

PRIVATE EQUITY AND COMPETITIVE ADVANTAGE IN EMERGING INDUSTRIES: THE CASE OF LIFE SCIENCES IN THE NETHERLANDS

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Abstract. *The aim of this paper is to discuss the competitive effects of private equity industry in emerging industries, with a focus on the Dutch Life Sciences cluster located in West Holland, a Dutch region. As our analysis shows, the circumstances which favored the early success of this industry includes factors such as education, infrastructure, governmental support, existence of key industrial players, as well as the investment strategies of private actors. The paper is structured in two parts. The first reviews the literature regarding the evolution of emerging industries and the impact of geographic locations on their attractiveness to private investors. The second part highlights the way in which an emerging industry (i.e. life sciences industry in West Holland region) has upgraded its competitive advantage under the influence of private capital.*

Keywords: *agglomeration; clusters; private equity; emerging industries; life sciences.*

Introduction

The emergence of new, high-growth sectors is, along with disruptive ideas or reconfiguration of value chains, one of the strongest determinants shaping the competitive landscape these days (Russo, 2003). This paper attempts to highlight the role of emerging industries for creating competitive advantage under the influence of private equity.

The emerging industries take advantage of location-specific opportunities in terms of specialization and diversification, and they are more advanced in those regions which host a significant portfolio of traditional sectoral clusters (European Cluster Observatory, 2016). Generally, these industries require significant research and development funds as they try to raise private capital, but at the same time investors are attracted by their high growth potential and innovative approach of the incumbent companies. This virtuous circle of entrepreneurship helps industries develop at higher than average rates and take advantage not only of the capital inflows, but of the accompanying business and industry expertise as well.

In the following, we will subject to scrutiny the hypothesis of a virtuous link between emerging industries' competitive positioning and private equity inflows with a case study on life sciences in the West Holland region (The Netherlands). In the first part of this paper, we review the literature on the evolution, locational advantages, and

attractiveness of the emerging industries. The second part particularizes the way in which an emerging industry (life sciences) has taken advantage of private equity.

Theoretical background

According to one established definition, “emerging industries are either new industrial sectors or existing industrial sectors that are evolving or merging into new industries. They are most often driven by key enabling technologies, new business models such as innovative service concepts, and by societal challenges that industry must address as a matter of survival.” (European Cluster Observatory, 2012). In the European economy, these sectors account for about 46% of all traded industry employment and are concentrated in approximately 20% of European locations (European Cluster Observatory, 2016).

The case for emerging industries is representative for what is disruptive and challenging in the contemporary business climate, with characteristics such as:

- New products/services resulting from technological development and socio-economical changes;
- Cross-sector convergences and applied innovation and creativity;
- Intensive research and knowledge;
- Changing business models;
- Uncertainty due to lack of information regarding the market conditions;
- Determined by agglomerations in areas with location-specific conditions, and strong inter-sectoral linkages;
- Requirements of significant research and development funds (European Cluster Observatory, 2012).

As this depiction suggests, two key features – location and risk associated with technological development – lie at the core of the business model of emerging industries. Let us turn to each of them to assess the key determinants in a competitive context.

Location mostly relate to clusters – groups of interconnected firms, and related private and public actors, which activates within an industry – as *drivers of competitive advantage*. A typical organization of clusters (Porter, 1990) includes companies, suppliers, other related companies, customers, educational institutions, public authorities, and regulatory bodies, all of these being related to one specific industry. The following graph shows a general approach of clusters’ organization.



Figure 1: A generic cluster environment (Author based on Porter, 1990)

According to Porter (2000), clusters affect business strategies in three directions, as follows:

- *Productivity*, because of the ease of access to qualitative information and technology, advanced-skilled employees and suppliers, and more support through coordination with institutions or other related companies.
- *Innovation*, because of direct competitive exposure to other companies' performances and innovative approaches. The proximity of customers brings more advantages for companies located in clusters, compared to isolated competitors, thanks to rapid ideas-to-market transfers.
- *New business formation*, because of the linkages created between clusters' members. Market opportunities are immediately seized upon in such agglomerations and new businesses arise taking advantages of new needs, lower entry barriers, and resources already available.

In light of the accumulated evidence (Marshall, 1890; Schumpeter, 1939; Porter, 1990), clusters' development can be explained through the advantageous use of resources – tangible and intangible – available in particular areas, successful past experiences of entrepreneurs and industry specialization. Cooperation between companies, suppliers, customers and institutions help clusters evolve. Local rivalry is another important factor which positively influences the development of such agglomerations through innovative improvements for changing needs in the marketplace. Since qualified labor is another pre-requisite for clusters' development, the whole business “community” takes advantage of high skills of employees and their continuous improvements.

Governments have a clear interest in supporting clusters since these agglomerations are conducive to increasing exports and are a constant source of attracting foreign investments (Porter, 2000; InterCluster, 2010; European Cluster Observatory, 2012). In the case of emerging industries, this support targets technological development, especially through regulations, improvements in infrastructure and education, or innovation grants oriented to specific business needs. Due to the influence of all these determinants, clusters develop and become stronger and stable in the market even during economic downturns. Delgado et al. (2016) conclude that strong clusters become more resilient to negative shocks, while the regional economy and the related industries take advantage of rapid recovery.

As for the *risk* associated to technology development and innovation, the existing evidence (Invest Europe, 2017) points to a virtuous circle from emerging industries to clusters and to private equity industry. In a context of optimal determinants of competitiveness, emerging industries are basically innovative traditional industries, which were transformed according to market trends; clusters are geographically agglomerations of high innovative companies, while the private equity firms are the financial supporters of innovative ideas. As long as innovative approaches are encouraged and financed, new industries develop, while the traditional ones are transformed. Their growth attracts specialized suppliers and support other related business sectors. The business environment is enriched due to new technological resources and because of increasing high skilled labor. Also, governments observe the power of the innovation and join this *cycle* through preferential and supporting policies. Investors receive high returns because of their financial and strategic support for the development of these disruptive ideas, and in the end, the whole economy benefits.

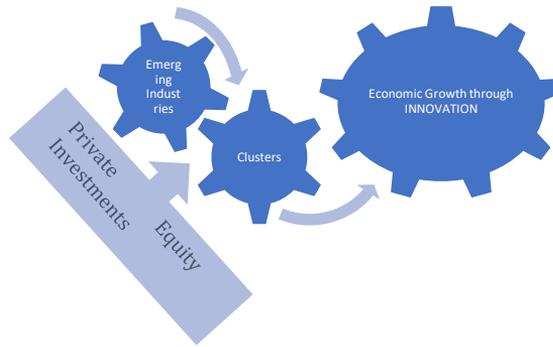


Figure 2: Linkages between emerging industries, clusters and private equity investments
(Source: author)

Private equity investments help industries, and especially the emerging ones, evolve through capital inflow and business expertise. Joining the companies and offering strategic advice, they support the increased productivity of investees and innovative products or services, at the firm level, and enhance competitiveness at macroeconomic level (Frontier Economics, 2013). Nonetheless, because each private investor accepts to take part of the growing plans of a company, the exit strategy is important, for shareholders will expect to benefit from the increasing value of their equity through an appropriate selling alternative. Even if companies will be sold to other players or will be listed on the stock exchange markets to increase their capital and to attract other investors, or another private equity firm will continue their development plans through fresh inflow of capital, or the management teams/owners will take back their shares, the divestment method should be a win-win situation for both the company and the investing firm.

For emerging industries, to attract private capital can be challenging because of their disruptive business models. Traditional financing instruments such as bank loans, overdrafts, credit lines, leasing or factoring, are limited for these companies because of the lack of collaterals (Masiak, 2017), while public investors are afraid of risks because of the difficulty of measuring the maturity of the industry. Moreover, because these industries are research-intensive industries the need of funding is higher compared with traditional sectors, so the companies which are active in emerging industries try to raise capital from private investors which are attracted by their high growth potential. Some alternative financing instruments available are venture capital (start-ups and early-stages companies financing), development capital (financing for expansion of mature companies), mezzanine (equity and debt financing through a subordinated loan) or distressed debt (financing for restructuring of troubled companies) (Seretakakis, 2012). A report of the European Investment Fund (Kraemer-Eis et. al, 2018) suggests that equity as source of financing for the SMEs of the Eurozone was mostly required for activities concerning companies' development such as developing and launching of new products or services and hiring and training of employees, compared with traditional instruments.

According to a report prepared by the European Savings and Retail Banking Group, the dominant financing sources for both European and American SMEs are bank loans. The report emphasizes that the banking sector is smaller in the United States compared with the European Union, but with a large access to capital markets. According to British

Bankers' Association (2014), in Europe 70% of total financed amounts come from banks, while in the United States bank lending represents only 30% of total financing, (70% of American financing is supported by capital markets and other institutions), in 2014. Moreover, banks usually provide significant amounts of money as debts for the private equity firms, in order to cover companies' acquisition costs, during buyout investments (Gilligan and Wright, 2010).

The Guide on Private Equity and Venture Capital for Entrepreneurs (2007) defines the private equity industry is defined by medium to long term investments in non-listed companies, with the purpose to pursue their development plans and to *create value* for companies in critical stages of development.

Several studies identified the economic impact of the private equity investments on innovation, productivity and competitiveness, as follows:

-Impact on Innovation. By allocating funds to research and development, private equity firms directly help investee companies to create new products and services, compatible with the changing needs of customers. Together with capital, the companies also receive business expertise and support for their corporate governance for the innovative plans. In order to highlight the direct effects of these capital inflows over the innovative potential of companies, Popov and Roosenboom (2009) studied the private equity investments and number of patents developed by private equity-backed companies during 1977-2004. Considering the patents as a proxy for innovation, they concluded that 12% of innovation by private companies is attributable to investments made by private equity firms.

-Impact on productivity. Investments made in physical capital such as plants and equipment increase the companies' productivity. Also, by improving their management, companies benefit from a better utilization of resources, which lead to development as well. The capital inflows also help companies develop and create new jobs, significantly contributing to economic growth. According to Frontier Economics (2013), the private equity investments led to creation of approximately 5,600 new businesses each year in Europe, based on 2007-2012 average numbers of new companies backed by private equity. The same study highlights the improved productivity of private equity-backed companies of 6.9 % on average, measured as EBITDA per employee. A study made by Kaplan and Strömberg (2009), over 1979-2007, with data from 17,171 worldwide companies backed by private equity firms, demonstrated the positive relationship which exists between the investments made by these firms and the performances of investee companies.

-Impact on competitiveness. At the local level, competitiveness between companies is enhanced through investments for increasing productivity. By attracting capital flows, companies produce more and improve their offerings, gaining more market share, therefore they become more competitive. Also, at the international level, private equity investments can lead to competitiveness by supporting companies oriented to export activities or by helping companies to expand abroad. New or small businesses have the opportunity to grow by receiving capital for internationalization efforts (Frontier, 2013).

The West Holland Life Sciences Cluster

Methodological orientation

To emphasize how the emerging industries, create competitive advantage, supported by private equity investors, an analysis of the life sciences cluster located in West Holland (The Netherlands) was made. The linkages created between the cluster members demonstrate cluster's success, and, in the same time, industry's growth perspective.

Following Porter's (1990) general cluster map, investors – as cluster's members – have a significant impact over economic growth of agglomerations, through their power of financing. Their influence over emergent life sciences companies is the focus of the cluster map analysis. Nonetheless, we are interested in highlighting private equity influence over the cluster evolution through financing support offered to big industry players in their early stages of development.

An overview of the Dutch business environment

The Netherlands ranks fourth as the most competitive global economies. According to the Global Competitiveness Index 2017-2018, the Dutch economy's competitiveness is supported by advanced infrastructure, a strong education system, but mostly by an innovative environment, with a high capacity of innovation (6th rank out of 137).

The country's *strategic location* is important for attracting customers – around 170 million customers within a 500-km radius, according to PWC Report (2017), from London, Paris, Dusseldorf, or Brussels, as well as for taking advantage of the spill-over effects of technological developments in neighborhood countries due to *its proximity to other European strong economies*. Their demand forces producers and suppliers to offer innovative solutions to remain competitive. The *research and development* grants allocated by the Dutch government are increasing from year to year, according to OECD statistics (OECD, 2018), around 2% of the GDP in 2016. These activities are also supported by special tax credits and other tax incentives. The *economic stability* of the Netherlands attracts foreign businesses and workforce. Foreign companies take advantage of special fiscal measures, while the expats are enticed with competitive benefits (PWC Report 2017). In this environment, private equity investors' interest is being attracted by innovative ideas. According to the Invest Europe statistics, the number of companies backed by private equity investors increased with 30% compared with 2010 and reached the highest level of invested amounts after the 2008 financial crisis.



Figure 3: Private equity investments in the Dutch companies
(Invest Europe/European Data Cooperative)

According to Leading Life Sciences Clusters in Europe Report (2016), the Netherlands is home of approximately 63 life sciences parks, 12 universities and eight university medical centers, where ca. 98,000 people are employed (2014). The increasing innovation of the Dutch companies can explain the growth of emerging industries in this country. According to the European Cluster Observatory (2016), the South and the North Dutch regions are significant cross-sectorial hotspots in Europe in emerging industries clusters: out of the top ten emerging industries in the European economy (advanced packaging, biopharmaceuticals, blue growth industries, creative industries, digital industries, environmental industries, experience industries, logistical services, medical devices and mobility technologies), three of them are Dutch hubs, as follows:

**Table 1. Emerging industries in the Netherlands
(European Cluster Observatory, 2016)**

Emerging industries	Rank (out of 10)	Region	City
Blue Growth industry	5	Zuid-Holland	Rotterdam
Creative Industries	3	Utrecht	Utrecht
	4	Noord-Holland	Amsterdam
	8	Zuid-Holland	Rotterdam
Experience Industries	5	Noord-Holland	Amsterdam

One of the largest European clusters of exact sciences is located in *Amsterdam Science Park* and offers scientific opportunities for life sciences industry, together with high technologies, physics and chemistry. The cluster's development is strongly supported by academic and scientific institutions such as University of Amsterdam, VU University Amsterdam, the Academic Medical Centre Amsterdam, the Neuroscience Campus Amsterdam and the Pan-Amsterdam Technology Transfer Office (Leading Life Sciences Clusters in Europe Report, 2016). The *Utrecht Science Park* hosts the highest number of research institutions on a small area of 300-heactare and is focused on life sciences and health activities. More than 80 businesses are located in this cluster, together with the University Medical Centre Utrecht and the Utrecht University. Starting with 2012, a new business park supports the life sciences industry in the Netherlands, the *Pivot Park*, located in Oss. This cluster developed as mix of initiatives of government, existing companies and private equity investors. The pharmaceutical company MSD together with the municipality of the city and of the province, the Ministry of Economic Affairs and Ministry of Health, Welfare and Sports were the principal actors for this clusters' development. The financial support was offered by the Brabant Development Agency (BOM). Another very important life sciences hub in the Netherlands, is the *Zernike Campus Groningen*, founded in 1960s. In this park, there are around 150 companies, with more than 4,000 employees and researchers and approximately 35,000 students. The University of Groningen and the Hanzehogeschool supports the clusters' knowledge (PharmInvestHolland, 2018).

The Life Sciences Cluster

The life sciences industry combines advanced technologies for developing medical facilities, pharmaceuticals, and other healthcare appliances. The European Cluster Observatory considers the biopharmaceutical and the medical devices as two different emerging industries but taking into consideration that these industries develop together in clusters, and they are closely interconnected, they are perceived as one industry.

According to the data provided by Biotechgate Database, the industry of life sciences in the Netherlands is developing from year to year, based on the number of companies which are active in this sector (including both the companies which are directly involved and related companies as well) and the number of new technologies created each year. The following table presents a short overview about the Dutch life sciences industry.

**Table 2. Overview of Life Sciences Industry in the Netherlands
(The Dutch Life Sciences Trend Analysis 2014-2017, www.biotechgate.com)**

Description/Year	2014	2015	2016	2017
No. of Dutch biotech companies	280	411	404	462
MedTech companies	102	116	102	122
HealthTech companies	29	40	38	39
Medical Facilities and other public organizations	116	135	128	181
No. of other life sciences related companies	659	813	803	877
No. of technologies developed	174	220	209	162

The life sciences and health industry's potential can be assessed also by taking into consideration the Dutch Association Innovative Medicines' initiative to transform the Netherlands into the "choice in Europe when it comes to research and development of medicines" (PharmInvestHolland, 2018). The life sciences and health industry is one of the nine key sectors of the Dutch economy, with more than 3,000 active companies and research organizations (PWC Report 2017). The Dutch life sciences companies exported more than 37 billion EUR in 2017, out of which 25 billion EUR are revenues from pharmaceutical products (PharmInvestHolland, 2018).

The development of this industry, not only in the Netherlands, but at the global level as well, started around 1590 with the invention of the microscope (Hans and Zacharias Jensen), and continued with other great discoveries, scientific, for example microbiology (Antoni van Leeuwenhoek), human anatomy (Andreas Vesalius) or physiology (Herman Boerhaave), or mainly technical, for example electrocardiogram (Willem Einthoven), or different medical appliances such as heart-lung machine and artificial heart (Willem Kolff), according to PharmInvestHolland report (2018).

According to Euro Health Consumer Index 2017, the Netherlands is the best country based on the healthcare system, because of the significant number of health providers, who act in competition, compared with other EU countries. The industry is supported by significant investments made in research and development, more than 2 billion EUR per year, according to the PWC Report (2017).

The *Leiden-Rotterdam-Delft-De Hague/West Holland* region is home of the leading life sciences cluster in the Netherlands, home of the three largest bio sciences parks and more than 400 companies, highly supported by five research and educational institutions and ten R&D facilities (West Holland Life Sciences Hub). The cluster's most important members are as follows:

1. Large industry players. The West Holland cluster hosts a significant number of large healthcare and pharmaceutical companies, which strongly influenced the evolution of the region. Some examples are: Crucell, Pfizer, DSM, Janssen (part of Johnson and Johnson), Thermo Fisher Scientific, 3M, Siemens Healthineers and MSD. Two of the most

important innovative solutions developed by the companies located in this cluster are for auto-immune diseases and the first vaccine for five childhood diseases.

Big players of the life sciences industry were supported by private equity firms in their early stages of development, such as Crucell (in late 1990), Viroclinics Biosciences (in 2001), and PanGenetics (in 2005).

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-*Crucell*, a Leiden-based company, was backed in late 1990 by the leading life sciences investor, Life Sciences Partners. In 2000, the company was listed on the Euronext Amsterdam stock exchange, and later merged with another life sciences company, Introgene. It continued as a public company until 2011 when it was acquired by the global pharmaceutical company, Johnson and Johnson, and today the company is one of the most important actors in the vaccines industry.

-*Viroclinics Biosciences*, a Rotterdam-based company, was founded in 2001 as a spin-off from the department of virology of Erasmus Medical Centre Rotterdam. It became a global clinical trial operation companies after it was backed by Gilde Healthcare, in 2014, and it continues its development with a new capital inflow from Parcom Capital, after it changed its main shareholder in 2017.

-*PanGenetics* is another example of private equity-backed company located in the West Holland (Utrecht) which rapidly grew up because of private capital inflow. According to Business Weekly (2006), the company received two rounds of funding for its drug development. Soon after its establishment in 2005, a 2 million USD seed round supported the research activities of PanGenetics.

2. *Knowledge institutions*. More than 6,000 students at renowned technical universities – TU Delft University, Leiden University, Erasmus University Rotterdam, Leiden Medical University Center and Erasmus Medical Center Rotterdam – are engaged in the cluster's research and development activities. For this purpose, there are ten R&D facilities available and three incubators.

3. *Government*. At regional level, the local authorities support this cluster through the West Holland investment agency which facilitates the companies' development, together with fiscal incentives for innovation. The West Holland region benefits of the Health Ministry located in this cluster. The Association of Innovative Medicine is another national authority, located in The Hague, which tries to create the best conditions for pharmaceuticals' development and manufacturing. In the same way, HollandBio supports the biotechnology companies. The local authorities support the life sciences companies not only through direct grants, but also through support to private equity funds. In 2010, around 35% of the funds raised came from the governmental institutions, according to Invest Europe statistics.

The public-sector supports the industry's development also through collaboration between the European Investment Fund (EIF) (part of the European Investment Bank) and the Dutch Minister of Economic Affairs for financing innovative companies. According to the EIF's website, the first collaboration, namely the Dutch Venture Initiative I, ended up in December 2016 with a total amount committed of EUR 148 million, to 13 different venture and growth capital investment funds, out of which 5 are exclusive dedicated to life sciences sector. In 2016, the second program was launched with focus on med-tech and life sciences alongside with ICT, clean-tech and renewable energy, fact that indicates the high level of innovation of these industries and how attractive they are for investments. Moreover, in September 2017, the Dutch Growth Co-

Investment Program was launched to support the transition of companies from early-stages to growth lifecycles.

4. *Patient Organizations.* For healthcare policies, the patient organizations (such as The Netherlands Patient and Consumer Federation (NPCF), Dutch Cancer Federation and other disease specific organizations - Parkinson Association and the Epilepsy Association) have a crucial role, especially for the new regulations. They play the role of sophisticated buyers for the cluster and all the research activities are conducted in order to satisfy their medical needs through innovative drugs or appliances (Van de Bovenkamp & Trappenburg, 2011).

5. *Supporting Industries.* The logistics hub from Rotterdam significantly influences the pharmaceutical imports and exports, not only in this area, but in the whole Europe. The Port of Rotterdam and The Hague Airport are vital for the international trade with medical and pharmaceutical products, as well as for strong connectiveness with other cities. High-technology companies supply life sciences companies with new solutions, for instance the 3D-printing used for medical appliances. In the same way, the chemical industry provides high-quality inputs for drugs development.

6. *Private Equity Investors.* Because the life sciences sector's activities are high research intensive, the demand of funding is substantial. The product development of healthcare companies requires more funding rounds compared with other business sectors. In some cases, after years of research, these companies obtain a prototype after 4 or even 5 investments rounds. In the West Holland region, Innovation Quarter, an economic development agency, supports financially the life sciences companies in this area. Alongside with this regional investor, there are also other private equity firms with a broader focus, such as Life Sciences Partners, Merck Ventures, Gilde Healthcare and Forbion Capital Partners.

According to Invest Europe statistics, the investments made in the West Holland regions, in the biotechnology and healthcare sector represents in average 21% of the total investments made in this industry (2007-2016 data). More than 60% of the investments are made in small and medium companies, in early stages of development. Also, in 2016, 23,29% of the total fundraising in the Netherlands was raised by funds oriented to life sciences companies (Invest Europe data). This inflow of funds, the highest since 2007, explains the increasing potential of the life sciences industry in the Netherlands and how attractive it has become for private investors.

The local authorities support the life sciences companies not only through grants, but also through support to private equity funds, therefore the aid is not only financial, but also strategic because of the business expertise of these firms. Another significant categories of investors for this industry is represented by the corporations, which can activate in the same sector or related, and academic institutions. The following graphs shows the type of investors which invest in life sciences funds in the Netherlands.

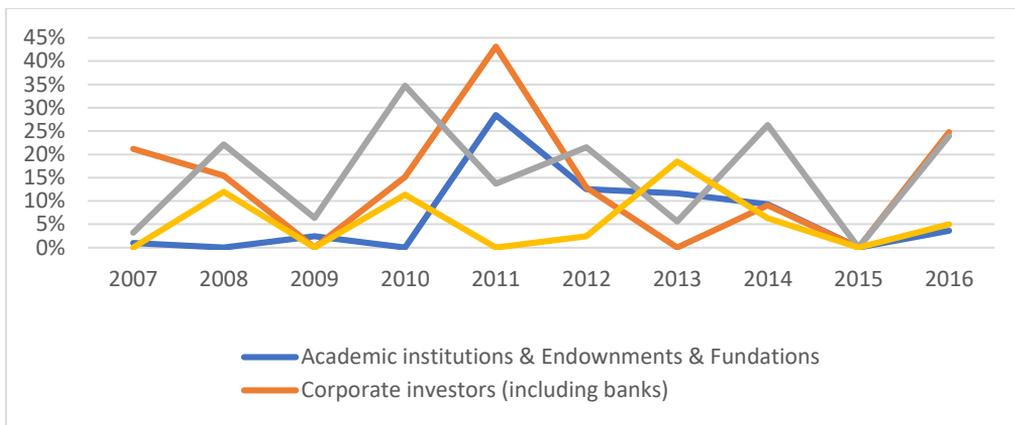


Figure 4. Type of investors in the Dutch life sciences funds (Invest Europe/European Data Cooperative)

The number of private equity backed-companies did not change significantly from 2007 until 2017, in average 11 companies received capital each year leading to increased workforce.

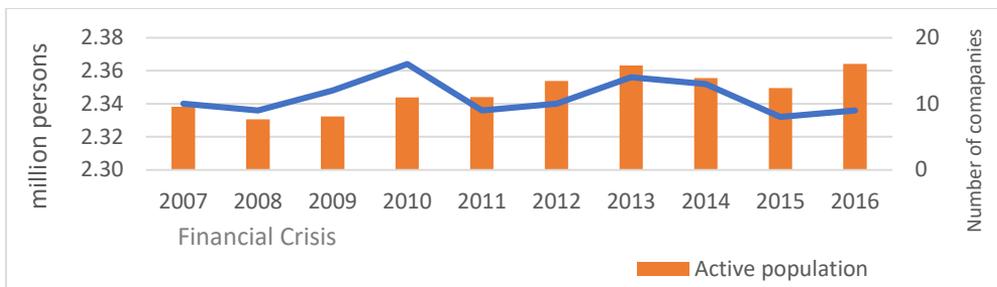


Figure 5. Number of private equity-backed companies and economically active population in the West Holland region (Invest Europe/European Data Cooperative, Eurostat)

Considering the economic growth of this region, mostly endorsed to the life sciences industry, around 13% of the increasing welfare is justified by the private equity investments made in the life sciences companies clustered in the West Holland, based on Invest Europe and Eurostat data.

Conclusions

Competitiveness at cluster level is enhanced through the high number of private equity-backed companies and follow-on investments which support the research and development activities. In the same way, new funding rounds increased productivity at the company level through expansion. But mostly, the private equity investments support the innovation in the West Holland life sciences cluster, throughout industry players, related-companies and governmental initiatives.

As this paper has emphasized, the success of the West Holland Life Sciences cluster is explained by a local context of strong cooperation between (1) large industry players, (2) knowledge institutions, (3) government and (4) patient organizations, (5) private

equity investors and (6) supporting industries, enhanced by the high competitive level within the region due to the large number of companies (the 18th most competitive European region according to Regional Competitiveness Index 2016).

The private capital inflows in this area are expected to increase in the following years due to the re-location of the European Medicine Agency from London to the Amsterdam. In the same way, some big industry players may change their operational activities in the European Union to take advantages of the community benefits, therefore the West Holland can become a better option for private equity investors instead of the United Kingdom, and a more successful life sciences cluster at the international level.

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