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Determinants of International Competitiveness in the Pharmaceutical Industry

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Abstract

Nowadays, the competitiveness of the pharmaceutical industry has been determined by a system or networks involving a variety of factors, therefore is essential to identify them. This study identified and analyzed the variables that impact the competitiveness of the pharmaceutical industry worldwide. We used the Model of Michael Porter for the Competitiveness operationalized with the Global Competitiveness Index of the World Economic Forum and determined which factors affect the international competitiveness in the pharmaceutical industry. Through a discriminant analysis, the study identified 32 determinants factors that affect the international competitiveness of this industry. Implications for companies, the pharmaceutical industry and for foreign direct investment policy were detailed in the study.

Keywords: Competitiveness, Pharmaceutical Industry, Porter's Diamond.

JEL codes: M16, O14, F23.

Introduction

The pharmaceutical industry is characterized by its size, its high growth (Pignarre, 2005), the globalization of its supply chain (Dhanaraj and Parkhe, 2006) and its intensive innovation (Gambardella, Orsenigo and Pammolli, 2001; Pattikawa, 2007). Nowadays it is a sector immersed in a reinventing process. Thus, financial aid for innovation, commercial alliance management, development and consolidation of clusters, support models in developing countries, and legal aspects both national and international, among others, are very important (Deloitte, 2006, Ketelhohn and Renko, 2002). It is obvious that the pharmaceutical industry represents a sector of

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strategic growth to many countries for its ability to innovate, and to create wealth and social development (The Allen Consulting Group, 2006).

From an historical perspective, the pharmaceutical industry has suffered an enormous reorganization since the decade of the 80's. According to Brännback, Hyvönen, Raunio, Renko and Sutinen (2001) and The Allen Consulting Group (2006), the pharmaceutical industry leads nowadays the development of biotechnology applications, a fact that, together with Research and Development (R&D) of medicines, has confirmed a new paradigm. Although the pharmaceutical industry worldwide is controlled by big multinational firms like Pfizer, GlaxoSmithKline and Novartis (Jiang, 2005), these firms have strategic alliances with smaller firms, that provide them with raw materials, product packing, distribution, quality control, general and specialized production and marketing services (Dunning, 1981; Gilbert and Rosenberg, 2004; and Corstjens, 1991), in order to reduce operational and administrative costs (Wiklund and Shepherd, 2009) and to improve their competitiveness (Pignarre, 2005; Taggart, 1993).

Some authors have indicated the necessity to establish which ones are the decisive factors of the competitiveness in this industry (Chen, 2006; Navarro Espigares and Hernández Torres, 2007; The Allen Consulting Group, 2006; GlaxoSmithKline, 2004). Although some of these studies have submitted findings about these decisive factors of the competitiveness in the pharmaceutical industry, none provide a comprehensive point of view. Most of the studies tackle particular requests in specific contexts, rather than making overall or international studies. For example, Chen (2006) established that some decisive factors of the competitiveness are scientific research, technological innovation, availability, the quality of the university education and the strategic alliances between firms. For its part, GlaxoSmithKline (2004), pointed out that some of the factors associated with the level of competitiveness are regulatory conditions, a strong legal framework for intellectual property, the provision of an attractive fiscal and economic climate, the availability of specialized capital, the relationship between industry and government and the access to skills, science quality and clinical research.

Nowadays, the pharmaceutical industry is part of a system or networks that involves a great variety of agents: different types of firms, research organizations like universities and centers of public and private research, regulatory authorities, governments, health care systems and doctors, among others (Byrne, 1993; David and Grindley, 1998; Franque, 1999). These agents join through a network of relationships of different kinds of organizations, suggesting that the competitiveness of the industry is not only seen in terms of individual firms but also in terms of a bigger group of factors. For this reason, it is essential to identify the factors that determine their competitiveness.

Theoretical Basics

The economic theory and other studies about the question of locating direct foreign investment suggest that the main reason for a company to invest in a foreign

country is that the investment's rate of return in the chosen location exceeds the estimated rate of return in competing locations (Ricardo, 1817; Dunning, 1993). This means that, in general, the company invests abroad to get access to: (1) low-cost locations, (2) resources and specialized skills, and (3) market demand (The Allen Consulting Group, 2006).

In general, investment decisions involve a mixture of two kinds of resources: 1) general resources and 2) specific resources. Normally, general resources are those that because of their nature are constant through different locations. On the contrary, specialized resources may change through the locations as well as the tacit knowledge of the trained people. However, in the pharmaceutical industry it is required a mixture of general and specialized factors. For this reason, more complex methods are needed to establish the investment decisions that, at the same time, have an impact on the competitiveness' level.

In the case of investments dominated by specialized resources, investment companies might necessarily focus on characteristics such as availability, quality and productivity of specialized resources. Although costs are important, they are not the main reason of this investment, opposite to investments dominated by general factors. From a point of view of current and potential countries, the investment and the building of the specialized resources' capacity, needed for the industry, are vital to attract and retain the investment (The Allen Consulting Group, 2006).

In this sense, creating attractiveness for foreign investment represents nowadays one of the pharmaceutical industry's main objectives. For that reason, the design, the structure and the initial strategic aspects of any business entity are conditioned (Van Pottelsberghe de la Potterie and Lichtenberg, 2001; Young, Hood and Peters, 1994).

The Pharmaceutical Industry in the Current and International Context

The pharmaceutical industry is dominated by companies of the developed nations (Deloitte, 2006). This power is shown in their intervention in the international market and the development of the innovation. With sales of $170,000 million worldwide (OECD, 2008), the sector keeps a solid growth, specialized by an oligopolic competitiveness of certain particular interests: 23 companies control about 50% of the world market (Brännback, **Hyvönen, Raunio, Renko and Sutinen,** 2001; The Allen Consulting Group, 2006).

Since the decade of the 90's, with pressure to improve their competitiveness, growing flows in FDI are seen in the pharmaceutical sector (Lippoldt, 2006). This, of course, is related to a continuous process of reorganization, mainly in merging and acquisition activities (Ketelhohn, 2002). Mergers and acquisitions between pharmaceutical companies lead to beneficial effects in terms of global competitiveness, being the main ones the reduction of high costs in R&D, the achievement of economies of scale, increasing the capacity of technological transfer (Lee and Mansfield, 1996; Mansfield, 1994), organizational abilities (Ketelhohn, 2002; Robbins Roth, 2000) and market access (Brännback and Renko, 2002). For his part, Fai

(2003) establishes that competitiveness is focus in R&D. This represents 12% of the industry incomes, due to the patent system and the marketing process.

The pharmaceutical industry has structural and functional characteristics that make it different from other sectors in both local and international levels. Some of these characteristic are: a highly fragmented global market (The Allen Consulting Group, 2006), (2) a high dependence on science and technology (Gambardella, Orsenigo and Pammolli, 2001), (3) high profitability with relatively high costs in R&D and marketing strategies (Michels and Jonnard, 1999; Brännback and Renko, 2002), (4) an increase of the commercialization time of new drugs (an increase of the product's life cycle) (Brännback and Renko, 2002), (5) direct link between the discovery of potentially effective medicines and the protection of the patent (Lippoldt, 2006), (6) cutting products' prices by 60% to 90% after expiring the patent protection (OECD, 2008), (7) product demand is determined by interrelationships between patients, doctors, and insurance companies (social security) and chemists (it is linked to changes in medical care patterns) (The Allen Consulting Group, 2006), (8) strong and strict approval processes by national and international control institutions (like Food and Drug Administration -FDA) (DiMasi, Hansen and Grabowski 2003), and (9) a tendency to be located near other pharmaceutical companies because a great percentage of the production is commercialized in the same commercial sector (Ketelhohn and Renko, 2002).

Michael Porter's Competitiveness Diamond

Porter made one of the models used to establish the level of competitiveness of a country or an industry (1987, 1991). In his competitiveness diamond, Porter presents 4 specific variables that try to establish the level of competitiveness that can have a country or an industry (Porter, 1998, 2001). The first variable is: factor conditions, it includes natural resources (physical), human resources, capital resources and physical, administrative, scientific and technologic infrastructure, etc. The second variable is: firm strategy, structure and rivalry, it covers firms' structure and rivalry, and reports the existence of a local context that encourages the rivalry based on investment and sustained improvement. The third variable is: demand conditions, sophisticated and demanding clients are taken into account. There are specialized segments that can be served globally and clients whose necessities are ahead the ones of their region and other areas. The last variable is: related and supporting industries, it takes into account the presence of local suppliers and companies in related areas, conglomerates instead of isolated industries.

However, to establish the diamond, two more variables (not so specific) need to be considered, they are explained below (Ketels, 2006; Porter, 1987): the role of the government as a catalyst, it encourages companies to raise their aspirations and move to higher levels of competitive performance, and the role of the chance, referred to the circumstantial and dynamic inherent aspects, and commercial operations. In other words, it studies things that cannot be programmed.

Purpose of the Study

The study's main purpose is to determine which factors have a bearing on the international competitiveness of the pharmaceutical sector, using data provided by Global Competitiveness Index from the Global Competitiveness Report and operationalized in Porter's Competitiveness Diamond Model. There are the following specific purposes:

- To establish which countries have a high level, a medium lever or a low level of competitiveness in the pharmaceutical industry (including main FDI recipients' countries).
- To know and to analyze the competitiveness of the pharmaceutical sector in these countries based on Global Competitiveness Index from the Global Competitiveness Reports 2001-2002, 2004-2005 y 2007-2008.
- To establish determinant factors in the location and the international competitiveness in the pharmaceutical industry.
- To establish if Michael Porter's competitiveness model can explain the level of competitiveness of the pharmaceutical industry and how.

Study's Hypothesis

Literature revision suggests that there are factors that can determine the level of competitiveness of the pharmaceutical industry (Chen, 2006; Navarro Espigares and Hernández Torres, 2007; The Allen Consulting Group, 2006; GlaxoSmithKline, 2004). According to Porter (1991), and his Competitiveness Diamond, the level of competitiveness of a country can be determined analyzing the following factors: factor conditions, related and supporting industries, demand conditions, firm strategy, structure and rivalry, and the government. For the purpose of this study, these factors were operationalized using variables presented in the World Competitiveness Report.

Factor Conditions. Some authors have established that physical, human and capital resources, that physical, administrative, scientific and technologic infrastructure and R&D, among others factors, play a significant role in competitiveness and location of the pharmaceutical industry (Jiang, 2005; Lewis, Bramley-Harker and Farahnik, 2007). Since the biotechnological revolution, the competitiveness of this sector has been left to industry capacity to acquire new technological, administrative, human, research and innovation resources (Brännback and Renko, 2002).Next identified variables on the World Competitiveness Report are linked to factor conditions of the pharmaceutical industry: quality of overall infrastructure, quality of port infrastructure, fixed telephone lines, quality of management schools, co-operation in labor-employer relations, hiring and firing practices, pay and productivity, reliance on professional management, financial market development, ease of access to loans, soundness of banks, availability of latest technologies, capacity for innovation, avail-

ability for scientists and engineers, willingness to delegate authority and brain drain.

Therefore, the following hypothesis can be assumed:

H1: Factor conditions of a country have influence in its pharmaceutical industry competitiveness.

Related and Supporting Industries. In the pharmaceutical industry, strategic alliances (such as, clusters conformations) and production and other services' outsourcing are important to maintain and increase the competitiveness in the pharmaceutical sector (The Allen Consulting Group, 2006). According to literature, following indicators indexed in the World Competitiveness Report operationalize the related and supporting industries' variable: quantity of local suppliers, quality of local suppliers, state of cluster development, university-industry collaboration in R&D, quality of scientific research institutions, local availability of specialized research and training services.

In this sense, related and supporting industries of Porter's Competitiveness Diamond Model (2001) are an analysis key-factor about the competitiveness of the pharmaceutical industry. Therefore, the following hypothesis is considered:

H2: Related and supporting industries of a country have influence in its pharmaceutical industry competitiveness.

Demand Conditions. The competitiveness of any industry is established by the quality and the quantity of the company products' demand (Porter, 2001). The quantity of the medicines can be referred as a demand equivalent worldwide, but quality is mainly measured in relation to acquisition capacities of potential clients, being those companies or individuals (Pignarre, 2005). According to the latter point demand conditions play a significant role in the competitiveness of the pharmaceutical industry (Cantwell and Piscitello, 2000). From the variable demand conditions were identified these indicators: extent of market dominance, venture capital availability, buyer sophistication, degree of customer orientation: Therefore, the next hypothesis is established:

H3: Demand Conditions of a country have influence in its pharmaceutical industry competitiveness.

Firm Strategy, Structure and Rivalry. In relation to the strategy, structure and rivalry variable are considered the next indicators: firm-level technology absorption, intensity of local competition, sophisticated production processes, control of international distribution, nature of competitive advantage, extent of marketing, company expending on R&D, efficacy of corporate boards.

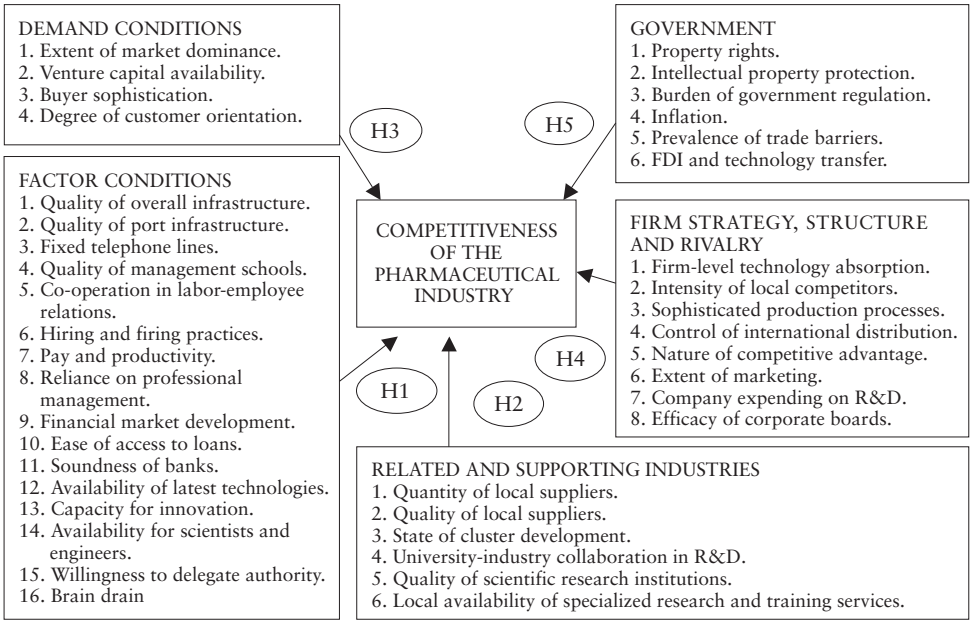
Therefore, the next hypothesis is established:

H4: Firm strategy, structure and rivalry of countries have influence in their pharmaceutical industry competitiveness.

Government. Different strategies, structures and features of the companies could not be developed in a proper economic way without the underlying context that promotes that development and progress. For this reason, the quality of the relations between the government and the industries is a key-factor for the competitiveness of any company (Indacochea, 2000). In the pharmaceutical sector these associations are translated in medicaments regulation, public funding, fixing prices, support of competitiveness culture, long-term plans, provide legal certainty, accept innovation and manage patents properly (The Allen Consulting Group, 2006). The following concepts are indicators of the Government's variable: Property rights, intellectual property protection, burden of government regulation, inflation, prevalence of trade barriers and FDI and technology transfer. Therefore, the next hypothesis is established:

H5: Governments have influence in the competitiveness of the pharmaceutical industry.

Figure 1. Conceptual framework



Methodology

To identify the factors that operationalize in Porter's Competitiveness Diamond Model, 99 variables presented by the Global Competitiveness Report 2001-2002 (World Economic Forum, 2002, p. 75) were analyzed. Revising the literature, 53

variables were identified as determinant in the level of competitiveness of the pharmaceutical industry. These variables were related with each one of the Competitiveness Diamond's variables to obtain the study's conceptual framework.

A non probabilistic sample of 36 countries (high, medium and low level of competitiveness in the pharmaceutical industry) was created. This sample was created from the UN Comtrade database (2008), from it were obtained exports of pharmaceutical products of the years 2001, 2004 and 2007. To establish their level of competitiveness they were classified as follows: Countries with a high level of competitiveness (exports value ≥ $10 bn); countries with a medium level of competitiveness (exports value < $10bn and $1 bn), and countries with a low level competitiveness countries (exports value < $1bn).

Countries classified as having a high level of competitiveness in the pharmaceutical industry are: Germany, Belgium, the United States, France, Ireland, Italy, Netherlands, the United Kingdom, Switzerland and Puerto Rico. Countries classified as having a medium level of competitiveness are: Spain, Sweden, Denmark, Canada, Austria, Singapore, India, Israel, Australia, Japan, Hungary, China, Slovenia, Mexico, Greece, Poland, and Czech Republic. Countries classified as having a low level of competitiveness are: Hong Kong, Finland, Brazil, Norway, Republic of Korea, Portugal, Argentina, Jordan and Turkey.

Were considered as independent variables the variables associated to each one of the five dimensions of the Porter Diamond. The level of international competitiveness (high, medium and low level of competitiveness) in the pharmaceutical industry was considered a dependent factor.

To determine the relations between competitiveness variables of the Global Competitiveness Reports 2001-2002, 2004-2005 and 2007-2008 of the World Economic Forum (2002, 2004, 2007) and decisive factors of the competitiveness of the pharmaceutical industry in countries taken for the analysis (countries with high, medium and low levels of competitiveness in this sector), it was used a discriminant analysis to examine the information (Guisande González, Barreriro Felpeto, Maneiro Estraviz, Riveiro Alarcón, Vergara Castaño and Vaamonde Liste, 2006).

Data Analysis

Competitiveness indexes of the Competitiveness Reports 2001-2002, 2004-2005 and 2007-2008 were used in each one of the variables identified in our analysis. Due to our interest in researching the factors that have an impact in the competitiveness of the pharmaceutical industry, we have chosen the discriminant analysis. Although using other statistical techniques, like multiple regression, may be more appropriate given that variables are measured by intervals, a test of the correlation matrix for the group of independent variable showed a high multicollinearity in data. This result strengthened our decision of using a discriminant analysis (like the analytical method) because the multicollinearity does not affect the interpretation of the discriminant analysis' results (Eisenbeis, 1977, Ramanujam, Venkatraman and Camil-

lus, 1986). Therefore, discriminant analyses were carried out between groups of countries (with high, medium and low levels of competitiveness in the pharmaceutical industry). Each year was studied separately (2001, 2004 and 2007) to sort out if variables: factors conditions, related and supporting industries, structure and government, are decisive for international competitiveness in the pharmaceutical company.

Finally, statistical results were assessed from the basics of Porter's Competitiveness Diamond Model to observe to what extent this model can explain the international competitiveness in the pharmaceutical industry.

Before executing the discriminant analysis, the statistical Kolmogorov-Smirnov test and the Box's M test were carried on to prove the applicability of the discriminant analysis for the data group, in relation to the assumptions of multivariate normality and equality of the group or the population covariance matrices, respectively (Hair, Anderson, Black and Tatham, 1999).

The dependent variable, as well as independent variables with their respective operationalization, are shown in the following chart.

Table 1. Independent and Dependent Variables

INDEPENDENT FACTOR	DEPENDENT FACTOR
Factor conditions (16 variables) Related and supporting industries (6 variables) Demand conditions (4 variables) Firm structure, strategy and rivalry (8 variables) Government (6 variables)	Competitiveness' level

All dependent variables were analyzed during the three-year study. Tolerance tests were carried on before going through the discriminant analysis. As shown in chart 1, factor conditions were operationalized with 16 variables, related supporting industries with 6 variables, firm structure, strategy and rivalry with 8 variables and the government with 6 variables. A tolerance test was carried on these variables, all the variables that define the constructs' factor conditions, supporting industries, demand conditions and firm structure, strategy and rivalry, passed the test. In other words, these given factors are taken into consideration in the discriminant analysis because they provide with significant information to the creation of the group of countries and consequently discriminant functions. Only factors that define the government's construct fail the tolerance test (minimum tolerance limit=0.001). So, the government variable does not affect the competitiveness of the pharmaceutical industry. This implies that H1, H2, H3 and H4 are not rejected. On the other hand, H5 is rejected.

Of 40 variables analyzed, and along the three-year study, 32 of them passed the tolerance test (minimum tolerance limit=0.001). In this sense, the 32 analyzed vari-

ables are introduced simultaneously countries group discrimination, representing discriminant variable among them.

Analysis' results are reported in charts 2, 3 and 4. These charts include statistics that show the quality of the discriminant function obtained. The above statistics are Eigenvalues, Canonical Correlation and Wilk's Lambda.

Table 2. Discriminant Analysis' Results (Data 2001)

Function	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi-square	Significance level
1	31.750	.985	.006	85.529	.037
2	4.445	.904	.184	27.962	.623

Table 3. Discriminant Analysis' Results (Data 2004)

Function	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi-square	Significance level
1	18.946	.975	.004	91.425	.014
2	11.780	.960	.078	42.040	.089

Table 4. Discriminant Analysis' Results (Data 2007)

Function	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi-square	Significance level
1	45.002	.989	.002	106.410	.001
2	10.367	.955	.088	41.322	.125

Eigenvalue is 37.750 (2001), 18.946 (2004) and 45.002 (2007), this indicates the good quality of the discriminant power of the selected variables. The canonical correlation coefficient is, in both groups' cases, identical to the "Pearson product-moment correlation". These coefficients are a second sign that proves the quality of the discriminant purpose obtained. Wilk's Lambda test was also taken into consideration. Lambda values that are near zero denote a high level of discrimination, according to the low's Lambda values: .006 (2001); .004 (2004) and .002 (2007). They are a third sign of the quality of the discriminant function obtained.

Thus, the following discrimination of different countries according to their membership to the high, medium and low level of competitiveness' group was obtained from discriminant canonic function. They were obtained from variables of the Glob-

al Competitiveness Reports 2001-2002, 2004-2005 and 2007-2008 and were considered for the dimensions of Porter's Competitiveness Diamond Model.

In interpretative terms, this means that factor conditions' dimensions, supporting industries, market demand and firm strategy, structure and rivalry represent an adequate discrimination's application in relation to the level of competitiveness of the pharmaceutical industry in the studied countries. In particular, the following variables are determinant to the competitiveness of the pharmaceutical industry: quality of overall infrastructure, quality of port infrastructure, fixed telephone lines, quality of management schools, co-operation in labor-employer relations, hiring and firing practices, pay and productivity, reliance on professional management, financial market development, ease of access to loans, soundness of banks, availability of latest technologies, capacity for innovation, availability for scientists and engineers, willingness to delegate authority and brain drain, quantity of local suppliers, quality of local suppliers, state of cluster development, university-industry collaboration in R&D, quality of scientific research institutions, local availability of specialized research and training services, Extent of market dominance, venture capital availability, buyer sophistication, degree of customer orientation, firm-level technology absorption, intensity of local competition, production process sophistication, control of international distribution, nature of competitive advantage and extent of marketing.

Conclusions and Recommendations

The purpose of this study was to study determinant factors for the competitiveness of the international pharmaceutical industry. This study's main difference from other similar studies was that it tested empirically 35 variables that were related, at the same time, with Michael Porter's Competitiveness Diamond. Therefore, the study makes progress in understanding the competitive nature of this industry and how it affects countries that want to attract its investment. Results suggest that international pharmaceutical firms take into account a country's factor conditions above any other competitiveness' variable. These results are supported by Dunning (1998) and Taggart (1973). On the other hand, factors linked to the government, like property rights, intellectual property protection, burden of government regulation, inflation, prevalence of trade barriers, FDI and technology transfer, do not affect the competitiveness of countries who want to attract pharmaceutical's industry investment.

The pharmaceutical industry is one of the most geographically diversified sectors in terms of its subsidiaries' location (OECD, 2005). Is very likely that pharmaceutical companies will continue with their internationalization and also they will try to capitalize new market opportunities around the world. In this context, one can expect a higher level of deepening and geographic diversity of FDI while firms try to get benefits for being located around the world, to reduce costs or get a strategic position.

As we saw in this study, the best factor to establish the attractiveness of a region is a location that has all the elements of the pharmaceutical industry's value chain. Nevertheless, these study's results may give a clue to governments for creating an attractive investment climate. It is important to acknowledge that in the last decade there has been an enormous progress concerning countries that want to attract pharmaceutical's direct investment and the reorganization of the above firms to be more competitive (Gambardella, Orsenigo and Pammolli, 2001). To conclude, countries who want to improve their competitiveness in this sector must (1) improve scientific research; (2) favor the integration of scientific and industrial research; (3) strengthen research and development areas and (4) strengthen markets' competence in an integrated environment.

References

BRÄNNBACK, M., HYVÖNEN, P., RAUNIO, H., RENKO, M. and SUTINEN, R. (2001). Finnish Pharma Cluster-Vision 2010. Target Programme initiated by the Finnish Pharma Cluster. *Technology Review, 122*.

BYRNE, J. A. (1993). The virtual corporation. *Business Week, 8*, 36-40.

CANTWELL, J. A. and VERTOVA, G. (2004). Historical evolution of technological diversification. *Research Policy, 33* (3), 511-529.

CHEN, K. (2006). *Biotechnology Cluster Analysis across Metropolitan Areas in the United States*. Tesis doctoral, Universidad de Cincinnati, Ohio, EE. UU.

CORSTJENS, M. (1991). *Marketing Strategy in the Pharmaceutical Industry*. Londres: Chapman & Hall.

DAVID, C. and GRINDLEY, J. (1998). When the ink dries on research alliances. *Scrip Magazine*, 45-47.

DELOITTE (2006). *I Foro de Competitividad de la Industria Farmacéutica (Barcelona)*. Recuperado el 25 de noviembre de 2008. Disponible en: http://www.deloitte.com/dtt/article/0,1002,sid%253D10544%2526cid%253D110939,00.html

DHANARAJ, C. & PARKHE, A. 2006. Orchestrating innovation networks. *Academy of Management Review*, 31:659-669

DIMASI, J. A., HANSEN, R. W. and GRABOWSKI, H. G. (2003). The Price of Innovation: New Estimates of Drug Development Costs. *Journal of Health Economics, 22*, 151-185.

DUNNING, J. H. (1981). *International Production and Multinational Enterprise*. Londres: George Allen and Unwin

FAI, F. (2003). *Corporate technological competence and the evolution of technological diversification*. Cheltenham: Edward Elgar.

FRANKE, U. (1999). The virtual web as a new entrepreneurial approach to network organizations. *Entrepreneurship & Regional Development, 11* (3), 203-230.

GAMBARDELLA, A., ORSENIGO, L. and PAMMOLLI, F. (2001). *Global competitiveness in Pharmaceuticals. A European Perspective*. Enterprise Paper, 1. Luxemburgo: Enterprise Directorate-General of the European Commission

GILBERT, J. and ROSENBERG, P. (2004, enero). *Addressing the Innovation Divide: Imbalanced Innovation*. Annual Meeting 2004 Governors of the World Economic Forum for Healthcare, Davos, Suiza.

GLAXOSMITHKLINE (2004). *Competitiveness and Investment Criteria*. Londres: GlaxoSmithKline Briefings

GUISANDE GONZÁLEZ, C., BARREIRO FELPETO, A., MANEIRO ESTRAVIZ, I., RIVEIRO ALARCÓN, I., VERGARA CASTAÑO, A. R. and VAAMONDE LISTE, A. (2006). *Tratamiento de datos*. España: Ediciones Díaz de Santos.

HAIR, J. F., ANDERSON, R. E., BLACK, W. C. and TATHAM, R. L. (1999). *Análisis multivariante* (5ª ed.). Madrid: Prentice-Hall.

INDACOCHEA, A. C. (2000). La promoción-país y el desarrollo de las ventajas competitivas: un nuevo rol del Estado para la descentralización del país. En: B. BOZA (Ed.), *El rol del Estado en la labor de promoción-país: hacia una auditoria académica de PromPerú* (pp. 241-264). Lima: PromPerú.

JIANG, F. (2005). Driving Forces of International Pharmaceutical Firms' FDI into China. *Journal of Business Strategies, 22* (1), 21-39.

KETELHOHN, N. W. (2002). *The Role of Clusters as Sources of Dinamic Externalities*. Tesis doctoral, Universidad de Harvard, Ann Arbor, EE.UU

KETELS, C. H. M. (2006). Michael Porter's Competitiveness Framework-Recent Learnings and New Research Priorities. *Journal of Industry, Competition and Trade, 6* (2), 115-136.

LEWIS, D., BRAMLEY-HARKER, E. and FARAHNIK, J. (2007). Economic Drivers of Pharmaceutical Investment Location. *World Economics, 8* (3), 171-182.

LIPPOLDT, D. (2006). *Intellectual Property Rights, Pharmaceuticals and Foreign Direct Investment*. Paris: Groupe d'Economie Mondiale de Sciences.

MICHELS, D. and JONNARD, A. (1999). Review of Global Competitiveness in the Pharmaceutical Industry. *Staff Research Study, 25*.

NAVARRO ESPIGARES, J. L. and HERNÁNDEZ TORRES, E. (2007). Industria farmacéutica, competitividad e integración económica en Europa. *Boletín Económico de ICE, 2902*, 49-63.

OECD (2008a). *Intellectual assets and value creation: Synthesis report*. Paris: OECD.

– (2008b). *Pharmaceutical Pricing Policies in a Global Market*. Paris: OECD.

PATTIKAWA, L. H. (2007). *Innovation in the Pharmaceutical Industry. Evidence from Drug Introductions in the U.S.* Tesis doctoral, Universidad Erasmus, Rotterdam, Holanda.

PIGNARRE, P. (2005). *El gran secreto de la industria farmacéutica*. Barcelona: Gedisa Editorial.

PORTER, M. E. (1987). *Estrategias competitivas*. México: CECSA.

– (1991). *La Ventaja competitiva de las naciones*. Barcelona: Plaza y Janés.

– (1998). Los clusters y la economía de la nueva competencia. *Harvard Business Review, 76* (6), 77-90.

– (2001). *Estrategias competitivas: técnicas para el análisis de los sectores industriales y de la competencia*. México DF: Compañía Editorial Continental S.A.
RICARDO, D. (1817). *Principios de economía política y tributación*. México: Fondo de Cultura Económica.
ROBBINS ROTH, C. (2000). *From Alchemy to IPO The Business of Biotechnology*. Cambridge, Massachusetts: Perseus Publishing.
TAGGART, J. (1993). *The world pharmaceutical industry*. Londres: Routledge
THE ALLEN CONSULTING GROUP (2006). *Drivers of Pharmaceutical Industry Investment. Understanding Australia's Competitive Position*. Australia: The Allen Consulting Group.
UN COMTRADE (2008a). *Data Query*. Recuperado el 20 de noviembre de 2008. Disponible en: http://comtrade.un.org/db/ce/ceSearch.aspx?it=pharmaceutical+products&rg=2&r=842&p=0&y=2007&px=H3
– (2008b). *Export all commodities*. Recuperado el 13 de enero de 2009. Disponible en: http://comtrade.un.org/db/mr/daCommoditiesResults.aspx?px=H3&cc=TOTAL
VAN POTTELSBERGHE DE LA POTTERIE, B. and LICHTENBERG, F. (2001). Does foreign direct investment transfer technology across borders. *Review of Economics and Statistics, 83* (3), 490-497.
WORLD ECONOMIC FORUM (2002). *The Global Competitiveness Report 2001-2002*. Nueva York: Oxford University Press.
– (2004). *The Global Competitiveness Report 2004-2005*. Nueva York: Palgrave Macmillan.
– (2007). *The Global Competitiveness Report 2007-2008*. Nueva York: Palgrave Macmillan.
– (2008). *The Global Competitiveness Report*. Recuperado el 20 de diciembre de 2008. Disponible en: http://www.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm
WIKLUND, J. and SHEPHERD, D. A. (2009). The Effectiveness of Alliances and Acquisitions: The Role of Resource Combination Activities. *Entrepreneurship Theory and Practice, 33* (1), 193-212.
YOUNG, S., HOOD, N. and PETERS, E. (1994). Multinational enterprises and regional economic development. *Regional Studies, 28* (7), 657-677.

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