

## **The Role of Technological Innovation in the Successful Trajectory of Multinational Companies from Latin America**

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### **Abstract**

This paper presents and discusses the emergence of multinational companies from Latin American countries, the so-called Multilatinas, and suggests that technological innovation is mainly responsible for their capacity to compete globally. Using the OECD classification of industrial sectors by technological intensity, we show examples of eight successful companies that incorporated technological innovation into their products and processes. We also suggest a relationship between the presence of a growing number of multinational firms from some Latin American countries and a strong support of R&D activities by their governments. As latecomers, these companies have grown in their domestic markets prior to taking risks in the international arena, and this growth was assisted by Science and Technology public policies.

Traditional companies from developed countries expanded globally after World War II, to take advantage of their financial, technological and managerial resources, looking for new markets to settle subsidiaries. In Latin America, there was a “marriage of interests” between this strategy and the industrial policy adopted in most of the countries, which gave priority to import substitution that later resulted in foreign prevalence in the most dynamic industrial sectors. Instead of exporting products, developed countries multinationals started to manufacture them in Latin America. The integration of developing countries in the production networks of MNCs had a significant role on exports growth, besides technological learning.

Latin American companies, in general, do not possess specific advantages in high-tech industries or in capital intensive sectors. The disadvantage partly results from the initial model of industrial development, the low rate of accumulation of physical and human capital, but also from short-sighted public policies, especially those focused on education, industry, and research and development. All these factors led to a low productivity level of production factors and lower innovation capacity. Latin American countries relied on large domestic markets and laws that protected domestic companies.

Technological innovation is one of the topics that stand out in the literature on the internationalization of companies. Presently, there is a group of Multilatinas which are setting subsidiaries abroad, due to their innovative capacities, and we examine the role of technological innovation on their global competitiveness. We present case studies of the companies Cemex and América Móvil (Mexican), Sonda and Viña Concha y Toro (Chilean), Tenaris (Argentinean), Petrobras and Marcopolo (Brazilian), to illustrate our assumptions.

**Key-words:** Latin American countries, multinational companies, technological innovation, internationalization

## Introduction

This paper examines the emergence of multinational companies from Latin American countries, the so-called Multilatinas (SANTISO, 2007; CUERVO-CAZURRA, 2008), and their rising relevance in the global trade. Since the 1970's, firms from developing countries started their way into foreign markets, but in Latin America, this movement took impulse only in the 1990s, with the liberalization of most of the countries' economies, except for Chile, which opened up its economy in 1975.

In previous years, Latin American countries adopted import substitution strategies, attracting multinational companies from advanced countries to set up subsidiaries, which imported parts and components to be manufactured in Latin America, and this was the main route for technological learning, even though it resulted in a foreign prevalence in the most dynamic industrial sectors. In the 1990 decade, economic liberalization stimulated and even compelled national firms to improve products and processes in order to meet global standards. At the beginning, only a few achieved a level of international excellence, but this number has grown substantially in the last 20 years. They challenge traditional models, especially because of countries' *institutional voids*, which represent a strong constraint on firms' competitiveness.

We also examine the role of technological innovation on Multilatinas' enhanced capacity to act globally, once it is one of the topics that stand out in the literature on the internationalization of companies. MNCs from developed countries spread throughout the world to take advantage of their innovative products, which gave them competitiveness.

Inward foreign direct investment (FDI) played a relevant role in the process of economic change and growth in many developing countries, in the past three decades. The arrival of capital, technology and managerial capacity from industrialized countries benefitted emerging markets, increasing their productivity and the levels of employment and income, in addition to the effects of *learning-by-doing* on local suppliers. Hence, in a short time, some local companies accumulated capital and knowledge, which allowed them to invest abroad, becoming "emerging multinationals" (NARULA & ZANFEI, 2005).

When competing with foreign MNCs in the domestic market, emerging countries' firms develop capabilities, experience and confidence to compete with the same MNCs anywhere. This may explain why countries that successfully attracted FDI (China and India, in Asia, Brazil and Chile in Latin America) increased their investments abroad. Apparently, foreign investment stimulated or helped them accelerate the reverse process (LUO & TUNG, 2007).

We argue that there is a strong relation between internationalization and technological innovation in multinationals from emerging economies. We base our proposition on the experience of Latin American companies, using the OECD classification of technological intensity to group the sample of seven firms whose innovation efforts are presented.

The following section presents a review of the literature, emphasizing the importance of Latin American companies' internationalization and exploring several dimensions of firms' technological efforts to gain competitive advantage and become transnational companies. We present the methodology, describing the data sources utilized both for the internationalization process of companies and for the practices involving innovation. Results suggest that additional research is still needed to deepen knowledge about this phenomenon that turns to be extremely relevant for the development of Latin American international businesses.

## Literature Review

### Multinationals: Traditional, Emergent and Multilatinas

There were three major waves of globalization after World War II: the first was dominated by Europe and the United States, until the 1970s. Large companies expanded throughout the world, in search of new markets for their products, in a movement of export substitution, establishing industrial units in other central countries and in some of the most promising peripheral ones, profiting from technological innovations developed in their home countries, extending the products' life cycle. Until then, they used to set sales and technical assistance offices in developing countries, to where they exported products, but these countries had started import substitution strategies, planned and organized by public policies. Instead of importing end consumer goods, local production of these goods was encouraged, by importing equipment and machinery, and attracting foreign investment through multinational companies. The goal was to rapidly repeat, in different historical conditions, the industrialization experience of developed countries (TAVARES, 1982). A good side effect was to integrate emerging countries in the production networks of multinational companies, thus increasing exports and providing technological learning.

The second wave was led by Japan and the Asian Tigers, extending to the late 80's. And the third wave is represented by BRIC (Brazil, Russia, India and China) and some Latin American countries. The first generation of multinational companies from emerging countries appeared in the context of import substitution strategies (the 1970s), operating in an environment protected by high tariffs, with limited resources, and adapting products to local conditions, in labor intensive processes whose main objective was to gain markets and production efficiency (DUNNING, 1988, 1994), and investments were directed to neighbor developing countries. This movement originated predominantly in Latin America - Argentina, Mexico, Chile, Brazil, Colombia and Venezuela (GAMMELTOFT, 2008). At first, subsidiaries abroad intended to establish partnerships with their customers, staying close to adjust products, to provide technical assistance and logistics support, thus ensuring export channels for their products.

The second wave of internationalization was stimulated by a combination of factors "pull and push" (attracting foreign firms and encouraging the exit of local firms), whose major goal was to obtain strategic assets, hence the existence of investments in both developing and developed countries, outside their neighborhood. This phase began in the 80's and was dominated by multinationals from Asian Tigers - South Korea, Taiwan, Hong Kong and Singapore - soon followed by companies from Malaysia, Thailand, China, India and the Philippines (MINDA, 2008). Investments from these countries abroad were more significant than those from first-generation emerging countries' MNCs, and were targeted to more technologically sophisticated sectors (CHUDNOVSKY & LÓPEZ, 2000).

The second generation of Latin American MNCs came up with economic liberalization. Dawar & Frost (1999) observed that there were three typical responses of companies to this situation – to ask the government for help, to become a partner subordinate to a foreign multinational, or to be acquired by a MNC. Economic liberalization played a key role in stimulating internationalization, by modifying the environmental conditions, requiring increased competitiveness. Many state enterprises, which had consolidated under government protection, were privatized, and were capable to compete abroad. In Latin America, Chile was the first country where this occurred, in 1975, and then spread across the continent.

Economic opening changed the profile of the largest companies in Latin America. Between 1991 and 2001, the number of state enterprises dropped from 20% to less than 9%, and foreign multinationals grew from 27% to 39%. This increased competition put pressure on local firms, and the most dynamic sought other markets, some settling in other parts of the continent, such as Mercosur and the Andean zone, while others sought emerging markets in Africa and Asia, or even in OECD countries, especially the United States (SANTISO, 2007). Currently, the third generation of emerging countries MNCs consists of firms that stand out in an environment of global competition, contending with other MNCs in emerging and also in developed countries, and threatening established global competitors.

Latin American companies do not possess the specific advantages of Asian multinationals in high-tech industries or in capital intensive sectors. The disadvantage partly results from the initial model of industrial development, the low rate of accumulation of physical and human capital, but also from short-sighted policies, especially those focused on education, industry, and R&D. These factors led to low productivity levels and lower innovation capacity (MINDA, 2008), and countries relied on large domestic markets and protective laws.

Also relevant are institutional constraints or voids, such as lack of legal protection for property rights, poor enforcement of commercial laws, non-transparent judicial and litigation systems, inefficient market intermediaries, political instability, unpredictable regulatory changes, government interference, bureaucracy, and corruption in public service and government sectors. Regardless of the skills and networks used by the companies to handle these constraints, they are costly and hinder their competitiveness (LUO & TUNG, 2007).

The success of some Asian countries is the result of consistent and targeted government policies that aim at strengthening innovation and knowledge influx. Strategic investments were made in human resources, in the development of R&D infrastructure (technology parks, incubators, government laboratories) and in protecting intellectual property. The lack of similar policies in Latin America explains the low proportion of companies in high technology industries (CHUDNOVSKY & LÓPEZ, 2000). However, Brazilian, Mexican, Chilean and Argentinean companies are gradually gaining international prominence and their evolution deserves the attention of scholars in the field of international business.

Research conducted with Brazilian multinationals disclose some reasons for international expansion (VALOR ECONÓMICO, 2008, 2009; ROCHA, SILVA & CARNEIRO, 2007), including the desire for growth; the reduction of government contracts; globalization of their industrial sector; installation of distribution centers to support export activities; to follow clients in international markets; access to raw materials, distribution channels, technology, cheap capital; to monitor competition in international markets; to seek economies of scale; saturation of the internal market; and institutional voids in the country of origin.

Companies internationalize motivated by the search for one or more factors: natural resources, markets, production efficiency, and strategic assets (DUNNING, 1994). In the last case, it means acquiring a set of skills which will lead to a greater competitive advantage in those markets, through product innovation and new distribution channels. The relevant issue regarding emerging countries' firms is that they internationalize, under globalization, in order to build advantages, to seek resources and capabilities (strategic assets), and not to exploit them – in a reverse movement to traditional MNCs (BONAGLIA & GOLDSTEIN, 2007).

Currently, the sequence of internationalization, according to which firms first export, then settle in other countries, following an incremental process, was virtually abandoned. In some sectors, the high cost of innovation, coupled with short product life cycles and the many skills needed to launch new products, has driven companies to internationalize rapidly. Others seek to increase their assets in several countries, without previous experience in exploiting their resources and capabilities in the international market (NARULA, 2006). Table 1 summarizes the main differences about the generations of MNCs in emerging countries.

**Table 1. Classical and recent theories on emerging countries' MNCs**

Unit of analysis	Third World MNCs (1970-1980)	Emerging countries MNCs (1990s)
Decision options	Exports or FDI	Exports, FDI, <i>joint ventures</i> , strategic alliances
Sources of competitive advantage	Strong. Tangible assets; experience with a big domestic market	Weak. Need to enhance resources. Intangible assets (networks), entrepreneurial capacity
Descriptive and explanatory models	Internalization; eclectic paradigm; Uppsala model	Internalization, value-added chain; "leapfrog" effect
FDI direction	Less developed countries	Less, equal or more developed countries
Reasons for FDI	Internalization; protection of markets previously served by exports (import substitution on target market)	Learning/future competence building; exploration of international opportunities; small domestic market
FDI location	Less developed countries that are geographically close	"Psychologically close" countries; countries in the same region or commercial block; less, equal or more developed countries
Reasons to invest in near countries	Risk aversion	Psychic distance; risk aversion; opportunities created by regionalization
Speed of internationalization	Slow, gradual	Fast
Political capability	Weak. Used to stable political environments	Strong. Used to unstable political environments
Traditional modes of entry	Internal growth: subsidiaries	External growth: alliances and acquisitions
Organizational adaptability	Low, due to strong structure and culture	High, due to weak international presence

Source: based on Costin and Herken, 2006; Guillén and García-Canal, 2009

Several publications rank the largest multinationals according to sales volume. Boston Consulting Group (BCG) has been publishing annual reports on the *100 New Global Challengers* since 2006. These companies are local champions (revenues above US\$ 1 billion), situated in fast growing countries, which are globalizing their businesses and confronting the established leaders in several industries. These rankings do not include banks and financial services firms. Table 2 compares data from the three published reports (2006, 2008, 2009), where Latin American countries are poorly represented.

**Table 2. Number of Latin American companies in BCG rankings**

	2006	2008	2009
Brazil	12	13	14
Mexico	6	7	7
Chile		1	2
Argentina		1	1

Source: BCG *100 New Global Challengers*

The *FT Global 500* (2009) lists nine Brazilian companies, three Mexican, two Chilean and one from Argentina. In the Forbes ranking (*The Global 2000*, 2009), there were 30 Brazilian firms against 18 Mexican, 8 Chilean, three Colombian, two Peruvian and two from Venezuela.

While these figures are still small, the number of Multilatinas increased sixfold from 1991 to 2005, from about 500 to nearly 3000 companies. Their relative importance has also increased from 1.5% to almost 4% of all MNCs (CUERVO-CAZURRA, 2007). Several companies compete for leadership in the oil and gas, mining, cement, steel, food and beverages industries. There are also companies working in new sectors such as software, petrochemicals and biofuels. Medium companies also become international, but do not appear in the rankings.

Since 2008, magazine *America Economía* publishes a list of the main Multilatinas, based on their globalization degree, which is made of five variables – assets, employments and sales abroad in relation to total numbers, besides geographic coverage and the potential for international growth. In the first list, there were 50 companies, of which 19 were Brazilian, 12 Mexican, 8 Chilean and 3 Argentinean. In 2009, the list had 60 firms – 25 Brazilian, 13 Mexican, 12 Chilean and 3 Argentinean. The largest Multilatinas are Mexican and Brazilian. Brazil has the highest FDI value, and concentrates 40% of all stock of FDI from the region.

### **Innovation, Internationalization and Multilatinas**

Authors like Dunning (1994, 1996), Lall (1983) and Tolentino (1993) explicitly refer to the influence of technological capabilities on the globalization process of emerging countries' MNCs. The importance of technological innovation for countries' economic development has been first recognized by Schumpeter (1985). In 1974, Freeman presented a classification of technological strategies, according to the investment degree on R&D activities, but also related to the importance that the company devotes to innovation, in face of deliberate and systematic processes (FREEMAN & SOETE, 1997). Competitive advantage results from the size or property of assets, but more and more it has been related to the capacity of companies to bring together knowledge, technological capacity and experience to create new products and services, as well as new forms of distribution and supply (TIDD, BESSANT & PAVITT, 2005). International acquisitions help companies obtain knowledge and technology but to sustain a competitive advantage, they need dynamic skills, that are renovated through the innovation (TEECE, PISANO & SHUEN, 1997).

A company goes through many stages in order to innovate and become international. Internationalization is a safe alternative for business growth, allowing companies to be exposed to global standards of products, technologies and management methods, which generate significant returns to their domestic operations. However, Multilatinas (or Translatinas) are globally competitive in intermediate consumer products that rely heavily on natural resources, and do not stand out in the most dynamic and innovative international industries (TAVARES & FERRAZ, 2007). Despite some exceptions, as CEMEX and EMBRAER, most companies have a regional vocation, which partly reflects the production and technological expertise of Latin American economies (MINDA, 2008).

Companies from emerging countries follow a different path from innovating firms of industrialized countries. In those, the accumulation of technological capacity tends to invert the sequence “*innovation-investment-production*”, by following the direction “*production-investment-innovation*” (FIGUEIREDO, 2004). A dynamic insertion of Latin American

countries in the global market will depend more and more on the countries' innovation capacity and on how they take advantage of the increase in technology-intensive goods' trade.

## **Methodology**

We used secondary data on firms' experiences in internationalization and innovation. Regarding Brazilian companies, interviews with firms' executives were used as primary data sources. Literature review was done on the issues *technology* and *internationalization*, and a documental search on national and foreign newspapers, business magazines, dissertations and theses, and several reports, besides research on companies' websites.

## **Innovation Indicators**

Although innovation is considered the basic phenomenon of economic development, there are still no adequate methods to measure it. It is not a linear process – from research to launching a new product in the market. On the contrary, there are links at the several intermediary stages, between the activities carried out within the company, available knowledge and market needs, forming a complex network of interactions (ARCHIBUGI & PIANTA, 1996).

Patent statistics have been traditionally used to measure technological research results, notwithstanding the existing limitations to this approach, especially in Latin American countries, where practice involving the granting of brands and patents is not of general use, as opposed to OECD countries. The utilization of a patent as an innovation indicator is the object of an old discussion. Pavitt (1988) and Archibugi & Pianta (1996) point to differences in the patent process between sectors – in some, patents are more important than in others –; among countries; and between patents of products launched in the market (innovations) and invention patents. Also, not all inventions are patentable, and those that qualify are not always patented.

Most part of the activities linked to innovation in developing countries refers to diffusion, adaptation and improvement of already existing technologies, more than the generation of new technologies (NELSON, 1993). Often, these activities are conducted along with routine tasks, as quality control, product and process engineering, and not in conventional R&D laboratories. Figueiredo (2004) states that a firm's conventional innovation indicators, such as personnel assigned to R&D laboratories, R&D expenditures and number of patents present limitations when applied to emerging countries. This author suggests an alternative metrics, adapted from the studies of Lall (1992) and Bell & Pavitt (1993). This metrics recognizes the distinction between technological capacity to operate and use existing technologies and production systems (routine capacity), and capacity to innovate technologies and technical-organizational systems (innovative capacity). To Figueiredo, one should utilize the broadened perspective of the innovation concept, including the learning efforts: copy, imitation, experimentation, adaptation, development engineering and design.

## **Classification of Innovation Efforts**

We used the Oslo Manual of OECD for definitions. OECD (2007) considers the two central dimensions of innovation indicators: efforts (inputs) and results (products), by classifying the industrial sectors into four main groups, based on the R&D intensity indicator (R&D expenditure/added value or R&D expenditure/production):

- *high technological intensity*: aeronautics and airspace; pharmaceutical, computer equipment and office machines; electronics and telecommunications, medical instruments, optical and precision;
- *medium-high technological intensity*: machines and electrical instruments, automotive vehicles, towing and semi-towing units; chemical products, excluding pharmaceutical; transportation equipment, railway and highway; machines and equipment;
- *medium-low technological intensity*: naval construction; rubber and plastic products; mineral coal; petroleum refined products and nuclear fuels; other non-metallic mineral products; basic metallurgy and metallic products;
- *low technological intensity*: manufacturing, recycling; wood, paper and cellulose; graphic products; food, beverage and tobacco, textile products and articles; leather and shoes.

This classification was used for the evaluation of companies listed in America Economía, in their process of internationalization. We selected seven companies to demonstrate their R&D efforts, independently of their technological intensity.

## **Results: Innovation in Latin American companies**

### **1. Cemex (Mexico): medium-low technological intensity**

Cemex (Cementos Mexicanos) is the third largest company in the industry of construction materials (cement, concrete and aggregates). With sales above US\$ 21 million, more than 60 thousand employees and operations in 56 countries (2008 data), it ranks as 389<sup>th</sup> in Fortune's Global 500 ranking (LUCEA & LESSARD, 2010). It internationalized very successfully, going from the world 28<sup>th</sup> largest cement producer to this position in less than a decade.

Its initial capabilities were constantly renewed, by adding solutions developed for different problems found in the several countries where it operates, from adapting new technologies or managerial techniques learnt from the acquired companies, or through access to inputs that were cheaper and copious in other countries. By investing heavily in automation and information technology (IT), which are mainly responsible for its global success, in 1992 its production costs were the lowest in North America.

It began connecting its factories by designing and deploying a satellite communications system (CemexNet), to avoid Mexico's inconstant and expensive phone service. Their equipment is connected to the network and the "executive information system" (SIE) measures the amount of material used by each one, resulting in a better control over production and costs, and supporting better decisions (BORINI, FLEURY & URBAN, 2009). Cemex expanded through acquisitions and competes on operational excellence, based on strong engineering capabilities and IT, in both emerging and developed economies (LUCEA & LESSARD, 2010). Its Post Merger Integration Process was also enhanced, by best practices of acquired companies, resulting in the *Cemex Way*, a strong organizational innovation.

The company offers innovative products and services for a sustainable, energy-efficient construction industry. Launched in 2001, the Cemex Global Center for Technology and Innovation (GCTI) is based in Switzerland, near Europe's best technology centers and research universities. GCTI develops innovative building solutions and business, focusing on product development, cement process technology, business processes and IT, sustainability, energy and CO<sub>2</sub> emissions' reduction. In addition to GCTI, Cemex has other technical centers,

located in Mexico, United States, Germany and France, which conduct internal R&D and partnerships with academic and industry institutions. Some important innovations that can be mentioned are high insulation concrete forms, self-compacting concrete, porous concrete, rapid-setting concrete, concrete with high acid resistance and antibacterial concrete. Cemex also develops sustainable methods of construction, including the use of industrial byproducts, wastes, and recycled materials. It also works with strategic partners in the energy sector to develop and deploy renewable energy initiatives and to reduce the company's environmental impact.

## **2. América Móvil (Mexico): high technological intensity**

América Móvil is the main mobile phone operator in Latin America, serving more than 140 million cell phones. It was transformed in just over two years, from 2003 to 2005, from a Mexican company with some presence in Central America to the largest telecommunications company in Latin America, through massive acquisitions. It took advantage of the closing of US operators in emerging markets such as AT&T, Bell South and MCI to get above 100 million subscribers in March 2006, compared with 74 million for Telefónica Móviles, its Spanish competitor (AYKUT & GOLDSTEIN, 2007).

At the end of 2008, it operated in 18 countries, and had a total base of 182,7 million subscribers. It was the largest privately held public company in Latin America, with a market value that has grown more than 5 times since 2002. Its competitive advantages are broad coverage, superior quality services, and cutting-edge products. It is Latin America's largest wireless company and, in terms of subscribers, the fifth largest wireless provider in the world. The company's main operations markets are Mexico and Brazil, the two largest economies.

It was created in 2000, as a spin-off of Telmex (Teléfonos de México), one of the largest and most profitable public firms that after privatization, in December 1990, began investing in modern infrastructure, creating a nationwide fiber optic network, extending services to most of the country. In the cell market, Telmex was granted the only nation-wide license to operate. Later, as several multinational companies decided to withdraw from the region due to economic turmoil, América Móvil applied an aggressive strategy to take control over the mobile business in Latin America, with clients in Mexico, Brazil, Argentina, Venezuela, Colombia, Ecuador, El Salvador and Guatemala (MARISCAL & RIVERA, 2005).

In 2007, Mexico accounted for only about one-third of its clients in 16 countries, and wireless penetration in Latin America stood at more than 55%, and it had turned into a strong brand. In an effort to offer the best coverage and service, it has invested considerable resources for providing an extensive wireless voice and data network such as WiMAX throughout Latin America, expanding the customer base while minimizing the amount of infrastructure normally needed to support large markets.

Since its beginning, it has invested 14.5 billion dollars across its operations. SMS (short message service), MMS (multimedia message service), mobile connection, localization services, "info-entertainment", internet access and Blackberry service are some of the wireless voice and data services that America Móvil provides. Technology is the most important driver and enabler for the development of new business models. However, technology developments must be linked to market response and regulatory regimes, which, in turn, can drive or limit opportunities for new services development (SANDY & BOUWMAN, 2006). Latin America has a significant growth rate of internet connectivity, but also some structural and cultural

features that may hamper the development of mobile services. Although they are increasing, Internet penetration is slow, which offers opportunities for mobile data services, due to limited support from Internet channels and portals. And the company is well prepared for it, as shown by the speed and frequency of new products' launching.

### **3. Sonda (Chile): high technological intensity**

Sonda was founded in 1974, in association with Copec (Compañía de Petróleo de Chile). It is the Latin American leader in IT services. Between 1975 and 1980, it represented Digital Equipment Corp. in Chile, which was an important source of learning. In 1978, it won its first outsourcing services contract. And in 1984, Sonda started the internationalization process, opening a subsidiary in Peru, followed by Argentina (1986), Ecuador (1990), Uruguay (1992), Colombia (2000), Brazil (2002), Costa Rica (2003), and Mexico (2004). During this period, it provided different types of services in all these countries, such as systems integration, ERP, banking applications, automation of horse race bets, environment monitoring, traffic control, mobile phone projects, health services, hospital automation, wine industry applications, pension funds, Chilean ID system, and cattle traceability, among others.

In 2006, it made an IPO in Santiago Stock Exchange, and after that, started to grow through acquisitions in other countries. In 2007, Sonda made an important acquisition of Brazilian company Procwork, the main SAP partner in the region. Operations in Chile lost its relative participation in revenues, compared to regional service sales. In 2008, after the purchase of company Red Colombia, 57% of its revenue came from outside Chile. Brazilian operations contributed with 40% of revenue, and 49% of the new services were generated in Brazil. Presently, Sonda has more than 50 offices in nine Latin American countries, and above 5 thousand clients. It has more than 7 thousand professionals and revenue of US\$ 671 million in 2009. Its successful business model is based on long-term relationships and proximity to customers. Its services comprise ([www.sonda.com](http://www.sonda.com)):

IT Services: systems projects and integration, infrastructure support, Data Center, IT outsourcing, IT management and support, specialized consultancy and advice

Applications: software solutions, industry-specific solutions, development of tailor-made software, implementation, support, maintenance and updating of versions

Platforms: servers, PCs, printers, storage and back-up, communications equipment, basic software (data bases, operating systems, etc.)

In 2009, Sonda received an important award for its outstanding trajectory from the Chilean Association of Information Technology Companies. It was the first time that this prize was awarded, and it acknowledges persons and organizations that contribute to industry development, to its internationalization and to its relevance for the country. It recognized Sonda's effort in "stimulating industry and the country growth through the use of technology". The company is still looking for acquisitions of mid-sized IT providers in Brazil, Mexico, and Colombia, expecting that demand in the region will increase at a 7.4% percent annual rate until 2013. Another area of interest is the cloud-computing business.

### **4. Viña Concha y Toro (Chile): low technological intensity**

The wine industry is currently characterized by the competitive performance of companies from latecomer countries such as USA and Australia, and emerging economies like Chile,

Argentina and South Africa, and their emergence can be explained by consistent research efforts (CUSMANO, MORRISON & RABELLOTTI, 2008). The wine industry has always depended on knowledge, but over the last decades, R&D strategies have become critical to success. And it is in these countries that the recent process of technological modernization took off, going beyond R&D and diffusion of oenological knowledge, and involving innovative approaches to markets, branding and business systems as well as large investments in human resources. The focus of research has been on the introduction of new grapes' varieties and on the reduction of variability of output, in order to obtain wines with regular taste and quality, despite the change in climate and soil conditions.

Product differentiation and process upgrading are the crucial points. New grape varieties (such as Carmenere in Chile) or new wine technologies adapted to local conditions can produce distinctive new products for international consumers (GWYNNE, 2006). Also, investing in new technologies (stainless steel tanks able to rigorously control the fermentation process) and transforming the inputs (wine grapes) more effectively into what international markets require. Between 1992 and 1997, Chile was the biggest importer of European wine equipment.

The Chilean industry grew notably over the 1990s, so did the total number of wineries, the largest one being *Viña Concha y Toro*, which is the 9th largest in the world in terms of volume of production (2006 data), and the only one from Latin America. The company has developed a broad portfolio of premium wines through its subsidiaries *Viña Cono Sur*, *Viña Maipo*, and *Trivento Bodegas y Viñedos* (the latter in Argentina), and focuses on market diversification, strong distribution network and investment in innovation. It is the largest wine exporter in Latin America, present in 130 countries, including the US and UK (BIANCHI, 2009).

*Concha y Toro* was founded in 1883, by Don Melchor Concha y Toro, who brought noble grape vines from the region of Bordeaux, France, to plant in the Rio Maipo valley, and hired the French enologist Labouchere to craft his wines. In 1921, *Viña Concha y Toro* changed from a family business to an open company. In 1933, thanks to the financially solid position of the company, it entered the Santiago Stock Exchange, which triggered the internationalization process, with exports starting that same year. The company kept growing, increasing exports and developing new products, by incorporating advanced technology, raising production capacity and modern equipment. In 1994, the company traded shares in New York Stock Exchange, which allowed it to obtain funding to invest in more technology, acquire more vineyards, and develop new product lines. In 1996, the company formed *Trivento Bodegas y Vinedos of Mendoza*, which is now the second largest wine exporter in Argentina.

One of the most ambitious projects in 1997 was the strategic alliance with French winery Barón Philippe de Rothschild, for producing a quality wine equivalent to French Grands Crus Classés, forming *Vina Alma Viva*. As a result, in 1999 *Concha y Toro* was chosen by the magazine *Wine Spectator* as the most important winery in Chile and Argentina. In 2001, it entered the Club des Marques, a congregation of the most prestigious brands of the world, being the only Latin American participant. In its special issue on 2007, the *Wine & Spirits Magazine* acknowledged *Concha y Toro* for its performance during the last 25 years as one of the best wine producers in the world.

### **5. Tenaris (Argentina): medium-low technological intensity**

Tenaris is the leading global manufacturer and supplier of steel pipe products (seamless and welded pipes) and related services for the world's energy industry and other industrial

applications. Its customers include most of the world's leading oil and gas companies as well as engineering companies engaged in constructing oil and gas gathering, transportation and processing facilities. Tenaris began with the formation of Siderca, the sole Argentine producer of seamless steel pipe products, in 1954. It grew organically in Argentina and in the early 1990s began to evolve into a global business through a series of acquisitions in different countries like Mexico, Italy, Venezuela, Brazil, Japan, Canada, Romania, United States and Indonesia. The Tenaris brand name was introduced in 2001 ([www.tenaris.com](http://www.tenaris.com)).

The steel pipe products are manufactured in a wide range of specifications, which vary in diameter, length, thickness, finishing, steel grades, threading and coupling. All products comply with ISO 9001 requirements. For the continuous improvement of its products, Tenaris conducts research in the areas of advanced metallurgy; advanced computer modeling of processes and products; fracture mechanics and structural integrity; full-scale testing of tubular products and premium connections; advanced corrosion testing; nanotechnology; advanced non-destructive testing techniques and optical measurement devices; welding metallurgy and technology.

With the support of four R&D centers - Argentina, Mexico, Italy and Japan – Tenaris can design, test and qualify its tubular products for its customers. The centers collaborate with top universities and research institutions worldwide in basic and applied research. Over 200 scientists and engineers, half of them PhDs or MScs, work in the centers.

#### **6. Petrobras (Brazil): medium-low technological intensity**

In 2009, Petrobras won the *Most Enterprising Exploration Company* and *Project Innovation* categories, of the Petroleum Economist Award, an annual prize granted by Petroleum Economist magazine, one of the most respected publications of the sector. It was the third consecutive time that Petrobras won the prize and, that year, it surpassed 23 competitors. The entrepreneurial award was granted for the determination to overcome the challenges presented by the development of pre-salt. Under the *Projects Innovation* category, Petrobras was recognized for the development of technology to recover extra-heavy oil. Its Research & Development Center, created in 1968, receives 1% of the company's net income and, throughout time, has consolidated itself as the largest research center in Latin America. The technologies developed made Petrobras the largest patent generator Brazilian company. It invests continuously in the development of new products, as gasoline adapted to new environmental standards, or biofuel, like ethanol and biodiesel, or natural gas.

The results of research conducted in partnership with universities and research institutes made the country leader in the offshore area, with over one thousand projects concluded. Through the *Thematic Networks*, as defined by the company's strategic planning, agreements with 80 institutions were signed in the entire country, totaling 50 networks devoted to different issues.

#### **7. Marcopolo (Brazil): medium-high technological intensity**

Founded in 1949, Marcopolo is the leader in the bus body sector, with over 40% of the Brazilian production, and exports to 80 countries. It is one of the main international manufacturers, contributing with 6% to 7% of world production. In 2009, it manufactured 19,384 buses, and had 13,715 employees, being 4,000 abroad. Innovation plays an important role in the launching of new products.

Marcopolo was the first company to assemble bus bodies on steel structure, replacing wood, in 1952. In 1984, it started the concept of the *Low-driver* bus, in which the driver is placed in a lower level. In 1996, the two-story bus was launched, the *Double-decker*, initially for the Argentine market. There are no other manufacturers with such diversified bus lines – mini and microbuses, two-story or bi-articulate, road, normal and adapted. Marcopolo manufactures convertible buses for the Muslim pilgrims travelling to Mecca: besides being convertible, the model has gutters to drain rain water and upholstery resistant to humidity. It also manufactures buses with partitions to separate men and women, as well as models resistant to very low temperatures, to travel in Siberia.

These types of orders make Marcopolo the largest world manufacturer of buses according to request, customizing the product for the client, which selects its favorite chassis. This is its competitive difference. There are hundreds of combinations among different items, as seats, driving position and size of windows. After three years of development and US\$ 17 million, the Generation 7 of road buses was launched in 2009, with fuel consumption 10% lower and a greater passenger transportation capacity, defined by research conducted with users in Brazil and abroad, generating the filing of 35 patents of products and processes.

## Results Analysis and Conclusion

We argue in this paper that technological innovation is directly related to internationalization, and show examples of firms that are successfully ranked in different lists of emerging multinationals. Even belonging to low or medium-low technology intensity sectors, as defined by OECD (2007), they perform systematic R&D activities.

Another relationship that can be drawn is the level of government support to companies' R&D activities. As of 1990, due to economic changes, Latin American countries started a more consistent move to international markets. And government support in some of the countries was responsible for the increase in firms' level of R&D, which led to more competitive products and processes, thus enabling the companies to compete abroad. In almost 20 years (Chile started its reforms earlier), the largest part of Latin America FDI has come from four countries - Brazil, Mexico, Chile and Argentina – with Colombia and Venezuela having important roles during some periods (Tavares and Ferraz, 2007). And these countries have organized “national systems of innovation” that operate with distinct levels of efficiency in order to stimulate and support companies' innovation efforts.

These four countries also have in common government agencies and programs that offer tax incentives and loans at low interest rates for R&D investments. They were created in the 1950s and 1960s, mainly to support science and technology development in universities and public research institutes. At that time, import substitution strategies were adopted, and most of the innovation was embedded in products and processes brought by foreign companies that were establishing subsidiaries in Latin America. Also, the linear model of innovation was predominant, and it was expected that a systematic support for research in universities and research institutes would end up with innovations in the market.

The seven companies presented hold technological innovation capacity, within the context of their respective sectors. The statements made by Figueiredo (2004) as to the need to count on other innovation indicators, besides the number of patents, confirm themselves in these firms. If we look into the 2009 ranking of the 60 Latin American firms in *América Economía* - 25

Brazilian, 13 Mexican, 12 Chilean and 3 Argentinean - we may suggest a relation between state support to innovation and their international presence.

Brazil has the most consistent system for R&D support since the 1950s, when CAPES, CNPq (agencies that give fellowships and grants for academic researchers) and BNDES (National Bank for Economic and Social Development) were created. FINEP, known as the Brazilian Innovation Agency, was founded in 1969. Science and technology enhanced their status with the creation of the Ministry of Science and Technology, in 1985. Tax incentives laws date from 1991. Along the years, existing programs and laws have been improved and others have been created, to stimulate innovation countrywide. Especially in recent years, government efforts in the creation of instruments to support innovation – Innovation Act, Economic Subvention, *Zero Interest*, among others – have influenced the list of export items. But intensive technology goods still represent a very small proportion of total goods, from 1.07% in 1996 to 4.2% in 2008.

Companies that benefited from tax incentives jumped from 130 to 441, between 2006 and 2008 (IEDI, 2010). It is still a small number, but it's remarkable that the declared R&D investments have increased 270%, amounting to five times the benefits granted. Recently, 200 Brazilian and foreign companies with local activities have presented the government an action plan (*Entrepreneurial Movement for Innovation*), where they commit themselves to double innovation actions before 2014, and seek cooperation with public institutions.

Until recently Mexico stood out among OECD countries for its support to innovation, through several agencies and programs as CONACYT (National Council for Science and Technology), and a 2002 Science and Technology Law. Between 2001 and 2006, there was PECYT (Special Program for Science and Technology). Recently, for the period 2008-2012, the government launched PECITI, which suggests an increased concern for innovation. There is a goal to attain a 2% PIB investments in R&D by 2025 (OECD, 2009).

Other programs include CONACYT AVANCE (support to new technology-based firms), PROSOFT (software), INNOVA PYME (for SME firms), a SME Fund, and a R&D fiscal incentives system, managed by CONACYT in coordination with the Ministries of Finance, Economy and Education. There are 17 sectorial funds jointly financed and operated by CONACYT and related ministries, to promote STI capabilities according to sectors' strategic needs. But in the last years, there were changes regarding innovation support. In 2007, R&D/GDP was 0.49%, despite PECYT projected goal of 1% in 2006. The amount of public resources remained the same between 2002 and 2007. The 2008 specific budget for the area increased 16.2% over 2007, which projected a new concern with innovation (OECD, 2009).

Chile has also a strong innovation support system, with several agencies like CORFO (Corporación de Fomento de la Producción), of the Ministry of Economics, and CONICYT (National Council for Science and Technology). One of CORFO's programs is *Innova Chile*, which helps domestic companies to access new technologies and to develop value-added products and services. Since 2008, there is a tax incentives law, to be used by firms with contracts with universities and research institutes. In 2006, the National Council of Innovation for Competitiveness (CNIC) was asked to prepare a proposal for a National Innovation Strategy for the next 15 years, by joining all projects and programs that deal with the subject.

Argentina has established strong institutions at the national level for science and technology, yet the country still lacks public-private partnerships. Comparative data reveal that the country

underinvested in R&D until 2001. That year a new S&T law was launched and public budgets started to gradually increase. There is a tax incentives program, but private sector involvement in R&D is very low by international standards. And there are different agencies and programs, which overlap functions and decisions (THORN, 2005). From 2003 to 2007 investments in S&T as percentage of GDP increased from 0.46% to 0.61%, and R&D investments went from 0.41% to 0.51%. In 2009, resources for the area grew by 44% in relation to 2008.

In December 2007, the Ministry of Science, Technology and Productive Innovation (MINCyT) was created, in a demonstration of the new government's concern for innovation. The former Ministry of Education, Science and Technology remained only with educational subjects. Agencies CONICET (National Council for Science and Technology) and ANPCyT (National Agency for the Promotion of S&T) were moved to the new Ministry.

Slowly, federal and state governments in the region have noticed the relevance of the Multilatinas and the need to support them and to help create others. Collaborations, alliances with traditional firms and recruitment of professionals that have a deep knowledge of the target markets are necessary. Firms must build up capabilities to compete in higher levels of the production chain, where innovation of products, processes and services is essential. Therefore, the use of public policies' mechanisms is highly recommended.

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