

Track 2 Innovation Agents in North America: The View from Mexico

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ABSTRACT

Economic disparities in North America are confirmed by the analysis of innovation infrastructures, especially when it comes to NGOs acting as public-private networking agents. NGOs and civic associations dedicated to innovation have a tradition in the U.S. and Canada, while in Mexico they have recently launched basic networking and brokering activities.

Given the unequal context of innovation institutions in North America that checks the possibility of a fair comparison, this paper provides a within-case analysis of the Arco Alliance in Mexico, a hybrid partnership involving public, private, and civic organizations, meant to promote regional innovation based on an OECD ideology. Additionally, policy-tracing methodology is used to analyze the adequacy of the OECD innovation model when applied to the Mexican situation.

Key words: innovation, Mexico, Arco Alliance, hybrids, OECD, North America

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INTRODUCTION

Innovation can be used as an indicator for measuring development. From the point of view of NGOs and civic associations whose aim is to stimulate innovation, North America has institutional disparities. While the U.S. and Canada have traditions of innovation-oriented associations connecting the government to the private sector, Mexico has only recently started the process with civic partnerships such as the Arco Alliance, analyzed below.

This article provides a description of Arco's contribution to innovation in Mexico, considering the possible contradictions between its bottom-up Organization-for-Economic-Cooperation-and-Development-(OECD)-based method and the federal government's top-down innovation public policies. Some of Arco's intermediate results are analyzed to determine whether its method offers an innovation strategy viable for developing the Mexican economy. As such, the paper examines whether or not the OECD model can be adapted to the Mexican situation.

This article's working hypothesis is that, compared to the U.S. and Canadian experiences, where innovation NGOs tend to complement official institutions' activities, Mexican civic associations try to assume the role left vacant by the lack of government mechanisms and public policies in the field, a difficult task because of Mexico's hierarchical power structures.

The article is divided into four parts: *a*) national innovation systems beyond NAFTA: isolated efforts (comparative background); *b*) innovation by hybrid strategic groups (methodological framework); *c*) Arco variations on the OECD model (within-case study); and *d*) concluding remarks.

NATIONAL INNOVATION SYSTEMS BEYOND NAFTA: ISOLATED EFFORTS

North American integration seen from the perspective of innovation, research and development has been insufficient in both institutional and financial terms. A brief comparison of the three governments' budgets for research and development (R&D) shows big differences among the purchasing power parities (PPP),¹ as shown in table 1: while Mexico provides 56.8, Canada offers almost ten times more (693.8) and the U.S., 19 times more (1082.1). These data prove that even though U.S. cuts in R&D budgets have been criticized (Atkinson, 2007), its policies are still better than

¹ Purchasing power parities (PPPs) are currency conversion rates that both convert to a common currency and equalize the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion. Source: www.oecd.org/std/ppp.

Mexico's. Among the three NAFTA partners, the U.S. is the only one to finance its R&D exclusively domestically; Mexico owes a 0.7 percent of its R&D budget to external sources, and Canada 8.7 percent.

Regarding the sources of government expenditures for research and development (see table 1), the Canadian and Mexican cases have certain similarities, with 47.9 percent and 46.5 percent financed by the business sector, respectively. Mexico shows a balance between government and business funds for research. In contrast, U.S. R&D funds come more from the business sector than from the government (64 percent versus 30.4 percent).

Interestingly enough, the three countries show a tendency to spend more than they receive for R&D in the business sector: in Canada, the business sector provides 47.9 percent of the research budget, but spends 53.9 percent; in Mexico it pays 46.5 percent but spends 49.5 percent; finally in the U.S., it subsidizes 64 percent and uses 69.6 percent. Government R&D expenditures are more comparable in Canada and the U.S. (9.2 percent and 12 percent, respectively), whereas Mexico spends double on R&D research (22.1 percent). This can also be interpreted in terms of support for basic and applied research: while Mexico emphasizes basic research, Canada and the U.S. are more oriented toward applied research.

Last but not least, it is of utmost importance to look at differences between private non-profit R&D expenditures and subsidies. In Canada, the private non-profit sector allocates 7.5 times more than it spends (see table 1) and in the U.S., it spends 1.3 times more. Mexico is the only country where the input and output for private non-profit research budgets tend to be the same, with a 1.25 parity.

More recent OECD statistics on the GDP expenditure on R&D in 2008-1 also show big differences between Mexico and its NAFTA partners (see <http://www.oecd.org/dataoecd/49/45/24236156.pdf>). Mexico allocates 5.919 billion PPP for R&D, while Canada assigns about four times more (23.8389 billion PPP) and the U.S., almost six times more (34.37475 billion PPP).

The institutional frameworks in the three countries have both differences and similarities. The three political systems have been criticized domestically for lack of adequate funding and incorrect mechanisms for stimulating innovation, in terms of insufficient coordination between the federal government and the states. All three countries have national research councils, the mechanism that drives the whole research system and implements policy. The highest decision-making authority on R&D issues is the president in the U.S., Mexico and Canada.

The non-governmental and commercial sectors have proposed alternatives to complement government R&D and innovation policies in the three countries. Associations dedicated to innovation in the U.S. and Canada express a particular

Table 1
GOVERNMENT EXPENSES FOR RESEARCH AND DEVELOPMENT (GERD) IN NORTH AMERICA IN 2005

Country	GDP %	PPP	GERD by sector of performance (%)				GERD by source of funds (%)				
			Business	Government	Higher education	Private non-profit	Business	Government	Higher education	Private non-profit	Abroad
Canada	1.98%	693.8	53.9%	9.2%	36.4%	0.4%	47.9%	32.9%	7.5%	2.9%	8.7%
Mexico	0.50%	56.8	49.5%	22.1%	27.4%	1.0%	46.5%	45.3%	6.6%	0.8%	0.7%
U.S.	2.62%	1082.1	69.6%	12.0%	14.1%	4.3%	64.0%	30.4%	2.6%	3.1%	–

Source: Adapted from UNESCO statistics on Research and Development, <http://stats.uis.unesco.org/unesco/tableviewer/document.aspx?FileId=76>.

viewpoint on the role of science in society with a priority on applied science as an instrument of development. While from this perspective, universities play a role in research and innovation, in Mexico, the main function of higher education is still considered to be teaching.² This makes for a different starting point for creating an appropriate atmosphere for competition, as well as for a possible balanced comparison among the three NAFTA partners.

U.S. R&D INFRASTRUCTURE: A DECENTRALIZED PANORAMA

Historically the U.S. has provided for a generous R&D budget and linked innovation to security issues. As a matter of fact, UNESCO data show a small but constant increase in the R&D budget from 2.55 percent in 1996 to 2.61 percent in 2008 (<http://stats.uis.unesco.org/unesco/tableviewer/document.aspx?FileId=76>).

Regardless of these expenditures, the U.S. R&D system has been criticized domestically in terms of taxes and organization. Atkinson (2007) shows that while in the 1980s, the U.S. was admired as a policy leader with the most generous R&D fiscal policy of all the OECD countries, in 2004, it ranked seventeenth among the OECD nations in terms of R&D tax policy.

Lane (2008) also appreciates that the U.S. provides insufficient industrial support for university research, due to the fact that the U.S. federal science and technology (S&T) system is a superposition of many programs operated by dozens of federal agencies, each largely independent of the others, with no long-term plan for S&T, in contrast with other countries such as China. This can be explained by the lack of general legislation regulating all structural aspects of U.S. science policy, besides the existence of the National Science Foundation and the National Research Council, which coordinate R&D-related activities.

In this decentralized S&T panorama, several U.S. state and city governments have moved forward with programs and policies of their own, sometimes with the help of non-governmental associations initiated by the private sector but funded with federal money. Examples are the Advisory Committee on Measuring Innovation in the 21st Century, which works directly with the Department of Commerce (see <http://www.innovationmetrics.gov/Innovation%20Measurement%2001-08.pdf>) and reports on how to measure innovation in the U.S.; the Business Roundtable (see www.business-roundtable.org), an association of executives from leading corporations, committed to public policy advocacy; Compete America (see www.competeamerica.org), a coali-

² According to the OECD (2003), there are three types of institutions of high education: teaching, research, and innovation universities.

tion of corporations, universities, research institutions and trade associations dedicated to talent recruitment; and the Council on Competitiveness (CC).

Among these, the Council on Competitiveness (CC) is the only one that cooperates with the Arco Alliance in Mexico. It is a regionally-oriented association that aims to develop a National Center on Regional Leadership (see <http://www.compete.org/media-resources/entry/25/us-economic-development-administration-teams-with-the-council-on-competitiv/>). Like Arco, the CC is based on a bottom-up concept of regional innovation and growth. The CC has an OECD-friendly ideology evident in its Regional Innovation Initiative, which aims to improve networking among political, corporate, university, labor, and NGO sectors. In this respect, it is implementing the Clusters of Innovation Initiative with the U.S. Economic Development Administration as well as Innovation America with the National Governors Association. The CC's most important program at the moment is the 21st Century Leadership Initiative, which aims to boost innovation-driven economic development and expand trade opportunities.

INNOVATION AS A POLITICAL PRIORITY IN CANADA

In contrast with the U.S., Canada has had a federal innovation strategy since 2002, aimed at increasing economic growth. Innovation became one of the Canadian government's six priority areas. Federal policies are complemented by regional ones, and each province has its own innovation programs (Niosi, 2005).

In terms of R&D credits, Canadian policy seems to be more generous than the U.S. one, with large companies eligible for a flat 20-percent credit and small firms for a 35-percent credit (Atkinson, 2007). Similarly to the U.S., Canada's National Research Council (NRC) is in charge of standardizing and certifying R&D activities. The NRC's mandate is complemented by the NRC Industrial Research Assistance Program, the NRC Canada Institute for Scientific and Technical Information, and the Canadian Technology Network.

Official programs are enhanced by civil society innovation activities. According to a study on innovation in Canada, 154 associations leading innovation in Canada have been identified (see [http://innovation.gc.ca/gol/innovation/site.nsf/vDownload/PDF_NatSummit/\\$file/InnovationMap.pdf](http://innovation.gc.ca/gol/innovation/site.nsf/vDownload/PDF_NatSummit/$file/InnovationMap.pdf)). They hold networking events, facilitate access to experts, offer strategic expertise, organize educational seminars, and lobby.

A brief review of these organizations shows a strong emphasis on R&D, directly connected to companies' needs. The Canadian Innovation Centre is an independent, non-profit corporation that provides evaluation, consulting, and educational pro-

grams to help inventors, small and medium-sized enterprises and innovation partners to take their ideas from the drawing board to the store shelf (<http://www.canadabusiness.ca>). The center's services are primarily educational and consultative.

The Canada Foundation for Innovation (CFI) provides infrastructure, a cornerstone of innovation and discovery that enables cutting-edge research and training. The CFI supports all areas of the research and development spectrum while encouraging the collaborative relationships that lead to innovation (www.innovation.ca/).

International Science and Technology Partnerships Program (ISTPP) was incorporated as a not-for-profit organization with the primary objective of strengthening Canada's s&t, business-to-business relations, and ultimately overall economic, trade and political relations (<http://www.istpcanada.ca>). ISTPP Canada supports the development of research partnerships for Canadian companies and research organizations with international counterparts, with an emphasis on commercially significant research and development projects.

Despite these efforts, Canada does not have a similar context to be able to compare with the Arco Alliance since no innovation associations based on the OECD model have been identified.

MEXICO: FINALLY, AN INDUSTRIAL POLICY

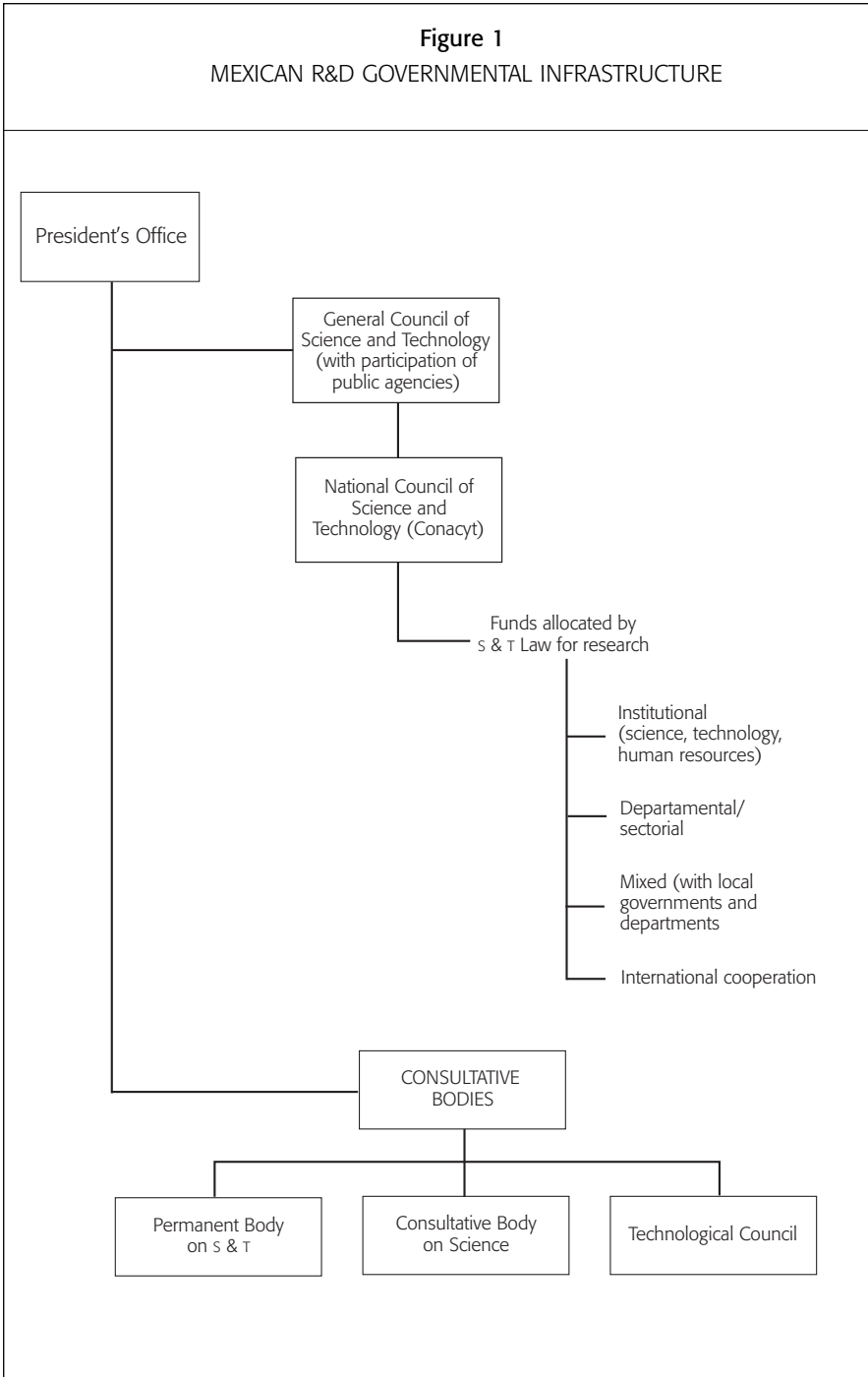
Mexico has recently adopted an innovation-based industrial policy, the first step forward after the previous "free" strategy, or the "policy of no policy." At the moment, Mexico is passing through a transition from a federal innovation policy to developing local state policies. Government institutions have experienced several conflicts of interest regarding the restructuring of the s&t institutional framework to encourage innovation and promote development without major cuts in public university budgets (see figure 1).

According to the National Development Plan and the Program for Science, Technology and Innovation (2006-2012), public s&t policy is a long-term plan that would not depend on each administration's decisions and would be known and accepted by the public. It is complemented by an accounting system that would allow policy evaluation and improvement, with the goal of articulating s&t research with technological and economic development.

However, Mexican legislation allows expenditures of up to 1 percent of GDP to be allocated for s&t,³ compared to other OECD countries that assign at least twice

³ Science and Technology Law, Art. 9.

Figure 1
MEXICAN R&D GOVERNMENTAL INFRASTRUCTURE



that amount.⁴ In practice, s&t spending in Mexico is around 0.4 percent yearly. The R&D budget has only risen 0.5 percent in the last 15 years (Díaz Betancourt, 2007). In 2007, the Fund for Technological Innovation was created by the President's Office to increase funding for the National Council of Science and Technology (Conacyt) by 500 million pesos (US\$47 million approximately) and thus stimulate technological innovation and economic competitiveness (<http://www.conacyt.mx/comunicacion/Comunicados/23-07.html>).

The lack of adequate infrastructure and budget to stimulate it seem to be the Mexican innovation system's main chronic problem. Public innovation policies in Mexico are reduced to an addendum to its Science and Technology Law (2007); moreover, the law is vague and creates no institutional framework for innovation. The lack of an adequate public innovation policy has created the need for alternative non-official institutions that serve as networking agents among public institutions, companies, and the scientific community to create efficient innovation mechanisms.

Some of the problems with the Mexican national innovation system (NIS) are the actors' isolated efforts; the lack of an aid network for technological development; insufficient flows of knowledge; a lack of understanding of the productive sector; little cooperation among companies; a lack of inter-institutional cooperation; and the disarticulated structure. As the Consultative Body on Science and Technology (FCCT) notes, innovation is still not the most important element in the competitive structure of Mexican companies (OAS, 2005).

A report by the Mexican Academy of Sciences (AMC, 2006) proves that the lack of a long-term coherent policy is the reason for the lack of national competitiveness. This could be solved, according to the report, by a more coherent institutional environment, closely connected to the requirements of the national economy and renewed participation of Mexico in the global market.

The AMC considers the relationship between research and companies to be the appropriate model for stimulating the development of knowledge, transferring it to society and fostering its acceptance, and stimulating commercial competitiveness (AMC, 2006: 11). The AMC proposes a national innovation system that would define and initiate an action plan of measurable objectives and results (AMC, 2006: 18).

The Mexican Constitution (Chapter 5, Art. 3) requires government bodies to aid scientific and technological activities. s&t are specifically regulated by the Science and Technology Law (LCT) of 2002, which charges the federal government with developing and strengthening s&t in Mexico (Article 1, Paragraph I). It also stipulates that local governments should coordinate with the federal government (Paragraph 4),

⁴ Mexico has been a member of the OECD since 1994.

but further on, it establishes a National System of s&t, with no clear connection between federal policies and the states (Article 3). In April 2007, the LCT was broadened to include certain provisions on innovation, although in a highly centralized way.

The law established a useful self-improvement instrument, with the aforementioned FCCT. This organization works directly with the government, parliamentary bodies and the Conacyt and has proposed alternative innovation legislation to replace and/or complement the former s&t law.⁵ On various occasions, the FCCT has criticized Mexico's innovation system, explaining that it is disarticulated because of a deficient higher education system that forces the country to import technology and knowledge instead of producing them (FCCT, 2006: 23 - 25).

The FCCT suggests as strategic objectives, among others, decentralizing regional development, based on knowledge and innovation (FCCT, 2006: 64); and building a public policy network to stabilize policies and coordinate the participation of different actors, governmental as well as non-governmental, that would permit the application of public policies regardless of elections (FCCT, 2006: 66).

The law's main critics, whether associations such as the FCCT or the media, have considered it more a mechanism for a centralized policy than a federal one. As a matter of fact, there have also been proposals for creating innovation legislation that would establish a bridge between scientific research and companies. For the moment, this role has been assumed by alternative, unofficial (track 2) agents that have tried to stimulate innovation using a bottom-up approach, in contrast with the official, top-down one. This is the case of the Arco Alliance, a unique effort by civil society that will be analyzed below.

INNOVATION BY HYBRID STRATEGIC GROUPS

This paper develops a within-case study of the Arco Alliance, based on two types of operational concepts: a) OECD open regional innovation, and b) scarcity-induced innovation theories by hybrid strategic groups, as explained below.⁶

According to Desarbo and Grewal's study (2007: 294), hybrid strategic groups may be formed in the economy among companies that combine the plans of one or more strategic groups to produce their own tactics. Competitiveness varies depending on whether a company is hybrid or not; companies in pure groups compete more

⁵ The proposal made on the initiative of a parliamentary group in 2007 was blocked. The document spoke of a regional concept, defining competencies at a federal level.

⁶ Besides being a case study of a Mexican institution, the theoretical and methodological framework is based on foreign literature, since the Mexican studies on innovation are generally focused on a micro level.

among each other than the ones in strategic groups. Hybrid companies seem to recognize that similar strategies increase competitiveness and may lead to more intense rivalries. Instead of understanding competitiveness as a dichotomy between actors, Desarbo and Grewal (2007: 297-298) conceive it in terms of levels. Competitiveness among strategic groups is complicated. In the end, the authors speculate that in the long run, there is a tendency toward more strategic groups.

One of this article's theoretical objectives is to show that hybrid strategic groups may involve actors that are not necessarily companies, even though they cooperate with them. As such, the Arco Alliance is a hybrid strategic group formed by at least four types of agents: NGOs, public and private actors in partnership, and the scientific community. For this purpose, a complementary concept of diplomatic hybrids (Tigau, 2007: 262) is recalled to define close networks of interaction in which two or more agents arrive at a level of merger. From this point of view, hybrids may be vertical or horizontal. Vertical hybrids are mergers of the international, national, and regional (local) levels, such as in the case of global NGOs represented in Mexico.

Horizontal hybrids "are created on the basis of networks of cooperation that work so closely that they end up merging to further their interests: public, political, and economic actors generally tend to converge" (Tigau, 2007). NGOs may cooperate with track 1 agents (public agencies, international organizations, political parties) or track 2 agents (companies, media, scientific community, public opinion, educational and religious institutions). The multidimensional association of these actors recalls the observation of Ojasalo (2008): from a network point of view, innovation may not be seen as a product of one actor but as a result of the interaction among various actors. In this respect, NGOs are catalysts for connecting track 1 (official actors) and track 2 (non-official actors).

NGOs and civic associations are networking agents that do not belong either to the government sector or to the for-profit sector, being non-state and non-market entities (Lambell et al., 2008). They act as innovation brokers, by building networks between the government and the private sector. Alternative initiatives from the non-governmental sector may complement deficient innovation policies such as in the Mexican case, or complement solid science and technology programs, like in the U.S. and Canada.

SCARCITY-INDUCED INNOVATION AND THE OECD MODEL

The Arco Alliance encourages regional innovation systems (RIS) that deal with the concentration of interactive private and public interests, formal institutions, and

other organizations with organizational and institutional arrangements and relationships conducive to the generation and dissemination of knowledge (Doloreux, 2004). Here, regions are considered homogenous areas that share certain economic, cultural, linguistic, and/or geographical characteristics with a country.

The study of NIS from the perspective of flows of knowledge (knowledge-based economies) according to the OECD (1997) offers a clear insight into Arco Alliance functioning. The NIS focus also reflects the application of systemic approaches to the study of technology development as opposed to the linear innovation model. In contrast with the linear approaches emphasizing science inputs as a source of innovation, the systemic view considers innovations a “result of a complex interaction between various actors and institutions” (OECD, 1997: 11-12).

Arco also borrows the concept of open innovation from the OECD that implies the end of the monopoly of knowledge, knowledge communication and networking, and control of technology transfer. One of Arco’s aims is to create a regional innovation system (Doloreux, 2004) that would harmonize knowledge and economic flows in every corner of a country, by stimulating innovation in areas that are not necessarily high-tech oriented. This possibility has been previously demonstrated in Canada by Doloreux and Dionne (2008: 260), who disagree with the hypothesis that innovation systems in peripheral and rural regions are difficult, because they lack the ability to foster an environment that can stimulate innovation and technological activity. On the contrary, as Montana et al. show, it is important for regions to build capacities of continuous reinvention in order to keep pace with the changes in the global economy (2001:9). This can be done by alternative networking agents who complement the activities of public institutions in charge of economic development.

Srinivas and Sutz demonstrate that abundance as well as scarcity can motivate innovation (2008: 132-133). Scarcity is what is of most interest in the analysis of the Mexican innovation environment and may be understood in at least three senses: *a*) cognitive scarcity refers to the lack of the knowledge and know-how necessary to generate innovation; *b*) physical scarcity is the lack of aid organizations and legal or technical instruments; and *c*) socio-economic scarcity is the lack of funds and of an appropriate social context, for example, the lack of an adequate work force; it may imply that solutions are available but not economically viable. However, all these disadvantages can also be used to generate scarcity-induced innovations (SII) that are not necessarily linked to poverty. SII attempt to create an innovation-friendly environment even in regions that are not always attractive to conventional business plans.

This article assumes that NGOs may identify areas of scarcity and economic needs in order to provide alternative development plans at the regional or national level. NGOs may cooperate or come together with other institutions so that they create

diplomatic hybrids (Tigau, 2007) or participate in hybrid strategic groups (Desarbo & Grewal, 2007).

ARCO VARIATIONS ON THE OECD MODEL

Arco is a partnership of three Mexican institutions: the Association of Applied Research and Technological Development Executives (ADIAT), a civic association that has initiated, hosted, and financed Arco since its creation in 2007; the National Network of State Science and Technology Councils and Organizations (Rednacecyt); and the National Coordinating Committee of "Produce" Foundations (Cofupro).⁷ The last two are associations subsidized by government programs.

As a peculiarity, Arco seems to be inspired more by European Union models such as Pro Inno Europe (<http://www.proinno-europe.eu/>) or Innovating Regions in Europe (<http://www.innovating-regions.org/>) than by the North American experience. The Arco Alliance is based on the concept of open regional innovation, promoted by the Organization for Economic Cooperation and Development (OECD).

The Arco Alliance aims for major culturally adapted social changes to stimulate the national innovation system.⁸ Arco's bottom-up view is designed to extend innovation plans to all the regions of the country, even poor states such as Chiapas, and includes all types of technologies, be they high or low.

Arco was established in 2007 on the initiative of ADIAT, an association created in 1989 to promote applied research and technological development among national executives in Mexico (see table 2). It cooperates with Conacyt, the Ministry of the Economy and the Chamber of Deputies Commission on Science and Technology. It links research centers, industry, the scientific community, and public agencies. Its most important activities are stimulating talent for innovation through public events such as congresses and seminars; commercializing technology projects in research centers; and knowledge management.

⁷ The National Chamber of Industry (Canacintra) also aspires to be an Arco member but it has not been accepted in the partnership.

⁸ Patel and Pavitt (1994, quoted in OECD, 1997: 10) define NIS as "the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning (or the volume and composition of change generating activities) in a country."

Table 2
ARCO PARTNERS AND TYPOLOGY

Name	Year		Function	Hybridization	
	Created	Funding		Horizontal	Vertical
ADIAT	1989	Self-financed	To foster the creation of a national innovation system	Citizen-expertise-economic	No
Rednacecyt	1998	Government	Connection of local S&T policies	Public-private-economic-scientific	Federal-regional
Cofupro	1996	Government	Coordinate the "Produce" Foundations at a national level	Public-private-economic	Federal-regional

ADIAT is a self-financed association funded by membership dues, courses, and yearly congresses. It also gets funding for specific projects from government bodies like Conacyt. In Arco's case, ADIAT complements its resources with subsidies from local governments to organize and promote its events.

The second member of the Arco Alliance, Rednacecyt, was created in 1998 to begin linking up public s&t policies with the federal legislative process and to the federalization of s&t public expenditures. Rednacecyt goes hand in hand with a paradigm of regional development; nevertheless, it does not exist all over the country, and it still has a lot to do to connect producers' demands and research centers. Rednacecyt, a civic association that promotes sustainable development of Mexico's scientific and technological infrastructure, exists in 28 out of 31 states. Its policy is to stimulate diversity in Mexico in terms of nature, population heterogeneity, and productive capabilities.

At this point, it works with information provided basically by Conacyt through its Integrated System of Scientific and Technologic Information and the National Institute of Statistics and Geographic Information. The organization is broad-based

but not enough to cover the entire country. Another problem is the insufficient circulation of information in the network, which has stopped Rednacecyt from being an important agent in the country's decision-making process.

Rednacecyt has been lobbying since 2003 at the Chamber of Deputies to promote a federal s&t policy and to start legal reforms that permit public spending in the field. This would include changes to the current s&t legislation. The association has also proposed the establishment of a fund for strengthening regional science, technology, and innovation systems that would allow states to manage their own budgets in the field. The fund would begin with a basic amount of Mex\$3.5 billion that would allow the states to advance their own s&t policies.

Rednacecyt's central project is the Observatory of Science, Technology, and Innovation, launched in 2006 to collect, process, and publicize statistical information and studies on the scientific, technological, and innovation systems in each Mexican state, with the aim of development and economic growth. It provides information in three basic areas: production of indicators on science, technology, and innovation; service to partners; and knowledge transfer. The observatory idea is not new; it has already been established in countries like France, Canada (see www.ost.uqam.ca), Portugal, Venezuela, Cuba, and Colombia.

The third partner in the Arco Alliance is Cofupro, the coordinating organization of "produce" foundation, representing them before public and private institutions that support technological innovation. Cofupro works with three types of strategies: 1) management of its partnership with similar institutions, sponsorships, and technological innovation units in the country's primary agro-industrial networks; 2) operational strategies, managing the "produce" foundations and gathering information; and 3) administrative strategies, seeking greater efficiency and transparency in the use of resources.

The "produce" foundations were created in 1996 at the initiative of federal and state governments, through the Subprogram of Research and Technological Transfer of the Alliance for the Countryside (*Alianza para el Campo*). These are non-profit associations, with no legal power, that seek to generate an appropriate technological basis for agriculture and forestry. They aim to increase competitiveness and reduce the risks for technological innovation in the field.

Cofupro is meant to register the demand of innovation per product and agro-ecological region and create awareness among researchers, academics, users, and businessmen, to achieve continuity among the generation, validation, and transfer of technology. Among Cofupro's results have been the consolidation of a national network of technological innovation; active user participation in the definition of the research agenda and technology transfer at the national level (3500 producers

and 32 states are currently involved); 52 studies of agro-food chains; average annual funding of 1 100 research projects; and technology transfer.

THE ARCO METHOD

The Arco Alliance bases its policy on the OECD vision of innovation incentives at a regional level. Arco thinks innovation is the key for the Mexican economy's entry into the information society, a way to create jobs. It offers a systemic plan (Regional Innovation System) to implement innovation bottom-up and top-down, by creating an equilibrium among high-, medium- and low-tech states. Regional clusters may concentrate independent companies, thus stimulating a network of regional innovation.⁹ In this way, companies cooperate with other organizations like NGOs.

Arco proposes several policy measures to be taken at a federal level, such as the establishment of competitive advantages and development visions based on innovation, for each region and federally; better access to budget and national innovation instruments; the creation of resource centers; harmonization of policies and legislation; the stimulation of seed-capital funds through Conacyt; and special protection for investors linked to the RIS, through risk capital funds.

Arco may be seen from two complementary vantage points: 1) collection and synthesis of the best innovation practices; and 2) innovation as a social system (Tigau, 2008). The first shows that Arco aims to gather and condense the best regional innovation practices. It identifies successful cases in order to integrate them into the Arco Alliance. It endeavors to propose new, real operational projects and connect them to the best international projects. It is not purely conceptual, as it aims to serve as a taxonomy/language for people interested in regional development, linking the national and international levels.

The second perspective demonstrates that Arco recognizes regional innovation systems not only as a technical issue, but also as an administrative one, which depends on the social system and on consensus with leaders of companies, universities, federal, state and municipal governments, and NGOs. In this model, NGOs are considered networking organizations.

According to the Arco perspective, innovation policies can be introduced even in poor regions; they can begin with low technology and later, high technology can be introduced; therefore, all the states need to be motivated. Arco offers regional innovation plans tailored to each specific area in order to integrate economic activ-

⁹ Regions are understood here in terms of different areas in a country.

ities less glamorous than high tech and stimulate competitiveness in all the regions, even those with medium-grade or low-level technology. In this way, the whole country will be able to develop an innovation system. Each state needs to define the concept of innovation. Sometimes regions may be states or parts of two states. In the regional innovation system, each region/state is different as it creates its own models of action according to the way the social system needs to be stimulated.

Arco is based on a three-step methodology meant to create major changes in the Mexican economy at a regional level (see figure 2). The first step is the definition of actors interested in generating an innovation infrastructure (government, companies, NGOs, etc.) and the background of each situation (economic cycles, political and social situations). In each case, the concept of "region" has to be redefined in order to evaluate the possibilities for innovation.

The second level is the analysis of essential processes, involving strategic mapping and the establishment of competitive vocations and strategies, indicators and objectives, interaction, innovation opportunities, politics, and members' agendas. The third level of habilitation processes offers incentives for technology and innovation commercialization, monitoring and communication, formal governance structures, and formal financial structures. Arco works in a scarcity-induced innovation environment, and its very creation was stimulated by this lack of public and private institutions interested in an innovation framework. As far as this research has gone, Arco has no serious competitors either at the official or non-official level.

INTERMEDIATE RESULTS

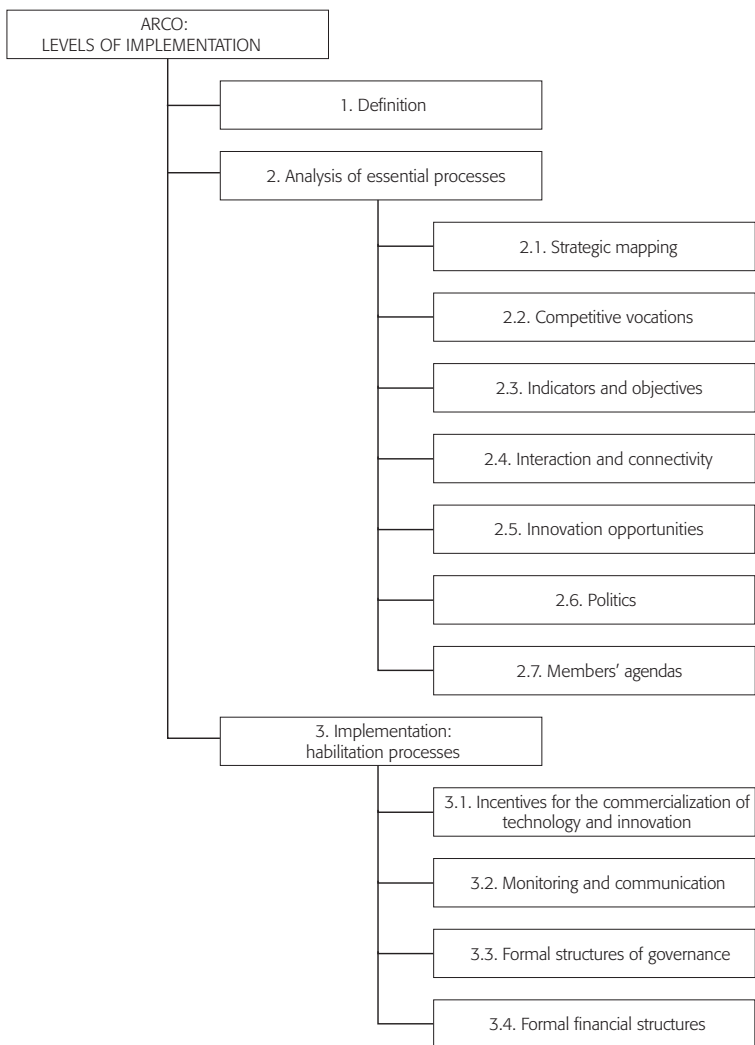
The Arco methodology offers a varied framework. Even though its results are difficult to evaluate after just one year of activity, certain conclusions can be drawn based on its ideology and capacity to adapt the OECD model to Mexican realities.

The Arco partners start with an evaluation of what is appropriate for each region through strategic mapping. Arco wants the states to finance innovation plans. First, a financial analysis of the government is issued. Then, company leaders and other funders are supposed to finance the innovation plans.

Arco has undertaken three projects in the states of Jalisco, Baja California, and Guanajuato. Innovation plans were designed with the local science and technology councils (Coecytjal, Cobacyt and Concyteg, respectively). In this case, local governments take on more importance than the federal one.

Baja California has a local system of economic development involving that state's council and one educational institution. The civic association *Producen* works

Figure 2
REPRESENTATION OF ARCO METHODOLOGY



Source: Adapted from Arco's booklet *Sistemas de innovación regionales. Taller de inducción: Modelo Arco dirigido a líderes de proceso* (Regional Innovation Systems. Initiation Workshop: The Arco Model, targeting process leaders), used at the workshop held in Guanajuato, Mexico on December 4, 2007.

as a networking agent and could be soon transformed into an NGO. Producen used to work under the auspices of the Ministry of the Economy, but now functions as a civil society body, independent of government structures. Baja California is really interested in cooperation with Arco and has accepted sharing information. In Baja California, ADIAT and the United States-Mexico Foundation for Science (FUMEC) have been especially active. In fact, the president of ADIAT is also president of the FUMEC Board of Governors.

Guanajuato has a plan aimed at setting up a public-private governance system. Arco looks for a fund in each state (for instance, the Guanajuato Fund). At the same time as Arco's, a similar organization was created in Sonora with the help of the Friends of Chile organization. Foundation Sonora was created as an organization of governance that sought to constitute the Sonora Fund.

Arco projects still lack proper funding. Some external sources have been the Competitiveness Council and FUMEC. There is also a joint finance program involving Mexico, the European Union, and Foncyt, but it always has to begin at the initiative of the local government. The Arco Alliance is currently undertaking workshops in Guanajuato and Nayarit and plans to start working in Jalisco, Chiapas, and Coahuila. Differences among states can be vast: while in San Luis Potosí they are starting from zero, in Nayarit they have already started implementing plans in the tourism and agricultural sectors.

CONCLUDING REMARKS

While the U.S. and Canada have adopted federal and state-oriented policies to stimulate innovation, Mexico is currently implementing the first steps toward an OECD policy emphasizing regional innovation. International models like the OECD's are difficult to apply similarly in countries with different levels of economic development, not to mention their idiosyncrasies and historical conditions. Even though Mexico has been an OECD member for 14 years, it has not really applied its economic perspective due to the lack of an innovation-friendly public policy that would transcend each successive presidential administration. Since 2007, the country has adopted an industrial policy that includes innovation to its S&T Law. Non-governmental mechanisms such as the Arco Alliance also exist to complement the dearth of official institutions dedicated to innovation.

More than adapting the OECD model to Mexican realities, Arco tries to create an innovation-friendly environment and stimulate the interest of local government institutions in creating R&D policies. This is a different way of understanding and

applying the OECD model from that of Canada and the U.S., where the institutional framework for innovation is being strengthened rather than replaced or complemented by innovation associations. From this point of view, due to differences in the development levels of the three NAFTA partners, there is no common background that would allow a proper integration in terms of innovation. Even though Arco cooperates with organizations such as the EU and FUMEC, there is no significant cooperation between NGOs dedicated to innovation in North America. However, the existence of a National Research Council in the three countries could offer similar institutional partners, if they were to initiate cooperation programs using this channel.

The Arco Alliance tries to stimulate the concept of bottom-up innovation, in contrast with the top-down government public policies. Due to the national political system's rigidity and the lack of funding, among other things, Arco's plans for major social change have been quite slow and insufficiently supported locally. The overview of the Arco program shows a satisfactory methodology and application of its policies. In one year, Arco has succeeded in implementing the OECD method in three states, and it is currently lobbying in several others. Long-term results may need to be reevaluated for a definitive assessment of its efficiency.

Civic associations in general and Arco in particular still find it difficult to lobby public institutions and get their innovation plans accepted on an official level. Problems are not only generated by financial scarcity, but also by a certain resistance to dealing with alternative, non-governmental institutions. Adapting the OECD view on regional and open innovation in Mexico further complicates the panorama, due to big disparities among states. While government policy is top-down and emphasizes development in the northern states, the Arco Alliance tries to sell its bottom-up programs of economic incentives in every state, even in the poor ones in the South, by implementing the scarcity innovation idea discussed above.

The current review shows that hybrid strategic groups may involve all types of actors interested in the innovation process. In this case, hybrid groups were formed on the initiative of a civic association but extended to involve public, private (economic) and scientific partnerships. The absence of other partners such as the public and the media is noteworthy. This would allow stronger visibility for Arco actions, as well as a better social acceptance and cultural adaptation to its programs. Arco could also benefit more from scientific cooperation, by acting as a broker between scientific institutions and the public-private partnership. At the moment, it acts on a scientific methodology but uses the possibility of scientific diplomacy insufficiently. At the same time, close cooperation with the OECD would enable a better application of its policies and a mutual learning experience.

BIBLIOGRAPHY

ACADEMIA MEXICANA DE CIENCIAS

2006 "Por un nuevo paradigma de política pública para el conocimiento y la innovación en México", April 2006, http://www.foroconsultivo.org.mx/documentos/plan_nacional/06_prop_amc_editada.pdf, accessed July 7, 2008.

ADVISORY COMMITTEE ON MEASURING INNOVATION IN THE 21ST CENTURY ECONOMY

2008 "Tracking the State of Innovation in the American Economy", <http://www.innovationmetrics.gov/Innovation%20Measurement%2001-08.pdf>, accessed June 18, 2008.

ATKINSON, ROBERT D.

2007 "Deep Competitiveness", *Issues in Science and Technology*, Winter 2007, www.issues.org/23.2.html, accessed June 18, 2008.

BUSINESS ROUNDTABLE

www.businessroundtable.org, accessed July 1, 2008.

CANADA FOUNDATION FOR INNOVATION

www.innovation.ca/, accessed February 2, 2008.

CÁMARA DE DIPUTADOS, COMISIÓN DE CIENCIA Y TECNOLOGÍA, LIX LEGISLATURA

2005 "Declaración de Cozumel", June, in http://www.foroconsultivo.org.mx/documentos/plan_nacional/01_declaracion_de_cozumel_ver03.pdf, accessed May 12, 2008.

CARRIER, MARTIN

2004 "Knowledge and Control. On the Bearing of Epistemic Values in Applied Science", in Peter Machamer and Gereon Wolters, eds., *Science, Values and Objectivity*, Pittsburgh, Pittsburgh University/Universitätsverlag Konstanz, pp. 274-293.

COMPETE AMERICA

www.competeamerica.org, accessed June 15, 2008.

CONACYT

<http://www.conacyt.mx/comunicacion/Comunicados/23-07.html>, accessed July 1, 2008.

COUNCIL ON COMPETITIVENESS

- 2007 "U.S. Economic Development Administration Teams with Council to Boost Innovation", <http://www.compete.org/media-resources/entry/25/us-economic-development-administration-teams-with-the-council-on-competitiv/>, accessed February 1, 2008.
- 2008 [http://innovation.gc.ca/gol/innovation/site.nsf/vDownload/PDF_NatSummit/\\$file/InnovationMap.pdf](http://innovation.gc.ca/gol/innovation/site.nsf/vDownload/PDF_NatSummit/$file/InnovationMap.pdf), accessed June 15, 2008.

DESARBO, WAYNE S. AND RAJDEEP GREWAL

- 2007 "Hybrid strategic groups", *Strategic Management Journal*, vol. 29, no. 3, March, pp. 293-317.

Díaz Betancourt, José

- 2007 "Nueva ley de ciencia, ficción pura", *Academia*, August 20, http://www.comsoc.udg.mx/gaceta/paginas/493/G493_cot%207.pdf, accessed May 6, 2008.

DOLOREUX, DAVID AND STEVE DIONNE

- 2008 "Is Regional Innovation System Development Possible in Peripheral Regions? Some Evidence from the Case of La Pocatière, Canada", *Entrepreneurship & Regional Development*, vol. 20, no. 3, May, pp. 259-283.

FORO CONSULTIVO CIENTÍFICO Y TECNOLÓGICO (FCCT)

- 2006 *Conocimiento e innovación en México: hacia una política de Estado. Elementos para el Plan Nacional de Desarrollo y el Programa de Gobierno 2006-2012*, November, http://www.foroconsultivo.org.mx/libros_editados/conocimiento_innovacion.pdf, accessed February 2, 2008.

GEORGE, ALEXANDER and ANDREW BENNETT

- 2005 *Case Studies and Theory Development in Social Sciences*, Massachusetts, MIT Press.

GOVERNMENT OF CANADA

<http://www.canadabusiness.ca>, accessed June 15, 2008.

INNOVATING REGIONS IN EUROPE

<http://www.innovating-regions.org/>, accessed June 15, 2008.

INTERNATIONAL SCIENCE AND TECHNOLOGY PARTNERSHIPS CANADA

<http://www.istpcanada.ca>, accessed June 15, 2008.

LAMBELL, RICHARD et al.

2008 "NGOs and International Business Research: Progress, Prospects and Problems", *International Journal of Management Reviews*, vol. 10, no. 1, pp. 75-92.

LANE, NEAL

2008 "U.S. Science and Technology: An Uncoordinated System that Seems to Work", *Technology in Society*, www.elsevier.com/locate/techsoc (forthcoming).

LILJEMARK, THOMAS

2005 "Innovation Policy in Canada. Strategy and Realities", Swedish Institute for Growth Policy Studies, http://www.itps.se/Archive/Documents/Swedish/Publikationer/Rapporter/Allmänna/A2004/A2004_024.pdf, accessed May 6, 2008.

MINISTRY OF ECONOMIC DEVELOPMENT, NEW ZEALAND

Economic Development Indicators 2005, Growth through Innovation, www.med.govt.nz, accessed February 2, 2008.

MONTANA, JENNIFER et al.

2001 *Strategic Planning in the Technology-Driven World: A Guidebook for Innovation-led Development*, Washington, D.C., Economic Development Administration.

NIOSI, JORGE

2005 *Canada's Regional Innovation System. The Science-based Industries*, Canada, McGill Queen's University Press.

OBSERVATOIRE DES SCIENCES ET DES TECHNOLOGIES

www.ost.uqam.ca, accessed June 15, 2008.

ORGANIZATION OF AMERICAN STATES (OAS)

Ciencia, tecnología, ingeniería e innovación para el desarrollo. Una visión para las Américas en el siglo XXI, Washington, D.C., Office of Education, Science and Technology, OAS, 2005, http://www.oest.oas.org/engineering/espanol/documentos/esp_web_ok.pdf, p. 31, accessed February 2, 2008.

ORGANIZATION OF ECONOMIC COOPERATION AND DEVELOPMENT (OECD)

1997 *National Innovation Systems*, in <http://201.149.22.140/documento/33.pdf>, accessed June 15, 2008.

2003 *Turning Science into Business. Patenting and Licensing at Public Research Organisations*, OECD, <http://www.oecd.org/dataoecd/49/45/24236156.pdf>, accessed June 15, 2008.

OJASALO, JUKKA

2008 "Management of innovation networks: a case study of different approaches", *Emerald Journal of Innovation Management*, vol. 11, no. 1, pp. 51-85.

PAUL LEE, MING DONG

2008 "A Review of the Theories of Corporate Social Responsibility: Its Evolutionary Path and the Road Ahead", *International Journal of Management Reviews*, vol. 10, no. 1, March, pp. 53-73.

PERELLO, CARLES AND MARIONA RIERA

2004 "Lleis i organismes per a la ciencia i la tecnologia", *Coneixement Societat*, no. 9, December, pp. 60-99.

PRO INNO EUROPE

<http://www.proinno-europe.eu/>, accessed May 6, 2008.

SRINIVAS, SMITA AND JUDITH SUTZ

2008 "Developing countries and innovation: Searching for a new analytical approach", *Technology in Society*, vol. 30, pp. 129-140.

TIGAU, CAMELIA

2007 "La diplomacia en la era digital. Modelos dinámicos de negociación y prospective", PhD diss., UNAM, http://132.248.9.9:8080/tesdig/Procesados_2007/0616785/Index.html, accessed June 20, 2008.

2008 Interview with Leopoldo Rodríguez, President of Arco and ADIAT, Mexico, ADIAT headquarters, May 19.

TOLEDO, VÍCTOR

2004 "La ciencia como dogma: corporaciones, transgénicos y biotecnología", *La Jornada*, December 16.

UNESCO

<http://stats.uis.unesco.org/unesco/tableviewer/document.aspx?FileId=76>, accessed July 10, 2008.