Chilean Engineering Exports and Free Trade

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Abstract
This paper aims to present how Chilean engineering has developed in the last 40 years and how exports have been increasing, and to explore the difficulties engineering faces for exports and how free-trade-agreements may influence these exports. Engineering activity is key for the development of construction projects and has an important multiplying effect. Chilean engineering is a consolidated services industry with a strong potential for exports, which still represents a small percentage of its activity. Free-trade-agreements are recognizing the need to eliminate factors that hamper international engineering trade. These efforts must be deepened through a greater participation of the private sector. This paper reports an investigation was done on the development of engineering services in Chile since the late fifties, as well as its export history. The investigation made major findings regarding limitations associated with the process of improving competitive advantage in engineering in a developing country like Chile. The paper also presents the experience of Chilean Engineering Associations with free-trade-agreements. It concludes that the findings should be brought to the attention to the main players in the construction industry and at governmental levels of the importance of engineering as a key factor for an increasing presence of all industries related to investment projects in a globalizing world and how free-trade-agreements can help increase engineering trade.

Keywords
Engineering, exports, chilean, Free-Trade agreements, competitiveness

A BRIEF HISTORY OF ENGINEERING SERVICES IN CHILE

Consulting engineering was practically inexistent in Chile until the late fifties.

In the early sixties engineering companies started to be founded as humble operations consisting of a few engineers and designers, specialized in a particular discipline. Consulting engineering was at this time embryonic in Chile, and most engineering for industrial projects was hired from abroad.

The late sixties were key for Chilean industry as well as for consulting engineering firms. Political changes came about when the copper industry became nationalized, which in turn led to new policies, one of which was to stimulate increased participation of local engineering in order to take
advantage of low local engineering fees, that varied between 1/3 and 1/6 of the foreign ones. This cost difference was maintained throughout the years and has been of great importance to the development of local engineering. Additionally local engineering has advantages related to a better consideration of local construction capabilities and codes, as well as of improving competitive advantages of local fabrication of equipments. Usually engineering companies adopted the policy of establishing alliances with other important local or their foreign counterparts so as to get access to multidisciplinary, complex projects. As a result, they gained an important participation in the main copper and steel industry expansions and in the new investments that were made in the pulp and paper, and the petrochemical fields during the 1960s and the beginning of the 1970s.

The increased complexity of the tasks local engineering was performing for the state-owned copper industry and the growing private industry resulted in the creation of multidisciplinary engineering companies with construction management capabilities in the early eighties. It was quite typical as well, that these firms entered into cooperation agreements with large international engineering companies that would usually be in charge of process design and overall management of large investment projects.

Project services, such as scheduling, estimating and purchasing were developed in the mid-1980s, and resulted in full management and Engineering, Procurement and Construction Management (EPCM) capabilities since 1988. In the mid-1980s also the first Chilean process engineering firms were created, thus initiating activities in conceptual and basic engineering until then performed only by foreign companies. This diversification paved the way for Chilean engineering participation in a major part of the big projects carried out in Chile during the second half of the 1980s. Examples are the CODELCO Copper Flash Smelter, the world’s largest at the time, and the CODELCO Copper Solvent extraction/electro winning (SX/EW) Plant, that was constructed to process solutions from the largest dump leach pile in the world. These two projects represented a total of 445,000 engineering man-hours, of which 93% were performed by Chilean engineering. Additionally, during the late 1980s, local engineering firms were highly involved in three bleached kraft pulp mill projects that represented more than 2.6 billion USD invested and over two million engineering man-hours for local firms.

Chilean engineering participation in terms of man-hours had grown from 20% in the early seventies to 90% in the mid eighties to almost 100% in the late eighties. Companies like Exxon’s owned Disputada de Las Condes claimed in 1992 a 96.5% of the engineering of their large investment projects had been done by local engineering. Later in the nineties the country entered into a fast growing process, yearly foreign investment increased several times, the engineering market exploded, an important number of international engineering and construction companies established operations in Chile and Chilean engineering companies increased their capacity by 30% in just a few years, reaching a peak of 12 million man-hours/year in 1996.

Present capacity in terms of man-hours is similar to the one existing in the late nineties.

Expertise of local engineering companies is found mainly in areas related to the large investment projects of the nineties, namely mining, energy, pulp and paper and forestry, fishing, agriculture and industry. In particular, world class expertise is found in mining planning, design and in hydrometallurgical and pyrometallurgical processes for copper and non metallic minerals, such as lithium, boron, iodine, sodium and nitrates.
THE EXPORT HISTORY OF THE CHILEAN CONSULTING ENGINEERING INDUSTRY

Considering the extensive cooperation Chilean engineering firms have been involved with foreign partners, and their improved competitiveness in the home market, their foreign market experience is surprisingly limited. An organized attempt to gain access to the international market was made at the beginning of the 1970s, partly provoked by the political instability then existing in Chile, through the creation of the organization CLAID, Consultores Latinoamericanos para la Ingeniería y el Desarrollo. The organization consisted of one representative for each one of the Andean countries. Chilean representative was INDEC, an association of several Chilean engineering firms. The activities within CLAID resulted in some exports in the middle of the 1970s from Chile to Venezuela, Ecuador and Bolivia, but in 1979 the organization ceased to exist due to the withdrawal of Chile from the Corporación Andina de Fomento and high local demand for engineering services.

In the nineties several Chilean engineering firms were forced to promote their services abroad in order to qualify for projects at the highly competitive home market. The reason for this was the great influence that new foreign investors in mining had in the engineering market. The decision-making of these investors normally took place at their home offices, where little knowledge, and less confidence in local engineering were found. Several attempts were made to initiate exports as subcontractor of internationally well-reputed engineering companies. However, when the moment of deciding how to organize the work within the project arrived, Chilean engineering was always excluded, notwithstanding its cost advantages.

At the beginning of the 1990s several Chilean Engineering Firms decided to make new, and serious attempts to internationalize their businesses. Although the focus has so far been on the Latin American market, engineering exports now include other economies such as the USA, Africa, Europe and Thailand. Among the results achieved and just as an example it can be mentioned an EPCM contract for a copper smelter revamp in Mexico, won in competition with four Northamerican engineering companies. Exports, as recorded by the Chilean Association of Consulting Engineering Companies (AIC), have grown from 2.2 million USD in 1995 to 12.8 million USD in 2003 (1).

FACTORS FOSTERING AND HAMPERING INCREASED EXPORTS

Chilean engineering possesses various qualities and advantages that could be successfully exploited in the foreign market, including the following:

1. Chile’s image of a country that has been able to find its own way to development and that has managed itself to carry through of a number of technologically advanced projects.
2. The awareness that local engineering firms have played an increasingly important role in these projects.
3. The existence in Chile of unique know-how, adapted to the specific conditions present in developing countries. One example is locally developed process technologies, such as the Teniente Type Modified Converter, for copper smelting. Another example is the specific

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know-how on seismic engineering for industrial installations, aimed to minimize shutdowns after earthquakes.

4. Most of the main local engineering firms are ISO 9001 qualified.

5. The still quite considerable cost advantage. The cost of a Chilean engineer is less than one half of that of an engineer from an industrialized country, and the difference is greater for designers and draftmen, thus resulting in an even lower cost for the integrated engineering team.

6. Improved financial conditions, including an attractive Chilean export credit line for capital goods and engineering.

However, there are still some factors, both in foreign markets and internally, hampering an increased export of Chilean engineering services.

An investigation in 2004 by the AIC identified the following barriers, for international development of Chilean companies 

• Unclear rules of origin.
• Legal restrictions at provincial or state level, that remain although a FTA exists.
• Double taxation.
• Double charge for social security.
• Restrictions in governmental purchases.
• Entry restrictions for professionals or business people.
• Professional registration requirements.
• Certification requirements.
• Cultural barriers.
• Difficulties in obtaining guarantees and insurances.
• Asymmetry in governmental financial and technological support.

The author has also identified the following factors that hamper exports of Chilean engineering services 

• Attitudes, among the potential exporters as well as their potential clients.
• Increasing quality requirements, including language skills.
• Insufficient market presence and insufficient access to market information and communication networks.
• Lack of government incentives for innovation.
• The absence of equal opportunity.
• An inadequate institutional frame.

A main challenge for the Chilean engineering industry is to go from thinking and talking globally, to acting globally. This is the only possibility of survival and growth in the long term in a country almost completely open to the rest of the world, where foreign investment is as important as local investment. The engineering firms have to invest a lot in confidence-building among their potential clients and convince them that the results they have achieved in Chile can also be repeated abroad. Additionally, the Chilean firms have to invest in internal competence development in order to meet the constantly increasing quality requirements in the highly competitive international market. This competence development should include productivity improvement through increased automation,

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improvement of the working environment, and continuous improvement of human resources through development of technical and marketing knowledge, as well as language skills. These efforts at the individual firm level should be supported by corresponding development efforts at the institutional and governmental levels, in order to secure the industry’s recruitment needs of highly qualified personnel in the long run.

The Chilean engineering industry still has a weak presence in the international marketplace. Whether individually, together, or in association with foreign partners, Chilean engineering firms must be constantly present in the marketplace and secure a position in existing communication networks, so that close links can be established to potential clients, partners and competitors.

Although difficult to achieve, Chilean engineering firms should make use of available official and commercial communication channels to propagate for that the principle of equal opportunity is applied in international tendering. The world as it is, is complicated enough for firms from developing countries trying to compete in the international market, and they should therefore be spared from measures that further distort conditions to their disadvantage. Too often proposals are lost against engineering companies from developed countries that offer lower prices than Chilean, thanks to subsidies from governmental aid agencies, presented as technical cooperation between countries.

CHILEAN LEGISLATION APPLICABLE TO WORK OF FOREIGN ENGINEERS

According to the Chilean law, if anyone wants to work in Chile as an engineer, he/she must be in possession of a degree given by a recognized Chilean university or a foreign institution. In the latter case the engineer must revalidate his/her degree at the University of Chile unless favored by any of the agreements for recognition of professions Chile has with several countries. Additionally, the law that created the “Colegio de Ingenieros de Chile” establishes that engineers graduated in third countries, that wish to practice in Chile under a contract and for a limited period of time, must request an authorization from the Colegio de Ingenieros, in which case revalidation becomes unnecessary.

Also, foreign citizens must obtain a visa. Usually visas are given easily to persons that are in possession of a foreign degree, which causes some misunderstanding as frequently engineers think that they are automatically allowed to practice when they obtain the visa, because of having presented their professional certificate. This is incorrect, according to Chilean law.

FREE TRADE AGREEMENTS AND ENGINEERING TRADE

I will refer to the texts of the Free Trade Agreements (FTA’s) Chile has with the USA, Canada, Central America and Korea, that are similar among them and similar to NAFTA.

In general terms, these agreements establish that all barriers for commerce are eliminated, except for those stipulated in the annexes, for which, in their majority, progressive suppression terms are settled.
The most common way of providing engineering services is collectively. Collective practice and collective responsibility is seldom recognized in the legislations of the signing countries. Consequently the FTA’s make no reference to it. So, regarding the collective practice of engineering, i.e. those services rendered by engineering companies, free trade would be secured by the clauses regarding National Treatment, Most Favored Nation, Free Movement of People and Local Presence, as long as existing barriers for the individual practice of the engineers that belong to these companies, could be overruled.

(The Canada case. An illustrative experience)

Regarding individual practice, I can refer to the only experience the Colegio de Ingenieros and the Asociación de Ingenieros Consultores, in representation of the Chilean engineering community, have, which refers to the Memorandum of Understanding (MOU) signed with our Canadian counterpart, the Canadian Council of Professional Engineers (CCPE), in 2001.

This was a major task due to the enormous differences between the engineering systems existing in Chile and Canada. As a matter of fact the first problem encountered was directly related to our mission as relevant professional body and resides in the text of the agreement, which establishes that the parties shall work “to provide for the temporary licensing in its territory of nationals of the other Party who are licensed in the territory of the other Party”. The agreement uses the word license in several parts, which is quite adequate for USA and Canada, where engineers are legally entitled to practice only after having obtained their license, which is given after some years of experience after graduation and passing special examinations, and that must be renewed after a certain number of years. In Chile engineers are formally entitled to practice when they receive their university degree, so licenses, from a formal point of view, are nonexistent. After much analysis, where we even thought that we had to create a licensing system in order to initiate conversations with our Canadian counterpart, this semantic “impasse” was solved by our lawyers, who interpreted the word license as entitlement to practice, condition that is included in the degree given by a university recognized by the Chilean State or in the authorization for temporary practice given by the Colegio de Ingenieros to engineers graduated abroad.

A second problem found refers to the Code of Ethics: The understanding reached by the Northamerican relevant professional bodies, on behalf of NAFTA, showed us how important it was for them the issue of professional ethics and that our code, oriented partly to protect the engineers, required a modernization. Indeed, Annex 2 of the agreement subscribed in 1995 by the North American engineering institutions contains a code of ethics of only 10 points, oriented to protection of the public. The Colegio de Ingenieros (further on “Colegio”) undertook the task of revising its code and, by the moment when we started negotiations with the CCPE, we already had a modern code in place.

A third problem encountered relates with the obligation of belonging to a professional institution in order to be able to have a license. In Chile, unlike Canada, it is not necessary to be affiliated to an institution of peers in order to practice. This was an unsolvable obstacle, as the CCPE would only authorize Chilean engineers as long as they belonged in their home country to an institution that would force them to comply with a code of ethics. So, for the moment being, the CCPE would only recognize engineers members of the Colegio, position that could change if the legal frame for the ethic regulation changes in Chile.
A fourth problem found was related with the inexistence in Chile of a system for the accreditation of engineering careers. One of the pillars of Canadian and USA engineering licensing is the existence of a well-developed system for accrediting careers. When the NAFTA professional bodies reached their agreements, Mexico suffered because they did not have such a system in place. As a consequence Mexican engineers were required more years of experience than those required to engineers coming from USA or Canada accredited programs. In Chile we did not have any professional accreditation system and we realized this would be of no benefit to the forthcoming negotiations so we, as professional institutions, promoted the formation of one, task that was undertaken by the Ministry of Education and presently we have a reliable system in place. When we signed the MOU with the CCPE the system was still not operating. Nevertheless, thanks to the prestige of the Colegio de Ingenieros and its longstanding experience in qualifying universities and engineering programs in order to accept new members, as well as on the information obtained by CCPE delegates on the career named “Ingeniería Civil”, where “Civil” refers to the depth of the studies rather than the engineering discipline, the CCPE agreed to substitute the lack of a national system by the Colegio procedures.

Finally we had a problem with the different duration between the engineering careers in Canada, generally 4 years, and Chile, between 4 and 6 years. This was not a minor problem and it required an in-depth analysis of the contents of the different careers as well as of the type of professional practice required for licensing in Canada. The result was the acceptance by the Colegio of 4 -years- career licensed Canadian engineers (with 7 years experience) and by the CCPE of Chilean civil engineers (6 years career) with 6 years of experience. Non existence in Chile of institutions similar to the Colegio for careers of 4 or 5 years duration, attempted against their possibilities of obtaining recognition by the CCPE.

These were all major problems that could be solved only thanks to the open attitude of the participants from the engineering institutions of both countries and their willingness to comply with the FTA.

A Memorandum of Understanding (MOU) was signed in June 2001. I will not go into details but just mention that the memorandum established a mutual recognition between the CCPE and the Colegio for accrediting studies and professional experience, and for passing exams, thus enabling engineers to obtain a license from the other country without the need of traveling. Equally important is the recognition as valid of the professional experience in the country of origin.

The MOU was to be ratified a year later. This did not happen because it did not find support from all the Canadian provinces. All the participants have regretted this situation, originated, in my opinion, in the imbalance inherent to a negotiation between two countries so different from an institutional point of view. While in Chile there is a single national authority, in Canada this type of agreement needs to be subscribed by the provincial authorities in order to enforce them. As we have the same situation with USA, we structured the FTA with them a little bit differently, preferring direct negotiations with each one of a selected list of states, instead of negotiations at a central level.

The world follows a trend and we are certain that, sooner or later, conversations with our Canadian counterpart will be reinitiated. In any case we do not regret the outcome of conversations ended in 2001, as the whole process has been of enormous value, not only for the degree of understanding we reached on the barriers existing for engineering practice in Canada and Chile, but for having found feasible ways to facilitate the free flow of engineers between our countries.
CONCLUDING REMARKS

In a world where the greatest contribution to Product is made by the Services Sector, export of services remains to be still emerging, particularly for developing economies, mainly due to the lack of unambiguous procedures, norms and mechanisms for exports. Export of engineering services is no exception, in spite of the recognition and special attention given to it by many economies, mainly developed, due to the important multiplying effect it has on other economical activities.

Chilean consulting engineering is a consolidated services industry thanks to its more than 40 years of continuous development. It represents an activity of more than 300 million USD/year, but more important than that is the fact that it is intimately related to the development of projects that exceed 2 billion USD/year.

Although Chilean engineering exports have been in continuous growth they still represent a very small percentage of the activity, partly due to the difficulties found in an area of the international market that is still very protected locally.

These difficulties are in the process of being recognized by the authorities of the different economies, having incorporated clauses related to services trading in the FTA’s, with the support of the private sector.

The main conclusion that can be extracted from this paper is that these efforts must be deepened, not only by our authorities but by a greater participation of the private business world as well.