

Determinants of university-industry collaboration: The cases of four states in Mexico

ABSTRACT

Universities in Mexico have shown little responsiveness to programs to stimulate direct forms of collaboration with industry. Evidence from this study suggests that university-industry collaboration is the result of locally determined factors, public policies and universities' own initiatives. These elements intertwine in complex ways to determine the level of integration of the academic and productive sectors in a region. This result challenges the widespread view according to which eliminating barriers that prevent collaboration –such as weakly defined intellectual property rights, lack of incentives, of bureaucratic structures operating in both firms and universities— will necessary lead to a closer interaction between the academic and productive sector. It also suggests that models of university-industry collaboration are not easily transferable between regions. Thus, regional policies that take into account local trends and actors are crucial. Their impact, however, will remain limited if public resources devoted strengthen universities' R&D capabilities remain so small.

I. INTRODUCTION

University-industry collaboration patterns in more advanced economies have played a crucial role in supporting regional competitiveness (Nelson, 1993). These experiences have greatly impacted expectations for higher educational systems in developing countries. In Mexico, the generally poor innovation performance of domestic industry has been perceived as a constraint on global competitiveness (CONACYT, 1995; OECD, 1997; World Bank, 1994). As a result, national policy makers and international development organizations have stressed the need to bring about more direct collaboration between Mexican universities and Mexican industry in order to foment development of technological capabilities (Casas & Luna, 1997; CONACYT, 1995; CONACYT, 2001; OECD, 1997; World Bank, 1994; World Bank, 2000; World Bank, 2003).

Following the dominant view, policies have been mainly directed to eliminate barriers that prevent collaboration, such as weakly defined intellectual property rights, lack of incentives, or bureaucratic structures operating in both firms and universities. According to this perspective, this will result in a higher integration of the academic and productive sectors (World Bank, 2003).

Despite the importance attributed to collaborative ties between academia and the productive sector in Mexico, *direct* public intervention has been limited to the implementation of a few programs that use public funds to finance joint university-industry projects (Casas, 1997). These efforts have generally been short-lived and

under-funded (see for example CONACYT, 2000). Reform-oriented higher education policies that were initially launched in Mexico in the early 1990s have played a role, albeit an indirect one, in determining the current conditions under which university-industry linkages may emerge. These reforms are characterized by increased federal government management and planning in public higher education institutions alongside a *laissez faire* stance toward the private sector (Kent, 2003). One consequence has been the emergence of a more complex and diversified higher education system, which, at least in theory, acknowledges that its role in economic progress goes beyond the formation of human manpower. Universities in Mexico have increasingly recognized the development of direct collaboration mechanisms aiming at strengthening national firms' competitiveness as a way to "authenticate" their contribution to the local economy. The development of strategies and mechanisms by which academic institutions approach the productive sector, however, has been left up to the individual institution.

The results of the qualitative interview methods applied in this study suggest that a lack of efficient direct public mechanisms to encourage university-industry collaboration has given rise to large disparities in the ability of individual institutions to interface with the productive sector. Differences prevail even among "equal" institutions, that is institutions that operate under the same category in terms of funding sources and governance. Collaborative links are scant in some universities, whereas others have developed internal structures that allow sophisticated forms of university-industry technological transference to take place.

Many of the arrangements between universities and firms have been, to a large extent, "invisible" to public planners. Hence, mounting social, economic and public pressure for universities to play a role in local economies has not moved beyond the level of discourse nor that Mexican policy makers have translated this pressure into programs to facilitate the delivery of targeted, efficient forms of technological knowledge to local industry.

Although available research has not addressed the causes of these distinctive patterns, available evidence presented in Chapter Two of this dissertation supports the idea that local conditions, such as the level of economic development, historic conditions and the ethos of a region, are determinant in driving the relations of universities and local industry. This evidence, however does not explain differences found within regions in the way individual institutions have addressed their role in industrial development. This is particularly the case of differences found between private and public academic institutions.

This research argues that local characteristics combine with other elements, such as the responses of the local higher education system to policy reforms, the characteristics of individual academic institutions –such as mission, funding sources or the ability to balance research and teaching activities— to explain distinctive collaborative patterns with local industry. The individual impact of each of these elements is hard to isolate, however, all these elements need to be taken into account to provide a more comprehensive explanation of why some universities have become more integrated into the local economy while others lag behind.

To this end, interviews were conducted with university representatives and local planners in the states of Guanajuato, Jalisco, Nuevo Leon, and Puebla. This study was conducted as part of a larger multi-institutional research project, the Alliance for International Higher Education Policy Studies (AIHEPS; <http://www.nyu.edu/iesp/aiheps>). AIHEPS aims at attaining a better understanding of the relationships between policy change and socio-educational outcomes of higher education in Canada, the United States and Mexico

II. BACKGROUND

The main goal of the higher education reform begun in Mexico in the early 1990s was to align the higher education system with the overall market-oriented economic model implemented in the prior two decades. This strategy implied encouraging a closer interaction between the academic and industrial sectors (CONACYT, 1995; CONACYT, 2001; World Bank, 1999). A first step was the establishment of strategies oriented towards rebuilding the capacity of the government to manage the higher education system; specific goals were to improve quality and access.

Public intervention took the form of market approaches, such as the implementation of competitive mechanisms for the assignation of funds. These efforts were particularly directed at limiting the growth of public universities in order to increase quality, and at decentralizing the system by creating two- and four-year

technical public institutes. These measures led to a more differentiated public higher education system characterized by the rapid expansion of technical post-secondary education (De Vries, 2002; Kent, 2004).

Although policies were designed with the public higher education system in mind, they had an impact on the behavior of private institutions through the creation of new, unregulated market niches for private investment. This led to diversification and expansion in the private higher education sector. A lax licensing policy for new private establishments encouraged this growth, albeit in an indirect way (Kent, 2003; 2004). Much of the current wave of private expansion, however, has taken the form of small academies with poor infrastructure and part-time, poorly trained faculty, which has resulted in drastic differences in the performance of individual institutions (Kent, 2004).

The higher education reform introduced two main strategies to facilitate university-industry interactions. First, the release of public research funds has been tied to the development of projects useful for industry. Second, policy makers have set the first steps toward decentralizing the national system of science and technology by involving state and municipal authorities in the decision-making and funding processes in order to account for the needs of regional economies (CONACYT, 2001).

Despite of the recent attention paid to regional economies little research has been devoted to study the factors behind differences observed in the levels of integration of the academic and productive sectors across regions (ITESM, 1999;

OECD, 2003). Nor research has been devoted to explain disparities found in the performance of individual academic institutions within regions (Casas, De Gortari, & Luna, 2000; Casas & Luna, 1997; Luna, 2001).

This paper argues that locally determined factors –such as the level of development of a region, and its cultural and historical background— combine in complex ways with the characteristics of the local higher education system to determine the responsiveness of academic institutions to their local environment. Taking into account these factors, this study uses empirical evidence to analyze the determinants of university-industry collaboration. Three specific questions are investigated: i) What motivates universities to develop collaborative ties with the productive sector; ii) How do universities establish efficient communication channels with industry; and iii) How do academic institutions balance their academic and research activities.

The rest of the paper is organized as follows. Section III presents the methodology. Section IV analyzes different factors that have driven the relations between the academic and productive sectors in the four states studied. Section V identifies determinants of communication channels developed between universities and firms. Section VI focuses on how academic institutions balance teaching and research. The final section concludes.

III. METHODOLOGY

The primary data source for this research consisted of semi-structured, in-depth interviews with representatives of higher academic institutions in the states of Guanajuato, Jalisco, Monterrey and Puebla. Interviews also included representatives of the local and federal governments involved in the planning and regulation of the higher education system (See Appendix B).

Interviews with representatives of universities were conducted with planners, representatives of liaison offices, and with representatives of the universities' R&D centers. In these interviews, universities' representatives were asked to describe the ways in which the educational reform introduced in the 1990s had affected their institution in areas such as governance, funding, accountability and in their interactions with the productive sector. Interviews conducted with local and federal government representatives provided a more in-depth understanding of the purposes and implementation mechanisms of the higher education reform and, more specifically, the way it changed the context within which collaborative arrangements are expected to take place in Mexico.

In order to understand the emerging structure of the higher education system, this paper uses a typology proposed by Kent (2003, 2004). This classification acknowledges the evolution of the public sector from a dual system constituted by universities and 4-year technical institutes, to an array of postsecondary institutions. It also addresses the expansion of the private sector, which has diversified to include i)

private universities (elite); ii) non-university, demand-absorbing institutions; iii) organizations that are formed and expand like businesses; iii) institutions that are transitioning towards becoming universities; iv) specialized institutions; and v) international corporations (See Appendix B). As Table 3 illustrates, the non-university is the fastest-growing sector in the four states included in this study.

Table 3. Horizontal differentiation in the higher education system, 1990-2003
Number of establishments

	Sector	Sub-sector	1990	2003
Guanajuato	Public	University	1	1
		Technical institutes (4-yr)	3	5
		Technical institutes (2-yr)		3
	Private	University	4	5
		Non-university	8	28
		Under consolidation		4
Expanding			3	
		Specialized institutes	1	16
Jalisco	Public	University	1	7
		Technical institutes (4-yr)	2	9
		Technical institutes (2-yr)		2
	Private	University	2	4
		Non-university	2	15
		Under consolidation		2
Expanding			14	
Specialized institutes		1	15	
Nuevo Leon	Public	University	1	2
		Technical institutes (4-yr)	2	2
		Technical institutes (2-yr)		2
	Private	University	4	6
		Non-university	8	21
		Under consolidation		3
Expanding			2	
		Specialized institutes	2	16
Puebla	Public	University	1	
		Non-university	3	
		Under consolidation		
		Expanding		
		Specialized institutes		
	Private	University	3	5
Non-university		13	53	
Under consolidation			3	
Expanding			17	
Specialized		6	17	

Source: ANUIES Database for enrollments, several years. Adapted from Kent (2004).

IV. WHAT MOTIVATES UNIVERSITY-INDUSTRY COLLABORATION?

Market-oriented public policies introduced to stimulate a closer interaction between the academic and productive sectors have had a little impact on academic institutions' individual decisions on whether and how to pursue collaborative efforts. The main limitation of public initiatives is that they are scantily funded (Table 4). For example, in 2002, the federal subsidy to support scientific and technological activities received by the four states included in this sample represents 0.02% of the Johns Hopkins University's annual expenditure in R&D in the sciences and engineering. This university had the largest expenditure in academic R&D that year (National Science Foundation, 2004). Subsidies to support university-industry collaboration in the four Mexican regions constitute only a fraction of the total subsidy assigned to fund scientific and technological activities.

Table 4. Federal funds assigned to the states to support university-industry collaboration and scientific and technological activities, 2002.
Thousands of pesos

State	University-industry collaboration	Scientific and technological activities
Guanajuato	1,149	63,860
Jalisco	3,358	55,713
Nuevo León	7,454	41,597
Puebla	184	71,848

Source: (CONACYT, 2003b).

Another limitation has been the fail of policymakers to foresee the impact of a more diversified, market-oriented higher education sector on local industry. In some cases, policy reforms have made collaboration less likely to occur. For example, the lack of regulation has allowed an uncontrolled expansion of low-quality private establishments. These institutions have remained virtually isolated from the needs of local industry, as their graduates frequently lack the skills demanded by industry (Kent, 2004). Private institutions receive virtually no public resources to support their operations, and little funding to support applied research (Table 3).

Table 5. Sources of funding for public and private higher academic institutions, 2001.
Thousands of pesos

State	Regular Activities		S&T Activities
	Federal	State	Federal
Guanajuato			
State U	364,391	191,590	19,404
Private U	0	0	0
Jalisco			
State U	1,347,812	1,555,094	43,599
Private U	0	0	945
Nuevo León			
State U	1,486,033	905,503	77,535
Private U	0	0	7,722
Puebla			
State U	1,050,954	272,215	41,770
Private U	0	0	7,450
National			1,742,442
State U	15,965,852	8,283,692	

Source: CONACYT, 2003b, Secretaría de Educación Pública, 2004.

State universities, including those that have managed to become reputable research centers, have traditionally operated with a very high degree of independence from both local and federal governments. Representatives from these institutions acknowledge that public financial incentives are

insufficient and irregular to support collaboration. Thus, public policy is generally perceived as inadequate to support a long-term strategy to engage universities into collaborative arrangements with industry (Interviews #13, 22). Pressure from increasing competition among higher academic institutions also has had a limited impact, since state universities receive public funds to operate as non-research institutions regardless of their performance within the local economy.

Technological institutes, which were created with the mission of interacting closely with industry, face constraints to provide forms of technological knowledge other than those incorporated in the formation of human manpower. Specifically, these centrally regulated institutions lack the autonomy to make legal contracts, which seriously restricts their ability to partner with industry (Interviews #12, 33). For these institutes, it is also particularly hard to make use of federal funding to support applied research due to their orientation towards pedagogical activities (Ramírez, 2002).

In sum, evidence suggests that although public policies have changed the conditions under which collaborative ties need to emerge, they have been unsuccessful in motivating universities to develop closer ties with the productive sector. Instead, universities' behavior towards industry has been driven by a combination of locally determined factors –such as the level of economic development in a region, and cultural and historical characteristics—, internal mechanisms –such as an institutional mission, form of governance and sources of

funding—. These initiatives, have frequently been accompanied by the implementation of internal long-term strategic planning strategies, flexible management practices and evaluation mechanisms, which have helped institutions to clarify the types of interactions the university is willing and capable of establishing with the private sector, to identify sources of funding, and to prepare the human resources and infrastructure these projects demand (Interviews #7, 8, 13, 14, 15, 16, 19, 20, & 22).

Motivated by these mechanisms, some universities have managed to become more sophisticated in their collaboration with industry in recent years. In each case where this has occurred, there has been an explicit decision by universities' governance bodies to move closer to the needs of the private sector (Interviews #7, 8, 12, 13, 15, 18, 19, 20, 21, 22 & 35). Some universities have moved closer to leading, large national firms, whereas others have chosen to target small and medium enterprises. The latter is particularly the case of those academic institutions that seek to contribute to local social and economic development as part of their mission. Also, although state universities, which concentrate the bulk of the human resources and infrastructure to support applied research (Casas, 2001; Casas & Luna, 1997), have been traditionally seen as the most fit to lead university-industry ties, some private universities have become important players in the local economy by introducing alternative ways to approach the local productive sector. The following sections illustrate how different elements determine the patterns of university-industry collaboration emerging in the four states included in this study.

A. Puebla

The central state of Puebla is the fourth largest industrial region in Mexico. In the last decade the state had an average rate of growth of 3.6 per cent, exceeding the national average of 2.9 per cent, but below more dynamic industrial regions such as Nuevo Leon or Guanajuato (4.1 respectively) (INEGI, 2004a).

An explanation for this gap is that economies such as Guanajuato and Nuevo León have managed to become more integrated with the North American economy, while the chief industrial sectors in the Puebla economy –textiles and garment, beverages and traditional food processing—experienced difficulties in adapting to an open economy. Further, as discussed in Chapter 2 of this dissertation, the main local economic strategy –attracting foreign direct investment—has led to a more polarized local economy. This is characterized by the presence of large subsidiaries of transnational corporations (TNCs) and big national firms belonging to Mexican business groups oriented towards exports markets, and a myriad of medium, small and micro enterprises in all sectors of the economy that focus on domestic markets and show levels of productivity far below international standards.

As shown in Chapter 2 the academic and productive sectors in the region remain highly disintegrated. One of the main reasons for this result is found in the structure of the productive sector. The upper pole of the local economy has easy access to state-of-the-art universities and laboratories abroad. Further, many subsidiaries of parent companies operating in the region do not perform sophisticated

technological activities. The lower pole of the economy, dominated by small and micro family firms, has virtually no ties to the academic sector.

The lack of interactions between the academic and productive sectors is also the result of the little success the state university (BUAP), the largest university in the region, has had in becoming a consolidated research institution. Among representatives of the local productive sector BUAP compares highly unfavorably with other prestigious local private universities. Evidence suggests that this institution has responded to the perceived of local firms on a case-by-case basis, more improvising than establishing a comprehensive strategy to stimulate collaboration:

We have had specific demands coming from industry and we have satisfied some of them but not in an organized way. We lack perspective and vision, we do not define strategies or select economic sectors to work with; here researchers would have a hard time explaining the basic characteristics of our local industry. Almost all universities have had successful experiences with industry but they are not enough. We need to ask ourselves, what do we want to do with industry? Where are we going to focus our efforts?" (Interview #1).

Additionally, between 1991 and 2001, enrollments in the region grew by 47 per cent. An impressive 94 per cent of this growth accounts for the expansion of the private higher education sector (Kent, 2005). The proliferation of private higher education establishments with doubtful reputation has deteriorated the overall image of the local higher education

system and has hampered the development of closer collaborative ties with industry.

Within this context, there are two main factors that have driven the relations between the productive and academic sectors in Puebla. First, the need for qualified human resources among predominantly labor-intensive industries in the region; second, internal motivations of individual institutions.

As discussed in a previous chapter, the need for trained manpower has led virtually all reputable private institutions in Mexico to open branches in Puebla. These institutions offer a wide range of academic, continuous education and training programs. This has made of Puebla an important recruiting center not only for the region, but also for the large labor market in neighboring Mexico City and Mexico state. Emphasis on human resources has also facilitated technological exchanges from the firms to the universities, in the form of infrastructure and equipment, in an attempt by local firms to provide students with practical experience.

Other factor driving university-industry relations is provided by universities' internal mechanisms. The *Universidad de las Américas*, an elite private university in México, provides an example of these types of motivations.

UDLA's mission stresses the need to impact the social and economic regional environment (Interviews #8 & 10). UDLA is a university that "has prided itself on its self-consciously U.S. orientation to education and its value on the job market" (Levy, 1986; p. 122). It was created as Mexico City College in 1940, and adapted a

university status in 1963. Its foundation aimed at serving “both Mexican and U.S. students in a de-politicized, secular environment that would foster international ties through bicultural, bilingual education” (Ibid).

According to university representatives, the university sees itself as a “first world university in a third-world world region” and has made the support of the most disadvantaged players within the local economy a priority (Interview #8). In 2002, UDLA launched the “Cholula Project,” an ambitious project aimed broadly at improving living conditions in the Cholula region, an underdeveloped rural community in the vicinity of Puebla where the university is located. The Cholula Project was also created with the purpose of integrating the different programs and individual efforts of UDLA researchers and students through internships, social service programs, and research projects under a single administration and management.

UDLA has envisioned this project as a “bridge” organism between the university and the Cholula community: “We have a mutual dialogue with the community here in Cholula. They know us and we have a very good reputation. In fact, the center was strategically located at the heart of Cholula, rather than on campus, in order to facilitate and promote the development of linkages with the neighborhood.” Identification and design of the projects undertaken have “come as a consequence of these close ties” (Interview #10).

Although it is too early to evaluate the total impact of this project, criteria to assess the regional impact of CDR included the fact that external donors, such as the

Inter-American Development Bank, are supporting its programs. It has also attracted an increasing number of faculty members into its programs, which was one of the primary objectives of the CDR, and has managed to establish collaborative networks with several local and foreign players, such as business associations, local government representatives and academic institutions abroad (Interview #10).

B. Nuevo León

The Northern state of Nuevo León is the second largest economy in the country after the Federal District. The Monterrey metropolitan region produces nearly 7% of Mexico's gross industrial product (INEGI, 2002). These data, however, do not properly reflect the importance of Monterrey's industrial firms, which have subsidiaries throughout the country and in some cases abroad. Nuevo León's average industrial growth rate for the period 1993-2002 was 4.1 per cent, above the national average of 2.9 per cent (INEGI, 2004a).

Nuevo León is regarded as a stronghold of heavy industry – concrete, glass, steel, among others— and of large financial and manufacturing business conglomerates. Overall, Nuevo León productive sector has been more successful in integrating to the North American economy than other regional economies. This is in part due to the close collaborative ties this region has held with the Southern American state of Texas, to a culture that praises entrepreneurship, and to the formation of powerful business networks that have expanded their influence beyond the geographic limits of the state (Cerruti, Ortega, & Palacios, 2000; Melgar Palacios, 1992; Vellinga, 1995).

Among the four states studied in this research, Nuevo León shows the highest level of integration of their academic and productive sectors. Although collaborative arrangements aiming at promoting technological transferences from the universities to the firms are not very frequent in the region, academic institutions have become important players in the local economy through characteristic channels. The driving forces behind these results are the presence of competitive national firms and large business groups that have strongly influenced the industrialization experience of the region and the local higher education system.

Nuevo León entrepreneurs have had a strong influence in shaping the local higher education system. ITESM is the bastion of private higher education of the elite sector in the region. ITESM was founded in 1943 by a group of businessmen of the *Grupo Monterrey* with the specific purpose of supplying the human manpower required by local industry. Modeled after the Massachusetts Institute of Technology, ITESM's strengths lie in engineering and business management (<http://www.mty.itesm.mx/principal.html>).

Although the state university (UANL) has traditionally kept its autonomy from external influences, the business community of Nuevo León has heavily influenced the changes taken place in this academic institution. In the last decade, UANL has become a leading research institution in the country, and has developed a strong orientation towards local industry (Medellin, 2005).

As shown in Chapter 2 ITESM and UANL have been important players in the local economy, not only because they have provided the skilled human resources

demanded by industry, but also because they has contributed to strengthen the “entrepreneurial spirit” of the region, to disseminate a “quality culture” that has been a key component in building the competitiveness of local firms, and to stimulate the formation of local business networks by keeping close ties to powerful business groups. The following examples show the mechanisms through which ITESM and UANL, the leading academic institutions in the region, respond to their economic surroundings.

In the last two decades, and motivated by the perception that local firms could not support an international competitive strategy based on low labor costs, ITESM’s governing body decided to move beyond emphasis in the formation of highly trained human resources to other potential market niches in applied research, graduate education and direct collaboration with the productive sector (Interview #18). Since then, the university has undergone a drastic internal reorganization that has led to the creation of liaison and research centers, to the formation of a cadre of researchers, and to the establishment of internal mechanisms to provide funds for research in the form of seed grants to help faculty members to conduct small projects that have the potential of attracting funding from industry (Interviews #18, 20). ITESM works primarily with large, leading manufacturing firms in the area, and virtually all of its research activities are applied to local industry. Their current involvement in technological design and innovation has fallen short of expectations due to the fact that “there are very few firms in Mexico that consider engineering and design capabilities as a competitive strategy” (Interview #18), its liaison centers have been

relatively successful (i.e. they are profitable) in selling consulting, training and other services to local and national industry (Interview #18).

In the case of the state university of Nuevo León (UANL), a governance body that includes prominent local entrepreneurs and sees the future of the university as becoming a crucial player in the regional economy (Interview #13) has driven the university's efforts to become a leading research university in the country. In the last decade, UANL has undergone a long process to improve its research capabilities. It has implemented internal mechanisms to upgrade faculty quality, to obtain internal and external accreditations, to find additional sources of funding to support research activities, and to invest in infrastructure, equipment and library upgrades (Interview #13).

With a mission that regards basic research as equally important as applied research, UANL has differentiated itself from other local universities that keep relatively close ties with industry –and particularly from ITESM—by focusing in the provision of graduate programs in the areas of sciences, engineering and medicine. Unlike ITESM, an important form of collaboration with industry for UANL – other than the provision of human manpower—takes the form of informal, person-to-person interactions with firms' representatives. Given the fact that UANL concentrates a relatively high proportion of human resources and infrastructure that support research activities (CONACYT, 2003b), the university has been successful in establishing interactions that involve joint research projects and consultancy services with both large national firms and transnational corporations operating in the region

(Luna, 2001). However, evidence suggests that informal interactions between faculty members and firms' representatives remain an important form of collaboration.

C. JALISCO

Jalisco is the third largest regional economy after the Federal District and Monterrey. Its economy contributes with 6 per cent of the national gross domestic product and shows a relatively high degree of industrialization and urbanization (INEGI, 2004a). The state capital, Guadalajara, is known for having attracted large US multinationals in electronics in the last two decades, which has earned it to be called the "Silicon Valley" of Mexico (Echeverri-Carroll, 1999). Guadalajara produces more than 60 per cent of all computers produced in Mexico. A small number of subsidiaries of TNCs (IBM, SCI Systems, Motorola and Phillips), however, conduct most of the computer exports (Dussel Peters, 1998).

The electronics industry shows a small degree of integration with national or regional producers, and most of the establishments operating in the region function as maquiladoras (Dussel Peters, 1998; Echeverri-Carroll, 1999). Other relevant industries in the region include chemical engineering and food processing (INEGI, 2003).

Part of the success of Guadalajara in becoming a magnet for electronic companies has been a large supply of well-trained engineers, and of unskilled but trainable labor (Echeverri-Carroll, 1999). Two institutions dominate the local higher education landscape, the state university (UdeG), the second largest state university in the country, and the *Universidad Autónoma de Guadalajara* (UAG), founded by local

business and ecclesiastical elites. UAG is known for its U.S. accredited medical school, and for being a “bastion of conservatism, symbolizing opposition to the progressive political activist at the public university” (Kent, 2002; p. 3). Other private academic institutions, such as the Jesuit-run *Instituto Tecnológico y de Estudios Superiores de Occidente* (ITESO), and a branch of ITESM have, together with UAG, played an important role in educating the Jalisco elite in engineering and business programs (Kent, 2002).

Like in the cases of Nuevo León and Puebla, the need for human resources has driven the relations between the academic and productive sectors, although the dominance of maquiladoras establishments in the dynamic electronics sector, has limited the emergence of more sophisticated forms of collaboration.

A combination of both universities’ internal decisions and locally determined factors, however, has supported the formation of collaborative ties between a group of private universities and small and medium enterprises. This is the case, for example, of the local branch of ITESM, the UdeG and ITESO.

These programs came as a result of the devastating effect the economic crises of 1994 had on local industry, and particularly on small and micro entrepreneurs in traditional sectors such as the garment and shoes industries. They were also the result of the region’s strong communal catholic tradition, which is reflected in the religious affiliation of universities such as ITESO and UAG (Interview #30). The catholic tradition was also reflected on the election of a National Action Party (PAN)

government since 1994. PAN is a right-wing political party with profound roots in dogmatic Catholicism.

Universities' decisions to operate community-service programs (*Clínicas Empresariales* [entrepreneurial clinics], for ITESM, *Produce* [Program to support the productive and service sectors] for the UdeG, and *Metaprograma*, for ITESO) were combined with government support to improve small and medium firms' competitiveness.

The local branch of ITESM has been a pioneer in establishing ties with local firms through its program of *Clínicas Empresariales*. This program involves teamwork between faculty members (project leaders), students, and firm representatives "to identify an opportunity area, to apply a methodology, and to offer a specific contribution to the firm" (Interview #30).

ITESO's *Metaprograma* aims at identifying mechanisms to support small business cope with market fluctuations and a more competitive environment. It works in a joint initiative from the Secretariat of Economic Development of the state of Jalisco and with a local business association to provide training to small and medium firms in the garment industry. This initiative has led to an innovative approach to strengthen intra-firm cooperation. Within this project, the role of ITESO has been to provide an institutional channel (*Metaprograma*) that has facilitated and encouraged the formation of support and upgrading networks between small establishments and larger, more competitive firms in the garment industry through the provision of training. ITESO has also acted as a bridge between participant firms and industrial

support centers, financial assistance programs, private consulting firms and business specialists in the region (Lowe, 2003).

Although the long-term impact of this initiative has not been assessed, evidence collected by a throughout study by Lowe (2003), suggests that it has contributed to “strengthen local institutions that nurture productivity” and to promote equity and local economic development by making its support to firms conditional to the “creation of upgrading opportunities for less skilled, resource-constrained and smaller sized manufacturers and assemblers in the region” (p. 40).

The success of these initiatives is also reflected in the fact that they have become models for the development of university-industry collaborative ties with small firms across the country. Today, many ITESM branches have implemented the *Clínicas Empresariales* program and ITESO’s programs has been used as a role model for other attempts to increase small firms’ competitiveness at both the federal and state levels (Interview # 30).

D. GUANAJUATO

Unlike the other three states studied in this research, Guanajuato’s main economic activities are distributed in four industrial cities, León, Irapuato, Salamanca and Celaya. These metropolitan areas concentrate leading industries, such as automobiles and auto parts, metalmechanics, petrochemical, chemical, agro industry, tourism, and garment and textiles (INEGI, 2003).

The regional economy contributes with nearly 4 per cent of the national gross domestic product. Although Guanajuato is not among the largest regional economies,

its fast growth—the economy shows an average rate of growth slightly above 4 per cent— has turned it into one of the most dynamic regions in the country (INEGI, 2004b).

A distinctive characteristic of the state has been the dominance of public higher education institutions in the academic sector. Although private universities absorb fifty per cent of enrollments, there are virtually no local major private universities operating in the region. Enrollments in private higher education institutions, thus, are divided among branches of ITESM (in Irapuato and León), of the Jesuit-run *Universidad Iberoamericana* (in León), and among several smaller establishments that started operations in the last decade. The public academic sector is formed by the state university (UG), which has built a respectable reputation as a research university, several four-year and two-year technological institutes, and specialized research centers (ANUIES, 2003).

The local PAN government has been the main force driving the relations between the academic and productive sectors in the last fifteen years. It has done so through an increase in the financial resources channeled to the higher education system. Between 1990 and 1995 state subsidies to higher education risen by 269 per cent (Ramírez, 2002). These resources were devoted to the creation of public establishments, but also to support academic applied research (Interview # 26)

Public strategies have also included the creation of a number of decentralized agencies to synchronize the higher education sector with the needs of the society (Ramírez, 2002). Among them, the local council for science and technology has been

instrumental in developing and carrying out a local plan that supports local students, researchers, graduate academic programs and research projects in strategic areas. The main purpose is to provide seed grants to prepare students, researchers and academic institutions to facilitate their access to more competitive federal funds (Interview # 27).

The local government has also exploited the strong orientation of technological institutes towards industry to stimulate academic-industry ties. These institutes are strategically located throughout the state, and specialize in the formation of human resources to respond to local demands. Technological institutes have developed a “*modelo de colaboración*” (collaboration model) with industry, which includes monitoring the local labor market to identify future demands of trained human resources, offering consulting and training services to local firms, and establishing practical training programs (Ramírez, 2002).

What makes the case of Guanajuato an interesting one, is that this is the only state in which university-industry collaboration has been incorporated in an integral plan of regional development orchestrated by local public agencies. Although, as in previous cases, the impact of these initiatives have not been evaluated, the competitive performance of local firms, the presence of a robust scientific community affiliated at the UG and at the different public specialized centers operating in the region, and a large supply of well-trained technicians and engineers represent a significant competitive advantage for the region.

V. BUILDING COMMUNICATION CHANNELS

Virtually all university representatives interviewed acknowledged that one of the main goals of their institutions was to *get closer to the needs of industry*, or to *develop collaborative ties* with the productive sector. Establishing efficient communication channels with industry, however, is a process that requires organizational change on the part of the university, as well as “institutional learning,” understood as the accumulation of experiences working with external actors, such as firms, research centers, government representatives or other academic institutions (Interviews #1 & 30).

Communication mechanisms were found to be key elements to facilitate a broad array of both collaboration mechanisms and purposes of collaboration, such as starting partnerships with firms in research projects, which facilitates mobility between academic institutions and firms of scientists, engineers, students and faculty members. In some cases, they also led to donations of equipment and infrastructure and joint updates of academic programs, particularly in engineering and business management. Finally, knowing the needs of the productive sector allow universities to design training and consulting services (Interviews #6, 9, 12, 13, 14, 16, 18, 19, 20, 26 & 30).

Overall, there prevails a poor understanding of the current needs of industry. At the level of individual institutions the reasons for this result include a widespread lack of knowledge about the characteristics of local industry, scant experience

working with the productive sector, reluctance of faculty members to conduct applied research, or lack of experience running liaison offices that manage these types of interactions (Interviews #1, 2, 3, 4, 5, 8, & 16).

Three types of academic institutions were found to be more readily able to establish communication channels with industry, although the strength of those ties vary drastically from institution to institution. These are private elite universities, which have been traditionally funded and, in some cases, also founded by the business community, state universities; and research institutes.

Strategies to develop communication channels by some of these institutions include i) the incorporation of local business representatives on consulting and executive boards; ii) the creation of programs that encourage faculty members to spend sabbaticals in industry; iii) emphasis on student's practical training programs; iv) the inclusion of firm representatives on committees that evaluate and update curricular contents and decide on the creation of new academic programs; v) hiring reputed practitioners as part-time faculty members; and vi) keeping close, interpersonal connections with local businessmen, business associations, and state agencies in charge of promoting regional development (Interviews #7, 13, 14, 15, 16, 18, 19 & 20).

Regional differences have also played an important role in determining prevailing forms of communication. Academic institutions in Nuevo León are integrated into local industry through business and social networks. These ties have developed as a consequence of the large influence that local entrepreneurs have had

on the local higher education system (Interviews # 11, 24 & 25). In both, Jalisco and Guanajuato, the coincidence of fast growing industries and a greater involvement of local authorities in the higher education sector have stimulated the formation of communication mechanisms between universities and firms through institutional channels, such as decentralized agencies and regional development programs (Interviews # 22, 26, 27, 30, 34 & 35). In the case of Puebla local players have struggled to launch large-scale mechanisms for universities and firms to interact, and what prevails are individual, isolated attempts to connect the two sectors (Interviews #1, 2, 10 & 23).

VI. BALANCING TEACHING AND RESEARCH

One of the main challenges academic institutions face to *grow up* in terms of establishing more sophisticated form of university-industry collaboration is their ability to balance research and the formation of human resources. Given the different characteristics of the public and private segments of the higher education system, particularly in terms of funding mechanisms, there are clear differences in the ways public and private higher academic institutions have attempted to reach this balance throughout the four states studied.

Federal support aiming at strengthening the research capabilities of public and state universities has been delivered in the form of additional funds to financially

starved public institutions through the National Council of Science and Technology (CONACYT). These resources, however, have been very limited (Table 4).

Table 6. Federal expenditure in Science and Technology, 2002
Millions of pesos

Activity	Public sector		Higher Education	Private Sector	External Sector	Total	%	% GDP
	Total	Conacyt						
R&D	15,163	2,487	1,770	7,681	247,01	24,861	57.3%	0.40%
Graduate Education	5,357	1,673	667	509		6,534	15.0%	0.11%
Science and Technology Services	4,435	362	211	7,383		12,029	27.7%	0.20%
Total	24,995	4,522	2,649	15,573	247	43,424	100%	0.71%
	57.5%	10.4%	6.1%	35.9%	0.6%	100%		

Source: CONACYT, 2003a.

CONACYT funds have been delivered through specific programs, such as the *Padrón de Excelencia*, an inventory of the best graduate programs in the country (Table 5). Institutions that offer programs included in this inventory become eligible to receive public funding in the form of scholarships and infrastructure. Other initiatives include the creation of the National System of Researchers (SNI), a program that provides financial stimuli to national researchers, and, more recently, the establishment of regional and local programs (*Fondos Mixtos* and *Fondos Sectoriales*) that provide resources to support specific research projects and acquisition of equipment and infrastructure (Casas, 1997; CONACYT, 1995; CONACYT, 2001).

Table 7. CONACYT Annual Budget, 2003
Millions of pesos

Program	Amount	%
Graduate Studies Scholarships	1,619	31.9%
SNI	1018	20.0%
Scientific and Technological Projects	1,959	385.6%
Operation	481	9.5%
TOTAL	5077	100%

Source: CONACYT, 2003a.

Thus, the “public path” to strengthening research activities involves as a first step, increasing the number of faculty members affiliated with the SNI. A larger number of SNI-affiliated research faculty members is likely to attract a larger number of research projects publicly funded, to improve and update the contents of academic programs, and to allow the opening of first-rate graduate studies registered in the *Padrón de Excelencia*. Evidence available suggests that most state universities continue to show weak scientific capacities, which has rendered these programs much less effective than previously expected (Kent, 2003).

According to state university representatives, even when a university manages to take this path, the introduction of evaluation mechanisms for both faculty performance and the assignation of funds it has encountered significant resistance in some institutions (De Vries, 2002). Additionally, the funds provided by the government are insufficient and unstable, which makes it hard to sustain long-term strategies (Interview #13).

Private universities have traditionally received no public funds to perform either academic or research activities (Kent, 2004). Although today they have access to the same programs as public universities, this has not always been the case. Thus

private universities that have developed research capabilities have turn to industry and other sources of funding.

The quest for funds has inspired the creation of two main mechanisms to support research capabilities. One source is private and corporate donations. Although figures are not available, large public and private universities depend more and more on this type of funding, as evidenced by the growing number of private foundations (Kent, 2003). This result was, to some extent, corroborated by reports from interviews. For example, representatives of UANL acknowledged that the university had raised funds for more than twelve million pesos in the year 2003 (that is, close to fifteen per cent the amount the university received from the federal government to support scientific and technological activities) to support some of its research activities (Interviews #9, 13 & 19).

A second pattern that has been common among private institutions but has increasingly attracted the attention of public institutions has consisted of differentiating their interactions with industry between “for-profit” and “not-for-profit” activities. For-profit activities have taken place through the creation of flexible internal structures –liaison offices— in charge of selling consulting, continuous education and training services to local industry (Interviews #14, 16, 19, 21, & 22). The proceeds of these for-profit agencies are destined to sustain the activities of not-for profit research centers, and to provide incentives for faculty members to launch applied research projects (Interviews #6, 8, & 20). This model has been found not only among more “entrepreneurial-oriented” academic institutions, such as ITESM,

but also among universities affiliated to religious orders, such as the *Universidad Iberoamericana*, or secular institutions, such as UDLA.

Liaison offices are increasingly seen as “unique alternative[s] to raise state universities’ income” (Interview #22). Nevertheless, to date, only a handful of state universities seem to have been able to make the organizational arrangements required to operate them. For many state universities, this mechanism remains elusive:

We have attempted to organize our interactions with industry through the creation of a liaison center. We visited ITESM in Monterrey to learn from its strategies, but there is a long distance from understanding what has to be done, and doing it. We have been working on that for almost ten years now (Interview #1).

At the regional level, different financial mechanisms to support research activities have led to differentiated, complementary patterns of interaction with the productive sector between the public and private segments of the higher education system. Differences can be identified in the types of research they perform, the provision of services offered to industry, the formation of human resources and the types of industries and firms they work more frequently with.

A. Research

In each of the four states involved in this study, research activities conducted in academic institutions were concentrated in specialized research centers, state and private universities. Until recently, specialized research centers and state universities saw their mission as the generation of basic knowledge (Gortari, 1997). Although, as

argued throughout this research, this view has changed drastically in the last two decades, in all regions studied these institutions concentrate the human resources and infrastructure (laboratories, equipment and research centers) that make them the main local providers of graduate programs and research activities (CONACYT, 2003b). Moving towards establishing formal, measurable mechanisms that support joint applied research with industry, however, has been difficult to attain (Luna, 2001).

Contrastingly, there is a clear pattern among private universities to favor applied research activities. Among private universities that participated in this research, only UDLA's representatives considered basic research a priority for this institution (Interview #8). For some institutions, like ITESM, this is the result of the difficulties they have found to finance their research activities:

We don't want to do basic research, because, who is going to pay for it? Basic research is very expensive and neither the federal or local governments are committed to giving private institutions resources to support it. We do not think it is ethical to use student fees to fund a group of researchers that maybe –or maybe not— in twenty years will come up with a good discovery. That is why we decided to perform exclusively applied research that industry can finance (Interview #20).

One consequence is that private universities' interactions with industry in the four states studied have been more organized than those found among public institutions. Frequently, private universities found it easier to interact

with national firms belonging to the most dynamic local sectors (Interviews #6, 14, 18 & 21).

Private institutions tend to become specialized in the provision of business management and engineering degrees. Most of the doctoral and research programs are based in public institutions, while the bulk of the masters and specialization programs for retraining professionals have burgeoned in private establishments (Kent, 2002).

Both, public and private institutions, share the view that thesis and dissertations constitute the most common mechanism for delivering the results of applied research to firms, and that working with subsidiaries of transnational corporations is an “uphill task”, due to the fact that these types of firms do not trust the research capabilities of national universities (Interviews #6, 8, 15, 14, & 18).

B. Services

Through the provision of services, such as the use of infrastructure and equipment, training and continuous education programs and consulting activities, academic institutions have identified profitable, unregulated market niches within local economies. For example, one of the most successful liaison centers in Nuevo León reported having annual earnings of about 3 million U.S. dollars. Around sixty-five percent of this income comes from the provision of consulting services (i.e. technology adaptation and installation of equipment); twenty-five percent from training and continuing education services; five percent from the rent of laboratories;

and five percent from public funds to support applied research projects (Interview #18).

The types of services demanded by firms change from region to region, which demands that universities become more aware of the economic characteristics of the regions in which they operate and identify industrial sectors with growing potential. For example, in Puebla, the presence of subsidiaries of transnational corporations and competitive national firms that demand highly trained human resources has made the provision of training services profitable among private universities located in the region (Interviews #1, 3 & 6). In Monterrey, the presence of large, national manufacturing firms has opened market opportunities in consulting, training, and quality certification services (Interviews #14, 18, 16, & 19).

Selling services through liaison offices has been a source of income for supporting not-for profit activities. It has also contributed to forming a cadre of expert business consultants, to the developed a marked “entrepreneurial” attitude among universities, and to the diffusion of technological knowledge among local firms. ITESM, for example, sees its role in the provision of services to local firms, as a “gatekeeper” for technological knowledge by selecting the technology it introduces to local firms (Interview #18).

The different patterns of specialization identified between private and state universities support the widespread view among university representatives that they complement each other in the ways they interact within the local economy. For example, in the case of Nuevo Leon, ITESM’s representatives acknowledge that they

“respect” the ability of UANL to become a research university, while UANL representatives acknowledge that ITESM fulfills an important role in delivering services and applied research to industry (Interviews #13 & 15). This is a significant result, given the fact that educational authorities have traditionally downplayed the role of private universities in the local economy.

VII. CONCLUSIONS

The educational reforms introduced by the public sector since the early 1990s have contributed to changing university attitudes towards industry and have created a new environment for academic institutions to develop linkages with industry. The new setting is characterized by the presence of a complex system, operating under competitive pressure and formed by highly diversified public and private segments that show large individual and regional disparities.

Universities have shown little responsiveness to programs to stimulate direct forms of collaboration with industry. Despite the increasing importance attributed to universities as sources of technological progress in economies like Mexico, little research has been conducted to understand the factors that drive the relations between these two agents. Thus, local and national planners have been left with a little understanding on how to stimulate the transference of technological knowledge—in the form of human resources, services, and applied research—to local industry.

Evidence from this study suggests that university-industry collaboration is the result of locally determined factors, public policies and universities' own characteristics. These elements intertwine in complex ways to determine the level of integration of the academic and productive sectors in a region. This result challenges the widespread view according to which eliminating barriers that prevent collaboration –such as weakly defined intellectual property rights, lack of incentives, of bureaucratic structures operating in both firms and universities— lead to a closer interaction between the academic and productive sector (World Bank, 2003).

It also suggests that models of university-industry collaboration are not easily transferable between regions. Thus what may constitute important factors for bringing universities and firms together in some regions (local business groups in Monterrey, a Catholic tradition or decentralized agencies) may have little impact in others. This result calls for both economic and educational policies designed with a deep understanding of local trends and actors.

Until the late 1990s, public planners frequently downplayed the role of private higher academic institutions, which were frequently seen as “accompaniments” to public institutions (Kent, 2004). Today, however, it is undeniable that the private sector plays a crucial role in regional economies. Elite universities in the four regions studied here constitute a rich source of experiences to learn how to establish effective communication channels that support collaborative linkages with the productive sector.

Public funding remains a key element to support university-industry interactions. Although the design of educational and economic policies that take into account a region's economy, culture and ethos, will constitute more effective mechanisms to promote the integration of universities to the local economy, their results will remain limited if resources devoted to this aim remain insignificant.

APPENDIX B

Table 8. University Interview References for Guanajuato, Jalisco, Nuevo León and Puebla.

ID#	Region	Private/ Public	Department	Position	Date
1*	Puebla	Public	Budget, planning and institutional research	Vice Dean	05-06-2003
2*	Puebla	Private	Academic	Dean	03-26-2003
3*	Puebla	Private	Economics	Faculty member	05-09-2003
4*	Puebla	Private		President	04-11-2003
5*	Puebla	Private		President	06-17-2003
6	Puebla	Private	Consultancy and training center	Adjunct Director	05-09-2003
7	Puebla	Private		President	06-21-2002
8	Puebla	Private	Institute of research and graduate studies	Dean	05-09-2003
9	Puebla	Private	Industrial and textile engeneering	Faculty member	05-12-2003
10	Puebla	Private	Regional development center	Director	15-02-2004
11*	Nuevo León	Public	Planning and evaluation	Director	04-03-2003
12*	Nuevo León	Public		President	03-26-2003
13*	Nuevo León	Public	Research department	Director	03-27-2003
14	Nuevo León	Private	Research center	Director	04-21-2003
15*	Nuevo León	Private	Research department	Director	03-26-2003
16*	Nuevo León	Private	Institutional development	Director	03-27-2003
17*	Nuevo León	Private	Department of education	Faculty member	03-28-2003
18	Nuevo León	Private	Research center	Director	04-21-2003
19*	Nuevo León	Private	Higher education	Vice Dean	03-27-2003
20*	Nuevo León	Private	Organizational management	Director	03-26-2003
21	Nuevo	Private	Research center	Director	05-18-2001

	León				
22*	Guanajuato	Public		President	10-29-2001
33*	Jalisco	Public	Technological institute	Director	10-05-2001
35*	Jalisco	Public		President	06-16-2000

Table 9. Government Interview References for Guanajuato, Jalisco, Nuevo León and Puebla.

ID#	Region	Department	Ministry	Position	Date
23*	Puebla	Higher education	Education	Sub-secretary	05-14-2003
24*	Nuevo León	Planning	Education	Director	03-25-2003
25*	Nuevo León	Higher education, planning and evaluation	Education	Sub-secretary	03-25-2003
26*	Guanajuato		Science and Technology	Director	10-21-2003
27*	Guanajuato			Governor	10-30-2001
28*	Federal	Subsecretary	Education	Former director of planning	06-10-2000
29*	Federal	Subsecretary	Education	Sub-secretary	25-07-2000
30*	Jalisco	Science and Technology	Education	Director	10-09-2001
31*	Federal	Subsecretary	Education	Former Sub-secretary	03-14-2001
32*	Federal	Subsecretary	Education	Sub-secretary	03-16-2001
34*	Jalisco	Secretariat	Education	Coordinator of middle and higher education	10-12'2001

* Interviews conducted by AIHEPS' research team.

Table 10. A Typology of the Mexican Higher Education System

Public Sector	Description
Federal universities	The federal government created these universities, which are autonomous in the sense that they are responsible for their governance but are funded by the federal government.
State universities	State governments create these universities. As is the case of federal universities, state universities are autonomous but funded jointly by the federal and state governments, with the former provided the gruesome of the resources.
Four-year federal technical institutes	These institutes were created and are centrally regulated by the federal government. Technical institutes were established in medium-sized cities the 1950s with the purpose of providing access to technical education to students of low social strata.
Four-year state technical institutes	The federal government creates these institutes by request of the states. Both levels of government fund them and their governance is in hands of a committee which members are chosen by the state governor in which they operate.
Two-year technological universities	These institutions are created and funded jointly by both the federal and state governments. Currently they are managed at the state level. Despite of holding the title of “universities” these are in fact technological institutes that provide post-secondary technical education in two-year programs. These institutions have been, since their creation in the last decade, oriented towards satisfying the demand of trained human resources of national industry. Hence, these are the only institutions that are governed by an executive board that incorporates representatives of the industrial sector.
Research institutes	Created and funded by the federal government across the country these centers specialize in certain areas of R&D, such as applied mathematics, optics, metallurgy, biotechnology and marine sciences. They are mostly staffed with young PhDs led by a small group of senior scientists, and their facilities are usually well equipped. Their mission is to develop strong links with firms and to train new generations of scientists. These institutions are coordinated directly by the national science council, CONACYT, rather than by the Assistant Secretary for Higher Education who is responsible for the university sector.
Private Sector	Description
Universities	Academically reputable institutions, many of which were created in the 1940s and 1950s with involvement of the business

	community. They offer undergraduate and graduate programs in a multiplicity of disciplines and hire well-trained faculty. A few of these institutions carry out research activities. This category includes multi-campus systems and virtual education delivery as well as more traditional universities.
Non-university establishments	They are usually (although not explicitly) for profit, proprietary and often family owned businesses, with undergraduate offerings in business, accounting and other “soft” social professions; part-time faculty with minimum credentials and usually non-accredited.
Specialized institutes	These institutes are frequently operated as partnerships with corporations in certain sectors such as law firms, hotels or restaurants and have as their main objective to train specialized workers for specific industries. Their focus is on training professionals in one or two associated disciplines, with reasonable academic infrastructure. Faculty is usually part-time but reputed practitioners.
Non-university establishments in the process of academic consolidation	Privately created, governed, and funded, these are a relatively small number of institutions that have strengthened their faculty and academic facilities and aim to become respectable universities.
Expanding non-university businesses	Private created, governed and funded –frequently family businesses—these establishments have prospered as educational businesses, growing in number but not in quality. Facilities remain elementary and faculty is largely part-time and under-qualified. They rarely venture beyond business and the social professions and grow mainly by expanding their original facilities and/or by creating new outlets in other cities.
International corporations	These establishments are large publicly quoted chains, such as Sylvan or Apollo, setting up operations in Mexico, usually through the merger with existing local institutions.

Source: Adapted from Kent (2003, 2004) and (De Vries, 2002).

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