ENHANCED COMPETITIVENESS THROUGH CLUSTER INITIATIVES:

A COMPARISON OF THE BIOMEDICAL SECTOR IN VENETO (ITALY) AND SOUTH AUSTRALIA

Mr Andrea Dal Betto

Trento University

State Development Division

Supervisor: Adj. Prof. Nicola Sasanelli

December 2012

Acknowledgements

The most difficult thing is to say thank you to all the people that both directly and indirectly contributed to the writing of this report. It is not easy expressing what I've felt during these months, but it is with great joy that I thank all the people that I met in the Office of International Coordination, and all the people that I came across in the Department of the Premier and Cabinet. Everybody has been kind-hearted and willing to help me, and a big thank you is what you all deserve.

Thank you to my colleagues that first and foremost are all great friends, Francesco, Annalisa and Marco. Without you, these months would likely not have been the same. We enjoyed parties and we shared troubles. Thanks to Francesco, every meeting in the kitchen was useful towards the success of my report.

Thank you to Carmela Sergi, who helped me with her knowledge to address my research, I really appreciate your advice.

Thank you to Corey, who helped me in different ways. When a problem arose, I just asked Corey how to resolve it, and every time he was keen to assist me.

Thank you to Desi, just as Corey did, she helped me countless times. It is not easy to explain what Desi is for the office, she helps everybody with not only working issues but also with her huge sense of kindness.

Thanks to Nicola, who gave me the opportunity to live this experience. Sometimes I lost myself in the work but he guided me towards the aim, and I am very grateful for his support.

I will remember all the people who I met here in Australia because everybody gave me something to take away. Unfortunately I cannot thank you all individually, but you shaped my memories and experiences.

A final very special thank you to the people who supported me from Italy, my family and my friends.

ENHANCED COMPETITIVENESS THROUGH CLUSTER INITIATIVES: A COMPARISON OF THE BIOMEDICAL SECTOR IN VENETO (ITALY) AND SOUTH AUSTRALIA

Abstract:

The main purpose of this paper is to explore the importance of a cluster in improving competitiveness and to analyze the Biomedical cluster in Veneto and investigate the opportunities for the medical technology industry in Australia and South Australia.

This study is divided in three sections:

1. The literature concerning geographical concentration and the importance of a cluster, particularly within the biomedical sector.
2. The biomedical cluster in Veneto in better understanding the growing cluster environment and to determine the policies required for innovation.
3. The trend of the medical technology industry in Australia and South Australia, and the relationship between companies and other actors, including academic institutions and the public sector.

Table of Contents

1 Introduction

All over the world the biomedical sector is increasing its importance, new countries and new actors are emerging, and the future forecasts extraordinary development in the sector.

The success of the biomedical sector, with a focus on the medical technology industry, characterized many developed countries that enjoy a well-being status in their economies. For this reason, countries need to define policies in order to foster the growth of the companies and the establishment of new collaborations at both a national and international level.

In a scenario where healthcare expenditure is rising and where health issues concern the population at an even higher level, new paths and technologies are boosted. Although the profitability in the sector is high, it is not easy to achieve good results in the medical technology industry.

Some countries have invested in discovering and exploiting a new opportunity for a long time now, and the position that they have reached is due to the huge investments in R&D. Among these, the United States is the first market in the world where companies deliver the best performance in terms of turnover and technology.

The biomedical sector is a rich source of opportunities and new niches constantly emerging, for this reason new countries may settle in different segments. The Veneto region and South Australia have an interesting background in biomedicine and they intend to improve their strength through initiatives addressing the development of a cluster. As a science based industry, a cluster may support the medical technology industry, creating collaboration between private and public bodies and academic institutions.

Moreover a high-tech cluster should refine the innovation process, break down the barriers to the diffusion of knowledge created locally, and attract external resources. The companies operating in the high-tech sectors need to have access to codified knowledge that is not present at a local level, and carry out first-class strategies.

2 Cluster history and evolution perspective

2.1 From Taylorism to Industrial Clusters

In the course of history the culture of entrepreneurship and the methods to develop new businesses has evolved. Established as the concept of a single firm, new theories have emerged for studying new types of firm aggregations, particularly when the small-medium size enterprises acquired relevance for regional development.

Dr Frederick Winslow Taylor (1856-1915) is recognized as a pioneer in internal firm dynamic analysis. He gave the name to a theory of scientific management called Taylorism; this theory analysed and synthesized workflows through a focus on the relationship between machine and worker efficiency, the aim was to promote a new and more efficient division of the labour. According to Taylor, the technology applied in a firm is the process where the work is structured and this path defines the framework of that same firm.

Other management theories were developed through Taylor's theory; Henry Ford (1863-1947) applied the discoveries of Taylor to pursue and achieve higher productivity by standardizing output, using conveyor assembly lines, and dividing work into small and unskilled tasks. A new manufacturing philosophy was therefore developed, and it took the name from its founder, "Fordism".

"Taylorism" was centred on machine and worker efficiency whereas "Fordism" concentrated on a desire to combine them as one unit and emphasize minimization of cost instead of maximization of profit. Until the 1970's, industrial culture and relative socio-economy were based on the principles of Fordism, their aforesaid principles being:

- vertical integration;
- mass production;
- standardized products;
- unskilled labour;
- production divided into easy and repetitive tasks.

The crisis of Fordism became apparent in the late 60's and in the 70's it reached breaking point. When the term Post-Fordism was developed, society was changing. In Western capitalist societies, welfare gave people the possibility to travel and to purchase and there was a certain standard of living. Society started to have new priorities, a new awareness towards the ecological environment and towards making money and producing a large quantity of goods was no longer the focus in the post war years. In addition, work in the factories was not very attractive for the workers, and the production process was also quite mind-numbing. For all these reasons the economy was not growing as much as in the first years after the Second World War and there was some criticism on the production methods which characterised the period of Fordism.

During this period, the most developed countries in the market of durable goods reached saturation point (automobiles, electrical appliances) and the demand went down due to substituted goods. So the Fordism principle of potential indefinite growth of production volume, which was formed on the basis of the scale of the economy where the more the production volume the less the industrial costs with a consequence of generating new demand, fell into crisis. Competitiveness between the United States, Europe and Japan therefore levelled out. The search for economies of scale induced internationalisation of productive processes and of the markets between developed countries. Price increases for primary commodities imported from the south (particularly oil) encouraged the competition for exports at the start of the 1970s. Due to the oil stock-out, the idea of the infinite availability of input of the productive system and of their prices (that were constantly decreasing as a result of the increase of the production volume) fell into crisis.

On the one hand, mass production faced trouble when at the threshold of the market new companies started producing products characterized by a high capacity of technology. On the other hand, customers became more demanding and wanted more diversified goods.

Post-Fordism is characterized by the application of production methods, considered to be more flexible than those of the Fordism era. The period is also called the age of Flexibility.

Diversity is a key component of Post-Fordism. The Post-Fordism way of thinking is based on the fact that it is important that factories are making more than only one product. Another important issue of Post-Fordism was Integration. In fact, workers were situated at more places in the production line and were able to produce more products. By doing this they worked harder and had

more job satisfaction because they felt more integrated in the production process and identified themselves more with the end product.
Dispersal was also a new element and different locations were used during the production process. Parts of the production process were displaced to the periphery while overseas investment in cheap labour markets became more and more popular and there was a growth in less labour-intensive high technological industries. Nevertheless, the management and the knowledge stayed in the Western countries. Moreover, teamwork became more important and a new managerial approach, “Just In Time” (JIT), was introduced. The principle of JIT is to minimize inventory at each stage of the production process. The JIT principle requires that parts arrive "just in time" for their use in the production process.

As a result of the new process, means of communication and infrastructure methods needed to be perfect. The outcome was that workers and managers were able to work more closely with each other and not through the traditional, hierarchical and compartmentalised Fordism-based system.

As a result, the importance of flexible specialisation became even more apparent in the 1970’s. In this scenario, the institutional context became fundamental to company operations, and so the focus moved to the interaction between companies and the local social environment. A consequence of this was that a labour division emerged in the interaction among the companies that belonged to the same geographical area. It was during these years that the first studies were conducted about the relationships between companies and regions that hosted them, and that were later identified with the industrial clusters.

2.2 Geographic concentration of firms

All the studies developed in regional economic areas have aimed to explain and define the reasons for close localization of the companies in some specific regions. The outcome of these studies is that the territory where the companies are established not only forms the background, in which economic action occurs, but the place where it is created, accumulated, and critical knowledge is shared for the production, which would otherwise be difficult to transfer through formal channels of communication. The type of knowledge involved in process of agglomeration is not only practical knowledge, but also incorporates research on the geography of innovation that states that technical and scientific knowledge also pushes towards localization. It is in this environment that the terms

"cluster" and "industrial district" obtain wide relevance. The two terms are often used interchangeably, although they cover two distinct concepts.

Industrial districts

The concept of industrial districts derives from Alfred Marshall's work (1890). Marshall is usually cited in literature as the first to acknowledge the connection between the economic productivity of firms and the business results with the location and proximity of economic actors.
The Marshallian industrial district has two dominant characteristics:

- high degrees of vertical and horizontal specialization; and
- a very strong reliance on market mechanism for exchange.

The firms of the industrial district tend to be small and only focus on a single function in the production chain.
Marshall argued that the dynamics of firm geographic concentration leads to growth and organisational development, enabling firms to utilise and grow from the benefits of external scale economies.

Marshall used the term industrial districts to describe the tendency of competitive firms in similar industries to be located in the same geographical area, and the advantages of this particular structural outlay. This form of cluster is different from the concept of urban agglomerations, which includes companies from different fields located in the same urban area, because the companies in question are performing similar or interconnected activities. Furthermore, Marshall noticed that the productions were not rationally distributed across the country, but had a tendency to be located in a relatively small number of cities, and that those few producers who were not located in these city clusters did not perform as well as those that were. So, instead of focusing on the individual location of firms relative to other factors, as the traditional location economists had, Marshall altered research to focus more towards the direct benefits of the co-location of firms, and his model does not take into account the social relations between cluster members.

Marshall identified three overall sources which were fostering spatial cluster formation through increasing returns to scale in the long run that were caused by economies of specialisation:

- Knowledge spill-over - Knowledge is generally believed to be communicated with greater ease between local firms, compared to the communication of firms over long distances. This influences the local inter-firm cooperation.

- Labour pooling - Labour pooling benefits existing firms, and attracts new firms to a certain geographical area. The pooling of labour is generally argued to have two types of advantages: Knowledge transfer, and improvement of industry skills.
- Cost advantages - The extended division of labour benefits the level of specialization and leads to increased inter-firm cooperation with extensive activity links and resource ties. Enhanced co-operation through sharing resources may lead to sharing the cost of innovation.

After Marshall, in 1979, Becattini, an Italian researcher, introduced the seminal concept of “industrial districts” for regional policy and territorial development in his article “From industrial sectors to industrial districts”. Based on Alfred Marshall’s concepts, Becattini raised the issue of the importance of place-based economic development with the notions of external economies that changed the approach to industrial policy. Becattini also stressed the importance of social capital geography, sociology, politics and history in the delineation of innovation policies.

Industry clusters

The term “industry cluster” is associated with economist Michael E. Porter, as Porter initially studied the competitive advantages of nations where the cluster concept became a subject of intense research studies and economic analysis. Porter broadened Marshall’s theories on localisation economies, and described the cluster as an economic phenomenon that is placed in a competitive environment where many businesses simultaneously compete and collaborate to gain different economic advantages.

According to the definition of Porter, businesses and other local actors form part of the cluster if they develop their own activities as part of a "particular field" and are characterized by a close technological production that facilitates the development of relations directed at enhancing innovation[1]. The aspect of the interconnection between local actors in the cluster is then established as a “cause and effect” relationship, usually with the involvement of co-focusing activities on common sector issues.
Porter redefined the cluster concept in a new analysis, concentrating on the type of relationships that exist between cluster members, and defining its boundaries that can “range from a single city or state to a country or even a group of neighbouring countries”.

The latter description extends to the concept outside a limited region and encompasses different types of actors with different goals and motivations, including suppliers, customers, and governmental and/or public institutions such as universities, colleges and centres of research. Porter’s analysis contributes to the process of innovation to the economic relations and flow of goods that takes place inside the cluster through the transfer of information, business-savvy knowledge, and experience.

On the basis of the last definition of a cluster, it is possible to describe the concept of clusters as a form of association characterised by:

- regional economic activity located at all levels: communal, geographical, and global;

[1] Some prominent examples of clusters with a global reach are easily identifiable throughout a range of industries, including financial services (London City, New York), film (Hollywood and “Bollywood”), cars (Detroit, Modena, Toyota City, Wolfsburg, Stuttgart, etc.), watches (Switzerland and Japan), optical equipment (Tokyo), flowers (The Netherlands and Colombia), computer software (Silicon Valley, Bangalore), marine technology (Southwest Norway), mobile telecommunications (Stockholm and Helsinki), wine (Barossa Valley, Rioja, Bordeaux, Southern Chile and parts of California), or biotech, life sciences and medical instruments (Boston’s Route 128, BioValley 21, Medicon Valley 22).

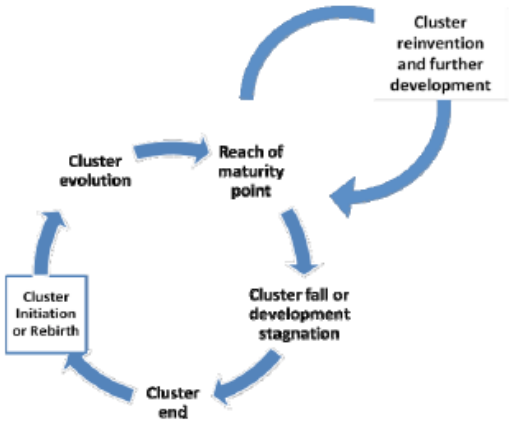
Therefore, clusters can be found in many economies around the world, each following its own trajectory and history.

- limitations to a specific industry;
- inclusion of both vertical links as supplier-manufacturer-dealer-customer chain or horizontal production links as in sectors of the same industry;
- companies that have identical or interrelated business areas;
- firms that are in competition but through specialisation that contributes to the cluster development;
- firm proximity which generates social and trust relations;
- a common infrastructure used in innovation by rapid transfer of knowledge and because of the support offered by universities and research centres.

2.2.1 Life cycle of clusters

Each cluster is unique in regards to its social and cultural environment, company activity field, objectives and factors. Clusters develop over time; they are not a trend that just appear or disappear overnight (Ketels, 2003) and clusters do not magically appear in random areas or in regions that theoretically provide the best conditions. Clusters are initiated in regions where they have previously existed, where a number of companies are grouped together, and have developed economic links for collaboration or competition; the cluster initiative also belongs to a market player, a "clusterpreneur" (Solvell, 2003) enforcing a major influence on the area, and can support the initiative while simultaneously attracting other members; in over 60% of cases the “clusterpreneur” is the Government, that by observing the natural clustering behaviour of existing businesses, may initiate autonomous or public-private projects; in other cases, private initiatives are started by multinational companies that seize possible expansion opportunities in the region.

Figure 1: Cluster lifecycle



Source: Clusters and automotive districts

The lifecycle of clusters includes events such as establishment, growth, decline and closure, graphically representing most business processes, and is also available for cluster models, as per figure 1 and as described below:

- The start or initiation of the cluster is generated by achieving a minimum threshold of firms operating in a region in the same field or related fields; this agglomeration may take place due to social or economic condition that fosters business development in that area, or may be instigated by a catalyst generating an opportunity for development; this first step is associated with an event, such as the discovery of gold or oil in California or is associated with the vision of an entrepreneur who had a business idea and it has created a local market that has evolved into a cluster.
- Clusters grow through the attraction or generation of new businesses or building relationships between existing ones; influence factors affect the cluster model lifecycle and describe distinct patterns of evolution that cannot be applied generically to any type of cluster; lifecycles can be so specific that same cluster types who benefited from the same original conditions, like Silicon Valley and Boston Route 128, have completely different development paths, mostly because of the aforementioned influencing factors.
- The point of maturity or stability is reached when the upper limits of development are stabilised through demand, and by exceeding the maximum availability point for a resource or by delaying the emergence of new technologies.
- Cluster renaissance describes a time when the cluster resumes development or returns to previous size; the trigger may be caused by the introduction of technological innovation, rethinking strategies for identification and entry into new markets or by attracting new companies to support a new developmental endeavour.
- Decline and possible dissolution of clusters is generated by the relocation of large companies to more cost- effective regions, representing the cluster core, as a result of technological growth or by economic events that have major, widespread influences, an example being a war, or regional/national crisis.

2.2.2 Actors of the cluster

It is possible to identify five key categories of players that are vital and are usually needed to start a cluster initiative. These include:

- Companies
- Governments

- Financial Institutions
- Centres of Research
- Universities and Educational Institutions

In addition to this, players have an important role where they formally or informally promote interest in the cluster initiative amongst the other players involved. The term for this description is called Institutions for Collaboration (IFCs):

- Chambers of Commerce
- Industry Associations
- Professional Associations
- Trade Unions
- Technology Transfer Organizations
- Quality Centres
- Think-Tanks

Connections amongst cluster players are characterised by simultaneous competition and co-operation. Competition is also the first market element in clusters, as it delivers important drivers for improving corporate performance and innovation. A sense of competition reduces prices, improves quality, enhances reliability, increases the search for new products and markets, and boosts developmental innovation. At the same time, a relevant sense of co-operation amongst cluster players is needed in order to attract fresh resources and services that would not otherwise be available to isolated participants, and through this co-operation, firms achieve economies of a much larger scale and scope. Trust and recognition are central to cluster operation quality in terms of information exchange and knowledge flows. In this context, trust lies in sharing a vision and belief in mutually fruitful relations. Clusters are not temporary solutions for all problems, but they provide a sense of direction and inner stability over time. Their structure is however, not rigid or static, and experience shows they actually undergo different developmental stages.

2.3 Cluster innovation and competitiveness

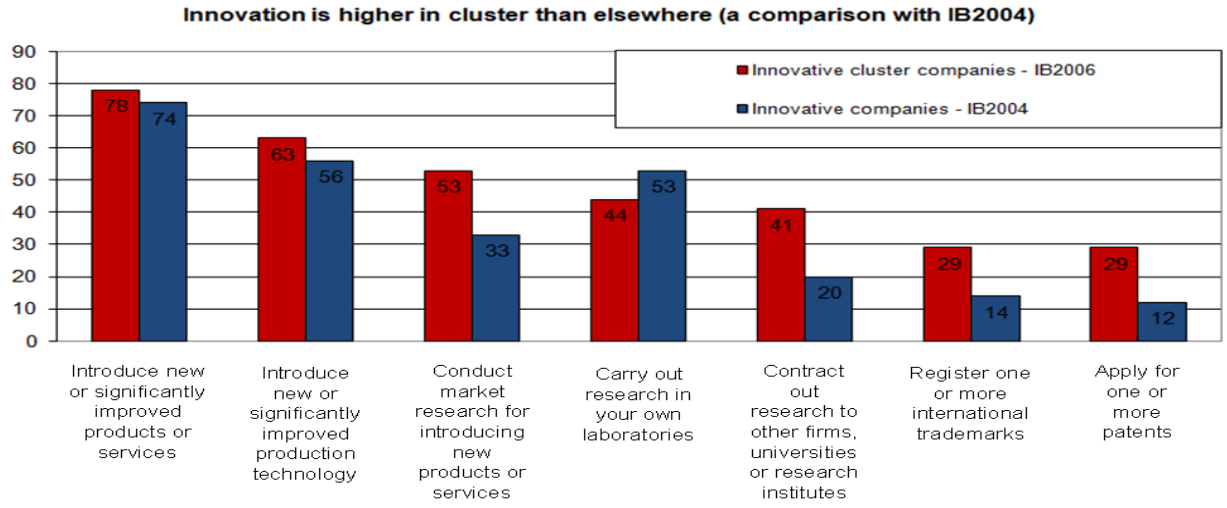
The approach of local systems to innovation has showed that it is an evolutionary activity, not linear, but interactive, and something that needs intensive communication and cooperative between firms and other organizations like universities, public research institutes, or centres of research[2].
Clusters are seen as important drivers of competitiveness and innovation, and the continuous success of a cluster depends on its capability to change and to adapt to the mutation of the economic environment. The most important "prerequisites" for the emergence of clusters are qualified labour and strong networks between actors.
Innovation in clusters is categorised as "open innovation". It is not generated by isolated organizations, but more in dynamic environments where competent organisations and a skilled labour force interact in a constructive and complementary way to assimilate existing knowledge and generate new ideas and products.

Furthermore, the concept of the "triple helix" is central in the cluster[3]. This model emphasises that innovation depends on the interaction between strong academic research (universities), dynamic entrepreneurship, and the availability of risk capital (private sector), as well as a supportive policy framework (public administrations).
As explained, the companies of a cluster benefit from particular advantages, and the geographic proximity of other drivers of innovation facilitates the flows of tacit knowledge and the presence of a skilled labour.

[2] Trippl, M. 2006. "Cross-Border Regional Innovation Systems, working paper, Department of City and Regional Development." Vienna University of Economics and Business Administration.

[3] Professor Henry Etzkowitz developed the Triple Helix Model in 2002, defining the capitalisation and transfer of knowledge as based on close relationships between three important factors for a cluster development.

Figure 2: Comparison innovative companies in cluster and not in clusters



Source: European Commission

As showed in Figure 4, the results of two surveys conducted by the European Commission, the Innobarometer 2004 survey which interviewed "innovative companies", and the Innobarometer 2006 survey which interviewed "innovative companies working in a cluster-like environment", point out a higher rate of innovation and more propensity to source out research to other firms, universities or public labs.

2.4 High-tech clusters

High-tech clusters (science based) are characterized for an innovation process that is based primarily on the use of analytical knowledge, and therefore the application of scientific principles and methods explained by academic publications.

Furthermore, each cluster is characterized for different sectoral specificity, and they could be distinguished for their use of different types of knowledge (Paolo Calvosa):

- "synthetic knowledge" tends to characterize, in terms of prevalence, the production sectors with low and medium rates of technology, where innovation is established mainly through the application of existing knowledge or processes of innovation recombination;
- "analytical knowledge" is typical of the high-tech areas (science based), where scientific knowledge is very important and dynamics of knowledge creation are based on rational or cognitive processes of formal models.

In these clusters, it is necessary to continuously upgrade technological knowledge at the base of the processes of innovation, and therefore is not possible to refer exclusively to those available in the local area. The renewal of the base knowledge owned and used by companies at local level is encouraged by the long-distance relationships that develop within large international companies located in the cluster. For this reason, a high-tech firm, in contrast with a traditional firm, needs a knowledge exchange at an international level to achieve a greater degree of socialization. The high-tech industry provides a positive influence on the growth of the other industries.

This report will now analyze the biomedical sector as one of the sectors with the highest growth rate followed by the analysis of the biomedical sector in two different areas, the Veneto region in Italy and South Australia, in order to define both common and different characteristics, and suggest various opportunities for cooperation in the future.

2.4.1 Basic characteristics of the biomedical sector

One of the first definitions about the Biomedical sector was proposed in 1978 by the Office of Technology Assessment of the United States' Congress: "the biomedical sector includes all companies that manufacture equipment, drugs and procedures used for the prevention, diagnosis and treatment of illness and rehabilitation".
In a second stage, the Kellogg School of Management in 2000 tried to define the industry in a more conscious way, attempting to truly represent what the Biomedical Industry consists of. It is further defined as "a particular industry that develops innovative products for the prevention, treatment, and cure of human diseases". According to the research, it is a widespread sector that consists of a variety of segments, and a particular distinction could be made between them. The Biomedical Industry may be differentiated through four key sections: pharmaceutical, biotech, medical device, and diagnostics. At first glance, each segment is separate and distinct from the next, but nevertheless, each segment is very convergent and increasingly interrelated with all the others.

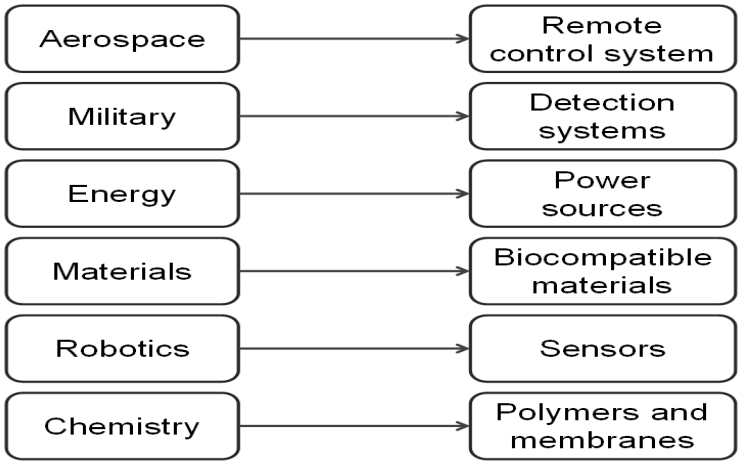
The four Biomedical Industry segments:

- Pharmaceutical is the mainstay segment, and is composed of large, fully integrated companies. The size of the companies is one of the most important aspects for maintaining productive competition on a global scale.

- Biotechnology is a segment that emerged in the later few years of the Industry's establishment, but it is increasing its force by bringing out innovation useful for the other segments and also for several other sectors.
- Medical device segment is older than the previous; it may be defined as a convergence between engineering knowledge and biomedical sciences.
- Diagnostics has developed alongside mainstream pharmaceuticals; it has also become more dynamic after the genomics revolution.

All of these segments have one common aspect that may be identified; science drives the profitability of these fields. The biomedical sector is characterized for different levels of specialization, but all of these are required to invest in specialized human capital, regulations, high sunk costs, and political issues. Each segment is extraordinarily inter-connected, and is useful for output in other sectors, i.e. aerospace, defence, and industrial automation's high-tech firms. Furthermore, the same sectors have technological spillovers on the biomedical sector. It may be possible to find out some contributions given to the sector analyzed.

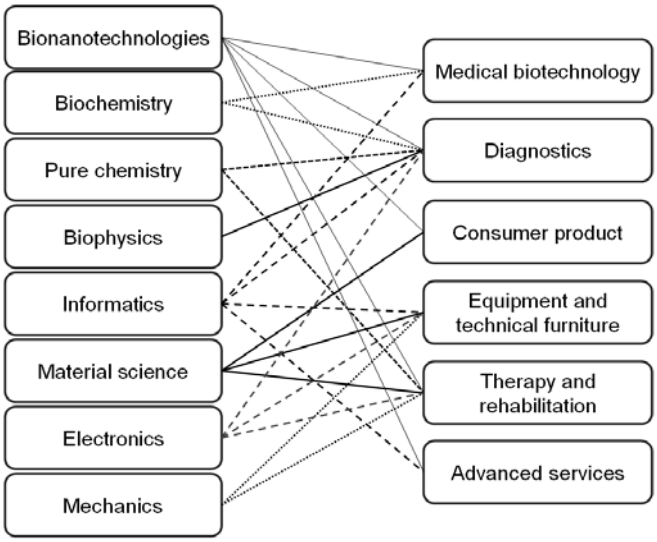
Figure 3: Examples of technological fallout in the biomedical sector



Source: The biomedical cluster in Veneto region

The biomedical sector is a knowledge-intensive sector that needs to benefit from networking and collaboration. Networks can guarantee increased access to information, knowledge, capital, and alliance opportunities for the firms involved.. The biomedical sector is required to be set in a supply chain composed by specialized players for its success. This industry is directly linked with the technological and scientists' progress.

Figure 4: Technological dependencies in the biomedical sector



Source: Biomedicale Veneto e competitivita' delle

In the biomedical sector, there is evidence that suggests the importance of innovation, both radical and incremental. The user training and technical support that the sector provides is often indispensable, as is feedback from doctors, nurses, and patients, which enables the sector to constantly develop its technology and various scientific focuses. Thus, the majority of new products typically bring added functions and clinical value to the sector, providing incremental improvements.

Innovation is the main force of the sector, so intellectual property rights play an essential role for the growth of the industrial segments. Innovation often results in new patents that ensure revenue for the participating companies.

2.4.2 Old paths and future trends of the biomedical sector

The biomedical sector started to acquire certain relevance in the early 1950's. Before this time, the sector was closely linked to the researchers in physical-mathematical and medical-biology fields. When the electronic technologies became useful for medical studies, a new industry was established. Since that time, several applications have been developed and the first promoters were the same medicinal scientists who themselves became the entrepreneurs.

Today, the sector is relatively fragmented, with different niches emerging, and the multinational companies are attempting to acquire these niches with varying results. Several companies with electronical- and mechanical backgrounds are trying to diversify their businesses, by applying their

engineering skills to a new field, such as the medical technology industry, in order to pursue possible advantages that have not yet been discovered. Every time the sector became more uniform and concentrated, new start-ups developed different technological pathways. An innovation in this sector, if applied to the right product, could represent a profitable opportunity for a firm, and could result in a change in market shares.

A new proactive approach has occurred in the industrial world; exploiting the biomedical companies system, an area with high technological specialization and strong impact on the quality of the economy and social welfare, to stimulate the development of new strategies integrated with the entire value chain in the area. The experts agree that the volume of business will continue to grow even in future years, both because the industry conveys technology and innovation in various fields of scientific research. It could be assumed that this is due to either the basin population affected by the growing number of biomedical products, not only for the increase in the average age of the population, but also for an increased sensitivity towards the improvement of the quality of life for people with disabilities, and the increasing capacity of diagnoses and treatment by physicians.
A particular aspect that might curb the development of the sector at a local level is the regulation that determines the launch of new products as a process of innovation. Not all the segments of this sector are satisfied by an equal regulation, and as a consequence, a product might comply with national standards, but simultaneously not comply with the necessary certifications for commercialization in the international market.

In the beginning of the year 2000, world-leading firms covered just 30-35% of the market share, and their turnover ranged from US$50million to US$500 million (The Biomedical Cluster in the Veneto region, 2003). This data confirms the high segmentation of the sector, and is welcoming for the small and medium firms who can compete through a niche strategy. In addition, the firms that produce biomedical machinery are, most of the time, very specialized, and this results in low production volumes. To compete in this sector, the size of the firm may not be the most important competitive advantage. In the production of some particular device, it could be better to maintain certain flexibility and a strong innovation approach.

3 Veneto region and biomedical cluster

3.1 Veneto Region, an entrepreneurial history

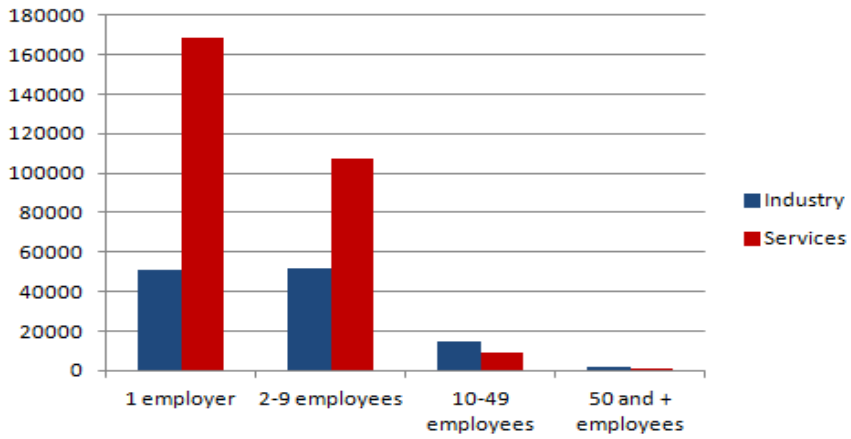
Veneto is one of the most committed economic regions in all of Italy. Situated in the North East of the country with its 4,937,854 inhabitants, Veneto is the fifth largest region in terms of population. A high number of firms and a wide territorial variety make Veneto one of the most industrialized, wealthiest, and most frequently visited regions in Italy. Veneto has a long history, with its capital Venice, and it has been very engaged in both the development of the Italian image and in the building of a business network, with its position also ensuring to itself an important role in international economic competition.

Investments and industrial policy have been pursued in the Veneto region since the early 1900's, and these developments have lead to sizable growth recognized by economists as the "Veneto Development Model" (The Model is characterised by a wide export-oriented entrepreneurship in traditional sectors and a strong social cohesion of the enterprises - which explains the relatively high level of employment and makes it the third richest region in terms of total GDP (€149.4 billion) after Lombardy and Lazio). (3.1.2 further explores the Model)

A large number of small medium-sized companies were developed after the Second World War. In 2007, Veneto counted 405,287 enterprises (Istat), second only to the close region of Lombardy. It can be estimated that one firm exists for approximately every 10 inhabitants.

The enterprises were divided as shown in the graph below.

Figure: Venetian firms in 2007 divided by industry and services



Source: www.istat.it

3.1.1 Industry

The enterprises in Veneto are more specialized in the traditional sector, and sometimes the industry's definition could switch into a sort of handicraft, for the high level of handwork requested. Linked to this aspect, the number of firms in Veneto that have an in-house laboratory of R&D is small. In 2007, just 7,135 employees were occupied in R&D inside the firms, and this is highlighted from the higher rate of SMEs than in large companies (Istat).
The deep specialization of the firms in the traditional sectors in the last few years has contributed to the bankruptcy of some SMEs who didn't react to the screening made by the markets. In order to remedy this situation throughout the region, Veneto is implementing a widespread policy: aim to help the entrepreneurs and promote innovation, while supporting the original industries and focus more on innovative and high-tech development fields.

In Italy, the high taxes implemented by the government to manage the financial situation and restore public spending have actually stopped local demand, and in dramatic contrast, the exports remain at the pre-crisis level. The exports of the region in 2010 had a positive trend, recording a +16.2%[4] increment in 2010 and a +10.2% increment in 2011. In addition, Veneto, with Lombardy, preserves the image of the best export-oriented regions in Italy. The balance between imports and exports is relatively positive; exports represent 34.4% of the region's GDP that stands at € 146,166 million. The Euro zone and the emerging countries (BRIC) represent the most important markets for exports, they widely contributed to the positive growth in Veneto. .

The most exported products in Veneto in 2011 were:

- Machinery (20.22%)
- Metallurgy (6.42%)
- Steelwork (5.69%)
- Other electrical equipment (5.55%)
- Clothing (5.24%)
- Eyeglasses (4.92%)
- Tanning and leather processing (4.36%)
- Footwear (4.36%)

[4] The economy in Veneto in 2011 and 2012 forecasts. Unioncamere Veneto (Center of economic and social studies). March 2012 (why is this in Italian"??? because the name of the work where I based part of my report is italian and so I wrote the original name of this work. The same is for other titles)

- Furniture (4.32%)
- Food (4.29%)
- Chemicals, pharmaceuticals and synthetic fibres (4.05%)

Although Veneto is characterized by small and medium sized enterprises, it is not so difficult to find some companies that are recognized as some of the most important actors within their relative sector. There are some companies that benefit from their public image and corporate identity; these include: Luxottica, Benetton Group, Diesel, and Geox, to name a few. Other foreign companies have instead recognized Veneto as a place where they could possibly move part/or all of their business. The reasons for this is because it is an area full of interesting opportunities and with services for the firms, companies want to enjoy the benefits of the local network.
The productive structure of the firms who operate within the region, besides the high taxation and bureaucracy, is very efficient and strongly focussed on the final consumer.

3.1.2 Veneto Development Model

In the 1950's, the industry sectors in Veneto were located in only two hubs: one in the area close to Venice, which specialized in Chemistry, and another in Vicenza, which specialized in Textiles. From that period, Veneto enacted a radical transformation of its productive system, in order to adopt the model that, after a few decades, would come to characterize it.
Dismissing part of the work-force in the primary sector, the regional government started to invest in new businesses and different industries. Before long, Veneto equaled the other regions of Italy in terms of productivity value. The trend of the investment was so positive, that key Venetian industries grew at a 10% rate

Then in the 1970's, a period of instability forced changes to the competitive dynamics, and a difficult economic and social context shaped the evolution of the new companies established after the Second World War. A wide number of small and medium-sized enterprises were established; these were more flexible than the large companies and more traditional, where human capital was required. Sometimes, the management of the large companies suggested to the more efficient employers to start their own business and become suppliers of the same products. There's no doubt that the most important companies, now still working, were established in a family-centered environment. As a consequence, a lot of family run firms, located close to each other, established an

important cohesion and a sense of belonging. The success shared and the growth of these firms were fostered through a vision that distinguished them, commonly referred to as *learning by doing*.

The 'Veneto Development Model' is well-characterized by the presence of a large number of firms interconnected to each other through network systems and clusters. The most important aspects of the model that shaped the Venetian economic structure are the dense relations that tie the firms, the institutions, the universities and the organizations together with the purpose to push the development of incumbent firms and promote the start-up.

Veneto is a perfect example of a representation of the districts' theory. This sense of being embedded within a sector takes the place of the individual firms, and the vertical integration does not exist, and with horizontal integration acquiring importance. The firms work as a set of actors, and the exchange of knowledge that occurs between them subsequently increases the value of each firm.

The competitors, by adopting economies of this scale, have been more able to put into effect price battles. For a long time, the specialization of the enterprises helped them to hold off the larger foreign companies. The new purpose of the Venetian SMEs will be a more intensive focus in lowering cost and a focus on the importance that the brand could represent. Then this focus will move from a small size in terms of employers to a small size characterized by a fleet strategy, automated production processes, and high innovation rates.

3.1.3 Veneto Industrial Districts

Several industrial districts have been recognized in Veneto , these are described below and divided by province.

<u>Belluno</u>

- Eyeglasses
- Tourism (Dolomites and Venetian mountains)
- Renewable energy

<u>Padua</u>

- Biomedical
- Conditioning and Industrial Refrigeration

<u>Rovigo</u>

- Fish
- Tourism (Polesine and Delta Park)
- Carousel

Treviso

- Wine
- Sport equipment and clothes
- Horticultural
- Rubber and Plastics
- Bicycle
- Hotel Equipment
- Dairy
- Fashion
- Digital and Media
- Wood Furniture
- Green Building

Venice

- Tourism
- Footwear

Vicenza

- Packaging
- Gold and Silver
- Mechatronics and Innovative Mechanical Technologies

Verona

- Food
- Footwear
- Marble
- Wine
- Computer and Advanced Technologies
- Logistics
- Thermomechanical
- Clothing

As explained, the cooperation and coordination between firms in Veneto holds strategic relevance, and is confirmed by the wide number of clusters and industrial districts that were established throughout the last few decades. After the approval of the *Regional Law (4 April 2003 – BUR n. 36/2003)*, the Regional Government now supports the development of the regional productive system. The regulation defines the criteria to identify and the procedures to acknowledge the industrial districts and other forms of productive aggregation. This law replaced the previous regulation issued in 1991, which stated that "Actions for innovation and development of small firms", and in 1999, "Specification of the industrial districts in Veneto".

A local productive system to be recognized as district has to respect the following criteria:

- Include a number of local productive firms not lower than 100 units, with at least 1,000 employees.
- Have at one's disposal a high rate of productive service integration.
- Be able to express innovative skills through original products and processes, leader firms in each sector, a meaningful number of patents registered and specific training institutions.
- Have a set of institutional players who support the local economy.

So the aim of this regulation allows functional infrastructures to be carried out, promoting industrial research activity and technological transfer. Other important factors include the planning of firm facilities, like observatories for data recording and exhibitions to increase the commercial appeal of the products developed.

3.2 Biomedical cluster in Veneto

In the last few years, a biomedical cluster has emerged in Veneto and, according to the forecasts, it is a system that produces significant relevance for the regional economy.

A study led by a professional team of researchers found that the biomedical sector has acquired a shape closer to a cluster than to an industrial district. The reason behind this definition is that in contrast with the industrial district, a cluster could not be characterized for a specific and limited localization. The biomedical sector in Veneto is rather a specialized firm cluster, and there are a lot of firms specialized in several niches.

To explain the dynamics of the sector, it is necessary to provide a detailed definition of what biomedicine is in Veneto.

According to the National Research Council (CNR) (1987), the biomedical sector was described as the industrial area that includes all technologies and products that pertain to health with the exception of drugs. After this clarification, the firms related to the biomedical cluster in Veneto

were involved in production and distribution of medical equipment, diagnostics, rehabilitation, therapy and consumable needed for treatment services.

It is necessary to distinguish the medical devices in two families:

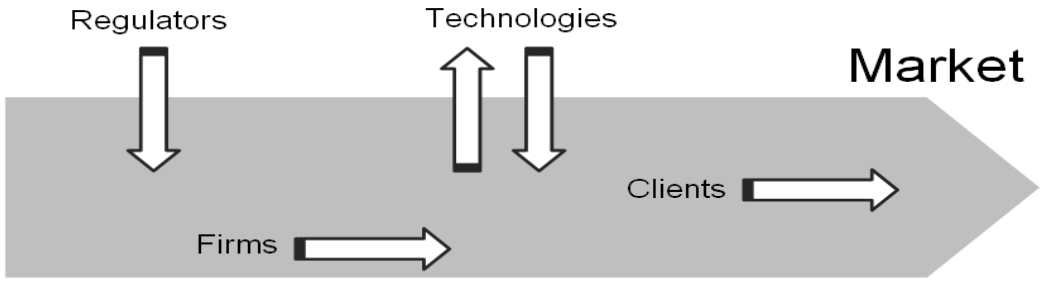
- In the first there are devices with modest complexity, all the products in this group have in common the use of common technology, easy to use, economies of scale, increased stability of the product over time, low margin and high volume.
- In the second, there are high R&D costs, critical in respect of regulatory requirements and compliance, high risk of obsolescence, high margins and low volumes.

Despite this division in two families, a wider number of products that differ to each other for many features may be recognized.

3.2.1 The actors

From this point of the study the biomedical sector will be defined as the medical device market, where clients and firms are tightly connected and regulators and technologies define the economic scenario. Particularly important is the relationship between clients and firms, where they both benefit from a continuous exchange of information The information flows between these two actors can result with new profitable market opportunities. The regulators, who are public-oriented, fix the requirements and the background documentation that firms must comply with. The actors of this market could be recognized as follows.

Figure 6: Actors of the biomedical sector



Source: Verso un profilo tecnologico nel medicale, trend del comparto e filiere

Clients:

- Private entities that purchase the products or services in analysis laboratories, pharmacies, and private and public clinical.
- Private businesses
- Health professionals and hospitals
- Analysis and diagnostic laboratories
- Foreign distributors

Firms:

- Product developers
- Service suppliers

Technologies:

- Firms, able to pursue innovation or improvement of either product and processes defining new standards
- Private research laboratories
- Public research institutions

Regulators:

- Regional administration institutions
- National and international organizations

3.2.2 The size of the cluster

The biomedical cluster is a network of firms that are situated in the whole region, but with key locations in the districts of Padua, Verona, Treviso and Vicenza. Amongst these districts Padua is certainly the hub of the region. These cities are important for the medical device industry because they represent higher opportunities, and there are very important university research activities and main hospitals.

Recent data suggests that in Veneto there are 933 firms[5] specializing in different biomedical fields. About 522 firms of this total are distribution firms, and with 7,400 employees. The total turnover generated is almost €,1,700 million and more than half of this total is a result from the production firms.

Table 1: Biomedical firms in Veneto

District	Firms	% Firms	Employers	% Employers	Turnover ('000 €)	% Turnover
Padua	299	32%	2,458	33%	545,915	32%
Verona	180	19%	1,327	18%	365,615	22%
Vicenza	147	16%	1,331	18%	299,385	18%
Treviso	153	16%	1,050	14%	208,695	12%
Venice	99	11%	621	8%	146,480	9%
Rovigo	37	4%	519	7%	107,635	6%
Belluno	18	2%	71	1%	10,015	1%
Total	933	100%	7377	100%	1,683,740	100.00%

Source: Biomedicale Veneto e competitività delle imprese

As explained in the second chapter, Veneto bases its economy in the presence of SMEs. In the table below there is a proof of Veneto Development Model, a small number of large and a dominant number of small firms.

[5]Osservatorio Biomedicale Veneto. 2008. "Biomedicale veneto e competitivita' delle imprese"

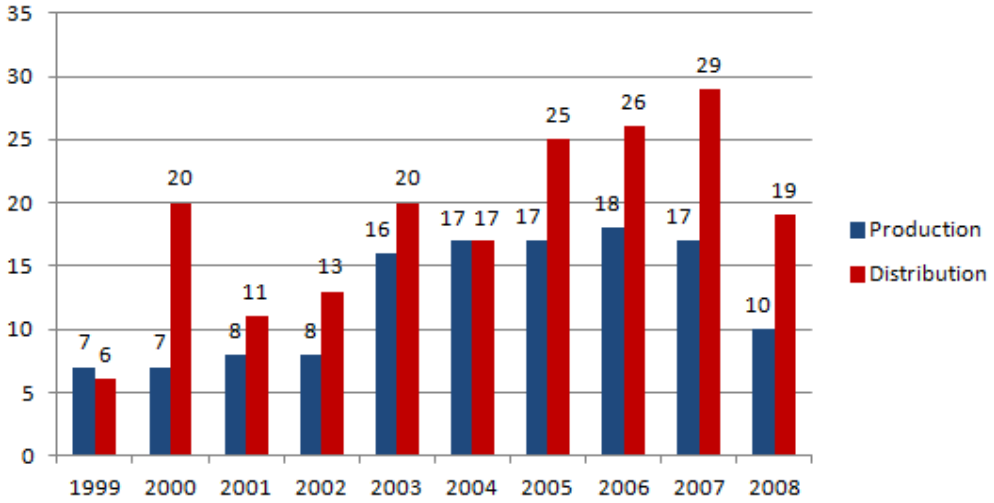
Table 2: Size of the biomedical firms in Veneto

Size Firms	Firms	% Firms	% Employers	% Turnover
Large	2	0.2%	4%	6%
Medium	40	4%	39%	42%
Small	168	18%	40%	37%
Micro	524	56%	18%	15%
Not classified	199	21%	n.a.	n.a.
Total	933	100%	100%	100%

Source: Biomedicale Veneto e competitività delle imprese

During the decade between 1999 to 2008, the trend of new start-ups in the biomedical sector was quite positive. But if we look closely at the segments where the start-ups emerged, you will notice that there is still broad specialization in the more traditional areas of the industry, there is particularly a higher rate of therapy and rehabilitation equipment and technical furniture[6].

Figure 7: Trend of new biomedical firms, 1999-2008



Source: Biomedicale Veneto e competitività delle imprese

[6] For a more detailed analyses of the biomedical companies in Veneto see the Annex.

3.2.3 Specialization and performance of the firms

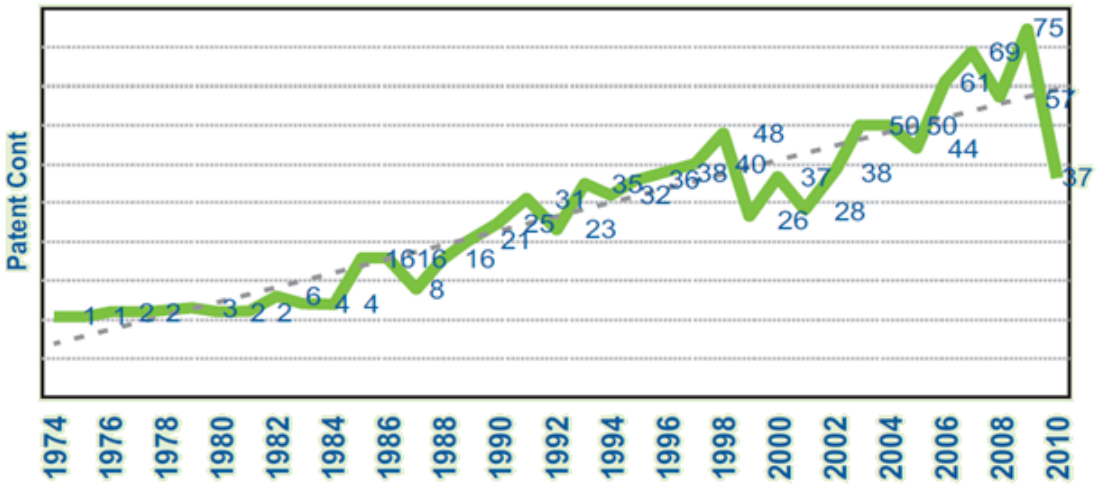
The specialisation of firms settled in Veneto region is quite diverse, it is similar to a mosaic of production niches, at the same time the biomedical sector respects the territorial vocation with a higher percentage of enterprises that manufacture modest and complex devices.
The areas where production firms are specialized include: equipment and technical furniture, medical biotechnology, diagnostics, consumables, services, rehabilitation and therapy. Among these areas the more concentrated area is rehabilitation and therapy, nonetheless it is the area with a smaller firm size. An interesting area is diagnostics that represents a strategic area because of the high technological sophistication required. The medical biotechnology area, with an increasing global growth rate, still has difficulties in acquiring importance in Veneto.
As explained earlier the dependencies of the sector with other technologies – mechanics, electronics, chemistry, informatics – are huge, in this particular case Veneto is rich of knowledge and a specific consistency in those sectors, i.e. the production of the mechanics industry in Italy is represented in the district of Vicenza for 20%. Linked to the high rate of the economy's diversification, the biomedical firms in Veneto tend to maintain a local supply chain. The linkages between these sub-sectors and their input suppliers, service providers, and distributors help to enhance the stability of the region's cluster. Proximity to the above actors decreases transportation costs and delivery times and increases the exchange of ideas and information.

The capacity of a firm or a productive system to compete in the international markets may be measured through Foreign Direct Investment (FDI). Unfortunately the data available doesn't highlight a strong presence in the international scenario of the biomedical firms situated in Veneto, only 12 companies of the total had established branches abroad. This is a weakness because this type of market prefers the FDI in the country than the classic solution of the importer/deliverer. It may be more useful to analyze the international presence of the companies in terms of imports-exports.
During 2003-2007 Venetian firms recorded a 40% increasing in their trade balance performance. The import share still remains higher than the export share, but they are close to the breakeven point. Europe continues to be the main market, 2/3 of the outputs produced have been commercialized in the European area, the country with the highest output market in Europe is Germany.
The USA, the first market for manufacturing and internal demand of biomedical products, doesn't represent a particularly high market for the Venetian enterprises; this is due to the difficulties that

concern the aggressive competition in the USA. Furthermore the currency has suffered an unpredicted over evaluation that shifted the exchange of the euro-dollar from 0.92 from the year 2000 to 1.53 in 2008. So production in Italy has generally been penalized for its strong currency in the exportation during those years.

Another indicator for analyzing the performance of the Venetian firms is of course the number of patents that firms have published. The patents may be recognized as an attempt to innovate and invest in R&D. The table below represents the trend of new patents between 1975 and 2010, the patents detected refer to the firms surveyed by the Biomedical Observatory in Veneto.

Figure 8: Trend of patents per year detected by the Venetian Biomedical Observatory



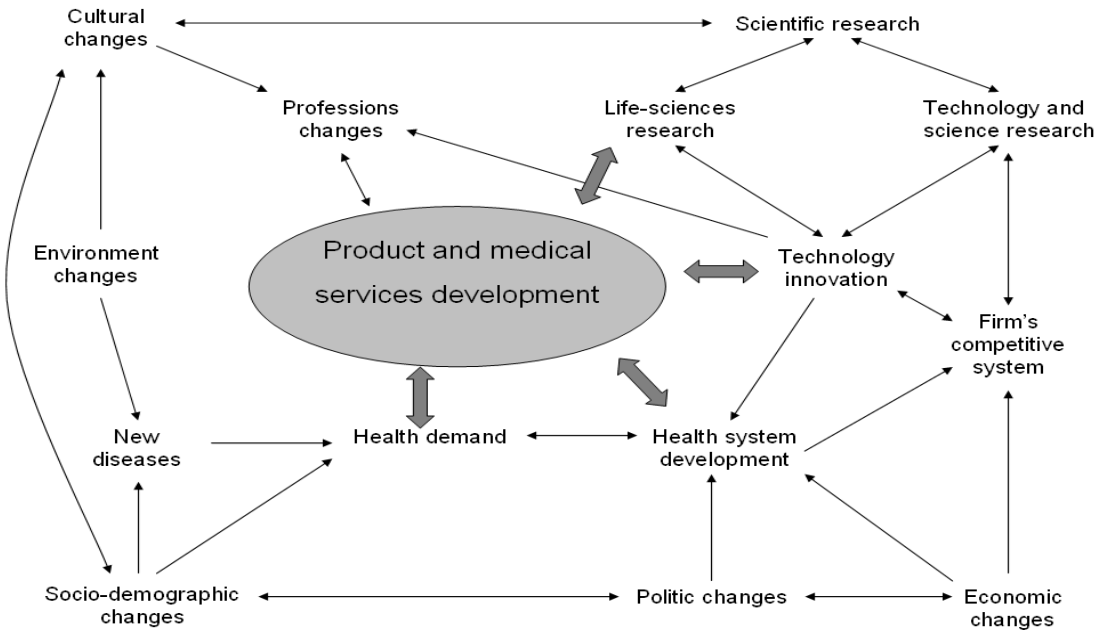
Source: Biomedicale Veneto e brevetti

3.2.4 The importance of R&D for clusters

As already reported, the biomedical sector benefits directly from the rate of funds invested in R&D. The size of the firms suggests that not all the companies might support high expenditure in R&D. More precisely some companies could not be advantaged from an in-house laboratory.

R&D in the biomedical sector is a critical factor for success and it is linked with the influence between technology and medical science. The institutions engaged in this activity rely on a complex network as shown in the figure below.

Figure 9: Dynamics and relations in developing product and medical services



Source: Trend tecnologico e innovazione nel medicale

Research can be distinguished as basic research and applied research. Basic research is addressed as an extension of current scientific knowledge and it hasn't the specific aim of supporting the development of new products and processes. Applied research instead uses the scientific knowledge or generates new technology knowledge with the purpose of developing innovative products and processes.

Through their research activity, key actors can promote innovation in the biomedical cluster in Veneto which may be classified in universities, main hospitals, scientific and technological parks and other research institutions.

Universities

Among the four universities in Veneto there are two that contribute their activity in basic research to the spread of knowledge spillovers. The two universities are:

- **University of Padua,** has almost 70,000 students and 178 active courses (both bachelors and masters) in 2010 invested €21 million for research activity and scientific equipment. In 2009 the amount invested was over €35 million. According to Ricerca Italiana (an Italian on-line research portal - www.ricercaitaliana.it/), until 2000 Padua was established as a university centre of excellence, an initiative that received an important international recognition from the Harvard Medical School. The same scientists then started another initiative, the Foundation for Advanced Biomedical Research (a private consortium) that later established the Venetian Institute of Molecular Medicine (VIMM).

- University of Verona, has more than 20,000 students and 15 departments engaged in research projects. Each department includes an average of 35 active research projects and half of these projects relate to medicine, biotechnology, diagnostics and life science fields. The projects are either self-funded or funded by firms, associations, regions or state ministries.

These universities maintain strong relations with the territory and they create networks between firms and institutions powered by the continuous exchange of knowledge and the flow of well-equipped students.

The biomedical sector network is shaped around the two main hospitals in Veneto, the Padua and Verona hospital. These structures are engaged in providing an application of the studies in medicine and biomedical fields promoted by the universities.

Scientific Parks

According to the CNR (National Research Council in Italy), three organisations in Veneto relate to Scientific Parks:

- Galileo Science and Technology Park, situated in Padua is engaged in activities such as innovation spreading, design and innovative materials, product quality and certification, new enterprises.
- Vega Science and Technological Park, established in Venice is a network of universities, research centres and manufacturing businesses who aim to promote and develop scientific research initiatives and help the knowledge transfer.
- Veneto Innovazione, an in-house agency of the Veneto Region was established by the Regional Law n. 45 in September, 6th 1988. Veneto Innovazione gives support to applied research, acting as an intermediary, creating consortia between universities and business. It supports innovation, offering a wide range of activities and services and consequently improving the start-up and development of innovative companies and supporting technology transfer, making company products more competitive. The transfer acquires importance when a company or a research centre transmits a new finding to another company that works either in the same or in another market sector. The organization is currently coordinating 11 projects with partners from both Italy and Europe. The projects relate to cluster management activities, how to make more and smarter funding available, how to develop multidisciplinary competencies and skilled Human Resources, how to facilitate contacts between SMEs and knowledge institutions in Italy and Europe.

Institutions and associations

Several other organizations are involved directly and indirectly in the biomedical cluster in Veneto. The major organizations in terms of influence and potential incentives are:

- **Venetian Biomedical Observatory,** an institute established in 2006 with actions planned on the biomedical cluster in Veneto. The purpose of the Observatory is to study the dynamic of the market and the district, act as a reference for the biomedical companies and analyze the possible scenarios of the sector. The number of associated members is quite representative of the sector, there are 151 firms that produce different products, from the diagnostics to the technical furniture, 15 associations and 22 services bodies.
- **Assobiomedica,** an Italian National Federation controlled by Confindustria Industrial Association, was established in 1986and represents companies operating in the field of biomedical technology, diagnostics, medical devices, and telemedicine.

- The purposes of Assobiomedica are to:
    - promote knowledge of the sectors products
    - affirm and develop the image of the associated companies
    - represent the reality of the business sector to the Authority Health and Public Administration
    - assist competitive public, national and international organizations to define regulatory issues affecting the industry
    - propose solutions to the problems that characterize the present and the future of the industry
    - promote the advancement of technology in the field
    - organize research and studies, debates and conferences on the economic, regulatory, technical and social interest for the sector
    - analyze the general economic climate with particular attention to all aspects of the organization, delivery and quality of health services.
- There are 249 firms associated with Assobiomedica from Italy. The idea behind the organization is to provide assistance to the daily issues that affect a firm and constitute a common database of benchmarks.

3.2.5 Regional policies

Several policies and covenants have been developed in Veneto to foster the biomedical sector. Among these agreements two have acquired more importance:

- *Agreement for the biomedical district development, triennium 2005-2007*
- *Agreement for the biomedical district development, triennium 2009-2012.*

The first agreement was sort after an analysis addressed the need to determine the strengths and weakness of the cluster. The promoters of the project were entities and institutions mostly settled in the Padua district.

The strengths of the cluster depend on the niche specialization of the firms and ability to develop new products jointly to the clients, hospitals. Through this relationship, the final product is innovative and high quality. In spite of this the size of the firms has resulted as a weakness in terms of the capacity to invest in R&D. The central location of Veneto between the North-Europe and the East-Europe needed to assist and improving competitiveness.

The firms were warned to accelerate the time to market, find out highly specialized competencies, and improve the presence in the international market. The actions carried out are as follows:

- Establish a Study Centre for technical assistance, procedures for product certifications, make product tests at a lower cost.
- Boost R&D through the aggregation of firms, community programs, incentives to develop thesis and support scholarships.
- Develop an observatory in the district and pick up data systematically to better understand the actors of the cluster and competitors.
- Establish a web site as an important landmark for both the firms and operators of Public Health in order to reduce transaction costs.
- Develop international marketing projects, in addition to the participation at international exhibitions; promoting the advisory and assistance in regulatory field.

The second agreement, *Agreement for the biomedical district development, triennium 2009-2012,* has the purpose of increasing the level of competitiveness of clusters to a higher level. After a more conscious understanding of the importance of the biomedical cluster, this agreement continues the actions established by the first agreement.

The new policy was developed in a fragmented sector, characterized by a fast life cycle of the products; about 70% of the products on commerce were introduced in the last two years. The sales curve is more compressed and the free cash flow curve is flatter and more dilated, a problem

connected mostly with the delayed payments from Public Health, one of the most important sales channels. This delay appears negatively to the investment and innovation capacity.
Moreover the health expenditure has been steadily increasing in all the developed countries. According to *OECD Health Data 2012*, total health spending accounted for 9.3% of GDP in Italy in 2010, slightly below the OECD average (9.5%). From 2000 to 2009 the health spending in Italy grew by an average of 1.9% per year, and by 1.5% in 2010. The health chain in general rose its importance, both in terms of employment, number of local units that shaped the sector and percentage of incidence on the GDP. This data is useful to attest the role that may represent the biomedical cluster that is very close to the health sector as a major output channel.

The actions promoted in the first agreement were reached. An observatory-study centre was established, new R&D projects were carried out, the attendance at exhibitions increased, a district brand was created.
These lasts results were the starting point for the implementation of new action. The table below displays the financial budget approved.

Table 3: Financial budget for the development of the biomedical sector in Veneto

Action	**Planned budget (€)**	**Implementation period**
Industrial research and competitive development	2,000,000	2009-2012
Strengthening of the Biomedical Observatory	210,000	2009-2012
Implementation of IT and Telecommunications services	130,000	2009-2011
Commercial promotion of innovative products	1,420,000	2009-2012
Total	3,760,000	

Source: *Agreement for the biomedical district development, triennium 2009-2012*

4 ANALYSIS OF THE OPPORTUNITIES IN THE BIOMEDICAL SECTOR IN AUSTRALIA

4.1 Introduction

As explained in the previous chapter, the biomedical sector does not have one definition, it is a wide sector that embraces several segments that are distinct and at the same time interconnected. To explain the biomedical cluster in Veneto this report has not considered the pharmaceutical industry because the dynamics that regulate that industry are very different and also the companies are not comparable to this case of study.
Moreover the definition of biomedical sector used to analyze the cluster in Veneto is not directly comparable with the performance of the companies in Australia. The Venetian cluster is a typesetting of actors that shape the network; the firms included in the cluster are engaged in the production of several goods and services, and distribution as well. This is a characteristic of Italian entrepreneurship, a territory rich of firms that work through strong cooperation and coordination of actors.

In the following chapter the medical technology industry in Australia is analyzed as one of the most attractive industries where attention is focussed. The purpose of this analysis is to understand the opportunities that the country might pursue and the level of growth that can be reached. The report highlights how South Australia supports the development of entrepreneurship in this affordable field.
As a result the next chapter discusses the different approach of the two regions: Veneto that is characterized by a cluster that has emerged in the last decade, and South Australia, a region that is investing a large amount of resources to lay the foundations for a cluster.

According to the Australian Government, the medical technology industry plays a very important role in the innovation system; it affects production segments intensive research, because it endorses and encourages the scientific and technological advances made in various disciplines and in a variety of industries involved with high technology.

The output of this industry is the medical device or technology, any article, including software, intended to be used by humans for the diagnosis, prevention, monitoring or treatment of a disease, injury or physiological process. This includes products such as complex capital equipment (including operating theatre equipment and diagnostic imaging equipment such as x-ray machines and magnetic resonance imaging (MRI) scanners), high-tech advanced devices (such as Cochlear ear implants, artificial hearts and other implantable devices), simple, low-risk devices (such as bandages and walking sticks), pathology tests and diagnostic devices such as in vitro diagnostic test kits (www.).

4.2 Medical Technology Industry in Australia

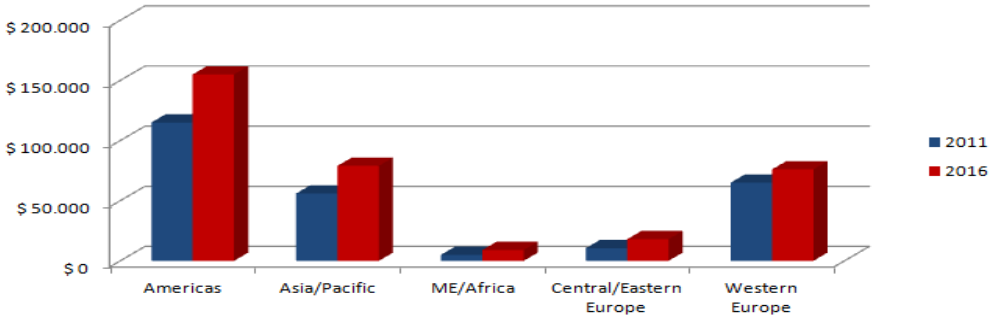
The Australian manufacturing industry in 2011 accounted 8.7 per cent of GDP, or $111 billion, in December 2010. Since 2000 the manufacturing industry has been growing at an average rate of 0.8%. The industry employs almost 1 million people or 8.5 per cent of the nation's workforce[7]. Within Australia's manufacturing sector, there is an interesting industry that over the past decade has grown dramatically in size and reputation, this is the health and medical industry.

According to the analysis carried out by the Medical Technology Association of Australia (MTAA)[8], the global medical technology market is valued at over US$ 300 billion per annum and it is increasing with an annual growth rate of around 10% (Griffith Hack). Despite the fact that global medical technology is around half the size of its neighbor, the global pharmaceutical market, the first is growing faster and mostly benefits from a shorter time to market compared to the drug discovery. This growth is driven by the ageing of the world's population and the per capita income increases in healthcare expenditure across developed countries.

[7] Department for Manufacturing, Innovation, Trade, Resources and Energy , High-Value Manufacturing, Industry consultation paper 2011, Government of South Australia.

[8] Medical Technology Association of Australia (MTAA), Key facts and figures 2011.

Figure 10: Worldwide medical markets forecasts to 2016



Source: Espicom

The United States is the largest market and has a strong supply chain with the majority of the world's largest medical technology companies originating in the country. The United States employs 422,000 people and is home to 32 of the 46 medical technology companies that have an annual turnover greater than US$ 1 billion. It is followed by Europe that is the second largest market and an even more competitive market such as the Asia Pacific.

In the Asia Pacific, Australia is the 4th largest market by revenue for medical devices and the third largest for diagnostics, where the top five positions are held by Japan, China, South Korea and India (AusBiotech).

In this scenario Australia is still a small market, with a share of the international market estimated at 2.61%. The total revenue for the Australian medical technology industry in 2010-2011 was AU$ 8.02 billion[9]. The Australian medical technology industry is expected to grow at a Compound Annual Grow Rate (CAGR) of 9% per annum over the next five years[10].

4.2.1 Companies in Australia

In Australia, medical devices are included in the therapeutic products list; these products are regulated by the Therapeutic Goods Administration (TGA), through the *Therapeutic Goods Act 1989*. This Act provides a "legislative basis for national controls over goods used in the prevention, diagnosis, curing, or alleviation of a disease, ailment, defect or injury. Medical devices are regulated according to risk classification, a system that has been endorsed by the Global Harmonisation Taskforce for medical devices, and is similar to that used in Europe. This system

[9] If sales of in vitro diagnostics (IVDs) and dental products are included the revenue is AU$ 9.7 billion. Source:MTAA.

[10] Department of Innovation, Industry, Science and Research (2008). Skills Audit of the Medical Devices Industry. Summary Report. May 2008. Deloitte. Insight Economics.

incorporates a set of essential principles for the quality, safety and performance of the medical device that must be complied with before the product can be supplied, the use of recognised standards to satisfy the requirements of the essential principles, regulatory controls over the manufacture of medical devices and a comprehensive post market surveillance and adverse incident reporting program[11]".

So the organization (sponsor) that wish to import or supply medical devices in Australia, or export medical devices from Australia, must be registered with the Australian Register of Therapeutic Goods (ARTG). The sponsor can be the manufacturer, a health professional, or someone else.

To be more precise, if a manufacturer in Australia also supplies their custom made devices directly to the market rather than through a third party, they will also be a sponsor under the Regulations. Or in another case, if a health professional obtains custom made devices directly from the manufacturer for supply to his or her patients, then they will be a sponsor under the Regulations.

Different regulatory requirements and processes are expected to be applied to medical device manufacturing; therefore the Australian regulation is specific to:

- manufacturing medical devices in Australia for the Australian market;
- manufacturing medical devices in Australia for export to overseas markets;
- manufacturing medical devices overseas for import into the Australian market.

In early 2011, the Office of Devices Authorisation (ODA) – Therapeautic Goods Association (TGA) started issuing new electronic Conformity Assessment Certificates to medical device manufacturers. The certificates are based on an assessment of the Full Quality Management System, applied to each stage of medical device manufacture, from the design of a device until its final inspection before being supplied.

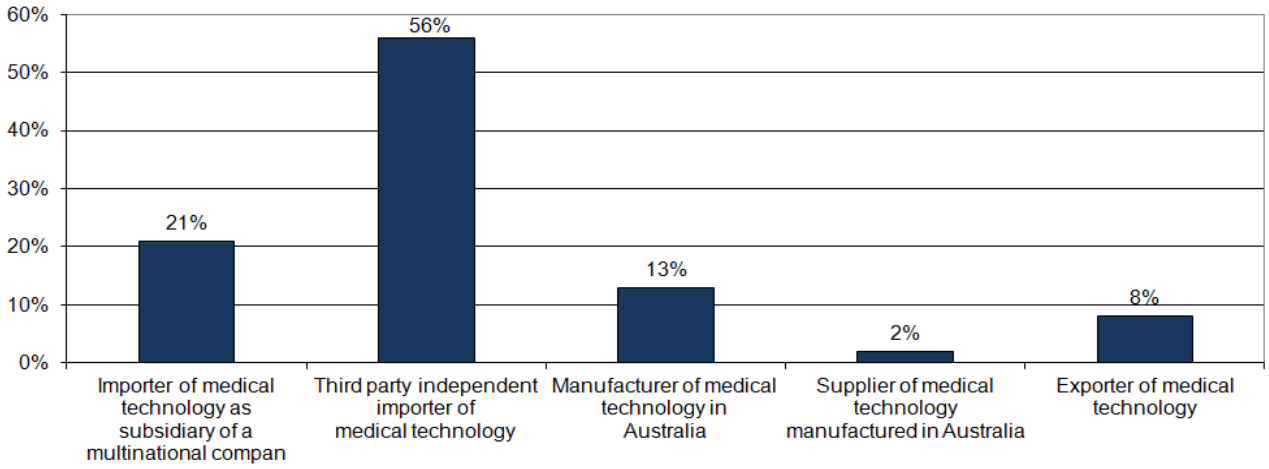
In the end of 2010 the ARTG accounted with over 500 medical technology companies in Australia[12]. About 53 medical technology companies of the total are listed on the Australian Securities Exchange (ASX) with a combined market capitalisation of $ 2.4 billion. Not all the companies are Australian manufacturers; 75% of the companies established in Australia are independent distributors or Australian affiliates of international companies.

---

[11] (www.tga.gov.au)

[12] The number of companies arrives approximately to 600 including IVD companies and dental. According a research leaded by IBIS World in 2009 (Medical and Surgical Equipment Manufacturing in Australia), the Australian Medical and Surgical Equipment Manufacturing industry comprises of approximately 2,900 establishments.

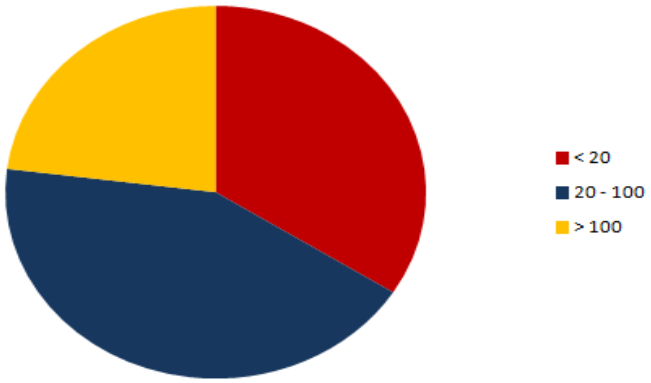
Figure 11: Classification of medical technology companies in Australia (%)



Source: Medical technology industry in Australia – Key facts and figures 2011- MTAA

The medical technology industry in Australia employs about 17,500 people. The majority of the companies are small; the companies that employ between 20-100 staff amount to two thirds of the total.

Figure 12: Number of staff in companies (%)[13]



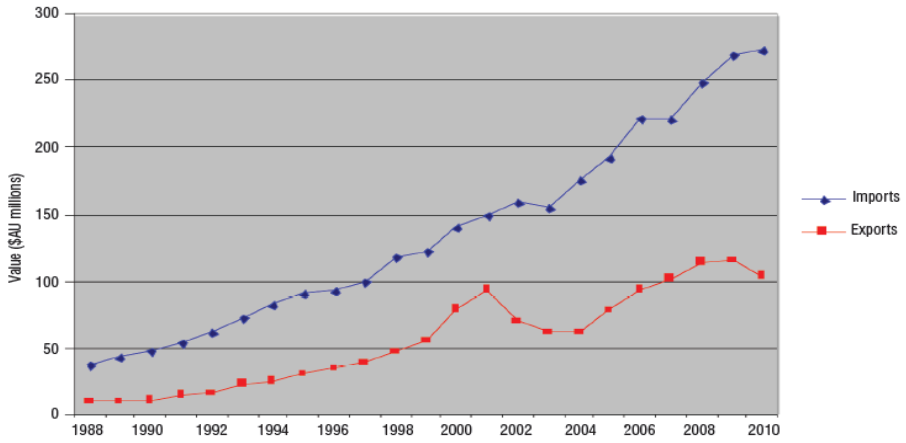
Source: Medical technology industry in Australia – Key facts and figures 2011- MTAA

[13] Data collect from the member companies of the Medical Technology Association of Australia (MTAA).

4.2.2 Performance and trade

In Australia, imports still overpower exports. In 2010-2011, the value of medical technology imports was AU$ 3.3 billion and the value of medical technology exports was AU$ 1.2 billion. The same relation occurs for the medicinal and pharmaceutical industry.

Figure 13: Imports and exports of medical technology in Australia (1998-2010)



Source: Medical technology industry in Australia – Key facts and figures 2011- MTAA

Although the performance of the companies in Australia is increasing, the country is still affected by a gap in terms of internal production and consumption efficiency. Nearly all medical technology products manufactured in Australia are exported, while the majority of medical technology products used in Australia imported – Australia imports more than it exports. Trade is mainly within the United States, European Union, Japan and China. This phenomenon may be linked with the weak trade between manufacturers and the public health sector; the public hospitals are widely supplied by foreign companies, mostly from the United States.

The imbalance in trade in medical technology could be addressed through the implementation of specific policies addressed to benefit the companies that sometimes may be affected by stagnation in sales; developing a strong domestic industry is the aim of the government.

The country focuses the growth of the industry around five attributes:

- significant health and medical research capability;
- quality health systems;
- highly skilled manufacturing workforce;
- stable financial system;
- proximity to the growing middle-class markets of Asia.

Keeping the above attributes as a basis to develop a sustainable medical technology industry in Australia, the policies that might be implemented include:

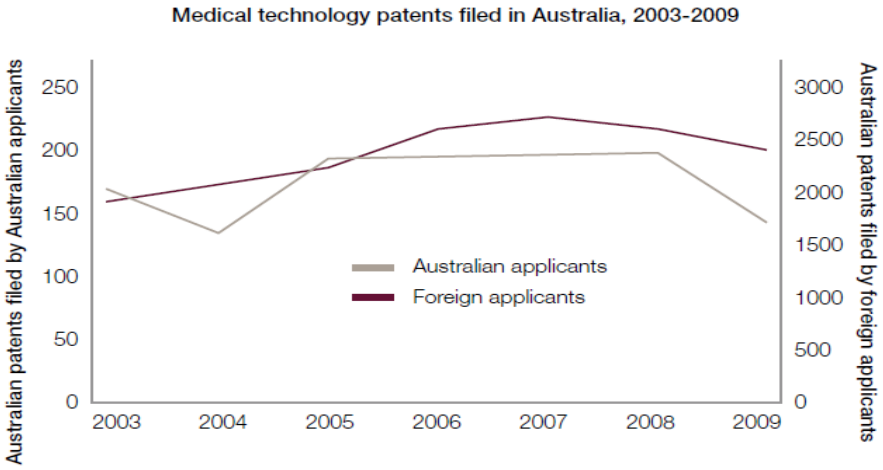
- better integration between health system needs and industry innovation and development;
- emphasis on science and engineering education;
- encouragement of clusters of industry and research;
- pathways to market for innovative technologies, both in Australia and regionally.

4.2.3 Research & Development

The medical technology sector invests and need to further largely invest in R&D to keep being competitive. In 2009 the expenditure in R&D by Australian medical technology business was AU$388million (divided between medical biotechnology, nanotechnology and biomedical engineering). In 2010 there was a decrease in the amount of funds invested in R&D to AU$194million. Moreover the medical technology sector is strongly related to the life sciences industries that allow the exploitation of new opportunities. The life sciences industries employ around 40,000, contribute AU$6billion in export earnings, and AU$450million in foreign investment earnings from clinical trials undertaken in Australia.

To understand the performance of a sectors science base, it may be useful to analyze the rate of new patents and their trends. The patents filed in medical technology may be divided into Australian applicants and foreign applicants. At once the shares of patents appear unbalanced; the number of patents filed by foreign applicants is ten times higher.

Figure 14: Overall trend in known medical technology patents filed in Australia.



Source: Griffith Hack – Medical technologies Group

According to the International Patent Classification (IPC) system, that defines the patents in main classes, the major classes for the number of patents filed during the period 2003-2009 were:

- "Diagnosis surgery and identification"
- "Blood vessel filters and prostheses" and
- "Devices for introducing media into and onto the body (including needles)".

With a more detailed analysis of the patents, Australian applicants focused their patent applications in several IPC sub-classes that denote the focus of the Australian companies in particular niches.

Analyzing the patents filed by foreign companies that have subsidiaries in Australia emerged as strong relevance of the role occurring with US companies. The main leading companies based in the US that file patent applications for medical devices in Australia are Johnson & Johnson, Covidien and Medtronic (Griffith Hack).

4.3 Medical technology industry in South Australia

Bioscience in South Australia has successfully doubled in size since 2001. "South Australia has made a substantial contribution to this growth with over 1500 products and services and generates in excess of AU$300million in revenue with approximately AU$150million a year in exports (AusBiotech,)."

In reference to the Medical technology industry, South Australia is certainly not the most important state in Australia, but it is constantly increasing the commitment addressed on research and development with the aim to achieve great results in manufacturing new applications.

Figure 15: Regional contribution in medical technology industry

Source: Author's elaboration, from "Mind the gap: medical technology innovation in Australia)

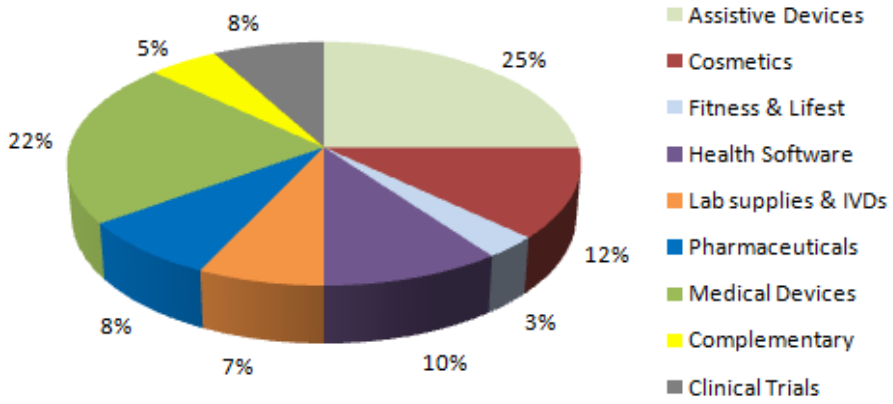
As shown in the above figure, according to the MTAA, of the approximately 500 Australian medical device companies, 4% of total companies of the industry are located in South Australia. . The patents filed from 2003 to 2009 recognized by the IPC are 49 (Griffith Hack).

4.3.1 South Australia companies

The majority of medical technology companies that operate in South Australia are small and medium sized (SME's), in most cases they don't pursue economies of scale; they'd rather emerge to exploit new opportunities and most of them remain small. It may be possible to find start ups and in the same time companies engaged in a generational change.

In 2008 the South Australian Centre for Innovation in cooperation with the Department of Trade and Economic Development (DTED) - (now called DMITRE), prepared a survey to get a better picture of the medical/health industries. As a result of the "South Australian Healthcare Industry survey[14]" different outputs were achieved; data allowed to constitute an up-to-date database, define benchmarking data and feedback to support the identification of key strategies for the future. The survey analyzed 100 healthcare companies in SA.

Figure 16: Sub-sectors of the Healthcare Industry in SA



Source: South Australia healthcare industry survey

[14] The results of the survey showed aggregate revenue, trends in employment, export, infrastructure and the issues faced by the businesses in the healthcare sector over the financial years 1995-1996 to 2006-2007.

As shown in Figure 16, the medical and assistive devices companies resulted through the survey were 47% of the sample analyzed and they recorded the highest revenue of the sector. If the total FY 06-07 revenue was AU$480 million (without including the biotech companies), the two sub-sectors accounted AU$196 million. At the same time the number of FTE's[15] employed in 2008 amounted to 2,210; half of these were just in the medical and assistive devices sub-sectors.
Despite the small number of companies detected in the Healthcare Industry, as much as 30% of these accounted revenues for more than AU$1 million; moreover the same percentage expected an increase in revenues by more than 20%.

The companies of the sector show a good performance in terms of exports, the 63% of the sample stated to export and another 25% plan to export in the next few years. This sector has shown a strong propensity to trade in either within South Australia, interstate or overseas. At an Australian level, the most supplied markets where SA companies are selling overseas include Asia, North America and Europe.

The main constraints to export are linked not so much with the quality of the products but instead with differences in regulatory and knowledge of the markets, resulting in a lack of stable distribution partnerships, brand awareness, and low bargaining power.

What differentiates the health care sector, and therefore the medical technology industry, from other sectors is the different supply chains; the clients are not the final consumers but intermediaries that benefit by the products through research or providing services to consumers. Thus the sectors served by health care are hospitals (the most important), retail, education and research, medical practitioners, distribution channels, aged care facilities, biotech and pharmaceutics industry and others.

When the survey was completed as much as 88% of the companies were developing new products or services; moreover the percentage of R&D on the total expenditure was really high with a large number of companies likely to spend from 20 to 80% in R&D, this might be explained through high research based companies engaged in clinical trials and pharmaceutical sub-sectors. Half of the companies analyzed benefited in their research activities by collaboration with research facilities or universities and were receiving government grants in the last five years. In spite of this finding, the

[15] Full Time Employers.

main constraint to growth in the healthcare industry is the lack of venture capital available.Financial resources are necessary to revitalize the sector and the companies; expansion and relocation, marketing, procurement and new technologies are should be the recipients of the funding.

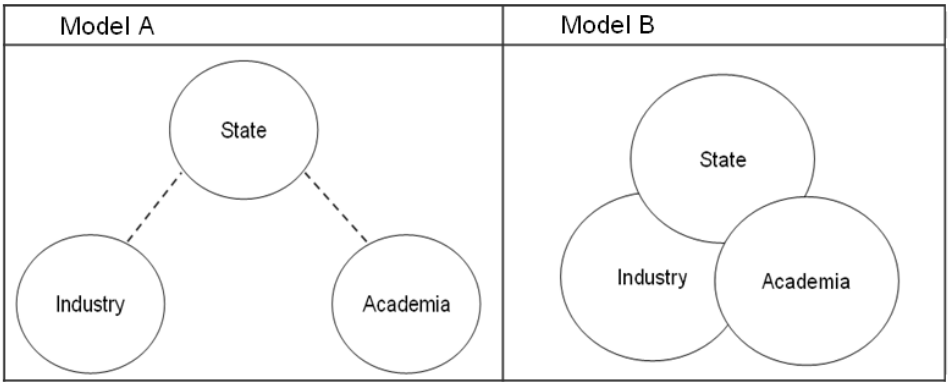
The new South Australian Government Department for Manufacturing, Innovation, Trade, Resources and Energy (formerly Dept. Trade & Economic Development) have recently commissioned another study focusing on the medical device industry in South Australia and the results should be known by the middle next year.

4.4 Start-ups and pathways to markets

In the past companies emerged to satisfy the local demand of medical devices and related products, these days, new companies emerge for the brilliant creative ideas of their owner.
To compete in such a dynamic market where innovation and new discoveries determine the performance of the companies a new type of entrepreneur is being created. The new entrepreneur has highly qualified skills and a global vision of the market; he can understand the new medical techniques and the more advanced methods and he links them with the engineering developments. The main driver to establish a new company is without doubt the idea behind the product.

As explained in the previous paragraph Australia has a quality health system, nevertheless the majority of the production is sold overseas. The same issue concerns South Australia, where companies are struggling to develop a profitable market for their production outputs.
If the idea allows a new enterprise to be established, the venture capital is what the entrepreneur needs to subscribe working capital and collect market shares. In this environment, with reference to the concept of “triple helix model”, the universities, the public bodies and the same private sector should support the entrepreneurial initiatives.
The next chapters of the report show how the three above important factors behave in South Australia and how they interrelate.
In the “triple helix” concept the most famous model is the institutional sphere one (*model A*); in this model the private sector, academia and the public sector are separated from each other but they join through a continuous flow of knowledge. In *Model A* the institutional spheres are separated form each other; a more suitable model may be *Model B* where the institutional spheres overlap and collaborate and cooperate with each other.

Figure 17: Triple helix models



Source: Authors elaboration

4.4.1 Private sector

In almost every group of the analysis there is a body that could influence, the actions of the entire group. The leadership could be assigned to a single or various leaders by a recognized authority or by an informal commitment of the leader.

The role of a leader in a market sector is to push the demand of products at an affordable level and improve the performance of the cluster. Hence the most developed companies should assist the emerging ones, providing services and fostering the knowledge exchange in order to improve the core competencies. The core competencies in a company are useful to increase competitive advantage. More core competencies allows companies to operate more efficiently in the business environment and responding better to the challenge that the firms have to face.

In the South Australia medical technology cluster, where there are a number of SME's, interesting dynamics of growth are emerging. (See Annex). Established companies are slowly, making available their collective experience and knowledge in order to support the management of younger companies.

Among these, Ellex, a company strong in its power, is carrying out a knowledge service available to the other actors of the cluster. Ellex is an international leader in medical laser and ultrasound design and manufacture, it markets a complete line of lasers and diagnostic ultrasound systems used by ophthalmologist to diagnose and treat eye disease[16].

The new tendencies of the established companies that have achieved great results in their original business are now trying to diversify their portfolio in order to reduce the risk and improve their

[16] www.ellex.com

revenues. Therefore different companies using their knowledge package are emerging in the medical device sector. Great interest concerns the electronics industry, companies like Sony and Samsung is planning to invest a large amount of funds into specific areas including acquisitions of medical technology businesses; meanwhile two other giants of electronics, Siemens and Panasonic, are committed to the production and the supply of medical products and services.
In South Australia there is a company that is becoming a key player in the medical device field. SMR Automotive Australia Pty Ltd, one of the major car component manufacturers based in South Australia, is a company specializing in the production of mirrors and lighting components for the automotive industry[17]. SMR owes its success to the direct access to highly efficient production facilities, R&D capabilities, engineering expertise and skilled employees; these characteristics allowed it to enter in a different sector.

These new actors in the medical technology industry let one think that for success within such a complex field on the basis of medical science is not enough. A profitable opportunity discovered in the R&D laboratory does not always match the right engineering skills to design and physically produce the product. The companies mentioned above are an example of the contributions requested to other sectors in developing a medical device.

Generally, the sector's products are based on mechanical, electrical and/or materials engineering, where an average product lifecycle is around 18 months before an improved product becomes available on the market. Compared to consumer electronic products or cell phones, medical devices offer manufacturers lower volumes but a relatively steady income and high profit margins.
For a more detailed analyses of the medical device companies in South Australia the Annex includes a public list of companies operating in South Australia identified by BioSA.

[17] www.smr-technologies.com

4.4.2 Universities and academic research

South Australia boasts three high profile and internationally recognized universities based in its capital city: University of South Australia, University of Adelaide, and Flinders University of South Australia. In addition to this, two foreign universities have opened offshore campuses in Adelaide including Carnegie Mellon University (USA) and University College London (UK). These are extremely outstanding and renowned universities, which are offering niche degrees in the field of technology, energy and public policy.

University of Adelaide

The University of Adelaide was founded in 1874 (it is the oldest of the State's universities) and is one of Australia's leading universities. In fact, it is one of Australia's Group of Eight (*Go8*)[18]. The Go8 is a coalition of leading Australian universities, intensive in research and comprehensive in general and professional education.

The University of Adelaide has major strengths in wine and food, health sciences, biological sciences, physical sciences and social sciences. There are five faculties: Engineering, Computer and Mathematical Sciences; Health Sciences; Humanities and Social Sciences; Professions; and Sciences. The University of Adelaide has more than 19,600 students, including over 4,800 international students.

The University of Adelaide contributes more than AU$120million a year to South Australian R&D activity. Its research earnings are consistently the highest per capita of any university in Australia. Although the encouragement of R&D is important, the University of Adelaide has started to implement a programme to give a real world impact to research outcomes. The university is open for business with government, industry and other research organisations throughout Australia and internationally. Adelaide Research & Innovation Pty Ltd (*ARI*) - the University's commercial development company - has been established and its purpose is to facilitate collaborative opportunities between the university and partners in the private and public sector, as well as encouraging networking and engagement.

The University of Adelaide in order to improve its commitment in the research areas of Engineering and Medical Health and Medical Sciences established a Centre for Biomedical Engineering (CBME). The aim of this Research Centre is give importance to an emerging discipline where

[18] The Group of Eight is a coalition of leading Australian universities, intensive in research and comprehensive in general and professional education (www.go8.edu.au).

engineering principles and techniques are applied to medical and science fields, in order to further design and develop medical devices.

There are several research projects currently running under the CBME. The University has recognized some specific targeted areas of research: Biomedical Signal Processing, Orthopaedic Biomechanics, Spinal Biomechanics, Cardiovascular Engineering, Neural Networks and their Applications to Biomedical Problems, Biofluid Mechanics, Wavelet Transforms in Biomedical Engineering, Biomechanics[19].

University of South Australia

The University of South Australia was funded in 1991 through the amalgamation of the South Australian Institute of Technology and the Magill, Salisbury and Underdale campuses of the South Australian College of Advanced Education. Therefore, it was built on more than a century's experience in educating professionals and applied research and it is the largest university in South Australia. It is a member of the Australian Technology Network of Universities (*ATN*), an influential alliance of five distinctive universities[20] from each mainland State and its aim is to help enhance Australia's social and economic wealth by creating, disseminating and applying new knowledge. Furthermore, the University of South Australia is among the largest providers of transnational education in Australia. Its transnational programs offer students in four countries the opportunity to complete a University of South Australia degree in their home country (*Offshore Programs*).

The University has four divisions: Health Sciences; Business; Education, Arts and Social Sciences; Information Technology, Engineering and the Environment.

The university owns six flagship research institutes and 17 research centres and it ranks fifth in Australia for funding received to support CRCs (*Cooperative Research Centres*).

Flinders University

Flinders University was established in 1966. Flinders has built a strong reputation for quality and innovation in its courses and in its teaching. It was the first university in the world to have a bachelor course in nanotechnology, and the first in Australia to offer a graduate entry medical course.

---

[19] www.adelaide.edu.au/cbme/

[20] University of Technology, Sidney; RMIT University; Curtin University of Technology; Queensland University of Technology; University of South Australia.

Flinders University has four faculties: Education, Humanities and Law; Science and Engineering; Social and Behavioural Sciences; Health Sciences. A wide range of courses are offered, from undergraduate degrees to PhDs; among these the courses in biomedical engineering are interesting, in this field Flinders has achieved strength since its first bachelor in biomedical engineering in 1994 (the first in Australia). Biomedical engineering is the discipline that involves the application of engineering techniques to improve health care and health services to enhance the quality of human life.

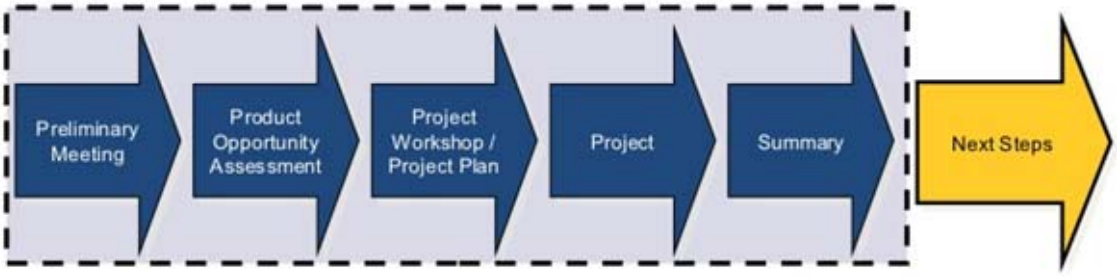
The fields covered by biomedical engineering are medical devices, biomechanics, medical imaging, physiological signal processing and biomaterials.

In order to connect academia to industry in the biomedical sector and keep pace with other prestigious universities, Flinders University launched the Medical Device Research Institute (MDRI). The MDRI is a uniquely multi-disciplinary research institute that aims to be the national research leader in medical device research and development. The MDRI encourages projects that have a common focus on delivering benefits through the application of various technologies to the medical and allied health sector; it includes more than fifty researchers and clinicians from Flinders University, Flinders Medical Centre and the Repatriation General Hospital. The MDRI collaborates in research, development, application and commercialisation of medical devices and technologies. The ongoing research programs are strengthening the knowledge in: assistive technologies, biomechanics and implants, health informatics, medical devices and instrumentation, medical signals and imaging, medical simulation and modelling.

Flinders University has been committed in the Medical Device Partnering Program (MDPP) for almost four years. The MDPP is a collaborative program that brings key players to develop medical devices and improve healthcare, it is addressed to start-up companies, early stage companies, established companies, technology transfer and spin-outs.

The program is developed in five steps; other steps (next steps) are supposed to be faced up after the program and these concern: further product development, funding, product to market.

Figure 18: Main steps of the MDPP



Source: Medical Device Partnering Program

The MDPP outcomes after four years of the start are: barriers between companies and research institutions reduced; collaboration established between research organizations; companies have a single point of contact to access the expertise they require; universities research is more application-focused; practical outcomes achieved; MDPP nationally recognised[21].

4.4.3 Public sector and institutional bodies

The public sector deals with many other institutions and actors. As part of its broader role, the public sector manages communities: it facilitates business activities, develops legal regulations and establishes a better business environment. At the same time the public sector indirectly expects that business communities enhance their role as government partners in national economic development and in improving the socio-economical welfare of local communities. Furthermore it participates as a stakeholder in the development of all sectors and receives benefits from developmental activities.

The medical technology companies require an affordable environment, where systems and structures are in place to ensure companies have the best opportunities of manufacturing locally and commercializing a new technology. Briefly, government needs to put a strategy in place with the aim of supporting the industry and to drive economic growth.

In this respect, schemes like the Medical Device Commercialisation Program (MDCP) funded and administered by the Department of Trade and Economic Development (DTED) provided the opportunity to assist the commercialization process in a faster and easier way. The annual AU$500,000 grant program is now closed. ,

[21] "*The MDPP is possibly the best model for fostering University/Industry collaboration that I have encountered in an Australian University*" - Dr Steven Farrugia (Vice President, Technology) - ResMed Ltd

To advance Australia's international trade, investment and education interests the Australian Government established Austrade, the Australian Trade Commission. Austrade's focus is to assist Australian businesses to succeed in exporting their goods and services to international markets.
Through a network of offices in over 50 countries, Austrade agency assists Australian companies to grow their international business, attract productive foreign direct investment (FDI) into Australia, promote Australia's education sector internationally and manage the Building Brand Australia program to enhance awareness of contemporary Australian skills and capability and enrich Australia's global reputation.

As explained earlier in this study, the mechanism for regulating all new technologies for safety and efficiency is the Therapeutic Goods Administration (TGA) and it applies to both the public and private sectors. The TGA is part of the Australian Government Department of Health and Ageing and is committed in a close dialogue with various national associations on a range of regulatory issues. Among these there is AusMedtech[22], the national industry group that represents the medical devices and diagnostics industry sector.
AusBiotech, and for the medical technology industry AusMedtech, works to shape public policy and address issues via the media, government submissions, working groups, face-to-face meetings with government representatives and parliamentarians.
In order to foster innovation and facilitate the collaboration between universities, research institutions and industry the Government of South Australia has established BioSA and has also committed to the redevelopment of Tonsley Park.

Bio Innovation SA

Bio Innovation SA (BioSA) was established in 2001 by the South Australian Government to foster the growth of the local bioscience industry. Since then, the number of bioscience companies operating in South Australia has doubled. BioSA provides grants to companies and public research organisations to promote company development and enable commercialisation of technologies. The organisation also provides mentoring, advice on business and product development, financial and marketing advice as well as infrastructure development support for the local bioscience industry.

[22] AusMedtech is part of AusBiotech, the Australia's biotechnology industry organisation, working on behalf of members for more than 25 years. AusBiotech is a well-connected network of over 3,000 members in human health and the life sciences, medical device and diagnostics, IVDs, food technology and agricultural, environmental and industrial sectors. In 2011, AusBiotech facilitated over 2,000 business meetings, assisted members to access international markets and assisted Australian companies exporting and seeking investors (www.ausbiotech.org).

In June 2008 to promote and accelerate the commercialisation of research and development in South Australia was opened the BioSA Incubator. The Incubator was fully funded by the South Australian Government and developed for BioSA by the Land Management Corporation; it provides modular office and laboratory space to accommodate early stage bioscience companies.
Among the tenants of the Incubator there are two medical technology companies:

- Reproductive Health Science, founded in 2003 as Spinout Company from the University of Adelaide, is developing advanced prenatal screening technology, invented by biomedical researchers in South Australia, for worldwide use.
- Signostics, an innovative Australian company dedicated to the development of ground-breaking products for medical professional to improve patient outcomes, that in 2009 has launch the palm-sized Signos which is the smallest and most affordable handheld ultrasound tool in the world.

Redevelopment of Tonsley Park

The South Australian Government has approved funding and a Master Plan for the redevelopment of Tonsley Park to create a vibrant and integrated precinct that will expand the industrial and economic base of southern Adelaide and the State of South Australia.

Tonsley Park will be developed on the former Mitsubishi site, as an advanced manufacturing, education and community hub. The precinct were the Master Plan has been signed is a 61-hectare site, the aim of the park is to stimulate AU$1billion in investment and lays out the plan to accommodate 6,300 jobs within 20 years. The site development is estimated to deliver net economic benefits of up to AU$492 million during its 20-year life.

The redevelopment of the site is being led by the Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) in partnership with the Urban Renewal Authority (URA).
Tonsley is seeking to attract investment into high value manufacturing and services and nurturing business enterprise linked to the State's leadership.
In this ambitious project Flinders University is investing $120 million in a new teaching and research facility on the site. The new facility will bring 2,000 students and 150 staff and house the School of Computer Science, Engineering and Mathematics. Undergraduate and postgraduate programs will be taught and allow for expansion and relocation of research programs in nanotechnology, medical devices and clean technology. The University’s investment will enable it to deliver teaching, research and business investment activities aligned with the high-value manufacturing vision for the site.

Flinders University will collaborate through its Medical Device Partnering Program and the Centre for NanoScale Science and Technology in emerging high technology and entrepreneurial companies at Tonsley Park. Together with individual companies the Flinders Medical Device Partnering Program, is driving the development of new medical devices in Australia and its nanotechnology researchers are exploring interesting new opportunities.

5 CONCLUSION

During the development of this report, the biomedical sector emerged as an increasingly strong sector, benefiting an even large number of stakeholders. In both of the case studies analyzed, Veneto and South Australia regions, there are some interesting aspects that suggests a similar growth path and a set of common needs.

Veneto and South Australia are mainly composed by small and medium enterprises that present some issues to their growth. The enterprises have been specialized in traditional sectors for a long time and now a change has occurred: a shift of attention from the traditional sectors to high-tech sectors.

As expected the results of the analysis and the performance of the firms are different, but in other ways not so different. South Australia and Veneto do have different cultures but the role that they play is also the same. The tables detailed in the next section summarize the results of the biomedical cluster in Veneto and the medical technology industry in South Australia.

The findings represent, in the author's opinion, key fields where more attention is required in terms of a future development perspective.

5.1 Veneto findings

Figure 19: Strengths and weaknesses in the Veneto biomedical cluster

STRENGTHS	WEAKNESSES
o Strong entrepreneurial culture o Developed network of public and private bodies o Good performance of firms in exporting and filing patents o Emerging profitable niches o Partnership with local and international actors	o Small company sizes and inability to manage crisis o High dependencies on public healthcare and payment delays o Financial situation of public sector in Italy o No leaders in the cluster

Source: Authors own evaluation

Veneto as explained in earlier owes its strong economy and high rate of entrepreneurship to the regions origin and culture that dates way back. In Veneto the economic structure is based on a strong cooperation between firms and the Veneto Development Model where its identification allowed establishing accurate policies to foster the development of the region. In spite of biomedical industry in Veneto it is not at an early stage within the sector, it started receiving great attention only in the last decade; this gap is without doubt caused by a missed growth in international markets.

The biomedical industry in Italy is extremely dependent on the public healthcare system and the issues that affect these issues are transmitted to the supplier companies. First of all, the amount of accumulated debt of the public healthcare system has became tough and also suffocating for the firms that are affected by the delays in payment time.

However, in regards to innovation, the Venetian firms benefit from a dense network of public and private bodies that sometimes fill the lack of a well-structured in-house R&D laboratory. The enterprise performance depends widely by academic research; this particular linkage, normal for a science based sector like the biomedical sector, may emerge as a wasted opportunity if the knowledge flow is not correctly managed.

Anyway in Veneto the firms show a good performance in terms of exports and international patents, the ability to settle in several niches give to the firms a competitive advantage.

At the same time the huge number of segments and sub-segments where the firms act has not allowed the emergence of sector leaders.

Despite the biomedical cluster size in Veneto, it still remains restricted when compared to other success stories in Italy and in other countries, it has ample margins for growth. The success of a specific cluster is not easy to be replicate, what shapes a cluster is a set of aspects where most of the time is linked with the culture of a territory.

For this reason Veneto has implemented several policies (see paragraphs 2.2.4; 2.2.5) to improve its commitment in the biomedical sector, characterized by the need for high innovation, the Veneto region believes in the importance of collaboration and partnership with local and international actors.

5.2 South Australia findings

Figure 20: Strengths and weaknesses in the South Australian medical technology industry

STRENGTHS	WEAKNESSES
o Significant health and medical research capability o Quality health system o Highly skilled manufacturing workforce o Stable financial system o Proximity to the growing middle-class markets of Asia	o Exports overcome by the imports o Public healthcare purchase abroad o Medical skills not complemented by engineering skills o Need venture capital

Source: Author's own evaluation

In South Australia the focus in high-value manufacturing is growing and the medical technology industry is achieving relevance as well. Within a country it is necessary to create a sense of social cohesion; in this regard manufacturing is the largest provider of direct and indirect employment.

The problem of South Australia's manufacturing has been for a long time a lack of domestic market. Indeed, for scale-intensive manufacturing industries to be competitive, they need a large domestic market, which Australia does not provide. Linked to this the medical technology industry doesn't find in the public healthcare system a profitable channel for its products; in contrast with the Veneto region where the main buyer is just the public healthcare system.

South Australia is an attractive region to invest; the research activities create high value; although South Australian medical device companies have been affected in building stable relationships with universities and the public sector, especially in the development and commercialisation of products. Companies suffer from a lack of funds and in some cases the medical skills are not complemented by engineering skills.

The challenge for an advantageous future is to develop reliable business models and foster new start ups. Enterprises are the main actors in the production, adoption and use of new technologies; they are constantly engaged in processes of learning and accumulation of knowledge. Companies are thus the main channel of innovation outputs. Their exploitation of the available resources is also thanks to other agents; universities, venture capitalists and government bodies play a crucial role in

basic research and in the formation of human capital, supporting innovation, technology diffusion and business production. As mentioned above South Australia has five factors that may become a source of competitive advantage:

- significant health and medical research capability;
- a quality health system;
- a highly skilled manufacturing workforce;
- a stable financial system;
- proximity to the growing middle-class markets of Asia.

South Australia will only be able to build a qualified biomedical cluster by adopting the correct policies.

6 References

Assobiomedica, “Rapporto Assobiomedica 2010”. Assobiomedica Documenti, 2010.

Assobiomedica, “Rapporto su ricerca e produzione nel settore dei dispositivi medici in Italia”. Rapporto Assobiomedica, 2011, from: http://www.assobiomedica.it/static/upload/111/111108-abstract-def.pdf

Belussi, F., Birolo, A., Camuffo, Corò, G., A., Di Bernardo, B., Fiorentini, R., Gottardi, G., Grandinetti, R., Messina, P., Micelli, S., Rullani, E., Tattara, G., Volpe, M., “Innovazione, distretti industriali e filiere globali: il caso veneto”. Criapi, Settembre 2007.

Belussi, F., Cargasacchi, P. G., Tosello, D., “The biomedical cluster in the Veneto region”. Provincial CNA of Padua, February 2003.

Benetti, S., Decarli, S., “An overview of the research & development system in South Australia”. Office of International Coordination, Greater Europe Desk, Adelaide, South Australia, February 2011.

Calvosa, P., “Le strategie regionali per l’innovazione dei cluster ad alta tecnologia in una prospettiva evoluzionista”. Sinergie Journal, sinergie no. 83/10,

Centro Studi di Unioncamere del Veneto, “L’economia del Veneto nel 2011 e previsioni 2012”. Unioncamere del Veneto, Marzo 2012.

Commision Staff Working Document SEC (2008) 2637, “The concept of clusters and cluster policies and their role for competitiveness and innovation: main statistical results and lessons learned”. Europe INNOVA, PRO INNO Europe paper no.9, 2008

Coro’, G., Micelli, S., “I distretti industriali come sistemi locali dell’innovazione: imprese leader e nuovi vantaggi competitivi dell’industria italiana”. From: http://www.firstdraft.it/wp-content/economia-italiana_Coro-Micelli_2.pdf

Department for Manufacturing, Innovation, Trade, Resources and Energy, “High-value manufacturing”. Government of South Australia, Industry consultation paper 2011.

Department of Industry, Innovation, Science, Research and Tertiary Education “Innovation policy report”. Australian Government, March 2012.

Department of Innovation, Industry, Science and Research, “Skills audit of the medical devices industry”. Deloitte, May 2008.

Distretto Biomedicale del Veneto, “Patto per lo sviluppo del distretto – Triennio 2005-2007”.

Distretto Biomedicale del Veneto, “Patto per lo sviluppo del distretto – Triennio 2009-2012”. From: http://www.osservatoriobiomedicaleveneto.it/upload/sections/13/Patto2009_2012.pdf

Ernst & Young, “Pulse of the industry – Medical technology report 2012”. Ernst & Young Publishing, 2012.

Espicom, “World medical forecasts to 2017”. Espicom, August 2012.

Etzkowitz, H., “The triple helix of university – industry – government, implications for policy and evaluation. Institutet för studier av utbildning och forskning, working paper 2002 – 11.

Franchin, M., Storelli, S., Tosello, D., “Biomedicale Veneto e competitività delle imprese”. Osservatorio biomedicale Veneto(distretto biomedicale veneto), 2008.

Ghiringhelli, C., Pero, L., “ Le PMI in Italia – Innovazione, strategie, modelli organizzativi”. APOGEO, 2010.

Government of South Australia, “Submission to the commonwealth government on the review of health technology assessment in Australia”. Government of South Australia Publishing, May 2009.

Griffith Hack, “Mind the gap: medical technology innovation in australia”. Griffith Hack Medical Technologies Group, June 2010.

Interlace-Invent, “Segmentation framework for the medical device sector”. Europe Innova, InJection: Workpackage 1. Deliverables 1.1 and 1.3, 2006.

Löffler, A., Stern, S., “The future of the biomedical industry in an era of globalization”. Kellogg School of Management, Northwestern University, from: http://www.kellogg.northwestern.edu/biotech/faculty/articles/future_biomedical_industry.pdf.

Maggiorni, M. A., Riggi, M. R., “High-tech firms and the dynamics of innovative industrial clusters”. DRUID Summer Conference, 2006.

Malimpensa, L., Petrone, N., Storelli, S., “Usabilità e personalizzazione del dispositivo medico – dialogo tra utenti e produttori”. Osservatorio biomedicale Veneto, 2011.

Medical Technology Association of Australia, “Australia in the Asian century: comments from the Australian medical technology industry”. MTAA Limited, April 2012.

Medical Technology Association of Australia, “Building a sustainable Australian medical technology industry”. MTAA Limited, March 2012.

Medical Technology Association of Australia, “Medical technology in Australia - key facts and figures 2011”. MTAA Limited, 2011.

Medical Technology Association of Australia, “MTAA response to the South Australian Government’s manufacturing green paper”. MTAA Limited, 2012.

Moronato, B., Ruaro, G., Storelli, S., “Medicale Veneto e brevetti”. Osservatorio Biomedicale Veneto, 2010.

OECD, “Clusters, innovation and entrepreneurship”. OECD Publishing, August 2009.

OECD, “OECD Health data 2012: how does Italy compare”. From: http://www.oecd.org/els/healthpoliciesanddata/BriefingNoteITALY2012.pdf

Petrone, N., Storelli, S., Tosello, D., " Verso un profilo tecnologico nel medicale, trend del comparto e filiere". Osservatorio Biomedicale Veneto, 2009.

Productivity Commision, "Impacts of advances in medical technology in Australia". Australian Government, 31 August 2005.

Productivity Commission Research Study, "Impact of advances in medical technology on healthcare expenditure in Australia". Government of South Australia, January 2005.

PwC, "Medical technology innovation score card – the race for global leadership". PwC Publishing, January 2011.

Rasmussen, B., "An analysis of the biomedical sectors in Australia and Canada in a national innovation systems context". Centre for Strategic Economic Studies Victoria University of Technology,

Regione Veneto, "Disciplina delle aggregazioni di filiera, dei distretti produttivi ed interventi di sviluppo industriale e produttivo locale". Legge regionale 4 aprile 2003, n. 8 (BUR n. 36/2003)

Ricerca Italiana, "Centri di eccellenza universitari". Trasduzione del segnale: dalla biologia molecolare e cellulare alle applicazioni cliniche, from: http://www.ricercaitaliana.it/centri/dettaglio-CE00198917.htm

Rosenzweig, E. D., Roth, A. V., "Towards a theory of competitive progression: evidence from high-tech manufacturing". Production and operations management, Vol. 13, No. 4, pp. 354 – 368, Winter 2004.

Russo, S., Storelli, S., Tosello, D., "Trend tecnologico e innovazione nel medicale". Osservatorio Biomedicale Veneto, 2010.

South Australian Centre for Innovation, Department of Trade and Economic Development, "South Australia healthcare industry survey". Government of South Australia, 2008.

Storelli, S., Tosello, D., “Biomedicale Veneto – tra società del benessere e mercato”. Osservatorio Biomedicale Veneto, 2007.

The Gallup Organization, “Innobarometer’s on cluster’s role in facilitating innovation in Europe”. European Commission, Flash Eurobarometer 187, July 2006.

Therapeutic Goods Administration, “Australian regulatory guidelines for medical devices”. Department of Health and Ageing, Australian Government, Version 1.1, May 2011

Trotta, L., “Clusters and automotive districts”. Office of International Coordination, Greater Europe Desk, Adelaide, South Australia, July 2012.

Yu-fen Chen, Tsui-chih Wu, “An empirical analysis of core competence for high-tech firms and traditional manufacturers”. Journal of management development, Vol. 26, Iss: 2, pp. 159 – 168, 2004.

Annex

I. Medical Device Companies in South Australia[23]

Company	Products	Contact Address and Website
Aus Systems	Aus Systems has been a leading Medical Products Manufacturer and Distributor since it was established in 1988. Aus systems has developed the next generation suction rectal biopsy system that combines a single-use capsule procedure pack and a re-usable handpiece. Capsules are supplied sterile and fully assembled with an ultra-sharp blade and airtight seal. Moreover Aus Systems designed a Titanium Reconstruction Plating Systems for use in: oral maxillo facial surgery; cranio facial surgery; ear, nose and throat surgery; neuro surgery; hand surgery.	3 Charles Street Allenby Gardens SA 5009 www.aussystems.com
Austofix	Designer, manufacturer and marketer of innovative, high quality orthopaedic implant systems. Austofix has a dedicated specialist network throughout Australia to provide supply and support to its product range.	18 Kinkaid Ave North Plympton SA 5037 www.austofix.com
Ellex Medical	Designer, manufacturer and marketer of a complete line of lasers and diagnostic ultrasound systems used by ophthalmologists to diagnose and treat eye disease. In December 2006 Ellex acquired Innovative Imaging, a leading provider of diagnostic ultrasound systems for ophthalmology. With more than 16,000 systems delivered to the market, Ellex has evolved since 1985 from a manufacturing company of primarily OEM products, to direct marketing of its own branded products through subsidiaries in the United States, Japan, Germany and Australia, and a network of distribution partners in more than 100 countries. Among the company's current research efforts is Ellex 2RT™ (Retinal Rejuvenation Therapy), a project that is focused on new treatments for diabetic retinopathy and age-related macular degeneration.	82 Gilbert Street Adelaide SA 5000 www.ellex.com
Flinders		

[23] A recent industry survey conducted by BioSA identified the following medical device companies in SA. Also, when extrapolated to the entire industry (taking into account the response rate to its survey), BioSA projects that would be further medical device companies in the state to give a total of 21.

Biomedical Engineering (FBE)	Joint unit of Flinders Medical Centre and the School of Medicine (SOM). FBE delivers a comprehensive range of biomedical engineering services to Flinders Medical Centre and the School of Medicine at Flinders University. The unit offers technical support to users of clinical and laboratory equipment. Devices for research in the SOM are designed and constructed within the unit, while self initiated research is also carried out. FBE offers consultancy and training services both locally and internationally.	Flinders Medical Centre Flinders Drive Bedford Park SA 5042 fbe.support@health.sa.gov.au
Idexx Laboratories	IDEXX Laboratories, Inc., is the global market leader in diagnostics and information technology solutions for animal health and water and milk quality. Headquartered in Maine, IDEXX employs over 4,700 people in more than 60 locations around the world. The Idexx business helps more than 50,000 veterinary practices worldwide advance medical care, improve staff productivity and increase practice profitability. It accomplish this via an integrated portfolio of pet-side diagnostic tests, point-of-care instruments, reference laboratory services, digital radiography, and practice management solutions. In addition, IDEXX is the world leader in microbiology testing technologies that ensure safe water and the top provider of diagnostic tests and health-monitoring systems for milk safety and production animal health.	117 Greenhill Road Unley SA 5061 www.idexx.com.au
LBT Innovations	Developer of clinical and diagnostic technology. Based in Adelaide, SA, the company was formed in 2004 and listed on the Australian Securities Exchange in July 2006 (ASX: LBT). LBT Innovations receives milestone and royalty payments for its first product, marketed globally as PREVI™ Isola, which automates the inoculation and streaking of culture plates in clinical microbiology laboratories. The company is actively pursuing growth of its technology pipeline and is currently evaluating commercialisation options for its second product, APAS, which automates the screening and interpretation of agar plates following incubation.	300 Flinders Street Adelaide SA 5000 www.lbtinnovations.com

Norseld	Manufacturer of Medical Lasers, Norseld is an Adelaide based designer, manufacturer and exporter of unique Laser systems specifically designed for a wide based treatment platform in the medical market. Norseld currently exports to over 30 countries. The treatments are: vascular, pigmentation, melasma, acne, rejuvenation, bulky lesions.	18 Lowe Street Adelaide SA 5000 www.norseld.com
NovoSkin	NovoSkin is currently developing technologies that could revolutionise the treatment of severe burns. The first step is to temporise the wound after debridement to avoid wound contraction and limit the risk of infection. This is achieved by placing the NovoSkin Biodegradable Temporising Matrix ('BTM') in the wound bed to provide a suitable environment for dermal tissue regeneration. BTM is fully integrated to the wound within 10 days of implantation and is at this stage ready for the second step: grafting. Two types of graft can be applied: Autograft or Autologous cultured skin equivalent. NovoSkin is developing an autologous cultured skin equivalent called Composite Cultured Skin ('CCS'), where a small sample of the patient's own skin is harvested and cultured, on a NovoSorb™ scaffold, using well established cell culture techniques. The objectives are to eradicate the additional injuries resulting from autograft harvesting and to produce functional cultured skin sheets within 21 days of biopsy, ready for grafting on the BTM implant. The BTM has been successfully tested and benchmarked in porcine model, in large full thickness wounds, against the leading dermal replacement product.	38 Tom Packer Drive Athelstone SA 5076 http://polynovo.com/novoskin/
Optigen	Optigen has built a strong position as a leading supplier of raw materials in Nutritional Health, Pharmaceutical (API's), Cosmetics, Personal Care and Food segments in Australia and New Zealand, whilst its emerging export markets include customers in USA, China, Hong Kong, Singapore, Middle East and Europe. Optigen global network operates from the Australian Head Office based in Adelaide South Australia, and the New Zealand Head Office in Auckland New Zealand.	308 St Vincent Street Port Adelaide SA 5015 www.optigen.com.au

The Pipette Co.	Specialist manufacturer and supplier of high quality micro pipettes for human in vitro fertilization (IVF) procedures such as intracytoplasmic sperm injection (ICSI), embryo biopsy and assisted hatching. It also manufactures micro pipettes for other applications, such as micromanipulation of non-human gametes and embryos, DNA injection into cells, stem cell research and other specialized research applications.	22 Ware Street Thebarton SA 5031 www.pipetteco.com
Re-Time	Re-Time is an example of the Medical Device Partnering Program (MDPP), based at Flinders University. The MDPP has helped Re-Time Pty Ltd moving from prototype to production, with a low cost market entry product that utilises existing safety glasses and incorporates new electronics. Retimer is a portable light device that mimics the benefits of sunlight. Unlike the sun, however, the Retimer is 100% UV-free and able to be used on an overcast day or during long winters when the sun is not visible. This evidenced-based, patented technology has been developed through 25 years of university research by leading sleep psychologists. The retime can be use to reduce jet lag, increase energy, overcome sleeplessness, manage fatigue.	Mark Oliphant Building Laffer Drive Bedford Park SA 5042 http://re-timer.com/
Reproductive Health Science	Reproductive Health Science, founded in 2003, was originally established to develop and commercialise patented technology for single cell chromosome analysis from the University of Adelaide, South Australia. It is supported by local venture capitalist firms and angel investors. RHS is developing advanced prenatal screening technology, invented by biomedical researchers in South Australia, for worldwide use. The company's first product is a diagnostic test or microarray, which detects chromosomal abnormalities in fetal DNA.	40 - 46 West Thebarton Rd Thebarton SA 5031 www.rhsc.com.au

RianCorp	It focuses on medical laser products for photochemical applications in the field of Low Level Laser Therapy (LLLT). LLLT is the treatment of various conditions using laser to bring about a photochemical reaction at a cellular level. The laser light penetrates into tissue where it is absorbed by cells and converted into energy that influences the course of metabolic processes. RianCorp has completed the only randomised double blind clinical trial testing the effects of LLLT on lymphoedema/lymphedema in the world.	7 Fleet Street Richmond SA 5033 www.riancorp.com
Scan Optics	Manufacturer of ophthalmic microscopes for cataract surgery. Its products include portable ophthalmic microscopes, slit lamps, surgical lights, indirect ophtalmoscope and operating extension table.	32 Stirling Street Thebarton SA 5031 www.scanoptics.com.au
Signostics	With manufacturing and engineering based in Adelaide and sales and marketing operations based in San Francisco, the company's flagship product is the revolutionary Signos Personal Ultrasound device, which features unique patented technology developed by the company as a modern alternative to the stethoscope and other traditional methods of physical examination such as palpation and percussion. Assessing the volume of a bladder before catheterization can reduce urinary tract infections by up to 50%. As the world's smallest ultrasound device, the Signos is small enough for physicians to hang around their neck or carry in their pocket – a major advantage over conventional cart-based ultrasound systems which are much more expensive and lack portability. Weighing less than one pound (320 grams), the palm-sized Signos is competitively priced so that it is accessible to individual physicians and small rural hospitals, in addition to larger city hospitals that require separate ultrasound facilities for multiple wards. Incorporating the latest position-sensing technology to quickly and easily produce high resolution images of patients' internal anatomy, the Signos has been designed to help clinicians improve health outcomes and reduce operating costs in consulting rooms and at the bedside.	40 – 46 West Thebarton Road Thebarton SA 5031 www.signosticsmedical.com

SMR-Technologies	Based in Australia, it is a full service industry expert focused on the design, manufacture and distribution of high quality products for a broad range of industries including medical devices, cleantech and whitegoods. As an independent organisational division of SMR Automotive Australia Pty. Ltd., SMR Technologies has direct access to highly efficient production facilities, R&D capabilities, engineering expertise and 600 skilled employees. This provides significant economic benefits and enables direct access to the global network of industry experts of the global SMR Automotive Group.	Sheriffs Road Lonsdale SA 5160 http://smr-technologies.com/
Soniclean	One of the world's foremost manufacturers of innovative ultrasonic cleaners with over two decades of leadership experience in the ultrasonic industry. Soniclean ultrasonic cleaners are faster and safer than conventional cleaning methods while their unique Pulse Swept Power® technology gives a superior cleaning performance.	38 Anderson Street Thebarton SA 5031 www.soniclean.com.au

II. Biomedical Companies in Veneto[24]

Technical Furniture and Equipment

ARIES DI ADDA GIAMPAOLO & C. SNC	Furniture and equipment	105 via Venezia Vazzola TV 31028 info@aries-online.com / www.aries-online.com
ASLAN SRL	Sanitation and sterilization	18/B Corso Stati Uniti Padova PD 35127 info@aslan.it / www.aslan.it
BIDOIA SAS	Hospital supplies	18 via dell'Artigianato Vigonza PD 35010 bidoia@bidoia.com / www.bidoia.com
BIOTEC SRL	Medical devices	53 via Industria Povolaro di Dueville VI 36031 info@bioteconline.com / www.bioteconline.com
BTS SPA	Production of electromedicals devices	11 via della Croce Rossa Padova PD 35129 info@bts.it / http://www.btsbioengineering.com
CATO SRL	Professional furniture	5 via del Commercio Cornuda TV 31042 info@catoodontotecnica.it / www.catoodontotecnica.it
CENTRO ELETTROMEDICALI SAS	Electromedicals	33 via Falloppio Padova PD 35121 centrelsas@gmail.com / www.centrel.com
D.S. MEDICA SRL	Medical gas systems	22/B via Guido Rossa Scorzè VE 30037 info@dsmedica.it / www.dsmedica.it
DENTAL-ART SPA	Furniture	5 via dell'Artigianato Montecchio Precalcino VI 36030 info@dental-art.it / www.dental-art.it
EL.MED. GARDA SAS	Electromedicals	6 via S.Giuseppe Artigiano Costermano VR 37010 info@elmedgarda.it / www.elmedgarda.it
ELECTROMEDICAL SRL	Furniture and equipment	12 viale L. Da Zara Albignasego PD 35020 cattelan@electromedical.it / www.electromedical.it
ELETTROFOR DI RUGGERO MASSIMO & C. SAS	Electrophoresis equipment	6 via Arzerini Rovigo RO 45100 info@elettrofor.it / www.elettrofor.it
EUMACO ENGINEERING SAS DI SCHIAVON OLIVIA E C.	Biomedical systems and equipment	19 viale Regione Veneto Padova PD 35127 info@eumaco.it / http://www.eumaco.it/

[24] Companies that have given their consent to the publication of the data in the Biomedical Observatory website.

FARAM MEDICAL INTERIOR SUPPLY SRL	Technical furniture	71 via Schiavonesca Giavera del Montello TV 31040 farammis@faram.com / www.farammis.com
FAVERO HEALTH PROJECTS SPA	Technical furniture	20 via Schiavonesca Priula Montebelluna TV 31030 info@favero.it / www.faverohealthprojects.com
GIVAS SRL	Technical furniture	2 viale Veneto Saonara PD 35020 info@givas.it / www.givas.it
INDUSTRIE GUIDO MALVESTIO SPA	Technical furniture	121 via Caltana Villanova di Camposampiero PD 35010 info@malvestio.it / www.malvestio.it
INTERNATIONAL STEEL CO. SPA	Panwashers for industrial use	27 via Balegante Riese Pio X TV 31039 steelco@steelcospa.com / www.steelcospa.com
INVENTIS SRL	Electromedical equipment	1/3 Corso Stati Uniti Padova PD 35100 massimo.martinelli@inventis.it / www.inventis.it/it/index.htm
LAMBDA SCIENTIFICA SPA	Electronic equipment	39 via Retrone Altavilla Vicentina VI 36077 info@lambdascientifica.com / www.lambdascientifica.com
LASER.COM SRL	Medical aesthetic equipment	1 galleria Spagna Padova PD info@2000laser.com / www.2000laser.com
MD SRL	Medical gas systems	22/C via Guido Rossa Scorzè VE 30037 info@md-srl.it / www.md-srl.it
MITEC SRL	Air handling systems	14 via Svizzera Padova PD 35127 mitec@mitecsrl.com / www.mitecsrl.com
O.M.S. - SPA OFFICINE MECCANICHE SPECIALIZZATE	Dental equipment	20/A via Dante Caselle di Selvazzano PD 35030 info@omsstaff.com / www.omsstaff.com
P.A.M. SNC	Electromedical equipment	4 zona Artigianale P.I.P. San Michele al Tagliamento VE 30028 info@pam.ve.it / www.pam.ve.it
PROMETEO SRL	Electronic devices	2 via Marostica Padova PD 35142 andrea.trevisan@fastwebnet.it
RSA SRL	Electromedical devices	71 via Postumia Ovest S.Biagio di Callalta TV 31048 rsa2007@libero.it / www.prometeoitalia.it
RTK DEVICES SRL	Electromechanics devices	13 via Terenzio Mamiani Padova PD 35100 c.lotti@rtkdevices.it

STEELCO SRL	Instrument and utensil washers	27 via Balegante Rese Pio X TV 31039 steelco@steelcospa.com / http://www.steelcospa.com/index.php
TOPTECH SOLUTIONS SRL	Technical furniture	7 via dell'Artigianato Maserada sul Piave TV 31052 info@toptech.it / www.toptech.it
TRE T. SAS DI TOSATO EMILIO GIORGIO & C.	Metal furniture	20 via Emilia Romagna Saonara PD 35020 info@tret.biz / www.tret.biz
TSEM SPA	Manufacturing electromedical equipment	18/E via Enrico Mattei Saccolongo PD 35030 contabilita@tsem.it / http://www.tsem.com/
VYGON ITALIA SRL	Distribution of electromedical devices	60 via dell'Industria Padova PD 35129 dirgen@vygon.it / www.vygon.it
VYTECH SRL	Distribution of biomedical equipment	60 via dell'Industria Padova PD 35129 vytech@vytech.eu / www.vytech.eu

Biotechnology - Diagnostics

AB ANALITICA SRL	Diagnostics for analysis	16 via Svizzera Padova PD 35127 info@abanalitica.it / www.abanalitica.it/index.php
ANANAS NANOTECH SRL	Analysis systems and diagnostics	120 via Altinate Padova PD 35121 m.morpurgo@ananasnanotech.com / www.ananasnanotech.com/
ATES MEDICA DEVICE SRL	Electromedical equipment	20 viale del Lavoro Colognola ai Colli VE 37030 info@atesdevice.it / www.atesdevice.it
BIEFFE MEDICAL IMAGING SRL	Image storage systems	2 via Sile Silea TV 31057 info@bieffemed.it / www.bieffemed.it
BIOMEDIN SRL	Biomedical equipment	1 piazza Insurezzione Padova PD 35100 support@biomedin.com / www.biomedin.com
BMR GENOMICS SRL	DNA analysis and bioinformatica	21/A via Redipuglia Padova PD 35131 amministrazione@bmr-genomics.it / www.bmr-genomics.it
CLINI-LAB SRL	Clinical distribution	14 Z.I. - II STRADA Conselve PD 35026 info@clinilab.it / www.clinilab.it
DOTT. DINO PALADIN	Bionanotechnologies for diagnostic applications	8 via A.Formis Padova PD 35129 paladin@abanalitica.it /www.abnanotec.com

EXPERTEAM SRL	Molecular-diagnostics kit	12 via della Libertà Marghera – Venezia VE 30175 expertm@vegapark.ve.it / www.experteam.it
LAB 3 SPORT SRL	Assessment of motor function	4 via Lussemburgo Padova PD 35127 p.favaron@lab3cube.com / www.lab3cube.com
LABAT SRL	Electromedical equipment	39 via Don Tosatto Mestre VE 30100 info@labat.it / www.labat.it
MICROMED SPA	Equipment for medical diagnosis	2 via Giotto Mogliano Veneto TV 31021 micromed@micromed-it.com / www.micromed.eu
RAM - SOCIETA' A RESPONSABILITA' LIMITATA	Electromedical equipment	14 via Germania Padova PD 35127 ramsrl@tin.it / www.ram-medical.it
RESEARCH & INNOVATION SPA	Genetics and diagnostics research	16 via Svizzera Padova PD 35127 info@researchinnovation.com / www.researchinnovation.com
XEPTAGEN SPA	In vitro diagnostics	9 via delle Industrie Venezia VE 30175 info@xeptagen.com / www.xeptagen.com

Dental

ASLAN SRL	Sanitation and Sterilization	18/B Corso Stati Uniti Padova PD 35127 info@aslan.it / www.aslan.it
BELLATO WALTER	Production of dental prostheses	1 Calle Lunga Loreo RO 45017 bellatow@simail.it
BIANCHI PASQUALE LINO	Production of dental prostheses	3 Via Suriani Rovigo RO 45130 pierluigi.sandro@fastwebnet.it
BIOTEC SRL	Medical appliances	53 Via Industria Povolaro Di Dueville VI 36031 info@bioteconline.com / www.bioteconline.com
BIZZO LUCIO	Production of dental prostheses	286 Via Roma Urbana PD 35040 bizzo.lucio@tiscali.it
CLEAR LAB SRL	Production of dental prostheses	21 Via Savelli Padova PD 35129 clearlab@libero.it
CR.O.M.A. DI AZZI MICHELE	Production of dental prostheses	189 Statale Adriatica Albignasego PD 35020 michele.azzi@tiscali.it
D.P.P. DENTAL PROJECT PATAVIUM SNC	Production of dental prostheses	7 Via Monte Santo Padova PD 35141

DENTAL 2000 - SNC DI TOLLARDO JAMES & ROSSATO FABIO	Production of dental prostheses	39/4 Via Tito Livio Camposampiero PD 35012 dental2000@alice.it
DENTAL MAX SNC DI VEZU' MARCO & C.	Production of dental prostheses	28 Via Dell'artigianato Peraga Di Vigonza PD 35010 info@dentopolis.it
DENTOPOLIS SRL	Dental services	30 Via Bronzetti Pilade Padova PD 35138 info@dentopolis.it / www.paginegialle.it/agostini
D-TECH DI PICCOLO LORENZO	Production of dental prostheses	58 Via Cortina Godega Di Sant'urbano TV 31010 tomahawk63@libero.it / www.d-tech.it
EFFEDENT S.N.C. DI ROBERTO FRISON E GIUSEPPE ZILIO	Production of dental prostheses	5 Via D. Alighieri Romano D'ezzelino VI 36060 effedent@libero.it
ELECTROMEDICAL SRL	Furniture and equipment	12 Viale L. Da Zara Albignasego PD 35020 cattelan@electromedical.it / www.electromedical.it
FIDENTAL DI FINCATO MARTINO	Production of dental prostheses	8 P.Tta Maria Teresa Di Calcutta Rubano PD 35030 martino.fincato@virgilio.it
FRA. MO. DENTAL DI MONACO FRANCESCO	Production of dental prostheses	87 Via Gramsci Cadoneghe PD 35010 edo@framodental.com / www.framodental.com
GENNARO RENZO	Production of dental prostheses	16Via Lunga Lendinara RO 45026
L.B. DENTAL SNC DI LAZZARETTO SANDRO & C.	Production of dental prostheses	93/1 Via Matteotti Conselve PD 35026 lbdental@libero.it
L.O.R.I. SRL	Production of dental prostheses	82 Viale Della Navigazione Interna Noventa Padovana PD 35027 loripadova@tiscali.it
L.O.VE. LABORATORIO ORTODONTICO VENETO DI IANNOTTA MICHELE	Production of dental prostheses	21 Via Savelli Padova PD 35129 loveortodonzia@libero.it
L.P.S DI BARZON ANDREA	Production of chrome cobal	189 S.S. Adriatica Albignasego PD 35020 andrea_barzon@libero.it / www.adriaticaservizi.info/lps

LABORATORIO ODONTOPRO-TESICO DE NADAI LUIGINO E BASSO DANIELE	Production of dental prostheses	11 Via Roma Piombino Dese PD 35017 itosidepiombin@libero.it
LABORATORIO ODONTOPRO-TESICO MAZZETTO FABRIZIO	Production of dental prostheses	4 A1 P.zzale Caduti Di Nassirya Piove Di Sacco PD 35028 fabriziomazzetto@virgilio.it
LABORATORIO ODONTOTECNI-CO FIORETTO PAOLO	Production of dental prostheses	21/A Via Alfieri Padova PD 35125 labfiorettopaolo@msn.com / fiorettopaolo.com
LABORATORIO ODONTOTECNI-CO GAMBAROTTO VANNIO SAS	Production of dental prostheses	1/A Via Dell'altopiano Castelfranco Veneto TV 31033 vanniogambarotto@libero.it
LABORATORIO ODONTOTECNI-CO MARELLI FABRIZIO E TORTATO RENZO SNC	Production of dental prostheses	80/D Piazza Della Serenissima Castelfranco Veneto TV 31033 marelli.tortato@libero.it
LABORATORIO ODONTOTECNI-CO VENTI 07 SNC	Production of dental prostheses	150 Via Scortegara Zianigo Di Mirano VE 30035 venti07@libero.it
LABORATORIO ODONTOTECNI-CO ZARAMELLA SAS	Production of dental prostheses	1 Piazzale Stazione Padova PD 35131 labzara@gmail.com
LFB ODONTOTECNI-CA DI FABRIS ROBERTO	Production of dental prostheses	2 Via Poliziano Padova PD 35100 lfbdifabris@alice.it
MA.VI.DENTAL SNC	Production of dental prostheses	189 Via Statale Adriatica Albignasego PD 35020 mavidental@libero.it / www.adriaticaservizi.info/mavi
MARINOLLI PAOLO & LONGHI PATRIZIA SNC	Production of dental prostheses	2 Via Parpaiola Padova PD 35133 marinollilonghi@libero.it
MENEGHINI ANDREA	Production of dental prostheses	2/A Via Rolandino Padova PD 35131 mrtmen@tin.it

MINAZZATO MAURO LABORATORIO ODONTOTECNICO	Production of dental prostheses	12 Via Monte Lozzo Padova PD 35143 mindalab@alice.it
MORO PAOLO	Production of dental prostheses	4 Piazza Della Liberta' Montegrotto Terme PD 35036 moropaolo@libero.it
NICCHIO MARCO	Production of dental prostheses	22 Strada Cavedon Adria RO 45011 marknikk@libero.it
ODONTICS SRL	Production of dental prostheses	22 Via Zocco Montegalda VI 36047 odontics@libero.it
ODONTOTECNICA C2 SNC	Production of dental prostheses	1/B Via Matteotti S. Giorgio In Bosco PD 35010 cidue@odontotecnicac2.191.it
ODONTOTECNICA CASTELLANA DI ZANATA FRATELLI SNC	Production of dental prostheses	3 Via Delle Querce Castelfranco Veneto TV 31033 info@odontotecnicacastellana.it / www.odontotecnicacastellana.it/index.php
ORTODONTOTECNICA DI RUZZA MAURIZIO	Production of orthodontic appliances	Via Giovanni XXIII Paluello- Stra VE 30039
PINTONELLO MASSIMO	Production of dental prostheses	5 Via Piave Selvazzano Dentro PD 35030 pintonello.massimo@tiscalinet.it
SORRISO E SALUTE ODONTOIATRIA SRL	Production of dental prostheses	43/2-3 Via Della Provvidenza Rubano PD 35030 sorriso.salute@vianello.net
T & T DENTAL POINT – SNC	Production of dental prostheses	16/B Via Canton Interno Villanova Del Ghebbo RO 45020 tetdentalpoint@live.it
TECNO DENTAL DI BASSAN PIER LUIGI & C. SNC	Production of dental prostheses	27 Via Oberdan Rovigo RO 45100 pierluigi.sandra@fastwebnet.it
TECNODENT SNC DI ZOLLA VANIO E LAZZARO GIORGIO	Production of dental prostheses	50/10 Via Triestina Favaro Veneto VE 30173 tecnodentzl@alice.it
TITANIUM MEDICA SRL	Design and prototyping devices	Localita' Ansogne - Z.I. Caralte Perarolo Di Cadore BL 32010 info@vitzani.com
VITZANI SRL	CNC precision turning	Loc. Ansogne - Z.I. Caralte Perarolo di Cadore BL 32010 info@vitzani.com / www.vitzani.com

ZHERMACK SPA	Materials for dentists and dental technicians	100 Via Bovazecchino Badia Polesine RO 45021 info@zhermack.com / it.zhermack.com
ZONCAPE' ODONDOTE-CNICA DI ZONCAPE' MAURO & C. SNC	Production of dental prostheses	1 Via Della Seta Padova PD 35126

Consumables

AARMEG DI CAVINATO F.LLI E C. SNC	Disinfectants	Via Don Zonta 3 Limena PD 35010 info@mondialprod.it
AL.CHI.MI.A. SRL	Devices for ophthalmic surgery	14 Viale Austria Ponte San Nicolo' PD 35020 info@alchimiasrl.com / www.alchimiasrl.com
AQA GROUP SRL	Products for public and private	32 Via Trieste Padova PD 35121 info@aqagroup.net / http://www.aqagroup.net/
DISTREX - SPA	Distribution of medical and surgery	9 Via P. Dona' Padova PD 35127 info@distrex.it / www.distrex.it
FARMACIA BARATELLI BECCARI	Trade products for pharmacy	63 Via Sacro Cuore Padova PD 35135 bbeccari@libero.it
FERRARI L. DI FERRARI PIETRO SRL	Distribution of single-use devices	11 Via Della Consortia Verona VR 37127 info@ferraril.it / www.paginegialle.it/ferraril.it
HURRY UP FEDARS SRL	Textile article for the elderly	98/D Via Vittoro Emanuele II Legnaro PD 35020 info@hurryup.it / www.fedars.it
IN.CAS. S.R.L. - INNOVAZIONI CASAMICHELE	Health articles	40/A Via Staffali Dossobuono VR 37062 info@incas-srl.com / www.incas-srl.com/home.htm
LEADER MEDICA SRL	Medical devices	4 Via Cernaia Padova PD 35100 info@leadermedica.com / www.leadermedica.com
MEDIVAL - MEDICA VALEGGIA SPA	Distribution of hospital supplies	9 Via P. Dona' Padova PD 35129 info@medival.it / www.medival.it
MONDIAL SNC DI CAVINATO ANTONIO & C.	Disinfectants and chemicals	3 Via Don G. Zonta Limena PD 35010 info@mondialprod.it

NELSON DI EDOARDO BRAIDO	Protective clothing	3 Via N. Sauro Cappella Maggiore TV 31018 info@nelsonxray.com
NUOVA FRANCO SUISSE ITALIA SRL	Dental alloys	26 Via Dell'artigianato Vigonza PD 35010 info@nuovafrancosuisseitalia.com / www.nuovafrancosuisseitalia.com/it
PRO-ACTIVE SRL	Disposable plastic	12 Viale Del Commercio Borsea RO 45030 info@proactivesrl.it / www.proactivesrl.it/proactive/Home.htm
SECURMED SPA	Plastics, pharmaceuticals, parapharmaceuticals	2/G Via Monte Grappa Thiene VI 36016 infosecurmed@securmed.it / www.securmed.it
SEI EMG SRL	Devices for neurology	12/1 Via S. Chiara Cittadella PD 35013 info@seiemg.it / www.seiemg.it
SYNTESYS SAS DI RINALDO RUGGERO & C.	Analysis laboratori instrumentation	13 Via Derna Masera' Di Padova PD 35020 info@syntesys.it / www.syntesys.it
TITANIUM MEDICA SRL	Design and prototyping devices	Localita' Ansogne - Z.I. Caralte Perarolo Di Cadore BL 32010 info@vitzani.com
ZHERMACK SPA	Materials for dentists and dental technicians	100 Via Bovazecchino Badia Polesine RO 45021 info@zhermack.com / it.zhermack.com

Orthopedics, Rehabilitation, Aids

3 G - SNC DI MANFE' G. & C.	Orthopedic articles	236 Viale Della Vittoria Vittorio Veneto TV 31029 ortopedia3g@libero.it / www.paginegialle.it/ortopedia3g
ABILITY GROUP SRL	Electromedical and rehabilitation equipment	10 Via Trieste Mogliano Veneto TV 31021 info@abilitygroup.it
ASA SRL	Electromedical equipment	9 Via A. Volta Arcugnano VI 36057 asalaser@asalaser.com / www.asalaser.com
B.B. HOSPITAL SNC	Distribution of orthopedic and health articles	208 Via Antoniana Campodarsego PD 35011 bbhospital@libero.it
CE.ME.S. Centro Medico Specialistico	Center of physical medicine and rehabilitation	106 Via G. Boccaccio Padova PD 35128 info@cemes.it / http://www.gruppodatamedica.net/
CENTRO DEL PIEDE DI PIVATO & C. SNC	Foot orthoses	71 Via Montegrappa Montebelluna TV 31044 www.centrodelpiede.eu

CENTRO ORTOPEDICO SANITARIA 14	Orthopedic and health artiche	66-68 Via Circonvallazione Venezia VE 30174 sanitaria14@libero.it / www.sanitaritalia.it/index.asp
CENTRO SORDITA' DI CLAUDIO MARIUZZO & C. SAS	Hearing aids and prosthesis	4 Via Gattamelata Padova PD 35128 centro@sorditamariuzzo.it
COMFORT ONLINE SRL	Distribution of orthopedic articles	250/2 Via Castellana Venezia-Trivignano VE 30174 info@comfortonline.it / www.comfortonline.it
FABE ITALY SRL	Medical articles	17 Via E. Filiberto Padova PD 35122 info@fabeitaly.com / www.fabeitaly.com
KHYMEIA SRL	Biomedical devices	9 Piazza Europa Noventa Padovana PD 35027 info@khymeia.com / www.khymeia.com
LAB-OR SRL	Orthopedic aids	31/I Via Facciolati Padova PD 35127 info@ortopedia-labor.com
LABORATORIO DI ORTOPEDIA CITTADELLESE SNC	Orthopedic articles	36/38 Via Mura Rotta Cittadella PD 35013 info@ortopediacittadellese.com www.ortopediacittadellese.ws
LABORATORIO ORTOPEDICO DANIELE VITTORIO SAS	Orthopedic and health artiche	26 Via Xi Febbraio Villatora Di Saonara PD 35020 info@danielevittorio.com
LABORATORIO ORTOPEDICO DI VERONA SRL	Tailor-made orthopedic	35 Via Torricelli Verona VR 37136 lov_verona@libero.it
LABORATORIO ORTOPEDICO GIORGIONE SRL	Orthopedics devices	154 Via S. Pio X Castelfranco Veneto TV 31033 lab.giorgione@fastwebnet.it
MEDISAN SAS DI TOMBOLINI ORESTE & C.	Prostesis and Orthoses	73 Via Gramsci Mirano VE 30035 infomedisan@tin.it / www.medisansrl.it
OFF CARR SRL	Sports and orthopedic weelchairs	29 Via Dell'artigianato II Villa Del Conte PD 35010 ruggero@offcarr.com / www.offcarr.com/ita/default.asp
OFFICINA ORTOPEDICA GOMIERO SRL	Prostesis and Orthoses	57 Via Falloppio Padova PD 35121 loretta@gomiero.com / www.gomiero.com
ORTOPEDIA GABRIELE GIUBILATO & C. SAS	Orthopedic articles	77 Via Dei Colli Susegana TV 31058 ort.ggiubilato@libero.it

ORTOPEDIA GIUBILATO VINCENZO DI GIUBILATO STEFANO & C. SAS	Orthopedic and health articles	17 Via Garibaldi Conegliano TV 31015 info@ortopediagiubilato.it / www.sanitaritalia.it/giubilato
ORTOPEDIA SANITARIA BELLINAZZI SNC	Orthopedic and health articles	1 Via Tasso Belluno BL 32100 paolobertin@inwind.it
ORTOPEDIA SANITARIA CADORE DI PIAZZA DANTE	Orthopedic and health articles	38/I Via F. Coletti Tai Di Cadore BL 32044 ortopedia.cadore@libero.it
ORTOPEDIA SINISTRA PIAVE SNC	Orthopedic and health articles	118 Via Roma San Vendemiano TV 31020 ortopediasinistrapiave@tin.it
ORTOPEDIA VARIOLO DI LUIGI VARIOLO & C. SNC	Equipment, orthopedic products	6 Via A. G. Recanati Treviso TV 31100 variolotv@tin.it / www.ortopedia-variolo.it
ORTOTECNICA SERVICE DI SONCIN ALEX & C. SNC	Custom orthopedic products	7 Via Veneto Portogruaro VE 30026 ortotecnicaservice@dacos.it
PEDILA SRL	Custom shoes	68 Via Castellana Montebelluna TV 31044 pedilasrl@live.it
PELLETTERIA BERICA SRL (CESSATA ATTIVITA')	Textile artiche for the disabled	1 Via Cordellina Altavilla Vicentina VI 36077 info@pelletteriaberica.it
PERSONA ORTOPEDIA DI PERSONA MAURO	Shoes and orthotics	18/E Via Della Cooperazione Borsea RO 45100 persona@interfree.it
PIAI ORTOTECH SRL	Manufacturing aids	32 Via Meucci Vittorio Veneto TV 31029 info@piaiortotech.it / http://www.piaiortotech.it/
PODARTIS SRL	Shoes and orthotics	3/A Vicolo Boccacavalla Montebelluna TV 31040 info@podartis.it / www.podartis.it/ita/index.html
PROFESSIONE ORTOPEDIA SRL	Custom orthoses and prostheses	78 Via Pisano Verona VR 37136 info@professioneortopedia.it
REHATEAM SRL	Orthopedic wheelchairs	4 Vicolo Negrelli Castagnole Di Paese TV 31038 direction@rehateam.it / www.rehateamprogeo.com
REUMASAN DI PIZZO MARIA	Orthopedic and health artiche	286 Via Cesare Battisti Chioggia VE 30015

LETIZIA & C. SAS		ortopedia.reumasan@libero.it
SANITARI A.G. DI PIVATO G. & CASAGRANDE A. SNC	Custom orthopedic products	156 Corso Mazzini Montebelluna TV 31044 info@sanitariag.com / www.sanitariag.com/cont.html
SANITARIA BASSANESE SAS DI MOZZI ROBERTA & C.	Orthopedic and health artiche	38/42 Viale Dei Martiri Bassano Del Grappa VI 36061 r_mozzi@virgilio.it www.paginegialle.it/sanitariabassanese
SANITARIA ORTOPEDIA BRUN DI BERTOLDO CINZIA	Custom orthopedic products	55 Via Roma Lonigo VI 36045 sanitariabrun@inwind.it
SANITARIA ORTOPEDIA TROIAN DI NANI EDOARDO E GIANLUCA SAS	Custom orthopedic products	6 Via Garibaldi Feltre BL 32032 info@ortopediatroian.it
SIMED SRL	Electromedical equipment	10/A Via Machiavelli Mogliano Veneto TV 31021 level@level-laser.it / www.simedonline.com
SPADONI LUIGINA	Orthopedic and health artiche	41/B Via Lourdes Conegliano TV 31015 spadoniluigina@libero.it
TAGLIERIA SAN GIORGIO DI SILVESTRIN PIER GIORGIO (Lydda Wear)	Clothing for people with disabilities	35 Via Dossi Terrassa Padovana PD 35020 info@lyddawear.com / www.lyddawear.com
TELEA ELECTRONIC ENGINEERING S.R.L.	Electromedical devices	23 Via Leopardi Quinto Vicentino VI 36050 info@vesalius.it / www.vesalius.it
TERMOLETTO ITALIANA SRL	Anti-decubitus systems	57 Via Pierobon Limena PD 35010 amministrazione@termoletto.it / www.termoletto.it
TIRELLI SERGIO - ORTOPEDIA PIAVE	Orthotics and footwear	160 Via N. Sauro San Dona' Di Piave VE 30027 info@ortopediapiave.it / www.ortopediapiave.it
TONUS SAS DI TONUS ANNA E GAIANI ANTONIO & C.	Medical supplies	41 Via G. Tempesta Noale TV 30033 tonus@shineline.it / www.sanitaritalia.it/tonus
TOSIN NATALINO & C. SAS	Orthopedic and health articles	2 Via Goldoni Bassano Del Grappa VI 36061 tosin.ortopedia@virgilio.it

VASSILLI SRL	Aids for the disabled	1-3 Via Irpinia Saonara PD 35020 info@vassilli.it / www.vassilli.it

Optical, Technology, Vision

AL.CHI.MI.A. SRL	Devices for ophthalmic surgery	14 Viale Austria Ponte San Nicolo' PD 35020 info@alchimiasrl.com / www.alchimiasrl.com
BOTTEGAL SAS DI BOTTEGAL GLORIA E GUIDO & C.	Lenses and glasses	5 Piazza Dei Signori Treviso TV 31100 bottegal@bottegalsas.191.it
NEW OPTICAL INSTRUMENTS SRL	Optical and ophthalmic instruments	4 Via G. Da Verrazzano Verona VR 37100 mciucci@newoptical.it / www.newoptical.it/home.htm
OTTICA BERTAGNIN SAS	Optical and ophthalmic instruments	8 Via Cavour Vicenza VI 36100 pierpaolo@bertagnin.it
OTTICA PALLADIO SRL UNIPERSONALE	Optical and ophthalmic instruments	78 Corso Antonio Fogazzaro Vicenza VI 36100 san.lorenzo.vi@libero.it
PHOENIX - RICERCA E TECNOLOGIE OTTICHE SRL	Development of advanced optical instrumentation	6 Via Svizzera Padova PD 35127 phoenix@phoenix-rtro.it / http://www.phoenix-rto.it/
TECNO SRL	Optical, electronic and prostheses	71 Corso Del Popolo Venezia-Mestre VE 30170 info@tecnologievisione.it www.tecnologievisione.com

Useful links

Australia:

- AusBiotech – www.ausbiotech.org
- Australian Department of Health and Ageing – www.health.gov.au
- Australian Healthcare Association – www.aushealthcare.com.au
- Australian Health Insurance Association – www.ahia.org.au
- Australian Natural Health and Wellness 2009 Directory – www.australiannaturalhealthcare.com
- Chik Services Health-e-Directory Australia Online – www.health-e-directory.com.au
- The Commonwealth Scientific and Industrial Research Organisation – www.csiro.au
- Health Insurance Commission – www.hic.gov.au
- Medical Technology Association of Australia – www.mtaa.org.au
- Medicines Australia – www.medicinesaustralia.com.au
- The Therapeutic Goods Administration – www.tga.gov.au
- South Australia University – www.unisa.edu.au
- University of Adelaide – www.adelaide.edu.au
- Flinders University – www.flinders.edu.au
- AusBiotech – www.ausbiotech.org
- BioSA – www.bioinnovation.com.au
- Tonsley Park – tonsleypark.southaustralia.biz
- Technology Park Adelaide – www.techpark.sa.gov.au
- Austrade – Australian Trade Commission – www.austrade.gov.au

Italy

- Eucomed – www.eucomed.org
- Assobiomedica – www.assobiomedica.it
- Veneto Biomedical Observatory – www.osservatoriobiomedicale.it
- Veneto Region – www.regioneveneto.it
- Padua Business Chamber – www.pd.camcom.it
- Venetian Clusters – www.distrettidelveneto.it
- Istituto Superiore Sanita' – www.iss.it
- Ministry of Health – www.ministerosalute.it
- Padua University – www.unipd.it
- Verona University – www.univr.it
- Galileo's Scientific and Technological Park – www.galileopark.it
- VEGA – VEnice GAteway for Science and Technology – www.vegapark.ve.it
- Veneto Innovazione – www.venetoinnovazione.it
- Italian Medicines Agency – www.agenziafarmaco.it
- Confindustria – www.confindustria.it
- EDMA – European Diagnostic Manufacturers Association – www.edma-ivd.eu
- Lab Tests Online – www.labtestsonline.info
- Business Chamber – www.camcom.gov.it