University of St.Gallen

Pharmaceutical Cluster in Portugal and Michael Porter Diamond Theory

Business case study

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Abstract

This paper analyzes Portugal's Pharmaceutical Cluster by using Michael Porter's Diamond Theory. This model is also known as the Porter Diamond Theory of National Advantage and it is used in this research paper to study the Portuguese Pharmaceutical Cluster, taking into account the following four dimensions: Factor (Input) Conditions, Context for Firm Strategy and Rivalry, Demand Conditions and Related and Supporting Industries.

This analysis shows that the Portuguese Pharmaceutical Cluster is relatively small and when compared with benchmark countries in the industry, e.g. Belgium, Ireland, Spain, Switzerland and others, it becomes evident that it still needs to further grow and develop, so that it can become more productive and competitive. This paper also concludes that, although some key parameters for this Cluster to be able to expand do already exist in Portugal, they need to be further integrated and developed (see summary in Figure 14). This research study puts forward 10 policies that, if implemented, could enable the Portuguese Pharmaceutical Cluster to further develop and ultimately become a major player in the Portuguese economy. The paper concludes that, although there is a positive outlook for the Portuguese Pharmaceutical Cluster, this industry should be a strategic area of intervention by the Portuguese government and businesses in the coming decade. Only by doing so can the Portuguese Pharmaceutical Cluster become a powerful economic force within the Portuguese economy and improve patients' wellbeing and quality of life.

Keywords

Pharmaceutical Cluster; Portugal; Michael Porter; Diamond Theory of National Advantage; Economy

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About the author:

Daniel Guedelha comes from Portugal. He was awarded a Master's Degree in Biological Engineering by the University of Lisbon and has been working abroad for more than 9 years within the Pharmaceutical industry, mainly in Switzerland, France and Germany, in various roles from Research and Development to Manufacturing, Process Improvement, Global Project Management, Global Supply Chain and Global Key Account Management. This professional experience together with the MBA he obtained from St. Gallen University in 2015 have given Daniel Guedelha a good understanding of the dynamics and overall economics of the Pharmaceutical industry.

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1 Introduction

1.1 Purpose

The global Pharmaceutical industry has been registering double-digit profit margins throughout the last years; however, it appears that "The good old days of the Pharmaceutical industry are gone forever" (Hunt, Manson, & Morgan, 2011). In fact, the business environment and market conditions under which Pharmaceutical companies operate have changed fundamentally. Several factors have contributed to this, namely the fact that competition has increased considerably, governmental spending on healthcare is constantly challenged and stricter regulatory requirements have been transforming the Pharmaceutical landscape (Batra, et al., 2013).

Despite the challenging environment, this industry is adapting and according to a Deloitte report (Deloitte, 2015) the longer-term outlook is more positive. The Pharmaceutical spending growth should match health spending growth at an average of 4.3 percent during 2015-2019, and global Pharmaceutical sales should reach US$1.4 trillion by 2019. In fact, the main factors driving healthcare demand should lead to an increase of Pharmaceutical spending in the subsequent years, particularly due to the aging population, the increase in chronic diseases, and the advent of innovative and frequently expensive treatments, e.g. for cancer and hepatitis C.

Portugal is a member of the European Union and because it is a small and open economy, it is highly influenced by external factors (Guerron-Quintana, 2014). This is also true for the Pharmaceutical industry. However, empirical knowledge of the Cluster in Portugal shows that a lot of its potential is still not fully realized. This paper assesses the Pharmaceutical Cluster in Portugal using Michael Porter's Diamond model to analyse how that potential can be further explored. The Porter Diamond, properly referred to as the Porter Diamond Theory of National Advantage, is a model designed to help understand the competitive advantage that nations possess from certain factors available to them, and to explain how governments can act as catalysts to improve a country's position in a globally competitive economic environment (Investopedia, 2017). Within this model there are four parameters that will be looked at in this paper: Factor (Input) Conditions, Context for Firm Strategy and Rivalry, Demand Conditions and Related and Supporting Industries.

Each one of these parameters will be looked at from different angles, in order to answer the following questions:

- Which are the main strengths and weaknesses of the Portuguese Pharmaceutical Cluster when assessing it using Porter's model?
- How can this Cluster become more competitive?
- Which policies should be put into practice to make the Portuguese Pharmaceutical Cluster more competitive?

The methodology used in this paper will be mainly based on the analysis and review of other papers, data collection and interviews with Portuguese and international Pharmaceutical industry leaders.

1.2 Structure

This case study begins by presenting a brief overview of Portugal and its economy, followed by a chapter entitled "The Pharmaceutical industry", which describes the Pharmaceutical industry and its end to end definition. The chapter "The Portuguese Pharmaceutical industry" looks at the *status quo* of the Portuguese Pharmaceutical industry and is followed by an analysis of the four parameters that are part of the Michael Porter's Diamond Theory, with an emphasis on the most relevant elements already present in the Portuguese Pharmaceutical Cluster. This chapter starts with a visual representation of the four main forces and their sub-categories, some of which, for example, "Human resources" in Portugal, are looked at in more detail. The information was collected based on papers, articles, newspapers, public available statistics (e.g. Organisation for Economic Co-operation and Development - OECD) as well as through interviews with key leaders of the Pharmaceutical industry. In the "Conclusion", the author uses Porter's model to identify the main strengths and weaknesses of the Portuguese Pharmaceutical Cluster and discusses how this Cluster can become more competitive. Based on the analysis of the foregoing questions (see chapter "Purpose"), the author puts forward and discusses 10 policies which, if expertly implemented, can make the Portuguese Pharmaceutical Cluster much more competitive in the European as well as in the world market.

In this paper, Portugal will be compared with other economies. The largest markets for pharmaceuticals are the US and Europe, this being the reason why these regions were selected. Some European countries were selected, due to their characteristics as shown in Table 1.

Table 1 - Countries selected to compare Portugal with in this paper.

Cluster	Country (GDP per head)	Country important details
Similar size/population or similar culture	Belgium (US$ 45'063)	• Comparable population with Portugal (~11 million inhabitants) • 6th best pharmaceutical trade balance within EFPIA associates (2015) (European Federation of Pharmaceutical Industries and Associations – EFPIA)
	Ireland (US$ 72'975)	• Approximately half the population of Portugal (~5 million inhabitants) • 3rd best pharmaceutical trade balance within EFPIA associates (2015) • Recognized as European role model because of its fast development • Known for its aggressive tax incentives
	Spain (US$ 30'688)	• Higher population than Portugal (~46 million inhabitants) • Geographically and culturally similar to Portugal • Very tight economic relationships with Portugal
Big European economies	France (US$ 40'758)	• Higher population than Portugal (~67 million inhabitants) • Headquarters for some big pharma companies like Sanofi
	Germany (US$ 47'022)	• Higher population than Portugal (~81 million inhabitants) • 2nd best pharmaceutical trade balance within EFPIA associates (2015) • Headquarters for some big pharma companies like: Bayer, Boehringer Ingelheim and Fresenius
	United Kingdom (US$ 38'175)	• Higher population than Portugal (~65 million inhabitants) • Currently home of important institutions like European Medicines Agency (EMA) • Headquarters for some big pharma companies like: GlaxoSmithKline and AstraZeneca
Highly developed Pharmaceutical Cluster	Switzerland (US$ 84'599)	• Comparable population with Portugal (~8 million inhabitants) • 1st best pharmaceutical trade balance within EFPIA associates (2015) • Headquarters for some big pharma companies like: Novartis and Roche • Has highly developed Pharmaceutical clusters in areas like Basel
	United States (US$ 61'454)	• World most developed economy • Biggest pharmaceutical world market (Lai, Clark, Race, Parkes, & Blum, 2012)

According to "The world in 2018" (The Economist, 2017) the GDP *per head* in the countries selected is higher than that registered in Portugal which is US$ 22'502. However, the aim of this paper in comparing Portugal with the leading countries in the field is to devise a course of action to enable Portugal to aim high and to improve its productivity, thus becoming much more competitive.

2 Portugal and the Pharmaceutical industry

2.1 Portugal – a brief overview

As described by AICEP (Agência para o Investimento e Comércio Externo de Portugal – Agency for Portugal's External Investment and Commerce), mainland Portugal is geographically located in Europe's West Coast, on the Iberian Peninsula. It is bordered by Spain to the North and East and by the Atlantic Ocean to the West and South, thus being in a geostrategic location between Europe, America and Africa. In fact, for several centuries Portugal has had a very good relationship with Brazil (South America), Angola and Mozambique (Africa).

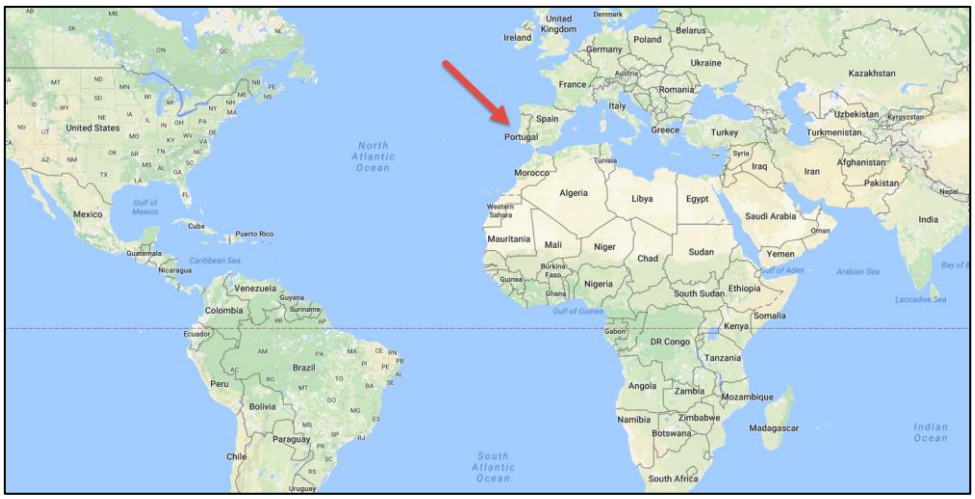

Figure 1 - World map highlighting Portugal's geostrategic location.

In addition to the mainland, Portugal's territory also includes the Autonomous Regions of the Azores and Madeira, two archipelagos located in the Atlantic Ocean. The Portuguese borders have remained unchanged since the 13th Century, making Portugal one of the oldest countries in the world, with nearly 900 years of history that clearly demonstrates its strong identity and internal cohesion. Currently, the population of Portugal is estimated at 10.3 million people, of whom 50% are economically active. The demographic concentration is higher near the coastal areas, with Lisbon (the capital city) and Porto (the second largest city) showing the highest population density. The Portuguese language is spoken by more than 200 million people worldwide. This diversity greatly contributes to the strong historical and cultural ties that Portugal has with the rest of the world (AICEP, 2017).

Area:	92'212 sq Km
Population:	10.306 million (2016)
Working population:	5.178 million (2016)
Population density:	111.8 (inhabit./sq Km)
Capital:	Lisbon (2.1 million inhabit. – metropolitan area)

Figure 2 - Key parameters in Portugal (2016) (AICEP, 2017).

Economic Performance of Portugal

Following the trend of its European partners, over the last decades one of the most important characteristics of the structure of the Portuguese economy has been the increase in the services sector that contributed, in 2016, with 75.4% of Gross Value Added (GVA) and employed 68.6% of the population. Agriculture, forestry and fishing generated only 2.2% of GVA and 6.9% of employment while industry, construction, energy and water represented 22.4% of GVA and 24.5% of employment.

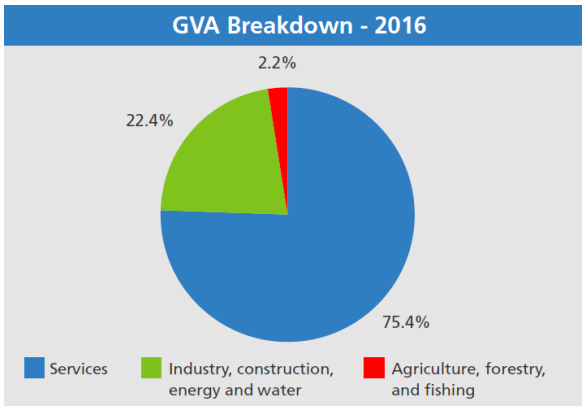

Figure 3 - Portuguese gross value added in 2016 (AICEP, 2017).

In the last decade, apart from a greater focus and diversification of services within the economic activity, there was a significant change in the manufacturing industry in Portugal regarding specialization. The Portuguese manufacturing industry evolved from a dependence on traditional industrial activities to a situation where new sectors with a larger amount of technology have gained importance and experienced significant growth, such as the automotive manufacturing industry and components sector, electronics, energy, the Pharmaceutical sector and industries related to the new information technologies and telecommunications. In the service sector, the importance of tourism should be emphasized, as Portugal benefits from its geographical position, the Mediterranean climate moderated by the influence of the Atlantic, and from being a safe country.

In recent years Portugal has been facing significant financial challenges. Portugal's economy was guided by a demanding Memorandum of Understanding with the troika – the European Commission, the European Central Bank and the International Monetary Fund – between 2011 and 2014 (Chipman, 2016). This austerity program and household deleveraging have subdued consumer spending (BMI Research, 2015). By the end of 2015 a new socialist government was elected in Portugal. The fiscal easing introduced by the Socialist-led Government and the increase in private consumption contributed to the increase in sales in different sectors. This, together with the rise in exports and growth of traditional trading partners of Portugal, led to good economic results in 2016 (European Commission, 2017), which were a surprise to the European Union and several rating agencies. In May 2017 the European Commission announced that Portugal was exiting the EU budget procedure 6 years after bailout. This announcement marked a reputational turnaround by a country rescued by Eurozone governments and the International Monetary Fund in 2011.

2.2 The Pharmaceutical industry

The Pharmaceutical industry is one of the key world industries, having generated nearly 1 trillion dollars in 2014 (IMS health, 2016). Most of this value was generated in North America, with a market size of around US$400 billion, followed by Europe (US$229 billion) and Asia/Australia (US$255 billion).

The Pharmaceutical industry discovers, develops, produces, and markets drugs or Pharmaceutical drugs for use as medications. Pharmaceutical companies may deal in generic or brand medications and medical devices. They are subject to a variety of laws and regulations that govern the patenting, testing, safety, efficacy and marketing of drugs (Lai, Clark, Race, Parkes, & Blum, 2012).

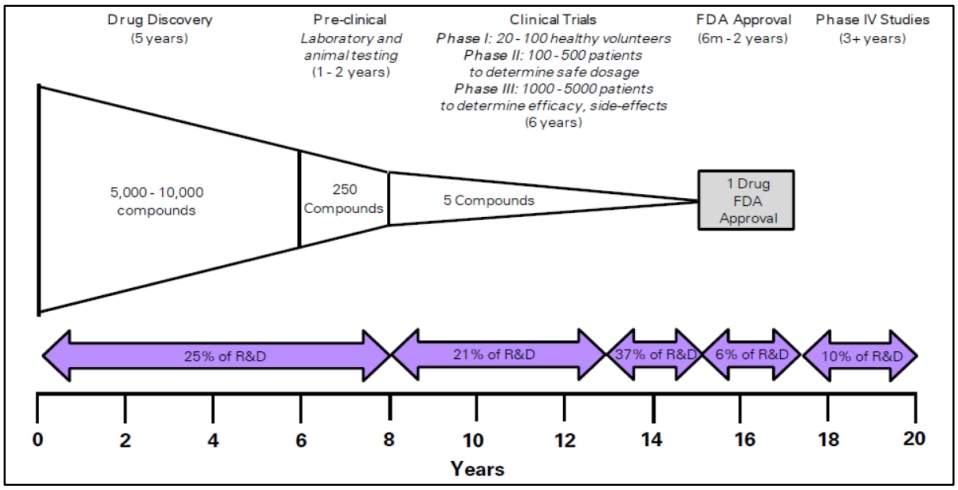

Figure 4 - Typical process of research and development (small molecule) – stages and timing (Lai, Clark, Race, Parkes, & Blum, 2012).

As described in Figure 4, the Pharmaceutical process begins with investing in Research and Development (R&D) and attempting to develop new drugs, followed by the patenting phase (a patent can have a span of 20 years including the clinical trials phase). Clinical trials have different phases (I, II, III), and they aim to ensure the safety, efficacy, and finally the appropriate dosage of the drug. Upon completion of trials, drugs are submitted for approval to a regulatory body (e.g. FDA – Food and Drug Administration – for drugs sold in the US). Once the drug is approved it is manufactured and distributed through an extensive sales and distribution network often controlled by the Pharmaceutical company. The cost of researching and developing a new chemical or biological entity was estimated at €1926 million in 2016 (DiMasi, Grabowski, & Hansen, 2016). It is also important to notice that this traditional model is currently being challenged, especially because of more targeted and personalized therapies and also because Pharmaceutical companies are trying to streamline this model.

Along this end-to-end chain, several key stakeholders need to be involved. These stakeholders can belong to the internal or external environment as shown in Figure 5. A similar methodology to the one used by the author Dimitris Dogramatzis will be used in this stakeholder mapping (Dogramatzis, 2001). Internal stakeholders include large companies, smaller companies (like start-ups), as well as universities and R&D centers that have a direct link to the Pharmaceutical

industry. The external stakeholders can be divided into three categories, similar to the ones used by Kotler and Clarke (1987): inputting, mediators and consumers. Inputting stakeholders include payers, regulators, and politicians, because they all play a significant influencing role in the company's success. Mediators include prescribers, opinion leaders, and other healthcare professionals who stand between the company and its final customers, the patients. Consumers include not only patients and their families or advocacy groups, but also media and the general public.

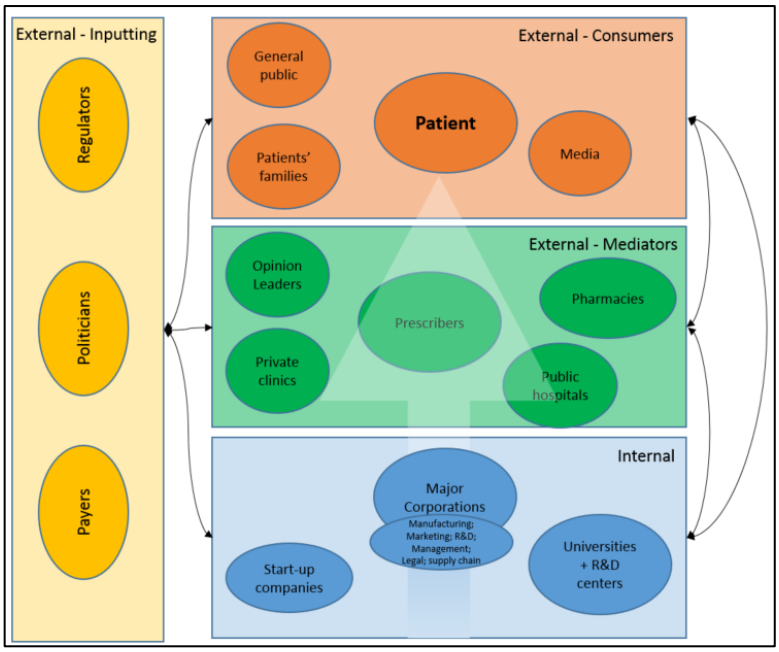

Figure 5 - Different stakeholders within the Pharmaceutical environment and their interactions.

The success of the Pharmaceutical Cluster depends on how well those stakeholders interact with each other, always keeping in mind that, as described in Figure 4, it takes a lot of effort, time, money and resources to come to a final approved drug. Some of these elements will be better analysed later in this paper.

It is also important to look at the value chain of the Pharmaceutical products and its price structure. The distribution margins, the VAT rates and the prices are generally fixed by governments and differ significantly from country to country. Considering the example of Europe, on average, approximately one third of the retail price of a medicine reverts to distributors (pharmacists and wholesalers) and the State as represented in Figure 6. One can also conclude that most of the value is generated upstream, i.e. by the manufacturers. Therefore, in order to maximize the value of the Pharma industry in a country, it is important to create the necessary ecosystem to attract those industries.

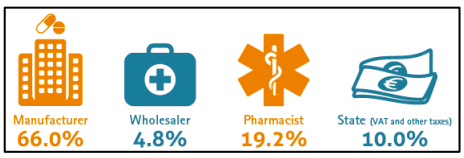

Figure 6 - Breakdown of the retail price of a medicine in 2015 (%). Non-weighted average for Europe (EFPIA, 2017).

2.3 The Portuguese Pharmaceutical industry

The Portuguese Pharmaceutical industry started at the end of the 19th century, having evolved from then until it achieved an important milestone in 1979: the creation of the National Health Service (in Portuguese "Serviço Nacional de Saúde" – SNS). The SNS is a universal tax-financed system, which provides health coverage to the population (Simões, Gonçalo, Fronteira, & Hernández-Quevedo, 2017). At the beginning of 2000, the Ministry of Health strongly pushed for the expansion of generics in the Portuguese market with several multinational companies starting to sell in Portugal. In 2014 the Portuguese company Bial got the Food and Drug Administration (FDA) approval for the first drug developed in Portugal, the antiepileptic branded APTIOM (APIFARMA, 2014).

Portugal's Pharmaceutical industry is dominated by multinationals, most of which import finished products. According to data from December 2014 (BMI Research, 2015), Merck Sharp Dohm (MSD) was the market leader in Portugal in value terms, followed by Novartis, Bial, Pfizer, Astrazeneca, Bayer, Servier, Sanofi, Boehringer Ingelheim and Generis. Portugal's domestic Pharmaceutical firms include Bial, Hovione, Generis, Bluepharma, Tecnimede, Medinfar and Cipan as described in Table 2. Some of those companies will be shortly described in this paper.

Table 2- Some Portuguese Pharmaceutical companies.

Name	Founded	Company info
Bial	1924	Bial is the leading Portuguese pharmaceutical firm in **R&D** investment. It commercializes **innovative drugs**.
Hovione	1959	Hovione is mainly a manufacturer of active pharmaceutical ingredients **(APIs)**. The company has expertise in solid tablets, injectable, inhalation products and topical applications. Has an active **R&D** centre.
Bluepharma	2001	Bluepharma's activities focus on three areas: drug manufacture, R&D and marketing of generic drugs. It produces both own-brand products as well as **generic drugs**.
Generis (Farma-APS that lately become Generis)	1982	Generis is a Portuguese Pharmaceutical Laboratory, specializing in the **generic** and similar market
Tecnimede	1980	Tecnimede group's portfolio includes more than **100 products**, as a result of its **R&D center**, which results in more than 2500 market Authorizations worldwide.
Cipan	1963	The Company specializes in the research, development, production and commercialization of active pharmaceutical ingredients (**API**). Its activities include API fermentation and organic synthesis.
Medinfar	1970	Medinfar **manufactures** drugs, OTC medicines, supplements and cosmetics.

Despite its relative small dimension, Portugal has an interesting market size, with sales of around €4 billion a year between 2010 and 2016 as it can be observed in Figure 7.

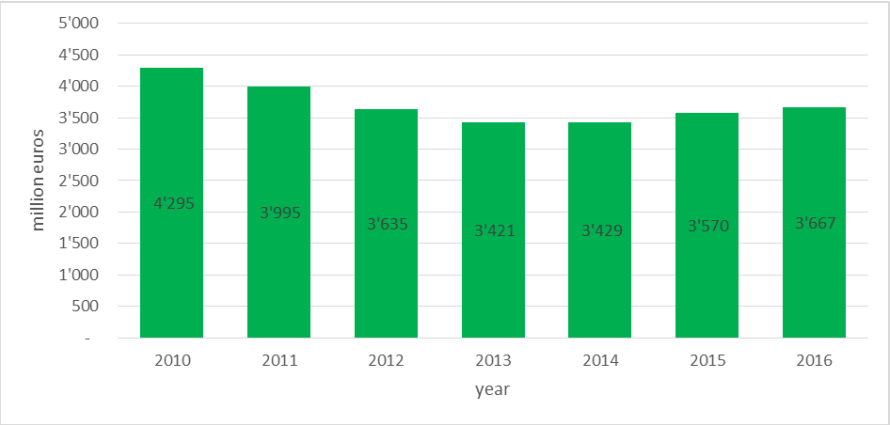

Figure 7 - Total Portuguese Pharmaceutical market (ambulatory and hospitals) (APIFARMA, 2016)

According to Paulo Nunes de Almeida (President of the Portuguese Business Association), it is not easy to identify the weight of healthcare in the Portuguese economy. This is mainly due to the fact that, in this industry, there are many cross-functional areas and also because it depends on a network of interconnected economic sectors. However, if we consider companies linked to the health sector, for example, those that manufacture Pharmaceutical products, equipment, instruments, surgical material, and if we add the services linked to the human healthcare, for example health facilities, laboratories of clinical analysis, nursing, among others, the total business volume will be around €7.5 billion (EXAME, 2017). This proves that the healthcare sector has a huge potential to positively influence the economy. In fact, the companies directly related with healthcare represent nearly 7.5% of all the companies in Portugal and employ around 255.000 people (EXAME, 2017).

Portugal is a net importer of Pharmaceutical products (Figure 8), since most of the multinational companies do not have production sites in Portugal, but mainly commercial offices. In reality, Portugal still has a trade deficit in the Pharmaceutical related products, but recently, the exports have been increasing. According to the Confederation of Portuguese Business, the healthcare Cluster is already exporting more than traditional industries in Portugal like wine and cork.

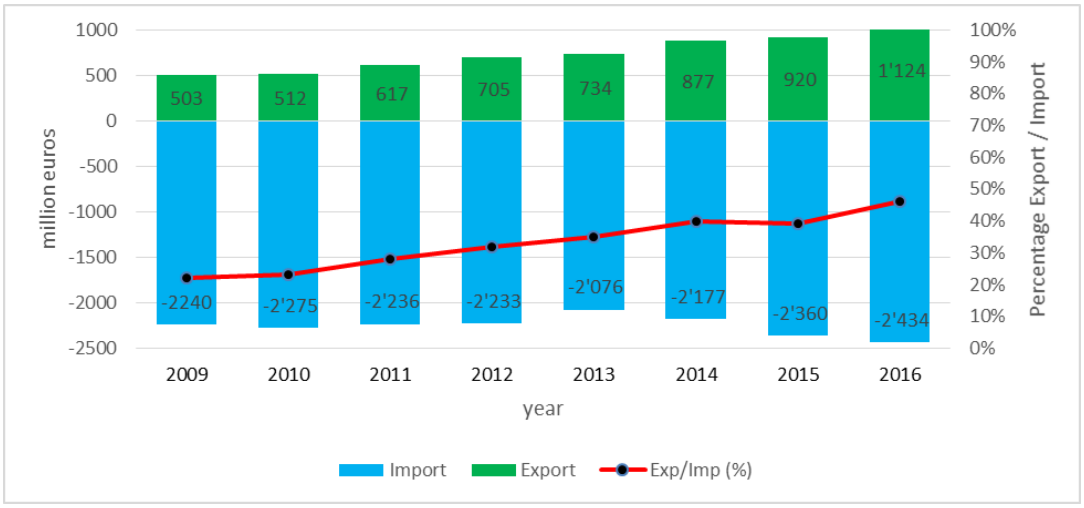

Figure 8 - Pharmaceutical Trade Balance in Portugal from 2009 to 2016 (APIFARMA, 2017).

Figure 9 shows that in 2015 the European Union (EU) represented 90% of the main imports origin followed by Switzerland (6%). As far as exports are concerned, it is possible to observe that the EU is also the main export destination (53%), followed by the EUA (19%).

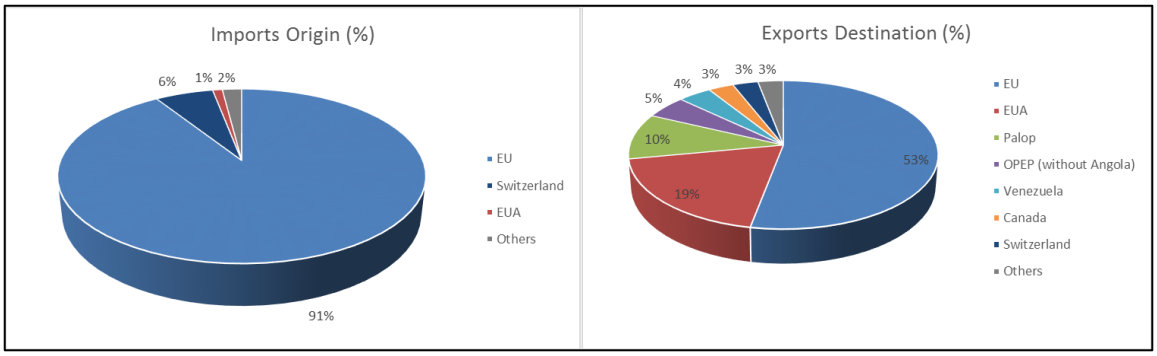

Figure 9 - Origin of imports and destination of exports in Portugal in 2015 (APIFARMA, 2015).

When considering individual countries, the key export markets include Angola, France, Spain, Germany and the UK. These EU markets are likely recipients of parallel exports – with wholesalers taking advantage of lower-priced drugs in Portugal (BMI Research, 2015). According to the PharmaPortugal Project, the priority export markets are Cape Verde, Mozambique, Spain, Poland, the Czech Republic, Algeria, Morocco, Tunisia, Brazil, the US and Israel. The PharmaPortugal is a trademark of Portuguese APIFARMA (Association of the Pharmaceutical Industry), registered in 2005, which identifies national exporting companies and promotes an image of European quality to the world (European Commission, 2017).

In this context it is important to compare Portugal with other European countries regarding the Pharmaceutical trade balance.

Table 3 - Pharmaceutical trade balance in 2015 for European countries (EFPIA, 2017).

Country	€ million	Country	€ million
Switzerland	37'439	Croatia	-241
Germany	26'424	Estonia	-297
Ireland	24'479	Bulgaria	-332
Netherlands	8'266	Lithuania	-332
Denmark	7'945	Norway	-892
Belgium	6'309	Finland	-1'158
France	4'198	Slovakia	-1'180
Sweden	4'024	Portugal	-1'440
United Kingdom	2'840	Czech Republic	-1'530
Slovenia	1'354	Romania	-1'763
Hungary	801	Greece	-1'772
Austria	470	Poland	-2'071
Malta	109	Italy	-2'320
Cyprus	33	Spain	-2'892
Luxembourg	-90	Turkey	-3'316
Latvia	-178	Russia	-6'596

Overall, considering the sum of the trade balance shown in Table 3, one can conclude that the European countries represented are net exporters, with Switzerland, Germany and Ireland being the greatest contributors to this scenario. Portugal, as already mentioned previously, is a net importer. It is also interesting to notice that the number of Pharmaceutical companies and wholesalers in Portugal has been stable during the last years (Table 4), which could indicate some market stagnation.

Table 4 - Number of Portuguese Pharmaceutical and wholesaler companies (APIFARMA, 2016).

	2010	2011	2012	2013	2014	2015	2016
Pharmaceutical companies	130	130	122	121	123	121	121
Wholesalers	402	406	409	409	443	N/A	N/A

Another important aspect to consider is the Portuguese Pharmaceutical production. As it is represented in Figure 10, despite a decrease between 2010 and 2012, which could probably be linked to the fact that some multinational companies scaled down their operation in Portugal due to the challenging operating conditions and the austerity measures, the fact is that from 2012 onwards there occurs an upward trend until 2016.

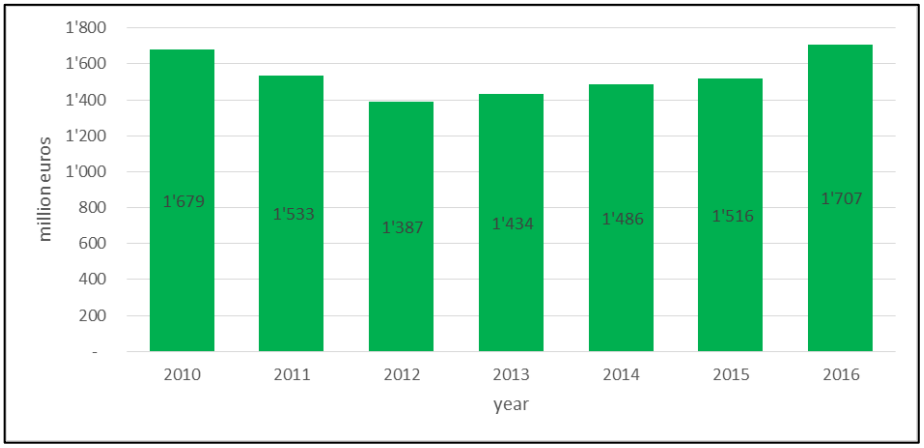

Figure 10 - Pharmaceutical production in Portugal (APIFARMA, 2016).

Comparing the Pharmaceutical production in Portugal with that in other European countries, one becomes aware of Portugal's huge potential to attract Pharmaceutical production, on the one hand; but, on the other hand, this value is relatively small when compared with countries like Switzerland, Germany and Italy. In fact, several multinational companies have their headquarters in these countries, which explains the reason why these companies often decide to have part of their manufacturing sites also there. For example, in Switzerland, Novartis and Roche have their headquarters in the city of Basel combined with a relevant number of manufacturing sites in that area, which contributes, to a large extent, to make Switzerland the largest producer of Pharmaceutical products in Europe, as represented in Table 5.

Table 5 - Pharmaceutical production in 2015 for European countries (EFPIA, 2017); (APIFARMA, 2016)

Country	€ million	Country	€ million
Switzerland	42'479	Finland	1'598
Germany	29'536	Portugal	1'516
Italy	29'326	Slovenia	1'354
France	20'554	Greece	929
United Kingdom	19'313	Norway	745
Ireland	19'305	Romania	655
Spain	15'213	Croatia	434
Denmark	13'080	Cyprus	180
Belgium	11'232	Bulgaria	121
Sweden	7'809	Latvia	120
Netherlands	6'180	Czech Republic	N/A
Russia	5'092	Estonia	N/A
Poland	2'964	Iceland	N/A
Hungary	2'933	Lithuania	N/A
Turkey	2'931	Malta	N/A
Austria	2'864	Slovakia	N/A

Portuguese Pharma companies

Three important Portuguese owned Pharmaceutical companies – Bial, Hovione and Bluepharma – will now be briefly described, together with their footprint in the world.

Bial

Bial has its headquarters near Porto, in northern Portugal. This Pharmaceutical company was founded in 1924, and is now among the largest companies of its kind in Portugal. Its products are sold in pharmacies in more than 40 countries in four continents: Europe, America, Africa and Asia (Bial, 2017). The company is focused on producing its own innovative medicines. The Bial team currently consists of about 950 workers. 77% of Bial workers have higher education qualifications, of which 6% are PhDs.

Figure 11 – Bial branches worldwide (Bial, 2017)

Hovione

Hovione was established in Portugal in 1959 by Ivan Villax and two other Hungarian refugees: Nicholas de Horthy and Andrew Onody. The first two letters of the three founders' names: HO, VI and ON were used to create the name Hovione. Currently Hovione employs 1200 people worldwide and offers more than 1300 m^3 of manufacturing capacity. Hovione remains a privately-owned family business (Hovione, 2017) and has different manufacturing sites worldwide as can be observed in Figure 12. Hovione also has two R&D centers with a team of over 200 scientists.

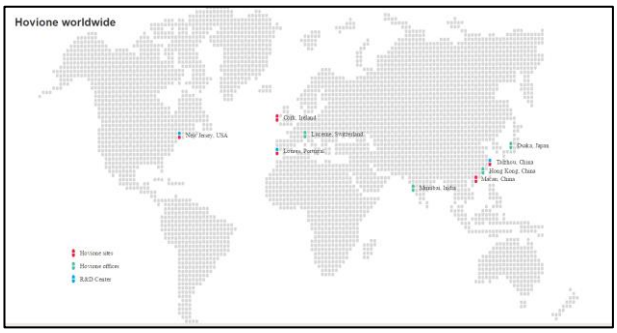

Figure 12 - Hovione main sites worldwide (Hovione, 2017)

Bluepharma

The Bluepharma group, throughout its 16 years history, has transformed an industrial unit that employed 58 people into an economic group of 20 companies employing around 450 employees. It has opened offices in 7 countries (Spain, Angola, Mozambique, Colombia, Chile, Brazil and US) and in 2016 exported 86% of its production to more than 40 countries (Bluepharma, 2017). The company is focused on the production of generics.

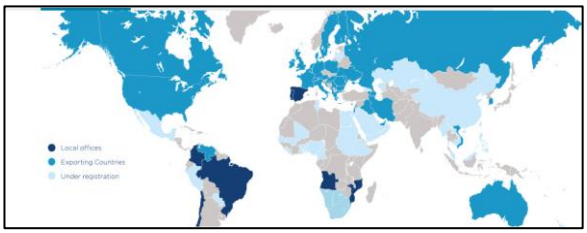

Figure 13 - Bluepharma and the world markets (Bluepharma, 2017)

3 The Pharmaceutical Cluster Diamond in Portugal

An industrial Cluster can be defined as a concentration of suppliers and supporting firms from the same industry located within the same geographic area (The Economist, 2009). The analysis of the Portuguese Pharmaceutical Cluster will be done using the Porter's Diamond model, which takes into consideration four dimensions:

- Factor (Input) Conditions
- Context for Firm Strategy and Rivalry
- Related and Supporting Industries
- Demand Conditions

Figure 14 shows a summary of the different parameters that influence each of the Porter's Diamond model. The parameters that are preceded by a green bullet point are mainly strengths. Those preceded by a red one are mainly weaknesses. All these parameters will be described in more detail in the following chapter.

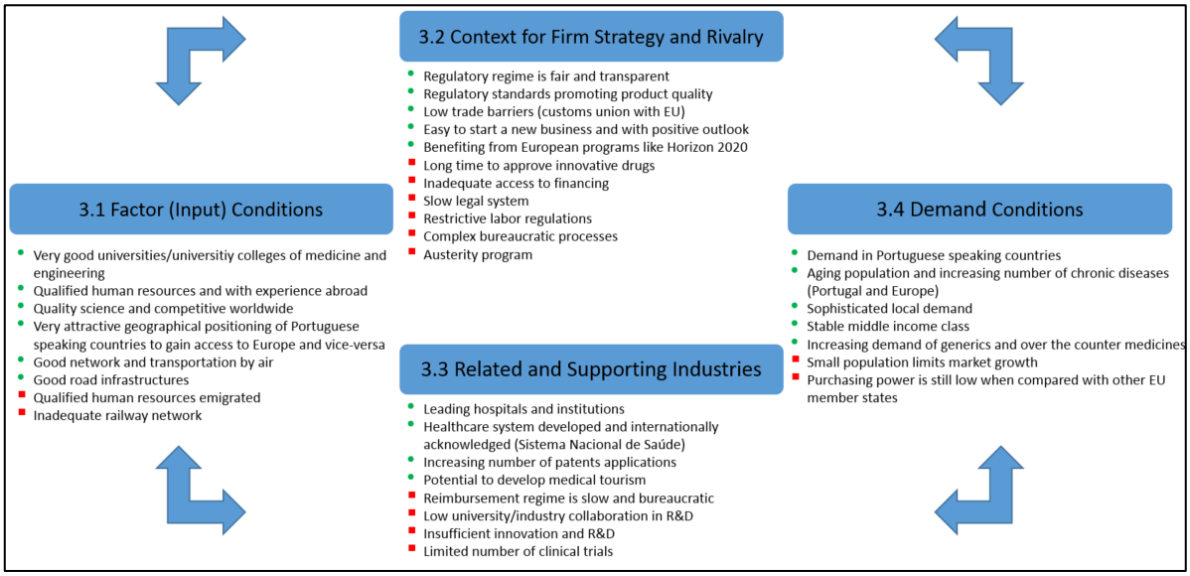

Figure 14 – Summary of Porter's Diamond model for the Portuguese Pharmaceutical Cluster.

3.1 Factor (Input) Conditions

The factor conditions are related with the quality and quantity of labour, infrastructures, natural resources, capital, technology, know-how, entrepreneurship, and other factors of production (see summary in Figure 14).

3.1.1 Human resources and education

Labour force scalability and flexibility is the number one factor when determining whether a location is ready to welcome key functions of companies that are undertaking business transformation (KPMG, 2016). The differences between countries can be significant and therefore, to be able to compete with the best, the availability of high skilled people in Portugal is extremely important. According to the Global Competitive Index, Portugal ranks 26th (among 140 countries) regarding higher education and training (World Economic Forum, 2016). Five universities in Portugal are featured in the QS World University Rankings® 2016/17. With a long history of well-respected universities, Portugal's higher education system was ranked the 35th best in the world in the first edition of the QS Higher Education System Strength Rankings (QS Quacquarelli Symonds Limited, 2017). Universities that are contributing to this good ranking are mainly the University of Porto, University of Lisbon, University Nova (Lisbon) and University of Coimbra. Especially the first two universities have a long tradition in Engineering which is a fundamental asset for a strong Pharmaceutical industry. In addition, the Universities Schools/Colleges of Medicine have a long tradition of graduating excellent medical doctors, together with the universities of Pharmacy that offer good curriculums for future pharmacists. This is a fundamental factor that can give the Portuguese Pharmaceutical industry a head start over other countries, in its attempt to become more competitive. For example, there are certain Pharmaceutical world class regions like Basel (in Switzerland), where the access to a large pool of highly trained employees is considered to be one of the key factors to attract leading companies in the field of the Pharmaceutical industry (Association of research-based pharmaceutical companies in Switzerland, 2015).

In Portugal, the healthcare sector demand for professionals has traditionally outweighed the supply of physicians, nurses and health technicians (Matins, Biscaia, & Ana, 2007). The Portuguese press reports almost daily that there is a shortage of resources mainly in the public hospitals. However, according to "Portugal – Health system review", recent decisions of the Ministry of Health regarding general practitioners training vacancies indicate a willingness to deal with this issue (Simões, Gonçalo, Fronteira, & Hernández-Quevedo, 2017).

Portugal is a developed European country where, nonetheless, wages are still relatively low. This seems to be the case across the industry and is endorsed by different stakeholders. According to the Federation of International Employers, in Portugal the monthly minimum wage is 557 euros when compared with 1480 euros in France and 707 euros in Spain (The Federation of International Employers, 2017). However, the qualifications necessary to apply for jobs in the Pharmaceutical industry are in the upper scale of qualifications and, consequently, this comparison is merely indicative.

Since 2011 Portugal has been affected by the global economic crisis. As a result, many highly qualified professionals decided to look for better opportunities abroad, opting for countries where the salaries are more attractive and the chances of career development are also higher. As a consequence, despite the excellent indicators in higher education, some of those highly qualified professionals are not contributing directly to the development of Portugal and consequently of the Portuguese Pharmaceutical Cluster. However, these professionals are acquiring know-how and developing their network abroad, which could be a unique opportunity for the Portuguese Pharmaceutical industry if well explored and developed in the future. The ability to attract these human resources back is of critical importance to enable Portugal to enhance its capabilities and leverage on the resources that the country has developed in recent years, making the current Portuguese generation the most well educated ever in Portugal (Wise, 2013).

It should be mentioned that in Europe, and according to Eurostat data, the Pharmaceutical industry is the technology sector with the highest added value per person employed, significantly higher than the average value for other high-tech and manufacturing industries. The research-based Pharmaceutical industry is one of Europe's major high technology industrial employers. Recent studies in some countries have shown that research based Pharmaceutical industry generates three to four times more employment indirectly – upstream and downstream – than it does directly. Furthermore, a significant proportion of these are valuable skilled jobs, for instance in the fields of academia or clinical science, which can help maintain a high-level knowledge base and prevent a European "brain drain" (EFPIA, 2017). In fact, the universities together with research centres play a very important role in the Pharmaceutical industry dynamics and they will be looked at in more detail in this paper. Table 6 shows that most of the employment generated by the Pharmaceutical industry is concentrated in Germany and France, while Portugal is showing a relatively low value. Also, when comparing the percentage of the active population employed in the Pharmaceutical industry (Eurostat, 2017) in Germany and France the value is around 0.3%, while in Portugal it is only half that.

Table 6 - Employment in the Pharmaceutical industry in Europe by 2015 (EFPIA, 2017).

Country	units	Country	units
Germany	114'069	Netherlands	12'000
France	98'690	Sweden	11'012
Italy	63'500	Bulgaria	10'500
United Kingdom	61'500	Slovenia	8'961
Switzerland	43'848	Portugal	7'500
Spain	38'677	Croatia	5'740
Belgium	34'617	Finland	5'233
Poland	29'700	Norway	3'800
Denmark	26'963	Slovakia	3'000
Ireland	26'373	Latvia	1'971
Greece	26'000	Lithuania	1'220
Romania	25'600	Cyprus	1'140
Hungary	23'000	Malta	445
Turkey	22'000	Estonia	400
Czech Republic	17'900	Iceland	N/A
Austria	14'140	Russia	N/A

3.1.2 Infrastructures

The **quality of infrastructure/flight connections** play an important role in the Life Sciences (LS) sector. In high productivity sectors such as LS, disruption in manufacturing or logistics can have a significant impact. As a result, infrastructure quality is of great importance. In fact, the LS is extremely regulated and, therefore, very important to control its end-to-end value chain. The majority of the drugs need to be transported within certain temperature and humidity controls and with validated carriers. The transportation of the drugs also needs to be fast and optimized. The warehouses footprint is also of critical importance, especially in locations where the drugs might need to be kept before following to the next node of transportation (e.g. airports, pharmacies).

Direct flight connections to key LS locations are an especially relevant decision factor. In this regard, London is Europe's best-connected city for air travel, followed by Paris, Munich, Amsterdam and Zurich (KPMG, 2016). Portugal has 7 international airports (3 in mainland Portugal and 4 in the islands of Madeira and The Azores). The main airport is in the capital, Lisbon. This airport has experienced an increase in the number of passengers in the last years (mainly due to tourism). Therefore, the Portuguese government announced early in 2017 that a new airport is needed in order to double passenger capacity in the coming years. The Portuguese airports and especially the national air carrier (TAP) have very good connections with markets of Portuguese speaking countries, such as Brazil, Angola and Mozambique.

Figure 15 - Portugal and the main infrastructures.

When considering the road network, Portugal is also very well positioned. In fact, this is the outcome of a lot of investment in this specific area in the last years, which has allowed the country to be covered by several highways, especially close to the coast, where most of the population is located (see Figure 15).

Portugal is also particularly well positioned as far as transportation by sea is concerned. Portugal has six main ports distributed along its coastline. In fact, several investments have been announced in this area and are expected to get under way in the near future. Regarding transportation by train, Portugal is still lagging far behind when compared with other European countries. In the last years several negotiations have taken place between Portugal and Spain to connect the two countries by high-speed train link. However, no final decision had been made at early 2017.

3.2 Context for Firm Strategy and Rivalry

It reflects the nature of domestic rivalry, and conditions that determine how nation firms are created, organized and managed, the regulations, the judicial system and the taxation (see summary in Figure 14).

3.2.1 Regulatory regime and innovative drugs approval

According to the APIFARMA (2013), Portugal ranks at number 17 in terms of the availability of **innovative drugs**, which remains below its European counterparts. One of the main reasons is the delay in drug financing and approvals (BMI Research, 2015). Despite that, the government is committed to promote conditions for patient access to drugs that demonstrate innovation, including through the implementation of the evaluation and decision deadlines prescribed by law, the adoption of innovative contracting methodologies and the recognition of the specificity of certain drugs, including orphan drugs and those for specific populations (BMI Research, 2015)

Due to its EU membership, Portugal's Pharmaceutical **regulatory regime is fair and transparent**. Gradual moves towards harmonization, marketing regulations within the EU should reduce bureaucracy and increase transparency. However, it takes a year, on average, to get a medicine approved in Portugal. In March 2012, consultancy firm Exigo claimed that the Portuguese authorities take an average of 331 days to make a decision regarding whether or not a drug will be financed by the State. The European Commission proposed faster access to medicines, limiting this time to 120 days for innovative medicines and 30 days for generic drugs. On the positive side, harmonising regulations with African countries should attract overseas investments from Pharmaceutical companies in other EU countries (BMI Research, 2015).

3.2.2 Tax regime, financing and starting a business

Tax regime

Low taxes are an important contributor to attracting industries to a certain country, in particular the Pharmaceutical industry. This is believed to be one of the major factors that led to the development of some Pharmaceutical HUBs, like the Basel region in Switzerland (Association of research-based pharmaceutical companies in Switzerland, 2015). According to OECD the Portuguese corporate tax rate is on the high end, when comparing with other countries of reference, such as Ireland and Switzerland (Table 7).

Table 7 – Corporate tax rate and personal income tax for some countries (OECD, 2017).

Country	Combined corporate income tax rate (2017)	Personal income tax (2016)
Belgium	34.0 %	46.3 %
France	34.4 %	54.0 %
Germany	30.2 %	47.5 %
Ireland	12.5 %	48.0 %
Portugal	29.5 %	50.3 %
Spain	25.0 %	45.0 %
Switzerland	21.1 %	36.1 %
United Kingdom	19.0 %	45.0 %
United States	38.9 %	46.3 %

These corporate taxes are an average and exceptions are often made if, for example, a company creates several jobs or brings a relevant amount of investment into the country. As Table 7 shows, Ireland is on the lower end of the sample of countries represented, followed by the UK and Switzerland.

When considering the personal income tax which is another important factor to attract key talent, it can be observed that Switzerland is by far the country with the lowest taxation. Portugal is one of the countries with the highest personal income tax, and in this sample of countries only France shows higher taxation.

In fact, according to the World Economic Forum (Figure 16), the biggest challenge for doing business in Portugal is the high tax rates.

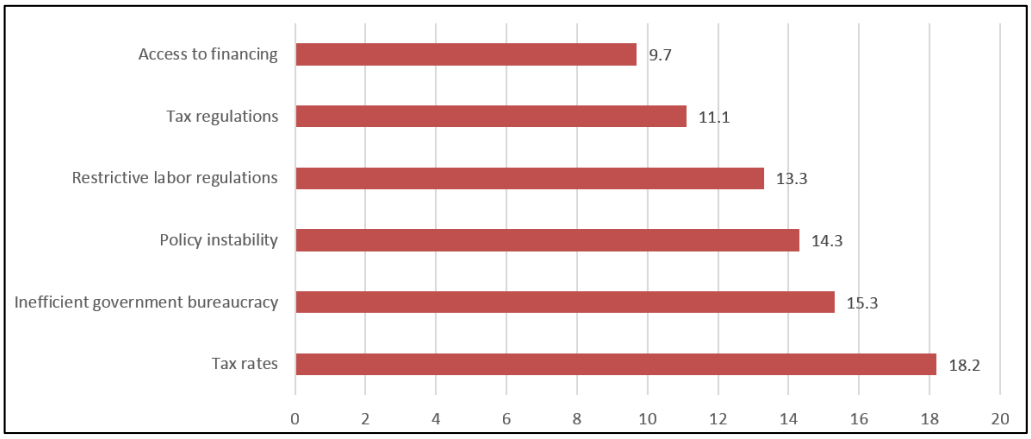

Figure 16 - The most problematic factors for doing business in Portugal (World Economic Forum, 2016).

Starting a business

Regarding the number of days needed to start a business, Portugal ranks 4th out of 140 countries (World Economic Forum, 2016). This is indeed a good indicator; however, within the Pharmaceutical Cluster, not a lot of companies have been created in recent years.

Table 8 - Ranking of selected countries on "Ease of Doing Business Ranking", "Starting a Business - Rank" and "Starting a business - time" in 2017 (The World Bank, 2017).

Country	Ease of Doing Business Rank	Starting a Business - Rank	Starting a Business - Time (days)
Belgium	42	17	4
France	29	27	3.5
Germany	17	114	10.5
Ireland	18	10	5
Portugal	25	32	4.5
Spain	32	85	13
Switzerland	31	71	10
United Kingdom	7	16	4.5
United States	8	51	5.6

In the analysis carried out by the World Bank, the economies are ranked on their ease of doing business, from 1 to 190. A high ease of doing business ranking means the regulatory environment is more conducive to the starting and operation of a local firm. Considering the sample of countries above, Portugal is ranked 25th among 190 countries. This is a good indicator; however, when compared with Ireland that is known as a very attractive country to do business in, Portugal still needs to go one step further.

Starting a Business rank is an aggregation of factors. It namely takes into consideration all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business, as well as the time and cost to complete such procedures and the paid-in minimum capital requirement. As for the above ranking and considering the sample of countries in this context, Portugal is clearly placed in the middle. Some countries, like Ireland for example, are known to foster the start-up spirit. Countries like the US that is also known for its start-ups should be considered as an average of all the States and therefore the ranking might look lower than expected.

Time to start a business is recorded in calendar days. The measure captures the median duration that corporate lawyers or notaries indicate is necessary in practice to complete a procedure with minimum follow-up with governmental agencies and no unofficial payments. In this particular parameter Portugal shows a very good performance, making it a very fast country in which to start a new business (less than 5 days).

In recent years, Portugal has been trying to foster a culture of innovation, together with a culture of start-ups. Lisbon has hosted the Web Summit since 2016, which has helped to bring a start-up spirit to the country. Even though this is mainly linked to the IT sector, the momentum can be leveraged to other areas like the Pharmaceutical industry.

During the last years the entrepreneur ecosystem in Portugal has changed. In fact, the entrepreneurs have also changed, as they are better qualified than ever and have a much more global vision about Europe and the world. The consequence of this has been that international investors are now paying much closer attention to Portugal as a good country to invest in. In 2016, according to a study by Tech.eu in partnership with Dealroom, the Portuguese start-ups were able to capture €44 million from venture capital funds, which represents an increase of 50% compared to 2015 (Exame, 2017).

Financing

Financing is certainly a key pillar of economic activities. In fact, countries with good access to financing are countries where the investors believe that there are good prospects and, therefore, expect good returns on investment. Table 9 shows indicators from "the World Bank" that allow comparing Portugal with other countries of reference in two dimensions: getting credit and strength of legal rights.

Table 9 - Getting credit rank and strength of legal rights index (The World Bank, 2017).

Country	Getting Credit rank	Strength of legal rights index (0-12)
Belgium	101	4
France	82	4
Germany	32	6
Ireland	32	7
Portugal	101	2
Spain	62	5
Switzerland	62	6
United Kingdom	20	7
United States	2	11

The ranking on the ease of getting credit are based on the sum of the strength of legal rights index and the depth of credit information index. In this index the lower the value, the better, and Portugal shows a bad performance. Countries like the US, UK, Ireland and Germany show much better performance in this parameter.

The second index analyses the legal framework for secured transactions by examining whether collateral and bankruptcy laws facilitate lending. In this case, the higher the value, the better it is. As it can be observed, the United States are consistently quoted as a country where the legal framework is very much focused on the business, which is clearly shown in Table 9. On the other hand, Portugal has a very low rank, which is also linked with the fact that the judicial system is not working in the best possible way in Portugal.

Since Portugal joined the European Union in 1986 it has been receiving important financing from this entity. Important amounts of these investments have been channeled to science and are considered to be a very important contributor to its development. According to the European Program Horizon 2020 (H2020), by March 2017 Portugal had 1109 participants receiving €355 million in H2020 (European Commission, 2017). Table 10 shows some of the top Portuguese beneficiaries of this Program.

Table 10 - Top Portuguese beneficiaries, European Commission (EC) financial contribution granted in H2020 (European Commission, 2017).

Name	Number of participants	EC financial contribution € million
Instituto de Medicina Molecular	20	18.68
Universidade do Minho (UMINHO)	31	15.27
Instituto Superior Técnico (IST)	21	11.43
INESC TEC – Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência (INESC TEC)	24	10.94
NOVA ID FCT – Associação para a Inovação e Desenvolvimento da FCT (NOVA ID)	16	10.02
UNINOVA – Instituto de Desenvolvimento de Novas Tecnologias – Associação (UNINOVA)	22	9.98
Universidade de Aveiro (UAVR)	27	9.85
Universidade de Coimbra	25	9.02
Fundação para a Ciência e a Tecnologia (FCT)	64	8.99
Universidade do Porto (UPORTO)	33	8.98

It is possible to notice that all these beneficiaries are university investigation departments or other institutions with clear links to science and innovation. Some of these institutions will also be analysed in more detail in the chapter 3.3.2.

3.2.3 Laws and the judicial system

Despite the 2015 changes in the Portuguese government, two moderate parties have ruled the country since the start of its democracy (1974): PS (Partido Socialista) which is the centre left party and PSD (Partido Social Democrata), which is the centre right party. This has contributed to the country being relatively stable in terms of political parties. Also, the fact that Portugal has been a member of the EU since 1986 provides relative stability to the Portuguese political context. However, this relative political stability is not translated into stable policies, making the "policy instability" the 3rd most problematic factor for doing business in Portugal (Figure 16)

However, according to the World Economic Forum (Figure 16), the second most problematic factor for doing business in Portugal is the inefficient government bureaucracy. This is also linked to the **judicial system** that is perceived to be slow and bureaucratic, with legal cases taking too long to be resolved. This is, definitely, a point to look at because innovation is linked to intellectual property and when innovators don't feel that their efforts are protected and rewarded, the innovation rhythm slows down.

The restrictive **labour regulations** are also pointed out by the World Economic Forum as a concern for doing business in Portugal (Figure 16). To better compare the Portuguese labour market with other countries, some parameters were analysed as shown in Table 11.

Table 11 - Labor market regulation data (Doing Business, 2017).

Country	Fixed-term contracts prohibited for permanent tasks?	Maximum length of a single fixed-term contract (months)	Minimum wage for a full-time worker (US$/month)	Standard working day	Notice period for redundancy dismissal (for a worker with 10 years of tenure, in salary weeks)
Belgium	No	No limit	2420	7.6	33.0
France	Yes	18	1867	7	8.7
Germany	No	No limit	1778	8	17.3
Ireland	No	No limit	1698	8	6.0
Portugal	Yes	36	748	8	10.7
Spain	Yes	36	1054	8	2.1
Switzerland	No	120	0	9	13.0
United Kingdom	No	No limit	1417	8	10.0
United States (New York City)	No	No limit	1519	8	0.0

Portugal, Spain and France prohibit fixed term contracts for permanents tasks, which in a way could be seen as protective of people's rights but on the other hand as providing less flexibility to companies. Also, these three countries have a limitation in terms of the number of months that a fixed contract can have (18 and 36 months). Switzerland joins this group, but allows this for 10 years. The other countries represented here have no limitation for fixed term contracts.

When looking at the minimum wages, it is possible to notice big differences among the countries, Portugal being the country with the lowest minimum wage. Switzerland shows a value of zero. However, this is linked to the fact that Switzerland held a referendum in 2014 whereby the minimum wage was rejected. Despite that, one should notice that the standards of living in

Switzerland are very high and according to OECD the average wage in 2015 was around US$ 4500/month (OECD, 2017).

Moreover, the notice period for redundancy dismissal shows a big difference among the countries represented. In fact, in the US no notice period needs to be given in order to dismiss an employee. In Spain, this is around 2 months and it is 33 months in Belgium. This parameter could be seen as the flexibility of the companies to renew their staff. However, if employees feel more secure in their jobs, they could increase their productivity, as they are focused on their activities, rather than looking for alternatives to their current job.

3.3 Related and Supporting Industries

This can be described as the presence of suppliers, competitors, and complementary firms that excel within a given industry (see summary in Figure 14).

3.3.1 Health system

According to the Euro Health Consumer Index (EHCI 2015), Portugal was ranked in the 20th place in Europe with a score of 691 points (maximum of 1000) (Björnberg, 2015). The EHCI is a comparison of European healthcare systems based on waiting times, results, and generosity.

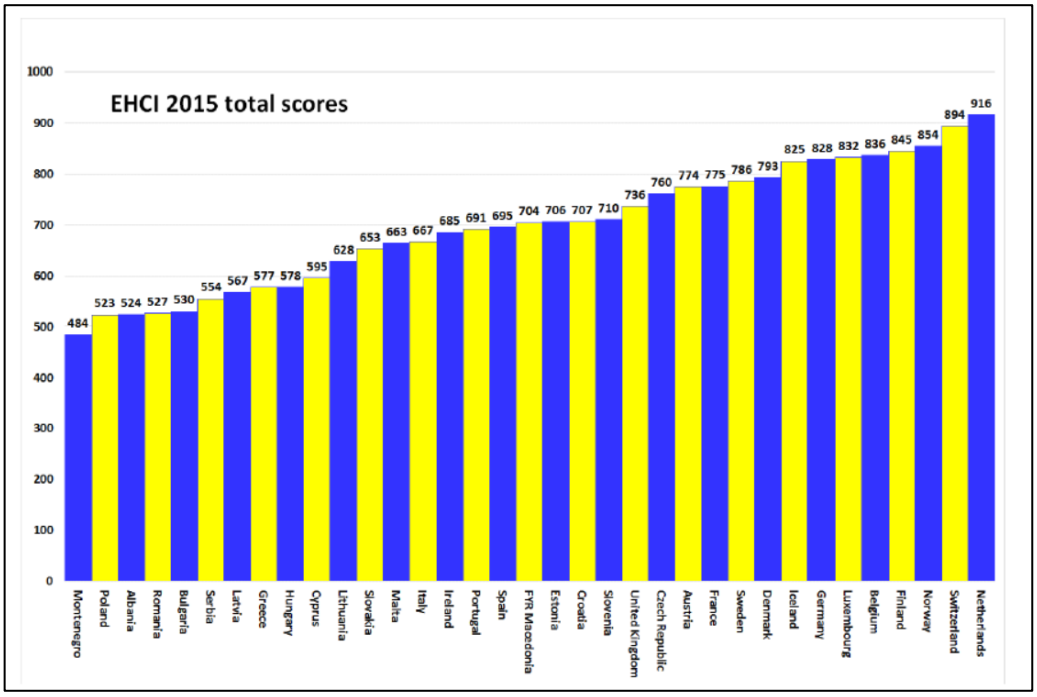

Figure 17 - EHCI 2015 total scores for European countries.

Considering the EHCI index, Portugal ranks in the middle. This shows a competitive healthcare system, but still with space to improve. Countries like the Netherlands and Switzerland can be used as role models in order to develop the healthcare system even further and, consequently, improve the demand conditions.

Portugal is, however, considered to have a high-quality healthcare system, with excellent professionals and modern well-equipped hospitals. This quality of the healthcare system is regularly assessed by an independent national regulatory organization, and there is a growing number of hospitals achieving international accreditation. The evidence of the quality of the Portuguese healthcare system is ultimately defined by the country's high-standard health indicators (Medical Tourism in Portugal, 2017).

Efforts to increase efficiency and a greater emphasis on generic drugs have been counterbalanced by increasing consumption of healthcare, making it harder to rein in costs. Continued concerns about escalating healthcare costs, as well as the desire to get the most out of limited resources, have led to a series of reforms of the health system, including more integrated health delivery and greater autonomy for healthcare providers setting up their own primary health clin-

ics. In addition to investing more in preventive healthcare, Dr. Leite explains, "we have tried to shift the way we were financing not just hospitals, but also access to innovation. That has been a slower process, but we did achieve some important changes" (Chipman, 2016).

In 2016 several measures were implemented under the agreement between the Ministries of Finance, Economy and Health and the Pharmaceutical industry. Those measures were the notified prices regime, the reinforcement of access to therapeutic innovation through a substantial approval of innovative medicines, and the publication of legislation containing the rules of the annual review of prices for 2017. There was also the introduction of three countries of reference, Spain, France and Italy, together with the introduction of a mechanism to reduce prices by no more than 10% (APIFARMA, Ministries of Finance, Economy and Health, 2017).

Despite that, Portugal is considered to have a **confusing reimbursement regime** causing bureaucratic delays and there are still high debt levels in the public hospital sector. According to APIFARMA, public hospitals in Portugal owed the Pharmaceutical industry around €1037 million in September 2017, an increase from €780 million in December 2016 (APIFARMA, 2017). In July 2015, the average payment days were about 449 days late, a decrease from the payment delay of 499 days in July 2014. However, while hospital debt levels and payment times declined in 2015, the ongoing inability of public hospitals to manage their finances is still a cause of concern (BMI Research, 2015).

3.3.2 Innovation, Research & Development, hospitals and institutions

Innovation has a major role to play in boosting productivity and non-cost competitiveness. Portugal's research performance has improved significantly in recent years, and the country has also invested heavily in scientific human capital (OECD, 2014). In fact, Portugal's gross expenditure on **R&D** (GERD) expanded significantly between 2005 and 2009 (Figure 18). Comparing to other countries like Belgium, despite Belgium not performing so well until 2009 (considering the index 2007), starting from that year, Portugal had a significant increase in the R&D investment, together with countries like Germany and Ireland.

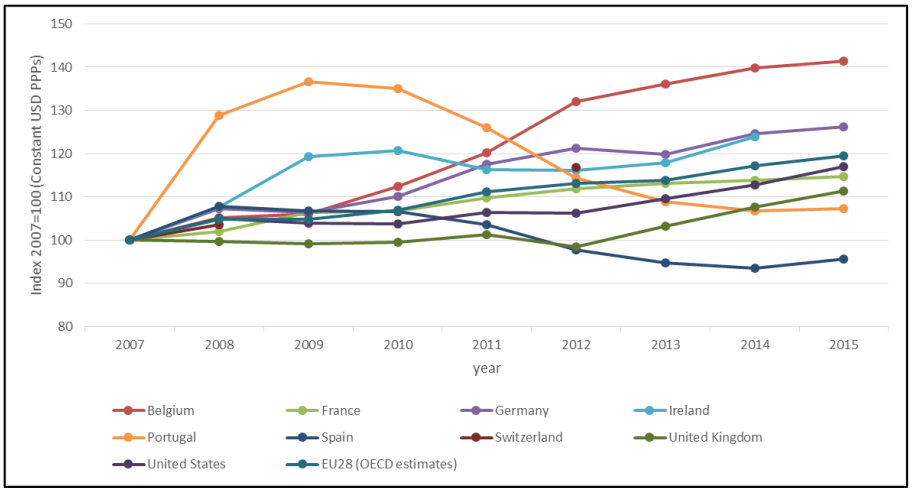

Figure 18 - Gross domestic expenditures on R&D including all sectors of activity (OECD, 2017).

Portugal has a relatively strong public research sector, and performs well in terms of publications. Nevertheless, linkages to industry remain weak, as indicated by the low share of public R&D expenditure financed by industry as a percentage of GDP. The creation of new high-tech firms from academia has also been weak (OECD, 2014).

Strengthening business innovation is a major challenge for Portugal. Public support for business R&D and innovation is mostly indirect (provided through tax credits). Raising the business sector's innovative capacity will also require continued efforts to make the business environment more conducive to innovation by reducing administrative burdens and strengthening competition (OECD, 2013). Any initiatives to boost national R&D and drug manufacturing, such as those coordinated by Health Cluster Portugal (HCP), have been funded by HCP's associates, rather than through direct government funding (BMI Research, 2015).

There are some areas where Portugal also has a vibrant and innovative Research & Development ecosystem, characterized by the presence of world-class institutions and scientists, in areas such as neurosciences, cancer, immunology, regenerative medicine and nanomedicine, as well as state-of-the-art core facilities and a highly-qualified workforce (Medical Tourism in Portugal, 2017). For example, oncology did receive an additional boost with the opening of the Champalimaud Center in Lisbon in October 2010, which aimed to employ up to 500 researchers and focus on cancer investigation and treatment.

Institutions

There are several institutions in Portugal that play a very important role in boosting innovation within the Pharmaceutical Cluster. Some of these will be mentioned here with a short description of their role and activities.

Champalimaud Foundation

On October 5th 2010 the Champalimaud Foundation inaugurated a state-of-the-art research facility to contribute to the development of biomedical research activities in Portugal. The history of the Champalimaud Foundation begins in the mind of a Portuguese visionary and entrepreneur and highly successful industrialist, António de Sommer Champalimaud, who decreed that following his death part of his fortune should be used to create an international project in the field of biomedicine (Champalimaud Foundation, 2017).

Figure 19 - The Champalimaud Centre for the Unknown, Lisbon, Portugal.

Fundação para a Ciência e a Tecnologia (FCT)

FCT is the national funding agency that supports science, technology and innovation, in all scientific domains, under the responsibility of the Ministry of Science, Technology and Higher Education. FCT started its activity in August 1997, succeeding the Junta Nacional de Investigação Científica e Tecnológica (JNICT) (Fundação para a Ciência e a Tecnologia (FCT), 2017).

FCT's budget encompasses funds from the Portuguese state budget and European structural funds. For 2015, FCT's budget for science funding was €460 million.

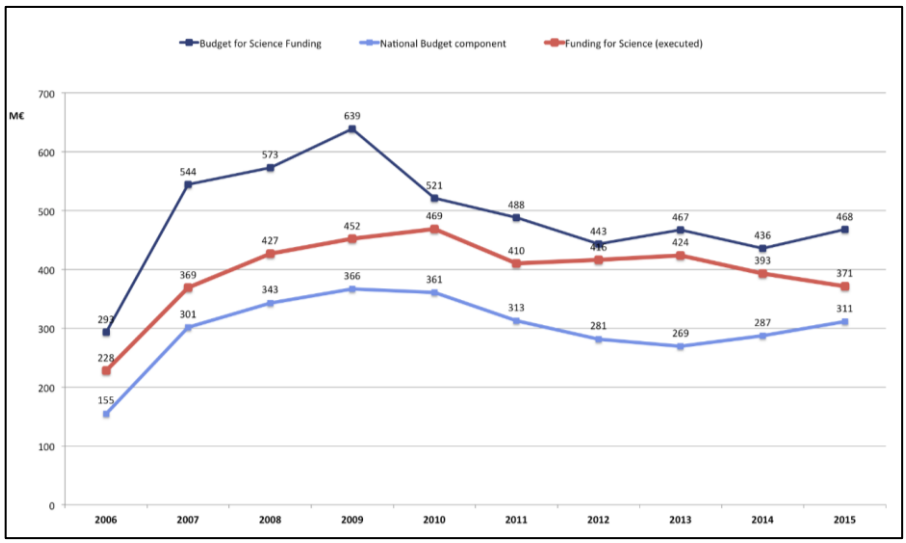

Figure 20 - FCT Budget and Funding (2006-2015) (Fundação para a Ciência e a Tecnologia (FCT), 2017).

Health Cluster Portugal (HCP)

The HCP main objective is the promotion and implementation of initiatives and activities leading to the consolidation of a national Cluster for competitiveness, innovation and technology. With an international outlook and, as such, taking into account high standards of quality and professionalism, HCP wants to promote and foster cooperation between companies, organizations, universities and public entities, with a view to increase business volume, exports and qualified employment, in the economic areas related to health and the improvement of healthcare (Health Cluster Portugal, 2017).

APIFARMA

APIFARMA is a Portuguese Pharmaceutical industry Association, founded in 1975, that succeeded to the National Guild of the Manufacturers of Medicinal Products (1939).This association represents about 120 companies, contributing to the socioeconomic development of the Pharmaceutical sector and to the improvement of healthcare in Portugal. It also facilitates patient access to new therapies and defends the common interests of its members.

Infarmed

Infarmed (or National Authority of Medicines and Health Products) is a governmental agency accountable to the Health Ministry, which evaluates, authorises, regulates and controls human medicines as well as health products, namely, medical devices, homeopathic products and cosmetics for the protection of public health. The Institute's main goal is to ensure the quality, safety and efficacy of medicines and the quality, safety and performance of health products in order to avoid the risks of their use while ensuring adequate standards of public health and consumer protection.

IBET (Instituto de Biologia Experimental e Tecnológica)

IBET is a private non-profit research-intensive enterprise in the area of biotechnology and life sciences. IBET bridges university and industry research, by establishing partnerships particularly in the areas of health-pharma, agroindustry, forestry, agriculture and the environment.

Hospitals

Portugal has several leading hospitals that play a very important role within the Pharmaceutical Cluster. They not only provide healthcare to the population, but also support clinical trials as well as research. In 2014, Portugal had 225 hospitals, 113 of which belonging to the NHS, with a total capacity of 34'522 beds (Simões, Gonçalo, Fronteira, & Hernández-Quevedo, 2017).

The investment in hospitals and clinics is still very relevant, with the Luz Saúde group announcing an investment of €100 million to expand its capacity which will generate between 1000 and 1200 jobs with the work expected to be finished by 2019 (The Portugal News, 2015). Those investments will include doubling the hospital's cancer treatment department capacity, as well as expanding the cardiovascular and neurosciences departments to include a teaching and research facility (BMI Research, 2015). In addition, the Portuguese group José de Mello Saúde (also known as CUF) invested €26 million in Viseu (2016) and is planning to invest, until 2018, €100 million in CUF Tejo (Lisbon) and €15 million in CUF Almada. €50 million in CUF Descobertas (Lisbon) (Expresso, 2017) and €30 million in CUF Sintra (*Diário de Notícias*, 2017).

3.3.3 Publications, patents and clinical trials

The innovation performance of the Portuguese industry remains modest, in terms of patents and trademarks. Portugal has few large R&D performing firms and few entrepreneurial firms. Venture capital expenditure remains low (OECD, 2013). Despite that, there has been an upward trend in the last decades in the number of scientific and technical articles, as Figure 21 shows.

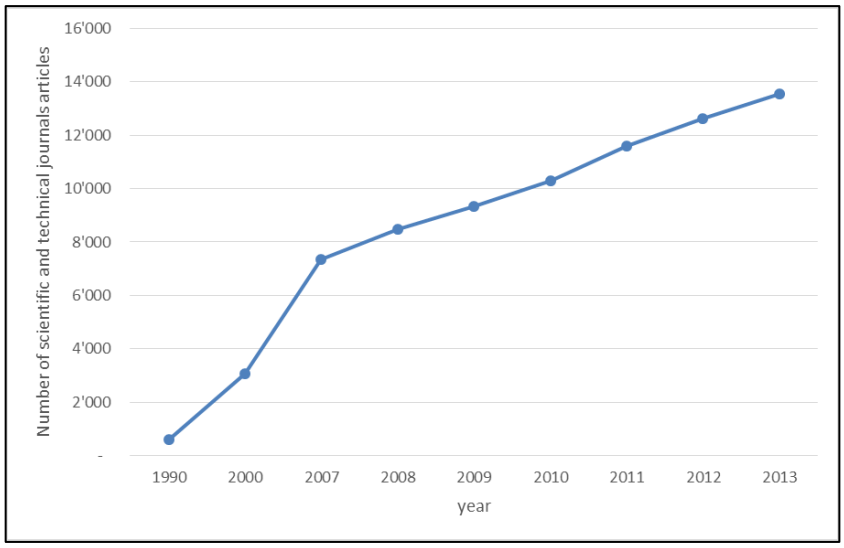

Figure 21 - Number of scientific and technical journals articles in Portugal from 1990 until 2013 (National Science Foundation, Science and Engineering Indicators, 2017).

This positive trend is mainly linked to the very good work that the Portuguese universities and institutions have been developing in the last decades to promote science and making it part of the political agenda. This effort should be kept and more emphasis into translating that science into business opportunities should be promoted. This is also very much related to the link between universities/institutions and the companies. Fostering that ecosystem is of critical importance to further develop the Pharmaceutical Cluster.

Patents

Portugal performed well in terms of patents filed by universities and public research institutions between 2005 and 2013, but the share of public R&D expenditure financed by industry as a percentage of GDP was at the bottom of the OECD ranking in 2009, and the creation of new high-tech firms from academia has also been weak (OECD, 2013).

The upward trend in patent applications is clearly visible in Figure 22. This effort must continue and cannot be slowed down. Innovation is the main source of competitiveness.

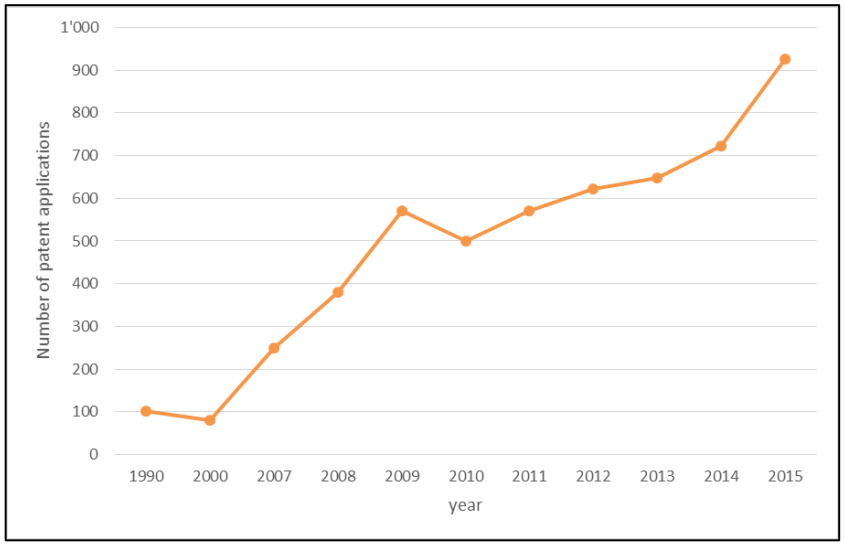

Figure 22 - Number of patent applications in Portugal (The World Bank, 2017).

The number of patent applications could serve as a good indicator of the innovation output. Furthermore, when a country files for a patent it is already an early indication of potential commercial use. In this context, it is interesting to compare Portugal with other countries analyzed in this paper (Table 12).

Table 12 - Number of patent applications per country in the last 35 years (The World Bank, 2017).

Country	1990	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL
Portugal	101	81	250	381	571	499	571	621	647	722	925	5'369
Belgium	643	577	454	575	669	620	636	755	715	889	949	7'482
France	12'378	13'870	14'722	14'658	14'100	14'748	14'655	14'540	14'690	14'500	14'306	157'167
Germany	30'724	51'736	47'853	49'240	47'859	47'047	46'986	46'620	47'353	48'154	47'384	510'956
Ireland	734	925	847	931	908	733	494	492	333	263	250	6'910
Spain	2'218	2'710	3'267	3'632	3'596	3'566	3'430	3'266	3'026	2'953	2'799	34'463
Switzerland	2'987	2'083	1'692	1'594	1'684	1'622	1'597	1'480	1'525	1'480	1'477	19'221
United States	90'643	164'795	241'347	231'588	224'912	241'977	247'750	268'782	287'831	285'096	288'335	2'573'056
United Kingdom	19'310	22'050	17'375	16'523	15'985	15'490	15'343	15'370	14'972	15'196	14'867	182'481

When we compare Portugal to other countries with a similar population, for example Belgium, Portugal seems to be competitive and to show a very positive trend. However, it is interesting to note that this does not apply when we compare it to Switzerland which, despite having a similar population to Portugal, has been filing many more patents.

The United States cannot be compared to other countries as far as the number of patents filed are concerned because of this country's much higher population, more than 300 million people.

Clinical trials

Clinical trials are an important component of innovation and a good link between the Pharmaceutical industry, hospitals and other institutions.

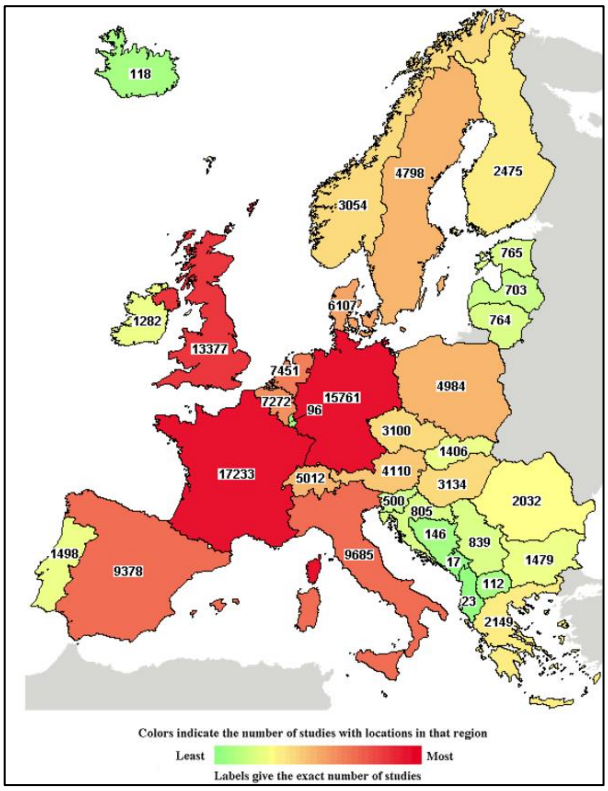

Figure 23 - Number of studies in the European countries (Clinical Trials gov, 2017).

In Europe, Portugal is among the countries with the fewest clinical trials (Figure 23), which are significantly fewer than in countries of similar size, such as Belgium or Sweden (Clinical Trials gov, 2017). In fact, between 2006 and 2011, there was a downward trend in the number of clinical trials submitted and authorized by Infarmed in Portugal (apifarma-ensp/unl, 2016). During the last decade in Portugal, the clear majority of clinical trials were essentially promoted by the Pharmaceutical industry, with only about 10% of the total number of investigators owning initiative trials. Regarding the type of clinical trial, since 2006 they are mostly phase III trials (about 2/3 of the total), followed by phase II (approximately 20% of the total). By 2015, only about 10% of trials were phase I (apifarma-ensp/unl, 2016).

From the macroeconomic point of view, there are several direct and indirect benefits of clinical trials that can be identified. It is estimated that in 2012, clinical trials were responsible for an overall gross value added of €72 million. This estimate of the impact on the economy (direct and indirect) means that for each euro invested in this activity there was a return of 1.98 euros to the Portuguese economy. To this end contributed: the relative value of medicines, the value of the remuneration of research teams, tax revenues, savings in public expenditure on medicines and complementary means of diagnosis and treatment (Pwc, 2017).

3.4 Demand Conditions

These can be broadly defined as the strengths and sophistication of customer demand (see summary in Figure 14).

3.4.1 Healthcare expenditure and prescribed drugs

When Portugal's National Health Service was established nearly 40 years ago, it received a budget of 2% of GDP. In 2014, Portugal spent 9.5% of its GDP on healthcare (see Figure 24), reflecting a decline from over 10.4% in 2009 with around 2/3 coming from public expenditure (Simões, Gonçalo, Fronteira, & Hernández-Quevedo, 2017). In fact, Portugal's spending on healthcare is expected to remain at high levels due to the country's ageing population and the projected increase in the burden of non-communicable diseases (BMI Research, 2015). With this in mind, it is important to notice that according to the Euro Health Consumer Index 2015 there is no correlation between accessibility to healthcare and money spent.

Following the global recession, the euro crisis and the bailout package signed with EU/IMF/ECB in May 2011, Portugal saw its spending slashed, affecting Pharmaceutical and healthcare markets. However, pockets of good news remained: the generic drug sector is making gains in terms of volume sales, while mass-market outlet sales of Over-The-Counter (OTC) drugs are increasing in both value and volume terms, according to Infarmed (BMI Research, 2015). The OTC and the generic market demand will be looked at in more detail in chapter 3.4.4.

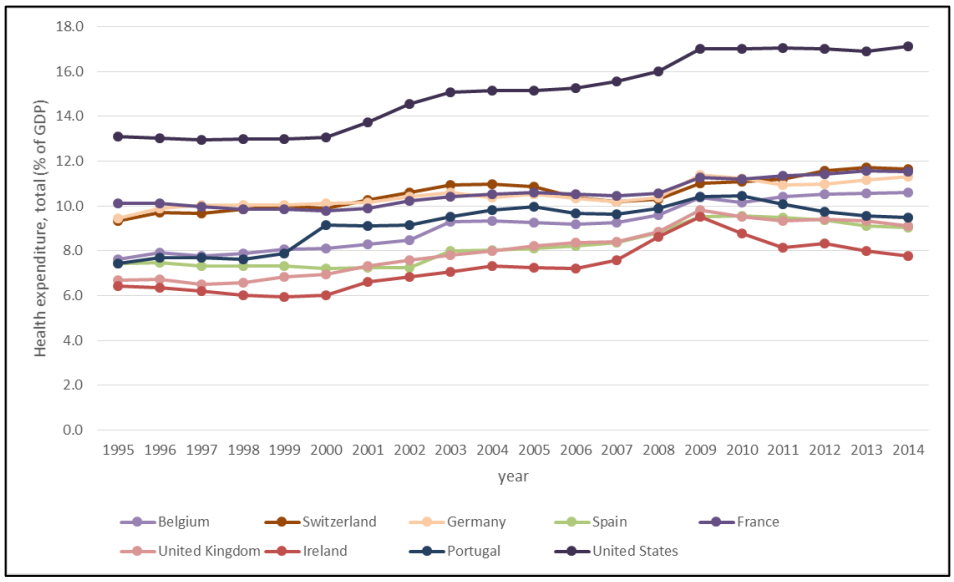

Figure 24 - Health expenditure in % of GDP – Portugal and other reference countries (1995-2014).

Looking at the prescription market, it can be observed in Figure 25 that between 2013 and 2016 there was a stabilization in the value of the prescription market. However, it is expected that by 2020 and onwards the prescription drug sales will undergo an upward pressure as a result of the growing use of high-value biologics, particularly personalized medicines, as well as the availability of newer drugs and improved economic stability (BMI Research, 2015).

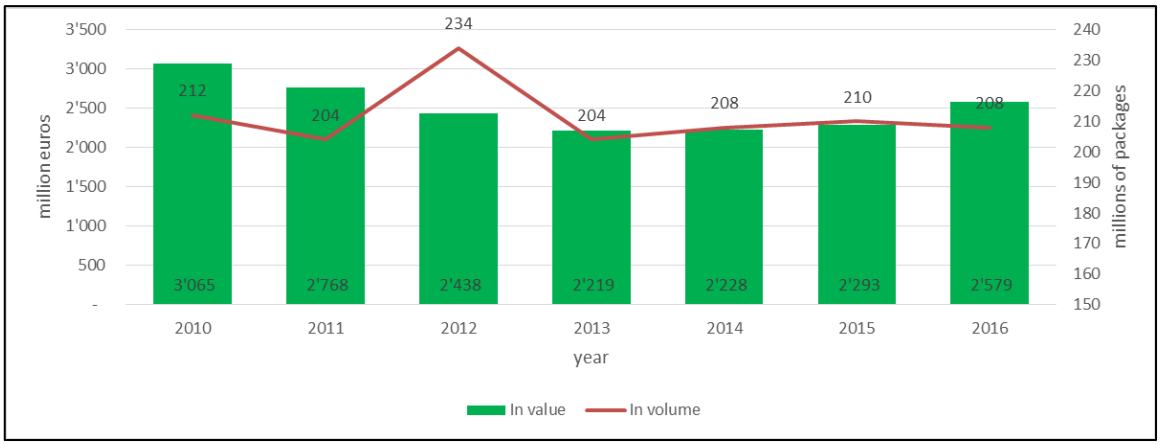

Figure 25 - Prescription market evolution – Portugal (APIFARMA, 2016).

3.4.2 Aging population, obesity and depression

Like in the rest of Europe, Portugal's demographics are indicative of a developed nation. The degree of urbanisation is high and the population is ageing, a fact that is worsened by the increased emigration of Portuguese young people (BMI Research, 2015). Along with the European trend, the Portuguese population is getting **older**. Even though this might create pressure in the national healthcare systems, it will also be an opportunity to further develop alternatives that can support the Portuguese population. According to Paulo Nunes de Almeida (President of "Associação Empresarial de Portugal"), the Portuguese demographic pyramid will demand a very relevant effort in health in the coming years (EXAME, 2017).

Also, the **oncological** diseases have been increasing dramatically in the last years as it can be observed in Figure 26 with three different cancers showing amongst the ten most common causes of death in Portugal. **Obesity** is also a concern and in February 2014, the WHO identified childhood obesity in Portugal as a deadly epidemic. Officials at the EU summit in Greece said that up to 33% of Europe's 11-year-olds and 27% of 13-year-olds are currently overweight or obese, with Greece, Portugal, Ireland and Spain having the highest rates in overweight and obese teenagers. Obesity's growing prevalence foreshadows increases in the occurrence of health problems (such as diabetes and cardiovascular diseases), and higher healthcare costs in the future (BMI Research, 2015).

In October 2011, the European Alliance Against **Depression** stated that Portugal is second only to the US in terms of the rates of depression in the country. In 2012, IMS data showed that sales of antidepressants climbed by 14% year on year, totaling €100 million, despite significant price reductions within the same period. A study published by Infarmed shows that the use of antidepressants in Portugal tripled between 2000 and 2012 (Infarmed, 2013). Figure 26 shows the ten most common causes of death in Portugal and their change from 2005 to 2015.

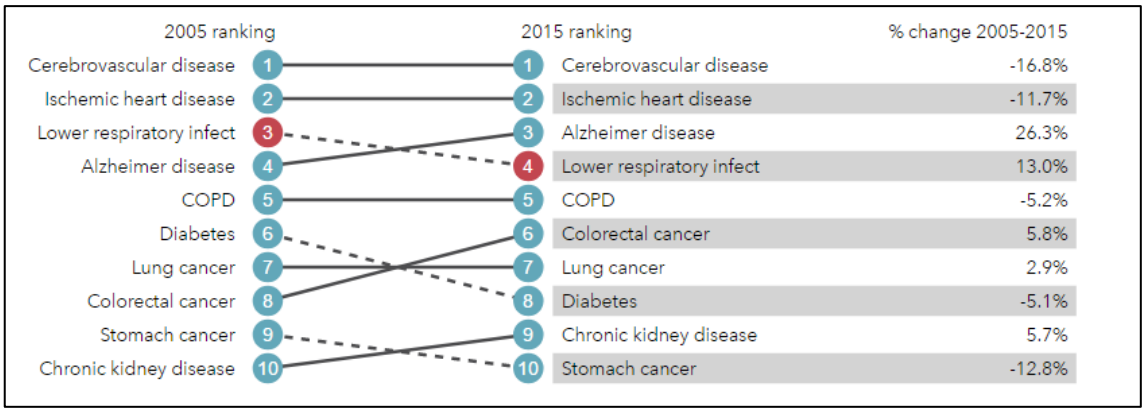

Figure 26 - Most common causes of deaths in Portugal comparing 2005 and 2015 ranking (Institute for Health Metrics and Evaluation, 2017).

3.4.3 Sophisticated local demand and its links with Portuguese speaking countries

Key factors underlying market contraction in recent years and slow growth prospects include austerity measures and increased purchases of low-priced generic drugs instead of branded alternatives, as blockbuster drugs lose patent protection and the government set incentives for generics substitution. Also, recent years have seen a rise in price control or price pressure measurements (BMI Research, 2015). All of this can also be seen as an opportunity, especially considering the generics market. Indeed, the Portuguese consumer is demanding specially regarding the price but also on the quality they are looking for. This has been creating a culture of feedback along the years; however, most of that feedback is negative, with people complaining rather than praising. Moreover, increasingly more people are going abroad and getting experiences from other countries, which will allow to create a positive feedback loop in Portugal. One of the recommendations would be to turn this negative feedback into a constant positive feedback that would help companies to better develop their products and services.

With a population of about 10 million people, the Portuguese internal market is limited when compared to other countries; however, it is still significant and fairly large. Portugal's low population, together with the economic factors described above, is a contributory factor to a limited market growth. Nonetheless, the historical links between Portugal and other Portuguese speaking countries like Brazil, Angola, Mozambique, Timor, Macau, can give a competitive edge to Portugal. As a matter of fact, the UK Trade and Investment recommends British Pharmaceutical manufacturers to partner with Portuguese companies to enter Portuguese speaking markets including Angola, Mozambique and Brazil (BMI Research, 2015).

The Portuguese speaking countries have several positive features, amongst which are their potential purchasing power, their geographical location and their development potential. To be able to leverage that potential, it would be important for the Portuguese government to work together with those countries and harmonize some of the procedures in order to facilitate access to those markets. Also, it is important to remember that Portugal is a member of the EU and this can be used as a platform for Portuguese speaking countries to enter into the European market. In addition, Portugal can be used as a market to test new and innovative approaches, due to its consumers' sophistication and sizeable population.

3.4.4 Demand of generics and over-the-counter medicines

Generics

The term 'generic' is widely used but its definition is not always consistent between countries. Generics are usually produced by a manufacturer who is not the inventor of the original product and are marketed when intellectual property protection rights are exhausted (EFPIA, 2017). However, some Pharmaceutical companies tend to keep two separate businesses within the organization, allowing them to do the transition phase between innovative medicines and generics easily, while changing the brand by keeping the exact same quality and sometimes producing the medicines even in the same machines and using exactly the same process.

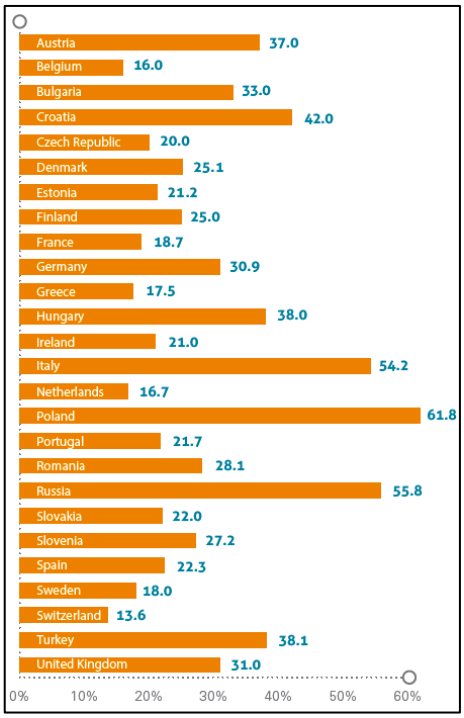

Figure 27 - Estimated share in percentage accounted for generics in Pharmaceutical market sales value in 2015 (at ex-factory prices) (EFPIA, 2017).

Figure 27 shows that Portugal had nearly 22% share of generics in 2015, which is in line with other countries like Spain, Ireland and France. In comparison, the generics market penetration is very high in countries like Russia and Poland, which could be linked to their higher focus on bedding processes. On the other hand, it is interesting to notice that Switzerland has one of the lowest generic market penetration. This might be because this country is home to the headquarters of several big Pharmaceutical players and there is a culture of buying branded names, rather than generic drugs. Moreover, it is also important to notice that Switzerland has the highest generic costs in Europe.

In Portugal, since March 2012 the implementation of prescribing by international non-proprietary names rather than brand names and legislation that sees the prices of branded drugs drop automatically once a patent expires form part of the obligations of Portugal's EU, IMF and European Central Bank economic adjustment programme. These austerity measures weigh on patented drug market growth, although the rate of use of generics instead of the original branded

drugs is taking place only gradually, partially due to cultural factors (BMI Research, 2015). This comes together with the fact that blockbuster drugs lose patent protection and therefore there are higher government incentives for generic substitution. The increase in demand for generic drugs is also boosting the generic drug exports in Portugal, with companies like Bluepharma improving their results (Portugal Ventures, 2017).

Over-The-Counter (OTC)

According to BMI, Portuguese OTC medicine market was valued at €211 million in 2014, and it is expected to reach €240 million in 2019, equating to a five-year compound annual growth rate of 2.6% in local currency. A high-level of self-medication and the government's increasing switch from prescription medicines to non-prescription categories will contribute to this positive growth trend. An additional market driver is the increasing number of outlets, especially non-pharmacies, selling non-prescription Pharmaceuticals (BMI Research, 2015). Large Portuguese supermarket chains are also entering into this market making it very competitive.

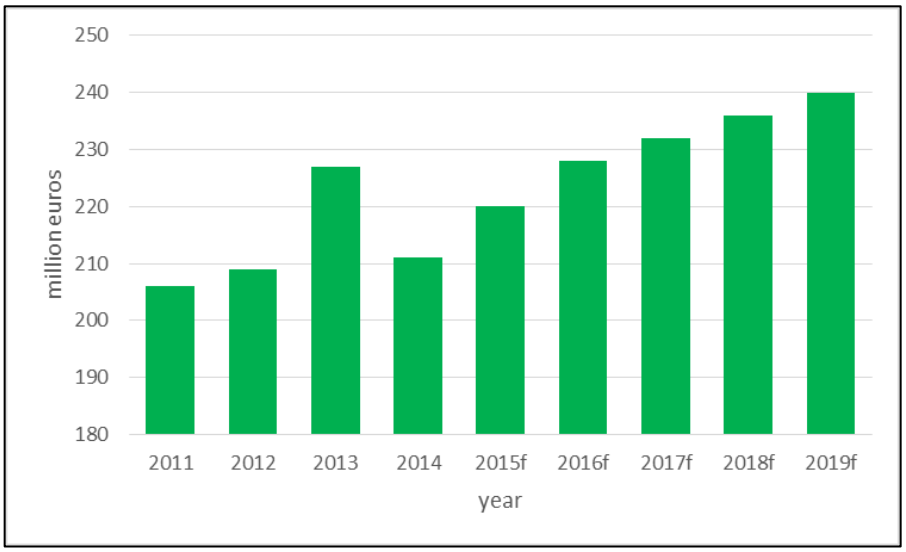

Figure 28 – Over-the-counter medicine market indicators, Historical Data and Forecast (Portugal 2011-2019) (BMI Research, 2015).

Portugal is currently below the European average in terms of OTC penetration. As the Portuguese government faces continued pressure to reduce healthcare expenditure, BMI predicts that the OTC sector will benefit as a result, as the authorities opt to promote self-care for minor ailments in an attempt to lower costs (BMI Research, 2015).

4 Conclusion

This paper has analysed Portugal's Pharmaceutical Cluster by using Michael Porter's Diamond Theory. This analysis has shown that, although the Portuguese Pharmaceutical Cluster is relatively small, it has the potential to play a much more relevant role within the Portuguese economy. Portugal should aspire to have 10% of its gross domestic product coming from Pharmaceutical production, i.e., around €20'000 million (similar to the absolute value registered by Ireland in 2016 – see Table 5). This is, of course, a very ambitious goal. However, because some positive signs for growth and further development are already present in the Portuguese Pharmaceutical Cluster, it is the firm belief of the author that if these positive factors were to be fully exploited and developed the Cluster would become much more competitive in the world market. To achieve this, the Pharmaceutical Cluster must be positioned at the very center of the Portuguese economy.

Bearing this in mind, and using the appropriate analytical methods and statistical data, the author has identified the following policies which, in his view, will contribute to Portugal achieving that target.

Factor (input) Conditions

If there is a key element that can provide countries with a competitive advantage, it is **human resources.** Being able to attract the best human resources is of the utmost importance for any country. Portugal is part of Europe and therefore should be attractive to any European with the right qualifications and ambitions. As mentioned by Professor Pita Barros "if it is attractive globally, it will be attractive to the Portuguese". Portugal has currently the most qualified generation ever (Wise, 2013), though many of those highly qualified people have left the country to search for better opportunities abroad. However, those who left have now built their network and got more knowledge and know-how. In order to successfully attract the best talents, it is important to understand which factors are the most critical for highly qualified people to want to work in Portugal. Very likely those factors will be different from country to country, hence the need to first identify such factors, so that the adequate policies can be implemented. In fact, Portugal ranks 5th out of 65 countries in 2017 in the preference of expats destination (Inter Nations, 2017), which is an excellent indicator.

> **Policy 1**: To identify the key factors that would make qualified European human resources want to work in Portugal. Define a 5-year plan and implement it.

Good infrastructures also play a very important role, particularly when considering air transportation, which nowadays is a pre-requisite for people to be able to circulate quickly and comfortably. The Portuguese air transportation system offers good and frequent connections both within Europe and with Portuguese speaking countries like Brazil, Angola and Mozambique.

Context for Firm Strategy and Rivalry

This analysis has shown that there is progress to be made in order to make "doing business" easier in Portugal. In particular, the non-attractive Portuguese **high taxes**, **inefficient government bureaucracy, deficient access to financing** and **restrictive labour regulations** should be looked at and addressed. In fact, the tax regime (both corporate and personal income tax) is very high when compared with other EU countries (see chapter 3.2.2). When considering the **ease of getting finance** and the **strength of legal** rights, Portugal ranks very poorly (see chapter 3.2.2). The European Union has an important role to play, as far as financing is concerned. In fact, Portugal is a net receiver of European financial programs, such as the Program Horizon 2020. The Portuguese **labour regulation** is overall too restrictive when compared to other more competitive countries (see chapter 3.2.2) and more flexibility would be more attractive to investors and companies.

Fostering a start-up culture is very important to encourage innovation in Portugal. With the Web Summit taking place in Lisbon, this unique opportunity should be considered so as to foster the creation of infrastructures in Portugal able to sustain the development of **start-up companies**. Those companies should work closely with academia and already established companies. This could be done in combination with already existing institutions such as FCT, hospitals or private institutions like the Champalimaud Foundation (see chapter 3.3.2). There are also other very important initiatives that are essential for the entrepreneur ecosystem such as Techcare (Techcare, 2017), startup Portugal (Startup Portugal, 2017), among many others.

Policy 2: To develop a strategic ecosystem for start-up companies related to the healthcare industry.

The Portuguese **regulatory regime** is fair and transparent also due to Portugal's EU membership. This goes together with **high quality** standards that are part of both Portugal and EU's culture. The **low trade barriers** with the EU countries have a positive effect in the Portuguese companies that are competitive allowing them to export more. Therefore, Portugal should keep promoting itself as a gateway to other European markets.

Related and Supporting Industries

The Portuguese **healthcare system** is internationally recognized and plays a central role within the Pharmaceutical environment in Portugal. In recent years, more private companies have been investing significantly in new facilities, which should be seen positively, as they will create more competition within the market. In fact, Portugal has several leading hospitals and institutions (see chapter 3.3.2) that play a key role in attracting talents and are part of the Pharmaceutical environment.

Research and Development (R&D) are very important in the Pharmaceutical industry. The analysis shows that the fact that Portugal is a small country could turn out to be an advantage, making it easier to connect companies with academic innovation. However, the link between institutions and the industry is still weak in Portugal and needs to be fostered (see chapter 3.3.2). It is of the utmost importance to consider a mid/long term strategy, having in mind that those results could only be visible in 5 to 10 years' time. Because this is a long period, it is important

to have a national acknowledgment of the importance of this strategy as well as political involvement and consensus. The R&D has also a strong link with universities and the creation of spin-off companies out of those R&D activities should be a priority. It is important to notice that, while designing R&D and innovation policies, policy makers should give them a multinational dimension, acknowledging that whatever happens in one country, affects the other countries and vice versa (Prato & Nepelski, 2013). Therefore, it is extremely important to create strong links and partnerships between Portuguese universities/institutions and other world-class institutions.

Policy 3: To create the right conditions for the Portuguese universities/institutions to be in the network of world-class universities/institutions and work together with them.

Innovation is indeed key for bringing the Pharmaceutical industry to a higher level. As mentioned by Michael Porter and Scott Stern in their MIT review "Innovation has become the defining challenge for global competitiveness" (Porter & Stern, 2001). In their review, they mention that a favorable environment for innovation includes strong university-industry linkages and a large pool of highly trained scientists and engineers. In fact, in Portugal, the links between the academic and business worlds must be improved. The companies need to provide more frequent feedback to the academia and vice-versa. This can be achieved more formally through regular meetings and aligned strategies between different institutions as well as more informally, for example, by supporting Alumni groups within universities where colleagues who attended the same course or studied at the same university can share ideas. In fact, big consulting companies such as McKinsey uses its Alumni network as an important strategy to its success (Burkus, 2015).

Policy 4: To foster close interaction between academia and companies, so that innovation and value-added activities can be incorporated more swiftly into commercial ideas and ventures.

Innovation is the main source of competitiveness in the long term and the number of **scientific articles and patents** is a good indicator of this. As it has been discussed in chapter 3.3.3, in Portugal there is a clear upward trend, although still behind other European countries.

The Portuguese healthcare system has a strong link to government agencies, having the public-sector expenditure accounted for 65.3% of spending in 2014. Because of that, it is also important to have a more efficient **reimbursement system** for drugs. Today it still takes several months for the government to pay back the money to Pharmaceutical companies and other suppliers (see chapter 3.3.1). This topic should be looked at with the involvement of the government, institutions and representatives of the Pharmaceutical companies. While doing this, the processes need to be looked at and streamlined in order to make the reimbursement faster and more efficient. As described in chapter 3.3.1 APIFARMA should keep working with the government so that this process can be speeded up and improved.

Policy 5: To speed up the reimbursement processes and make them less bureaucratic.

Clinical trials are an important component of innovation and a good link between the Pharmaceutical industry, hospitals, universities and other institutions. In fact, in 2012 a study showed that for each euro invested in this activity, there was a return of 1.98 euros to the Portuguese economy (Pwc, 2017). Moreover, clinical trials are often linked to innovative treatments, which would imply that the Portuguese would have faster access to treatments like oncological drugs. It should also be pointed out that clinical trials have some risk, seeing that new drugs or new combinations are being tested. However, with appropriate legislation, such risk could definitely be mitigated. The clinical trials are one activity that could foster the link between key stakeholders involved in the Pharmaceutical Cluster. This goes together with the approval of **innovative medicines** that is usually a long process in Portugal and doesn't foster the introduction of innovative treatments.

Policy 6: To position Portugal as one of Europe's main countries for clinical trials.

Portugal has been developing very good human resources in many areas, including the areas related to technology. This has been making Portugal very attractive for companies to invest in **shared business services**, such as: Siemens, Microsoft, Bosch, Europcar, Vodafone, Grünenthal, among others. In fact, there are 50'000 employees in the business services sector in Portugal (Corp Expansion, 2017), which makes it an attractive country to keep increasing those services. Also, the big Pharmaceutical companies have been looking for such approach to their businesses. Portugal should be positioned in this segment so as to attract Pharmaceutical companies.

Policy 7: To position Portugal as an attractive country for shared services activities within Europe, especially for the Pharmaceutical industry.

Medical tourism occurs when consumers elect to travel across international borders with the intention of receiving some form of medical treatment. This treatment may span the full range of medical services, but most commonly includes dental care, cosmetic surgery, elective surgery, and fertility treatment (Lunt, et al., 2011). Portugal has a lot of potential to further develop medical tourism. In fact, the country's tradition in high-quality touristic offering with state-of-the-art private medical infrastructures, as well as high-qualified medical teams, together with the good weather conditions, have the potential to further develop this activity. Medical tourism could be considered for some mid-term interventions, i.e., hip surgery where the patient needs to stay in hospital for a couple of weeks. In this case, during the most critical period, the patient would stay in a Portuguese hospital. Once the health of the patient had been stabilized, then the patient could go back to his/her home country. Follow-ups could be solved via remote consultation (like the Champalimaud foundation is doing today) or partnerships in other countries with clinics that would have full access to the patient's information and that could follow the treatments after the surgery. Another area to explore would be services for pensioners. Investing in centers where elderly people could spend their time doing activities while having full access to doctors and treatments. In addition, all over the world healthcare systems are getting more and more expensive, so it is important that countries consider alterna-

Policy 8: To make medical tourism one of the key strategic areas for development in the coming years.

tives. Portugal offers excellent conditions, including infrastructures, qualified personnel, good weather, which could support and foster medical tourism. Partnerships with the European Health Insurance groups in countries like Germany, Switzerland or the Scandinavian countries could help those countries reduce their healthcare budget, while supporting the Portuguese economy and mainly providing excellent conditions to the patients.

Demand Conditions

The Pharmaceutical industry represents today a relatively low share of the Portuguese GDP. The market size in Portugal is small (~10 million inhabitants) and this limits the market growth.

Policy 9: To foster cooperation with the Portuguese speaking countries and leverage on the EU positioning.

On the positive side, Portugal has a long history and close ties with other Portuguese-speaking emerging economies such as Brazil, Angola and Mozambique, which creates an opportunity to scale-up the market. In addition, the fact that Portugal is a member of the EU could also be an incentive for those Portuguese speaking countries to connect with European markets with Portugal as a strategic partner. Those countries might be given priority; however, a global effort of integration with other global markets is also of critical importance. Also, the **brand Portugal** is not yet automatically associated with Pharmaceutical/ healthcare industries. Countries which are famous for the quality of their Pharmaceutical industry are economically very competitive, perhaps because of the direct effect of this particular industry on the overall economy of these countries. Switzerland is a prime example of this. The brand Portugal should follow the example of such countries and position itself so as to ensure that the quality of the work developed in the country in the healthcare sector be recognized worldwide.

This paper has discussed the recent economic crisis in Portugal (starting 2011). The Portuguese population demonstrated an extraordinary resilience and was able to adapt. During this time, it became clear that Portuguese **consumers are very demanding**. Despite the difficult economic conditions, people keep asking for what they believe is the right thing. It is, however, important to make sure that this feedback from the Portuguese population can always be turned into a constructive and positive feedback that in turn can be used to improve Portuguese companies.

Even though the Portuguese Pharmaceutical market is mainly dominated by multinational companies, most of which import finished products, there is an interesting **manufacturing footprint** in the country. Looking at the Pharmaceutical industry value chain, most of its value is generated by the manufacturer (see chapter 2.2). As it is described in chapter 2.3, in Portugal some companies have relevant manufacturing sites, such as Bial, Hovione, Bluepharma, Medinfar, Generis, Tecnimede, Hikma and Cipan. They are, however, relatively small when compared with those in other European countries. The ability to **attract big Pharmaceutical companies** is of critical importance, and the investments per manufacturing facility can be in the range of US$50-500 million and therefore very important to the overall economy. To attract more Pharmaceutical production to Portugal would be extremely relevant in terms of generating more jobs as well as to foster the development of the Pharmaceutical Cluster.

Policy 10: To develop the right strategies to attract big Pharmaceutical companies to Portugal.

Looking forward and next steps

Mankind's drive to defeat illness and disease and improve **quality of life** has made the Pharmaceutical industry one of the largest and most significant global businesses. Driven by its own ability to innovate, the industry has grown strongly over the decades, as successful new medicines have extended average life expectancy and as governments across the globe have sought to improve the health and quality of life of their citizens (Sprang, Purcell, & Ryan, 2005). This paper puts forward and discusses a few policies for the Portuguese Pharmaceutical industry to be able to improve people's quality of life in two dimensions:

- To provide medicines that can improve people's standards of living,
- To make the Pharmaceutical industry a strategic pillar of the Portuguese economy and thus further improve the quality of life of people in Portugal and further afield.

The author is fully aware that due to its size and history, it would be hard to make Portugal the world's number one country in the Pharmaceutical industry. However, it is the author's view that Portugal Pharmaceutical Cluster can play a much more relevant role within the Portuguese economy and this paper can be considered as part of the broader analysis and reflection that the Pharmaceutical Cluster in Portugal should engage in.

Despite not being the only ones that could be implemented, the policies proposed in this paper could have a significant impact within the Portuguese Pharmaceutical Cluster and, consequently, on the economy and the status of Portugal as a leading competitor in the Pharmaceutical industry and global business. This is the reason why the author believes that this reflection and analysis must continue, so that these avenues for growth can be further researched, discussed and implemented. By expanding on healthcare, Portugal would surely improve its chances to compete on equal terms with other leading countries in the field. However, to become competitive, Portugal must innovate and use its strengths to their full potential. This paper aims to be a step in that direction.

5 References

AICEP. (2017). *Portugal - Basic Data (March 2017).* Lisbon: AICEP.

aicep Portugal Global. (2016, July 25). *Portugal Global*. Retrieved from Prominent Clusters: http://portugalglobal.pt/EN/SourceFromPortugal/prominent-clusters/Pages/prominent-clusters.aspx

APIFARMA. (2014). *A industria farmaceutica em Portugal - saber investir, saber inovar - 75 anos*. Lisboa.

APIFARMA. (2015). *The pharmaceutical industry in Figures.* Lisboa: Portuguese Association of Pharmaceutical Industry.

APIFARMA. (2016). *The Pharmaceutical Industry in Figures.* Lisbon: APIFARMA.

APIFARMA. (2017, July 5). *apifarma - Home*. Retrieved from http://www.apifarma.pt/indicadores/Portugal/IFPT/Documents/Balan%C3%A7a%20comercial%20Mar17.pdf

APIFARMA. (2017, September). *Indústria Farmacêutica em Portugal*. Retrieved from http://www.apifarma.pt/indicadores/Portugal/IFPT/Paginas/default.aspx

APIFARMA, Ministries of Finance, Economy and Health. (2017). *Amendment to the Agreement between the Ministries of Finance, Economy and Health and the Pharmaceutical Industry.* Lisbon.

apifarma-ensp/unl. (2016). *Ensaios Clinicos em Portugal.*

Association of research-based pharmaceutical companies in Switzerland. (2015). *Pharmaceutical HUB Switzerland - Basel Region.* Basel: Interpharma.

Barros, J. A. (2014, April 3). Conferencia: A Saude como motor do desenvolvimento economico e social - estrategia nacional para o turismo de Saude.

Batra, N., Patten, R., Shaikh, F., Jacoby, R., Chiodetti, B., & C, F. (2013). *Big pharma: Business model choices for the new market - Deloitte.*

Bial. (2017, August 21). *https://www.bial.com/en/*. Retrieved from https://www.bial.com/en/

Björnberg, A. (2015). *Euro Health Consumer Index.* Health Consumer Powerhouse .

Bluepharma. (2017, March 20). *Bluepharma*. Retrieved from https://www.bluepharma.pt/bluepharmagroup.php

BMI Research. (2015). *Portugal Pharmaceutical & Healthcare - Report Q1 2016.* London: BMI Research.

Brannback, M., & Renko, M. (2002). Technology and strategic chnage in the Finnish pharmaceutical cluster. The emergence of a cluster. *Pharmaceutical Policy & Law*, p. 27.

Burkus, D. (2015, July 5). *Forbes.* Retrieved from Forbes Web site: https://www.forbes.com/sites/davidburkus/2016/07/05/why-mckinsey-companys-alumni-network-is-crucial-to-its-success/#1d41882f1580

Champalimaud Foundation. (2017, March 29). *Champalimaud Foundation*. Retrieved from http://www.fchampalimaud.org/en/the-foundation/history/

Chipman, A. (2016). *Value-based healthcare in Portugal - Necessity is the mother of invention.* The Economist.

Clinical Trials gov. (2017, May 10). *clinicaltrails.gov*. Retrieved from https://clinicaltrials.gov/ct2/search/map/click?map.x=138&map.y=250&map=EU

Corp Expansion. (2017, June 21). *Corp Expansion*. Retrieved from http://corpexpansion.com/portugal-shines-new-age-discovery

Costa, J., Fazenda, L., Honorio, C., Louca, F., & Rosas, F. (2010). *Os donos de Portugal - Cem anos de poder economico (1910-2010).* Porto: Edicoes Afrontamento, Lda.

Deloitte. (2015). *2016 Global life sciences outlook - Moving forward with cautions optimism.* DTTL LSHC industry group.

Deloitte. (2017). *Comparison of European holding company regimes.* Deloitte.

Diário de Notícias. (2017, July 4). *Diario de Noticias - Economia*. Retrieved from https://www.dn.pt/lusa/interior/grupo-jose-de-mello-saude-investe-30-me-em-novo-hospital-cuf-em-sintra-8611123.html

DiMasi, J. A., Grabowski, H. G., & Hansen, R. W. (2016). Innovation in the pharmaceutical industry: New estimates of R&D. *Journal of Health Economics*, 20-23.

Dogramatzis, D. (2001). Pharmaceutical marketing: a practical guide. Taylor & Francis.

Doing Business. (2017, April 26). *Doing Business*. Retrieved from http://www.doingbusiness.org/data/exploretopics/labor-market-regulation

EFPIA. (2017). *The Pharmaceutical Industry in Figurs - key data 2017.* Brussels: EFPIA.

European Commission. (2017, May). *Economic performance and forecasts.* Retrieved from Economic forecast for Portugal: https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-performance-country/portugal/economic-forecast-portugal_en

European Commission. (2017, March 20). *European Commission*. Retrieved from https://ec.europa.eu/growth/tools-databases/smeip/service/apifarma-gives-support-associated-companies-project-pharmaportugal-pharmaportugal-trademark

European Commission. (2017). *Portugal - H2020.* European Commission.

Eurostat. (2017). *Eurostat - data explorer*. Retrieved from http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

Exame. (2017, May). Exame. *35 start-ups a nao perder de vista*.

EXAME. (2017). O negocio do futuro. *EXAME*, 77.

Expresso. (2017, February 10). *Jornal Expresso*. Retrieved from Jornal Expresso - Economia: http://expresso.sapo.pt/economia/2017-02-10-Mais-10-hospitais-privados.-Investimento-de-300-milhoes-ate-2020

Fundação para a Ciência e a Tecnologia (FCT). (2017, March 29). *Fundação para a Ciência e a Tecnologia (FCT)*. Retrieved from http://www.fct.pt/fct

Governo de Portugal. (2014). *Turism de Saude.* Lisboa: Governo de Portugal.

Guerron-Quintana, P. (2014, 4Q). The Economics of Small Open Economies. *Business Reviee*, 9-18.

Health Cluster Portugal. (2017, April 25). *Health Cluster Portugal*. Retrieved from http://healthportugal.com/title-1?set_language=en

Hovione. (2017, March 29). *Hovione*. Retrieved from http://www.hovione.com/about-hovione/history-hovione

Hunt, V., Manson, N., & Morgan, P. (2011, December). A wake-up call for Big Pharma. *Mckinsey Quarterly*.

IMS health. (2016). *Market Prognosis 2016-2020, Portugal.* United Kingdom: IMS Health Incorporated.

Infarmed. (2013). *Psicofármacos - Evolução do consumo em Portugal Continental (2000 – 2012)* . Infarmed.

Institute for Health Metrics and Evaluation. (2017, May 18). *Health data - Portugal*. Retrieved from http://www.healthdata.org/portugal

Inter Nations. (2017). *Expact Insider 2017.* Expact Insider.

Investopedia. (2017, January 25). Retrieved from Invetopedia.com: http://www.investopedia.com/terms/p/porter-diamond.asp

KPMG. (2016). *SIte Selection for Life Sciences Companies in Europe.* KPMG.

Lai, J., Clark, M., Race, T., Parkes, R., & Blum, H. (2012). *Pharmaceuticals for Beginners 2012.* London : Deutsche Bank.

Lunt, N., Smith, R., Exworthy, M., Green, S., Horsfall, D., & Mannion, R. (2011). *Medical Tourism: Treatments, Markets and Health System Implications: A scoping review.* OECD.

Matins, J., Biscaia, A., & Ana, A. R. (2007). Professionals entering and leaving the portuguese health service system. *Cah. Socio. Démo. Méd.*, 273-290.

Medical Tourism in Portugal. (2017, March 8). Retrieved from http://www.medicaltourisminportugal.com/en/health

National Science Foundation, Science and Engineering Indicators. (2017, May 9). *The World bank*. Retrieved from http://databank.worldbank.org/data/reports.aspx?source=2&series=IP.JRN.ARTC.SC&country=#

Neumann, J., & Sindreu, J. (2017, May 31). *Fox Business.* Retrieved from Portugal, From Europe's Periphery, Emerges as Bond Market Star: http://www.foxbusiness.com/features/2017/05/31/portugal-from-europes-periphery-emerges-as-bond-market-star.html

OECD. (2013). *PORTUGAL - Reforming the state to promote growth.* OECD.

OECD. (2014). *"Better Policies" Series Portugal .* OECD.

OECD. (2017, May 8). *Main Science and Technology Indicators*. Retrieved from http://www.oecd.org/sti/msti.htm

OECD. (2017, May 8). *OECD - Average wagesTotal, US dollars , 2015*. Retrieved from https://data.oecd.org/earnwage/average-wages.htm

OECD. (2017, April 24). *Organisation for Economic Co-operation and Development*. Retrieved from Organisation for Economic Co-operation and Development: http://stats.oecd.org/index.aspx?DataSetCode=TABLE_I7

Porter, M., & Stern, S. (2001). Innovation: Location Matters. *MIT Sloan Management Review*, 28-36.

Portugal Ventures. (2017, May 22). *Bluepharma 4th largest pharmaceutical exporter*. Retrieved from http://www.portugalventures.pt/en/article/bluepharma-4th-largest-pharmaceutical-exporter

Prato, G., & Nepelski, D. (2013). *The global R&D network: A network analysis of international R&D centres.* Institute for Prospective Technological Studies.

Pwc. (2017, May 11). *Ensaios Clínicos em Portugal 2013*. Retrieved from http://www.aibili.pt/ficheiros/EstudoInvestigClinica_em_Portugal_jun2013vf.pdf

QS Quacquarelli Symonds Limited. (2017, March 27). *topuniversities*. Retrieved from https://www.topuniversities.com/about-qs

Simões, J., Gonçalo, A., Fronteira, I., & Hernández-Quevedo, C. (2017). *Portugal - Health system review.* European Observatory.

Sprang, H., Purcell, M., & Ryan, B. (2005). *Global Pharmaceuticals - Pharmaceuticals for Beginners.* Deutsch Bank.

Startup Portugal. (2017). *Startup Portugal*. Retrieved from http://startupportugal.com/

Techcare. (2017). *Techcare Program*. Retrieved from http://techcareprogram.com/

The Economist. (2009, August 24). Retrieved from http://www.economist.com/node/14292202

The Economist. (2017). *The World in 2018.* London.

The Federation of International Employers. (2017, April 4). *The Federation of International Employers*. Retrieved from http://www.fedee.com/pay-job-evaluation/minimum-wage-rates/

The Portugal News. (2015, 11 5). Retrieved from The Portugal News: http://theportugalnews.com/news/luz-saude-announce-largest-ever-private-healthcare-investment/36541

The World Bank. (2017, April 26). *Doing Business*. Retrieved from http://www.doingbusiness.org/Methodology/Starting-a-Business

Wikipedia. (2017, February). *wikipedia*. Retrieved from Wikipedia - Pharmaceutical industry: https://en.wikipedia.org/wiki/Pharmaceutical_industry#cite_note-rl2007-1

Wikipedia. (2017, March 29). *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Bial

Wise, P. (2013, September 9). *Financial Times.* Retrieved from https://www.ft.com/content/5c57aff8-0f37-11e3-ae66-00144feabdc0?mhq5j=e1

World Economic Forum. (2016). *The Global Competitiveness Report 2016–2017*. World Economic Forum.

