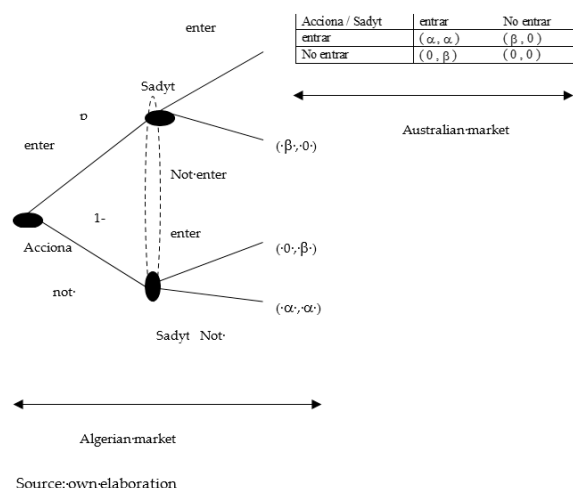


Figure 4. Representation of the game.

We can observe that both for Sadyt and for Acciona, the perfect Nash equilibrium is reached in sub-games when “enter” is chosen in all of the nodes where decisions must be made (As if we denote (5) $s_{acciona}' = (enter, enter)$ and (6) $s_{sadyt}' = (enter, enter)$ we obtain: (7) $U_{acciona}(s_{acciona}', s_{sadyt}) > U_{acciona}(s_{acciona}^*, s_{sadyt})$ for all $s_{sadyt} \in S_{sadyt}$ (8) $U_{sadyt}(s_{sadyt}', s_{acciona}) > U_{sadyt}(s_{sadyt}^*, s_{acciona})$ for all $s_{acciona} \in S_{acciona}$; (9) $NE = \{(enter, enter), (enter, enter)\}$).

6. Materials and Methods

So that it is possible to analyze the possibility of new projects in terms of the construction of desalination plants, data from the global water intelligence desalination data [1] will be used. This data contains water desalination capacity, gross domestic product (GDP) per person, available renewable water resources per person, total water resource extraction, population growth, and gross domestic product growth. A total of 23 observations are available for the year 2011, each from a country except for the resource extraction variable, for which a total of 22.

As for the method used, two models will be developed from ordinary least squares. In the first case, the water resources variable used will be the renewable water resources available per person and, in the second case, it will be the total water resource extraction. The equation to be estimated will consist of returning the installed desalination capacity as a function of the other variables, so that their influence on that capacity can be determined. The equation is as follows:

$$I_c = X_c\beta + \varepsilon_c \tag{1}$$

where I represents the installed capacity; X is a vector of individual explanatory variables and a constant term; and β is a vector of parameters and ε is a random error term. The sub-index c refers to the unit of analysis used, the country.

7. Empirical Analysis

This section will use the available data in order to determine the possibility of new business opportunities in other countries. In this way, Figure 5 shows the 20 companies with the greatest capacity contracted for the period 2007–2018. This shows the high concentration of projects in the largest companies, Suez, Veolia, and Doosan, but also how Sadyt, a relatively small company, has managed to be eighth in the ranking of contracted capacity for this period. This significantly conditions Sadyt’s chances of winning new projects, as although there are many companies with less recent contracted capacity, it is difficult to compete with larger companies, as they accumulate projects and experience.

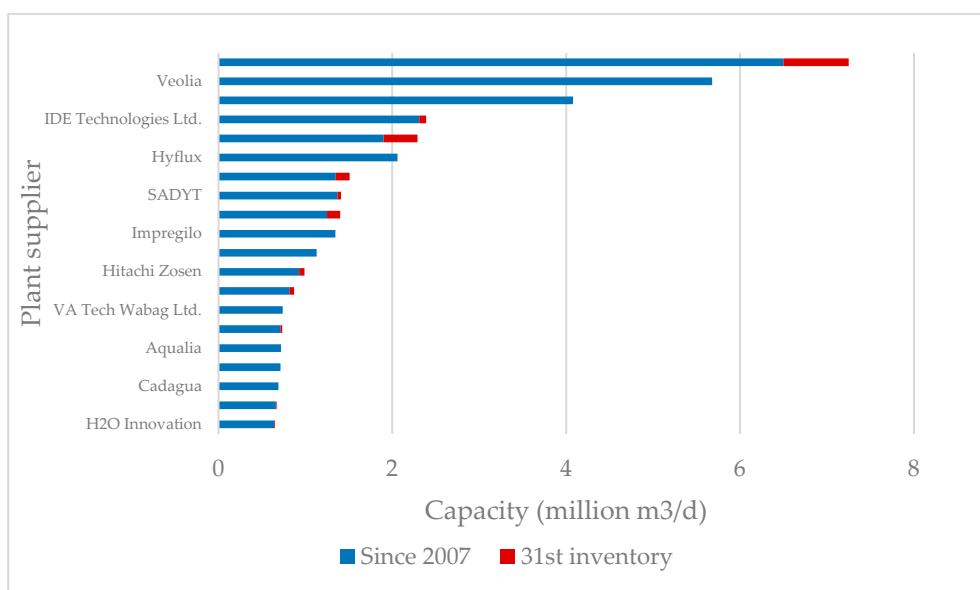


Figure 5. Top 20 plant suppliers by awarded capacity, 2007–2018; Source: Global Water Intelligence; Desaldata 2019.

In any case, it is to be expected that new business opportunities will arise to which Sadyt, as well as the competition, will be able to aspire. Under this idea, Table 2 shows the basic descriptive statistics of the variables total desalination capacity, GDP per person, renewable resources per person, total water abstraction, population growth, and GDP growth rate. These data show briefly that the countries are very different, as the standard deviation indicates. This means that among these countries the situation in terms of water resources, gross domestic product and population is very varied.

Table 2. Basic descriptive statistics of the variables.

Variable	Sample	Mean	Std. Dev.	Min	Max
Total capacity of desalination	23	1,394,662	2,098,918	54,089	7,245,901
GDP per person	23	12,090.43	11,893.37	560	37,240
Current renewable resources per person	23	5178.87	12,602.17	8	57,639
Current total abstraction	22	103,602.3	199,797.2	445	645,837
Population growth	23	1.865217	1.391173	0.13	6.51
GDP growth rate	23	3.952174	1.949095	1.3	8.9

Source: Own elaboration with Global Water Intelligence data. Desaldata 2019.

In addition, Table 3 shows the estimates made by ordinary least squares from the available data. The first equation uses available renewable resources per person as water resources variable, while the second uses total water abstraction. The evidence is not particularly robust due to the limited observations and large differences between countries, but population is a key variable, indicating that meeting the water needs of the population is the main reason for using water desalination. However, a country’s capacity is conditioned by its financial resources, since without these it is not possible to hire companies to install and manage desalination plants. In this regard, the variable of the interaction between gross domestic product and water resource extraction shows significance in estimation (2), thus indicating that wealth or need for water resources alone does not entail contracting new plants, but that both must coexist. However, water is an essential resource, and it is logical to think that in the event of a need for additional water resources, this investment should be a priority, thus generating a business opportunity for multinational companies in the sector.

Table 3. Estimates from Equation (1).

Dependent Variable: Total Capacity	(1)	(2)
GDP per capita	80.802 (44.740) *	41.456 (39.157)
Water resources	−11.729 (45.468)	1.083 (2.594)
Population growth	555,682.004 (307,832.757) *	733,454.345 (268,414.621) **
GDP growth rate	−32,997.007 (218,709.167)	−93,342.546 (229,327.400)
GDP*Water resources	0.001 (0.004)	0.000 (0.000) *
Constant	−472,553.892 (1,304,135.485)	−472,668.378 (1,111,918.656)
R^2	0.36	0.55
N	23	22

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Source: Own elaboration with Global Water Intelligence data. Desaldata 2019.

8. Conclusions

We have seen, therefore, that the position of Sadyt in international markets has become stronger in recent years. Following the logic that we have analyzed of the theory of oligopoly behavior, it is possible that inertias have arisen that have pushed Sadyt to strengthen its market position, although, in the same way, those companies that already have a higher market share than Sadyt could distance themselves even further. This is why, in the words of several of the directors of Sadyt who have been a primary source for this study, one of the company's principal competitive advantages has been its flexibility to adapt the facilities of the plant to the needs of the client. Precisely the use of this flexibility has made it possible to beat other more powerful and more experienced groups in several national and international bidding processes.

The strategy followed by Sadyt to expand internationally is explained by different theories and from different approaches. The cause that could have led both Sadyt and its competitors to take the first steps in their internationalization processes is that the desalination market in Spain is now saturated. In this respect, it acted according to Johnson's theory. The theory of oligopoly behavior best explains the internationalization strategy that is being followed by Sadyt as in order to maintain its market share, it has to expand internationally if its competitors are also doing it. Of the companies engaged in the construction and exploitation of desalination plants, the most direct competitors of Sadyt are the Spanish companies. Of these companies, Acciona is the leading firm. To some extent, the rest of the companies are conditioned by what the leader does. In this respect, the fact that Acciona has opted to expand towards Algeria and Tunisia has created a need for the rest of the companies in this sector to do the same. If Sadyt had not opted to enter the Algerian market it would have lost market share and would not have acquired experience of the Algerian market which would have meant that it would not have had opportunities in Australia as the government would have ruled out a company with little experience. Caves' theory leads to an interesting deduction. It would be interesting for Sadyt to carry out a backwards vertical integration process, acquiring shares in its suppliers. In this way it would establish greater barriers of entry for its future competitors. The manufacturers of the components making up the desalination plants are companies that generate innovations to compete with the rest of the component manufacturers. If Sadyt were to integrate with one of these companies, it could exploit this innovation and gain advantages. Meanwhile, the companies that construct and exploit desalination plants have no incentives to generate innovations, as those that are within their reach are engineering innovations, and in this field, innovation is public (Johnson's theory). Therefore, technology has not generated competitive advantages. The advantages in costs have enabled Sadyt to be awarded with many projects, as the construction and exploitation costs of a desalination plant are

lower when you already have several plants, as there is a workforce, materials and know how that generate decreasing costs. However, it is worth mentioning that although this advantage in costs, fruit of a higher quantity of plants operating, and of economies of scale, it would not give Sadyt comparative advantages over companies such as, for example, Veolia, which have a higher capacity of cubic meters produced per day.

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