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Abstract

While Mexico has potential to grow rapidly, its economic growth has remained low for the past three decades. There is no consensus on the country's development path or on how to achieve specific goals. Since the policy debate remains ideological and lacks pragmatism, productive development policies (PDPs) are often uncoordinated, redundant or even incongruent with each other. It is therefore important to understand the process whereby PDPs are designed and the institutional setting in which they are are implemented. This paper consequently examines whether PDPs respond to market failures and/or government failures. When PDPs are not designed to address specific market failures they can produce unwanted results or prove completely ineffective. When PDPs do address government failures, it is important to determine the reasons why the failure cannot be corrected in the first place and whether PDPs will be effective at addressing the problem in a second-best manner.

JEL Classifications: O25, O43
Keywords: Industrial Policy, Institutions, Policymaking, Mexico

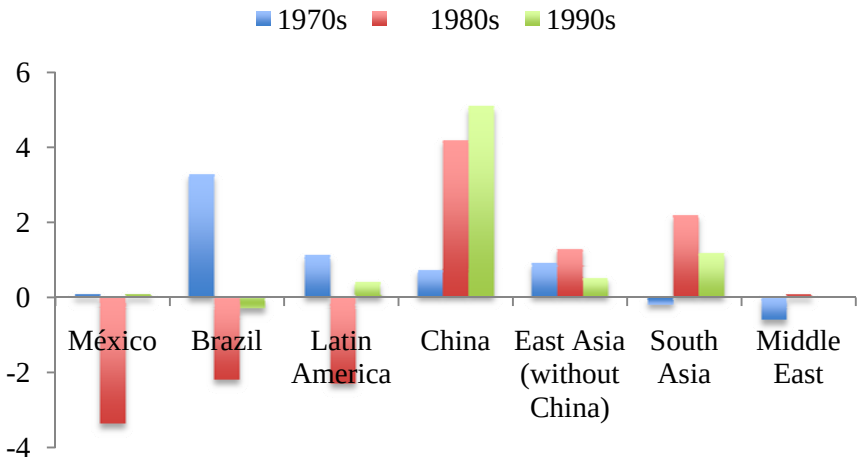
1. Introduction: A Story of Low Economic Growth and Stalled Productivity

Mexico has great potential for accelerated growth. It is among the 20 countries that, according the World Bank's World Development indicators, account for 80 percent of world GDP (World Development Indicators), and it has the world's ninth-largest oil reserves and third-largest quantity of fresh water resources. Mexico further enjoys a demographic bonus and shares its border with the largest economy in the world, and has signed commercial treaties that include over 42 countries.

However, economic growth has remained low for the past three decades. The structural reforms of the 1980s and 1990s led to the stabilization of the macroeconomic environment, with low levels of inflation, balanced budgets, and positive growth rates. Policies that promoted openness were also implemented with varied degrees of success during this period, and the political transition that began in the mid-1990s—which ended 71 years of one-party rule—created created a historical opportunity to transcend the mistakes of the past and move toward a high-growth era. Yet, neither openness nor macroeconomic stability has proven sufficient to promote productivity increases in the country's firms. As shown in Figure 1, Mexico fares poorly with respect to other regions in terms of productivity growth.

Figure 1. Total Factor Productivity Growth for Various Regions and Mexico

Annual growth rate (%)



Source: International Monetary Fund, Growth Accounting, 2008.

Mexico's experience is closely related to that of other countries in Latin America, where an onerous regulatory environment, little attention to microeconomic reforms, and the existence of higher competitive barriers than in other countries, has slowed the process of productive transformation for the region (CAF, 2006). Mexico has liberalized its economy and achieved macroeconomic stability, two key conditions for promoting firms' competitiveness. Microeconomic conditions, however, are still deficient: multiple non-trade barriers present obstacles to taking full advantage of commercial treaties, while the country's regulatory framework has failed to create the correct incentives for entrepreneurship to "take off" and inject dynamism into the economy.

In Mexico, complying with the rule of law is onerous, and registering property and opening a business is a slow and expensive process. On average, it takes about 28 days and an average investment equivalent to 12.5 percent of GDP per capita to complete the nine steps necessary to open a business, compared to 0.3 percent in Ireland and 0.7 percent in the United States. In addition, Mexico's onerous fiscal regime represents a burden on productivity and profitability for businesses. A firm owner in Mexico deals with 27 different payments, and invests approximately 550 hours per year in fiscal procedures, with taxes representing up to 51.5 of the utilities cost of a business. In a country like Ireland, the same firm owner would only have to deal with nine payments and invest 76 hours in fiscal procedures, with taxes representing up to 28.8 percent of utilities cost (World Bank, 2009).

Additionally, the lack of clarity in guarantees and bankruptcy laws in Mexico results in a misalignment of incentives for the financial system, and rigid labor regulations increase the costs of hiring and firing employees (52 weeks of average salary in Mexico versus four weeks in Japan and 24 in Ireland), which reduces incentivess to create new jobs as well as the salary expectations of new employees, which in turn affects their productivity (World Bank).

In order to understand the process by which the Mexican government encourages economic growth and firm productivity, this project will analyze productive development policies (PDPs) based on their justification and design, and the institutional framework under which they operate. Throughout this study, the analysis will focus on the *processes* of design and implementation of PDPs and how these affect the intended or unintended *outcomes* of these policies.

Melo and Rodríguez-Clare (2006) define PDPs as policies aimed at strengthening the productive structure of a national economy. The conventional approach to industrial policy design consists of outlining existing market and government failures in order to find responses to correct them. However, as Rodrik (2004) points out, the size and magnitude of these failures is highly uncertain and therefore strategic collaboration between the public and private sectors needs to take place in order to identify the most significant obstacles to restructuring the economy and design interventions that are most likely to succeed. Under this framework it becomes less important for a country to know how to pick winners than to have an institutional setting that promotes knowledge and responsibility-sharing with the private sector and that encourages the government to "know" when it is losing and consequently change directions.

Understanding the process by which PDPs are designed will provide clues to both the political economy context and the institutional setting in which they are promoted and implemented. Throughout this study, the analysis of PDPs will focus on the following: i) whether they are designed based on market and/or government failures or respond to other criteria; ii) the capacities embedded in implementing institutions; iii) the roles and motivations of relevant institutions and stakeholders, as well as the incentives created by PDPs for collaboration among these actors; and iv) outcomes, intended and unintended, resulting from the design and implementation of PDPs.

Hausmann and Rodrik (2003) identify four kinds of market failures that call for government intervention, namely: i) self-discovery externalities, by finding out what the country is good at producing; ii) coordination externalities, by targeting specific industries or activities that require high initial investments; iii) provision of missing public goods, such as infrastructure, regulation, and certification; and iv) information externalities, by correcting for situations where social returns to an investment outweigh private ones.

Sometimes government intervention can produce unwanted results, limiting the incentives for firms in a given country to increase their productivity. In this context, PDPs, instead of responding to failures in the market, can be designed as a second-best response to deficiencies in the market caused by ineffective government intervention. Government failures can result from: i) information deficiencies in quantity and quality with respect to the market—demand, costs incurred by entrepreneurs, externalities—which make it more difficult to diagnose the type of regulation required and therefore result in an additional burden for firms; ii) private

capture of regulators and policymakers, whether due to political or economic pressures, can result in regulation or government intervention being biased in favor of the regulated sector; and, iii) a dilemma between short- and long-term solutions and the search for social objectives, which are not necessarily compatible with the search for market efficiencies (CAF, 2006).

In the analysis of current PDPs in Mexico, this study will evaluate whether PDPs respond to market failures and/or government failures. When PDPs are not designed to respond to specific market failures they can produce unwanted results or even be completely ineffective. In cases when PDPs respond to government failures, it is important to determine the reasons why the failure cannot be corrected in the first place and whether PDPs will be effective at addressing the problem in a second-best manner.

Specific sectors and activities were selected for analysis based on their policy relevance, particularly since the year 2000. The focus on increasing competitiveness contained in National Development Plans (NDPs) translates into an emphasis on transversal activities that, by themselves, could result in higher economic growth. Mainly, the NDP focuses on the importance of supporting small- and medium-sized enterprises (SMEs)—which make up over 99 percent of the country's firms—as well as innovation activities through higher investment in research and development (R&D). In addition, despite its absence in the NDP, our study will also focus on analyzing training activities in order to understand policies that deal with human capital development beyond the educational system. In terms of specific sectors, the NDPs of 2001 and 2007 provide clues as to which industries the government considers relevant to its process of productive transformation. This study will focus on software and IT services and on aerospace. The software and IT industry bears particular weight in the country's prospective development given its potential to affect productivity throughout all economic sectors. Aerospace, on the other hand, provides an interesting case study of the potential for productive transformation, since the existence of a relatively developed automotive sector in Mexico could serve as a basis for moving into higher value-added activities and scaling up the production ladder. Table 1 classifies selected PDPs on their Horizontal/Vertical dimension with the Public/Market channel of intervention.

Table 1. Classification of Selected PDPs

	Horizontal	Vertical
Public Input	**Airport infrastructure (spillovers to rest of the economy)** **Improvements in customs regulation and process**	**Training: grants and new educational institutions** **Software: infrastructure for development of clusters**
Market Intervention	**R&D+I: AVANCE** **SMEs: Acceleration programs** **Training: scholarships for individuals and subsidies for in-firm training**	**Aerospace: fiscal incentives (property tax exemptions)** **Software: fiscal incentives and grants for training and equipment**

Source: Adapted from Inter-American Development Bank (2008).

2. Promoting Productivity and Economic Growth in Mexico

2.1 Background

From the 1950s to the mid-1980s, Mexico based its economic policies on the import-substitution and industrialization (ISI) model. PDPs implemented during this phase ranged from limited import quotas and high tariffs, to price controls for public inputs, to subsidies for specific products, to limited monetary supply. While these policies accelerated growth in the industrial sector at the expense of the primary sector (e.g., agriculture), this new industrial sector was characterized by firms with low and inefficient economies of scale and high unit costs, incapable of competing in international markets.

The ISI model created distortions in the economy as well as an anti-export bias, a reduction in the total value of agricultural production, and finally, a productive structure less intensive in labor and biased toward use of capital. After the 1982 financial crisis, the government had no option but to begin reforming a system that was clearly dysfunctional, shifting its economic policies to those based on the so-called Washington Consensus (Williamson 1989): achieve and maintain macroeconomic stability, and end the government stranglehold over the country's productive sectors. PDPs shifted toward export and investment

promotion, focusing mostly on the manufacturing industry through the maquila model. Though most sectors were liberalized, very important ones remained closed to competition, including telecommunications and energy. In addition, the failure to reform the country's regulatory framework resulted in remaining entry barriers for the whole economy (e.g., onerous financial system and labor regulation).

After facing a major financial crisis in 1994, which resulted from a mixture of rapid high-risk credit expansion, a fixed exchange rate, and a depletion of foreign reserves, achieving macroeconomic stability became the main priority. From 1995 to 2000, economic policies were directed at stabilizing the economy and creating solid macroeconomic conditions to prevent another economic debacle. Mexico's entry to NAFTA and newly acquired full access to the largest market of the marked the end of the closed economy but also highlighted large inefficiencies in the Mexican private sector, which found itself for the most part unable to compete in international markets.

Since 2000, the government has maintained its focus on macroeconomic stability. Public finances are healthy and monetary policy has remained stable, creating the conditions for attracting increasing levels of investment. However, the new party in power inherited a relatively unprofessional bureaucracy, a multiplicity of new interest groups, and a strong political opposition, particularly from Congress, which has often resulted in a stagnant policymaking process. The lack of political consensus necessary for effective public policies has resulted first in less than optimal policies to promote growth and raise living standards and second in long delays in approving policies (Stein and Tommasi, editors, 2008). See Table 2 for a summary of PDPs since 1956.

Table 2. Summary of PDPs in Mexico, 1956-present

Period	Ideological Framework	Policy Instruments	Effects
1956-1982	- Dominance of public sector over economic activities - Closed economy - Import substitution industrialization model - ECLAC, Prebisch-Singer thesis	- Limited quotas and high tariffs - Price controls for public inputs - Low inflation rates, exchange rate stability, positive interest rates and low interest income taxes - Subsidies to agricultural products - Controlled public deficit through limited monetary supply	- Lack of tecnological progress - Low TFP rates - Low non-oil exports growth rates - Strong dependence on inputs and capital goods - Firms with low or no economies of scale - Appreciation of real exchange rate due to increasing internal inflation
1982-1984	- Increased openness - Washington Consensus policies - Less government participation in economy	- Fiscal discipline - Deregulation and privatization of state-owned companies (at least in some sectors) - Rationalization of the financial and monetary policies - Trade liberalization	- Incomplete liberalization Lack of regulatory framework to promote competition - Privatization as a transfer from state to private monopolies, preventing competition in important sectors of the economy, such as telecommunications - Government still dominates important sectors, such as energy
1995-today	- Macroeconomic stability - Increased competitiveness - Independent Congress - Decentralization and political competition	- Political and economic structural reforms (slow process)	- Openness and macroeconomic stability evidenced large inefficiencies remaining in Mexican private sector - Close to 50% of GDP is produced by only 1% of firms - Slow TFP growth

Source: Authors' compilation.

2.2 How PDPs Are Shaped

There is no consensus on the development path Mexico wants to follow, or on what it needs to do in order to achieve specific goals. The policy debate remains ideological and lacks pragmatism. Discussion keeps focusing on whether to protect the agricultural sector from NAFTA competitors, who should own the country's energy resources, or the role of labor unions. Unfortunately, none of these issues directly affect productive factors, such as the quality of infrastructure, the development of human capital and the ability of the Mexican government to articulate a development strategy that can be subscribed by all relevant actors (Rubio, 2001). As a result, PDPs are often incongruent with each other, redundant and uncoordinated.

The government outlines in its National Plan for Development (NDP), and more specifically in the sectoral plan of the Ministry of Economy (SE), plan, its objectives for industrial policy design. The strategies contained in the Economic sectoral plan target the development of SMEs as a general activity as well as support for specific sectors based on their weight in economic terms or their potential to increase value added.[1] The NDP and sectoral plans are intended to serve as an all-encompassing vision for the country's development path including a prioritization of sectors and activities the government should support in order to encourage higher rates of economic growth. They are conceived as six-year programs—in accordance with the presidential term—and they are formulated on the basis of consultation with civil society. In addition, each state has its own development plan, which may or may not be aligned with the NDP and the cabinet's sectoral plans.

Other ministries, including those for the areas of Agriculture, Environment, and Tourism, design and implement—independently—their own PDPs similar to those of the SE. While PDPs should not necessarily be concentrated in one agency, coordination is important. This study will provide evidence of the kind of redundancies and inefficiencies in program design and application that result from the lack of consensus regarding the country's development path.

It is not clear whether objectives and strategies arise from careful analysis of the country's market and regulatory constraints or whether they are based on the opinions of those consulted. However, interviews with government officials revealed that in practice, the NDP and

[1] The list of "strategic sectors" includes the following: automotive, aerospace, electric/electronic, energy, biotechnology, software, IT and BPO services, logistics and tourism. See "Política Sectorial¨ section of the Economic sectoral plan in "Diez Lineamientos de la Subsecretaría de Industria y Comercio para incrementar la Competitividad 2008-2012."

sectoral plans represent little else than a legal requirement containing very few operational recommendations. As a government official, promising to meet certain specific objectives derives in legal commitments that can then be enforced by the Office of the Comptroller (Auditoría Superior de la Federación). Thus, even though a new law requires programs to provide a logic framework with specific goals and indicators, due to bureaucratic constraints officials have incentives to avoid specificity in program goals. This project will provide evidence for the kind of vague language used to set policy objectives, which provides room for maneuver without being subject to legal enforcement. This, in turn, makes it difficult for stakeholders—i.e., civil society and Congress—to evaluate the impact of PDPs on the country's productive structure.

3. Training

Based on equity concerns, the government chooses to intervene in the public provision of training activities for three main reasons. First, technological change disproportionately affects low-skilled workers. Second, firms have fewer incentives to invest in less qualified workers to the extent that there exists a relationship between educational attainment levels and "trainability." In other words, the less qualified a worker, the lower returns a firm obtains for training him or her and therefore the fewer incentives firms have to provide training for them. The same phenomenon occurs for older workers, who have a shorter time-horizon during which firms—and the workers themselves—can obtain returns on their investment. Third and finally, other government policies include retraining programs as an alternative to alleviate frictions caused by structural changes in the economy which result in the generalized loss of jobs through industries or sectors.

A low-quality educational system[2] –which results from a government failure in the case of Mexico—generates an inadequate labor force[3] that tends to require post-school training. Fewer abilities translate into higher vulnerability as well as less incentive for firms to offer training due to lower returns on investment. The skill-biased nature of recent technological

[2] In the PISA test, applied by the OECD in the year 2006 to 15-yr old students, 50 percent obtained scores below Level 2, considered the minimum necessary to live in society, and less than 1 percent obtained scores between Levels 5 and 6, which means only that proportion of Mexican students is prepared to perform complex cognitive activities. Accesed from Hhttp://www.oecd.org/pages/0,3417,en_32252351_32236191_1_1_1_1_1,00.htmlH

[3] Only 27 percent of the working population has schooling beyond basic education. Younger cohorts have higher levels of schooling, but the workforce still has on average only nine years of schooling.

changes thus favors workers with higher educational abilities and negatively affects less educated and qualified workers. Technological change additionally increases the negative impact of unemployment periods, accelerating in both cases the obsolescence of human capital (de Grip and Zwick, 2004). Thus, training programs are often justified by the government's inability to provide the labor force with adequate skills through the educational system.

In addition, training programs are usually justified by the presence of two kinds of market failures (see Acemoglu and Jörn-Steffen, 1998, and Heckman, 2003). The first is an externality problem whereby firms in competitive labor markets regard labor mobility as a disincentive to invest in training, given the potential for employees to claim wage raises equivalent to the marginal productivity acquired through training or take the newly acquired abilities to another firm. In both cases, firms are not able to completely appropriate the returns of their investment. The problem is exacerbated in the case of general training, which, by definition, provides employees with abilities that can be used across more than one firm.

The high labor mobility observed in the Mexican workforce, particularly amongst low-skilled workers, could reinforce the effects of the market failure mentioned above.[4] Thus, workers have more incentives to invest in obtaining general rather than specialized skills, since they perceive a higher value in abilities they can use in a variety of jobs. However, limited access to credit could limit employees' capacity to invest in their own training. Due to its inherent characteristics, human capital remains an inadequate form of collateral for obtaining credit. Workers could solve the credit problem by accepting lower wages for jobs in which they could develop the general abilities they seek. However, the already low wage levels for most of the Mexican occupied population could further inhibit their ability to adopt this strategy. Fifty percent of Mexico's occupied population earns less than two minimum wages per month, which is equivalent to approximately US$250 (INEGI, 2000).

The market failure mentioned above tends to result in suboptimal investment for training activities, which in turn provides the central argument for public intervention in the subsidy or direct provision of training, particularly for low-skilled workers who have less possibilities of acquiring training, although returns are higher for higher skilled workers.

[4] Job tenures in Mexico are short, 6.5 years, compared to those in the United States (9.8), the United Kingdom (7.8), and Spain (8.9), as well as the average of OECD countries (Calderón-Madrid 2000).

The second market failure has to do with an information asymmetry problem. During the hiring process, employers lack complete information to evaluate the quality of job candidates and to distinguish between highly and less productive workers. Thus, firms could fail to generate a number of jobs, even if a marginal benefit exists to creating that job, if the risk of hiring less productive workers is considered to be high.

Educational attainment levels and training can attenuate the risk resulting from this information problem by acting as signals that can help potential employers identify productivity levels among workers. In practice, this signaling system will only work if it is the highly productive workers who will obtain educational certificates, thereby helping firms separate among highly productive and less productive workers. In this framework, training works more as an instrument of intermediation for the labor market—solving an information problem- than as a mean for the accumulation of human capital (Ibarrarán and Rosas, 2008).

In addition, given that the real capabilities of an employee can only be measured ex post, in a highly regulated labor environment the high cost of firing employees increases the risk to firms of employing less productive workers, which seems to be the case of Mexico. According to the *Doing Business 2009* report, the average cost to fire an employee in Mexico is equivalent to 52 weeks (1 year) of wages (World Bank, 2009). In this regard, Mexico ranks fifty-sixth out of 175 countries.

Despite the existence of real market failures that justify government provision of training programs, due to the low returns on investment of training low-skilled and older workers, from the social perspective it would make more sense to train workers with higher marginal productivity as well as those who are younger, while solving the inequity problem—caused caused by a government failure to provide high quality education in the first place—via redistribution policies. Impact evaluations of retraining programs in the United States consistently indicate that investment by the beneficiary must be considerably high for this type of intervention to be effective (Heckman, 1999).

Table 3 provides a summary of the government and market failures that justify government intervention in training programs.

Table 3. Market and Government Failures in Training

Failure	Type	Description
Low-quality educational system	Government failure	- The skill-biased nature of recent technological changes favors workers with higher educational abilities and affects less qualified workers
		- Increases the negative impact of unemployment periods, accelerating in both cases the obsolescence of human capital
Underinvestment in training by firms	Information externality	- Labor mobility reduces incentives for firms to provide training for workers, particularly for general abilities
Underinvestment in training by workers	Coordination failure	- Human capital remains an insufficient collateral for obtaining loans, which limits individuals' access to credit for pursuing further credit
Suboptimal hiring levels due to incomplete information	Information asymmetry	- During the hiring process, employers lack complete information to evaluate the quality of job candidates and to distinguish between highly and less productive workers. Thus, firms could fail to generate a number of jobs.

Source: Authors' compilation.

3.1 The Program for Employment Support and BECATE

The National Employment Service (SNE for its Spanish acronym) was established in 1978 as a result of changes made to the Federal Employment Law. The SNE was created to: i) promote successful placement of job seekers; ii) encourage training to the unemployed and; iii) pursue a systematic study of regional markets. In general, the first two justifications for policy intervention provided in 1978 remain the main areas of the Program for Employment Support (PAE for its Spanish acronym), the largest program within the General Coordination of Employment, the current unit from the Ministry of Employment in charge of SNE.

In 1982, the BECATE program (then called PROBECAT) was created under the SNE, with the specific purpose of providing training scholarships for the unemployed. The program was born in the context of one of Mexico's most severe economic crises, with unemployment reaching unprecedented levels, oil prices falling, rising interest rates, and the beginning of the country's commercial liberalization process. It was the typical scenario for creating retraining

programs focused on increasing the workforce's abilities, which could help them cope with the structural economic changes taking place at the time.

BECATE initially provided scholarships for short-term training (up to three months) in a school-based format. The scholarships included tuition and a small living stipend equivalent to the monthly minimum wage. Training was provided by public institutions and on occasion by subcontracted NGOs. When the training was complete, workers would look for a job using the SNE placement offices.

In 1993 and 1994 two new modalities became part of BECATE: i) on-the-job training and ii) self-employment. The introduction of on-the-job training represented a notable innovation, since it included both teaching theory and practice at a firm. The school-based training was replaced in 1998 by the on-the-job modality as the dominant type of training and the former was discontinued in 2001.

Approximately 4.75 million workers were trained by BECATE between 1984 and 2005. At the program's peak (1995-2000) around 500 thousand workers were trained per year (Delajara, Freije and Soloaga, 2006). During 2001-2006 period (the Fox administration), the number of beneficiaries as well as BECATE's budget decreased substantially. In 2001, the program trained 400,000 beneficiaries, while by 2002 the number of participants had stabilized at 200,000. This reduction is related to budgetary constraints, as well as to the reassignment of budgetary resources to other programs within the PAE. In 2007, BECATE benefited 170,000 trainees, with plans for 90,000 trainees in 2008.

The real expenditure per beneficiary decreased continually since the beginning of the program in 1984 until 1995, when a new economic crisis hit Mexico. In 1984, the average expenditure per participant was approximately four times higher than the average spent in 1995. Since then, average expenditure has remained relatively stable, at around $600-$800 in 1993 peso terms (Delajara, Freije and Soloaga, 2006).

3.2 BECATE's Low-Impact Design and Implementation

The general objective of PAE is to reduce transaction costs for firms and the unemployed in the labor market, and to increase the employability of the latter. In this framework, with the support of state-level National Employment Services (state-level SNEs), which operate the training services, PAE coordinates informational and placement services, subsidizes short-term training

and reallocation expenses, and supports the development of micro-enterprises. Within PAE, BECATE is in charge of supporting the unemployed with short-term training to facilitate their transition to a job or self-employment.

BECATE offers training in two modalities:

- **On-the-job training** through the "internship" and "mixed" modalities at a firm facility. BECATE covers the costs for the beneficiaries' scholarships and the training expenses in the "internship" option (targeted to unemployed persons ranging from the ages of 16 to 29) while the firm finances the training itself in the "mixed" modality, committing to hire at least 70 percent of the trainees.
- **Self-employment training** through "productive training" and "self-employment training," which provides training for persons who own or work in micro-enterprises or who are interested in founding one. In both cases, BECATE pays for all training costs and provides a scholarship for living expenses. The training for self-employment approach denotes an interest in reaching marginalized populations who might have fewer chances to find a formal job either due to their low employability or their location in an area with scarce employment opportunities.

Of the three instruments mentioned above, on-the-job training is the most supported by the BECATE program since 1998. In the first nine months of 2008, beneficiaries of the "mixed" and "internship" modalities accounted for 27 percent and 52, respectively, of the subprogram's total participants. These modalities also exhibit the highest placement rates, as shown in Table 4 below).

Table 4. Beneficiaries and Placement Rates by Training Modality (2008)

Training modalities	Number of beneficiaries*	Placement rate*
Mixta (on-the-job)	14,627	76%
Práctica Laboral (on-the-job)	27,913	58%
Autoempleo (self-employment)	2,585	47%
Productiva (self-employment)	7,367	45%
Vales de capacitación	719	53%

* January–September 2008, preliminary data.
Source: General Coordination of Employment (CGL), Ministry of Labor.

The scholarships offered by BECATE are modest and, as shown in Table 5, the program also serves a very limited number of workers. In the case of "self-employment" training the program offers the equivalent of a monthly minimum wage (approximately US$120) for up to two months. For "on-the-job training" the program offers one-and-a-half minimum wages for the "internship" and two minimum wages for the "mixed" modality. Beneficiaries also receive a small stipend (of approximately US$40) intended to cover transportation, as well as insurance against accidents. The "mixed" modality additionally includes medical insurance, paid for by the firm.

Though BECATE formally targets the population of unemployed or underemployed 16 and older, in practice the program becomes attractive (and used) for people with low income and educational levels. PAE's Rules of Operation published in December of 2007 estimate BECATE's potential beneficiaries at 11.7 million people, of which the program plans to reach 91,375 (0.7 percent). In addition, the Rule of Operation requires the program to cover all municipalities and localities in the country, giving preference to those with resources and mechanisms that facilitate training opportunities.

The Federal Ministry of Employment is in charge of coordinating PAE's design and implementation. The Ministry of Labor (STPS for its Spanish acronym) defines PAE's operation rules, which define the program components and mechanisms of operation. Within the STPS, the General Coordination of Employment is the unit responsible for implementing PAE and therefore the BECATE program.

Following operations rules published by the STPS, state governments are responsible for program operation through their respective SNEs. Most State SNEs are attached to State Economic Development Ministries, although their institutional capacity and position in the hierarchy may widely differ by state. There are a total of 142 SNE offices in the 32 federal entities. State SNEs operate the program and provide matching budget funds while also absorbing operation costs.

According to PAE's operation rules, State SNEs should involve labor state councils in their planning process. These councils should include unions, business associations, academics and government representatives. Interviews revealed that in practice, the role and relevance of state councils' members in SNE's planning is not necessarily homogenous. Once the budget is

received by State SNEs, they must develop an annual plan that specifies how the budget will be distributed among PAE's services and that specifies coverage goals for each component.

State SNEs assign "advisors" (the program's contact point with users) to specific programs, with the responsibility to fulfill their coverage goals defined in the state-level operation plans. This could distort the way that the beneficiaries are assigned to the services offered by PAE, particularly because the requirements for each service are so vague that it is possible for one candidate to fit in more than one service (UAM Xochimilco, 2008). SNE's advisors might also face difficulties to identify if the host firm would have, in the absence of BECATE benefits, hired the same number of trainees and financed their training with its own resources. Were this to be true; the PAE investment would result in a transfer from the taxpayers to the firm without necessarily being justified. Preventing these situations is costly and it is not clear that State SNEs have the institutional capacity and mechanisms to fully avoid them.

3.3 Institutional Capacities

The programmed budget of PAE in 2007 was MXN$ 1,353 million, with MXN$ 943 million (70 percent) funded by the federal government and the IDB, and MXN$ 409 million (30) by state governments and firms. The actual budget further increased by 16 percent with direct contributions from state governments and firms. Almost half of the Ministry's total budget was allocated to the program BECATE.

Federal fund allocation to PAE follows the same process than other earmarked government expenditures. In this case, the Ministry of Employment presents every year a budget proposal that includes earmarked funds for PAE and financial resources called for in collaboration agreements with international organizations such as the IDB, which then become part of the Executive's budget proposal to Congress. Once in the hands of the legislature, the Chamber of Deputies negotiates adjustments to the whole budget and presents a final version to the Senate, which then must approve it. Once the Congress approves the budget, the Ministry is responsible for allocating PAE funds to the state governments. Funds are distributed among states in two large blocks: i) grants defined by the state's ranking in a set of predefined criteria and ii) matching funds grants. Federal funds are earmarked for beneficiaries' scholarships and training expenses, while state governments are responsible for operational expenses, and they must additionally supply at least 20 percent of the federal funding received by the state.

At the federal level, the ministry is responsible for coordinating the design and implementation for BECATE programs, as well as transfer budgetary allocation to state SNEs. In addition, it monitors the delivery of subsidies and is responsible for keeping records and gathering monitoring and evaluation indicators. State-level SNEs are in turn responsible for program operation. However, interviews with officials revealed variation in the institutional capacity and design of state-level SNE offices. Such variation, not only in budgetary allocation but also in personnel capacities, can serve as an indicator of how important the program is to the state-level administration. An external evaluation (UAM Xochimilco, 2008) indicates that in 2006 and 2007 the staff working for the federal-level Ministry office in charge of the program was reduced by 18 percent, while staff at state-level SNEs increased by 1.8 percent.

Normative powers and the fact that the largest part of PAE's budget comes from federal funds grants the STPS authority to shape the program's general form. External evaluations of the program agree PAE has built an institutional capacity since its inception. However, substantial changes in the period 1998-2001 affected the capabilities of the executing unit, particularly key officials with specific knowledge of program operations (IDB, 2006).

Since the PAE program transfers resources directly to the population, the STPS is obligated to formulate and publish Rules of Operation that delineate the program's characteristics and participation requirements every year. The Ministry must meet these requirements, in addition to those imposed by the Ministry of Finance for all public expenditures. The Ministry of Finance oversees the budget, monitors sub-exercises and authorizes changes to program expenditures.

This normative structure seeks to limit corruption and discretionary spending. In return, it increases operational costs, since delays in the approval of resources result in slow program implementation. Additionally, the budget is provided and approved on an annual basis.

A quick revision of BECATE's list of beneficiaries reveals that several large firms receive transfers and interns through this program. Though evidence is hard to come by, interviews with some state-level representatives confirm that in some cases, states do use programs like BECATE as part of a package to attract investment from foreign firms. (See Table 5 for a summary.)

Table 5. Incentives Embedded in BECATE

Stakeholder	Role	Incentives
Ministry of Employment/General Coordination of Employment	- Coordinate, design and implementation of BECATE - Manage federal budget - Monitor delivery of subsidies - Gather M&E indicators	- Set indicators prioritizing coverage and placement over increasing employability of workers - For on-the-job training: Since increasing placement rates serves as an indicator of success for the program, the STPS runs the risk of subsidizing firms for hiring workers they would have hired anyway
State Governments & Local Employment Offices (SNEs)	- Operate program - Complement funds	- Increase budgetary allocation to their dependency - Support unemployed population, and meet coverage and placement goals - For self-employment: state governments might use the program as a social policy instrument - Use BECATE as a transfer to firms to attract investment

Source: Authors' compilation.

3.4 Outcomes

- **Coverage.** About 4.75 million workers were trained by BECATE (and its antecessors SICAT and PROBECAT) between 1984 and 2005. At the program's peak (1995-2000) more than 500 thousand workers were trained per year. BECATE benefited 170,000 trainees in 2007 and set a goal of reaching approximately 90,000 in 2008.
- **Operational capacity.** The actual budget spent by BECATE in 2007 was 16 perecent larger than planned because of additional contributions from state governments and firms. BECATE exceeded its 2006 and 2007 coverage goals by more than 50 percent, and most of PAE's subprograms were able to fulfill their budget and coverage goals in 2007.
- **Placement efficacy.** The placement rate of BECATE in the first nine months of 2008 was 60 percent, which is around the subprogram's historic average. Place rates in 2007 and 2006 were 75 percent and 57 percent, respectively. The "Mixta" (on-the-job) training modality achieved a 76 percent placement

rate, the highest in the subprogram during the period of January-September 2008.

3.5 BECATE's Impact

There is a long list of external evaluations of PAE and BECATE. This extensive work is result of the role of World Bank (formerly) and IDB as funders, as well as recent legislation approved by the Mexican Congress, which made external evaluations compulsory (though these do not necessarily translate into accurate measures of program impacts). Despite this long list of BECATE's external evaluations, there are no conclusive estimates of the program's impact on beneficiaries' levels of employability and wages. There is some evidence pointing out a positive effect of the program on the employment rates of the trainees. There is less clarity about the program's impact on wages. The lack of robust estimators is directly related to the difficulties in using a randomly-selected control group.

Neither PAE nor BECATE have integrated a comprehensive evaluation strategy into their design, and therefore it has not been possible to set up an evaluation with experimental design that robustly gauges either program's impact. There are differences in the estimates of the impact evaluations done using quasi-experimental methods, but the bulk point out (Delajara, Freije and Soloaga, 2006):

- The program is relatively successful in increasing beneficiaries' participation in the formal sector at least in the short-term.
- On-the-job training in large firms has a positive effect on formal employment.
- On-the-job training in SMEs has a modest effect, since small and medium companies do not necessarily have enough resources to hire workers upon program completion.
- Neither modality has a significant impact on beneficiaries' wages, though if there is an impact it might be negative in comparison to a control group.
- Self-employment does not have a positive effect on beneficiaries in terms of either employment rates or future wages.
- Given the weakness of the wage estimates, a robust cost-benefit analysis is difficult to perform.

External evaluations have not focused on providing a general equilibrium view of the impact of the program. They have not measured whether participants are more likely to obtain a job upon program completion or whether they have "crowded-out" employees the firms would have hired even in the absence of the program.

3.6 On-the-Job Training for Large Firms

The introduction of on-the-job training to BECATE represented one of the main changes in the history of the program. In the school-based modality—the previous type of training provided by BECATE—curriculum topics were defined by program officials, and training was provided by public institutions in a school-like context. With on-the-job training, BECATE matches job seekers with firms interested in hosting them. In this modality firms define curriculum topics, therefore guaranteeing their relevance in labor markets.

Upon obtaining training within firms, trainees are exposed to "real" labor market experience, which could be positive in terms of learning as well as signaling for the market. In the case of "mixed" training, the private sector pays part of the bill (they pay the training costs as well as a medical insurance for the workers), which represents less cost for the government and serves as an additional indicator of the value firms assign to the program.

That host firms are able to design their own training programs indicates that the training obtained by participants will be specific to that firm. In terms of whether on-the-job-training addresses the coordination failure mentioned above, which suggests that general training will be more effective as a mechanism to improve human capital, it is possible that firms could be receiving a subsidy for something they would have done anyway. Thus, the quantity of training would not increase as a result of public intervention, which would represent from this perspective a transfer from taxpayers to participating firms.

For the case of the "internship" modality, the rationale behind not asking the firm to cover costs or to hire the employee upon completing the program has to do with the program targeting younger employees, who have higher rates of unemployment. (See Table 6 below.)

Table 6. Unemployment Rates by Age in Mexico
Percentage, 2nd quarter 2008

	Unemployment rate
Total	3.50%
14 to 19 year-olds	6.92%
20 to 29 year-olds	5.70%
30 to 39 year-olds	2.82%
40 to 49 year-olds	2.00%
50 to 59 year-olds	1.96%
60+ year-olds	1.28%
Not specified	1.70%

Source: INEGI, Encuesta Nacional de Ocupación y Empleo, 2008.

However, it is not yet clear that younger cohorts face higher unemployment rates because they face more difficulties during the hiring process or because they have a lower opportunity cost of remaining unemployed than their older counterparts, since they tend not to be heads of family. Having a specific program for younger workers is positive in the sense that it identifies a real problem, higher youth unemployment rates, but bases the intervention on the premise that these higher unemployment rates are due to discrimination issues. If this hypothesis is wrong, with younger workers having in reality a lower opportunity cost of remaining unemployed for longer periods, then not having a choice between the "internship" and the "mixed" modality (which requires firms to hire at least 70 percent of participants) could produce negative effects. Therefore, the "internship" modality would only make sense for less productive workers who need to gain work experience and who would not be attractive for firms participating in the "mixed" modality, independent of their age.

The "mixed" modality of on-the-job training can also be seen in terms of meeting the governmental strategy of reducing transaction costs in the labor market. This would address the perennial problem of asymmetric information faced by a hiring firm (which has limited information for distinguishing between high and low-quality job seekers), a problem exacerbated by the high costs of firing workers imposed by Mexican labor market regulation. In this case, only relatively more productive workers would choose to participate in the type of training that allows employers to measure their marginal productivity. In this sense, on-the-job training is a subsidy that allows hiring firms to reduce information costs for gauging the quality of the job seeker. The problem is that there is no way to know for sure that the firm would have

hired the employee whether or not he or she had participated in the government-sponsored training program.

3.7 "Self-Employment" as an Escape Valve

The "self-employment" training modality is an alternative more suitable for disadvantaged groups, who might have fewer chances to find a formal job either due to their low employability or their location in an area with scarce employment opportunities. It also provides an alternative for the STPS to contribute to the development of more marginalized regions. This responsibility includes specific commitments (contained in the General Law for Social Development), such as participation in the program for the Local Development of Microregions.

There are two issues of asymmetric information that might affect the efficiency in the selection process. First, SNE's advisors have incomplete information about the main motivation of a potential beneficiary to ask for support. Second, SNE might find it difficult to determine whether the applicant is interested in training as a mean to find a job or is interested in receiving the cash transfer for living expenses but unwilling to participate in the labor market. The applicants in the second case do not have incentives to reveal the relevant information. In BECATE, this problem might be larger in the self-employment modalities, because this training type requires lower levels of effort than on-the-job training. If this is the case, PAE might be subject to rent-seeking or might be considered as an expensive alternative to provide cash transfers to the needy.

Thus, the "self-employment" training program does not necessarily solve the intermediation or the human capital accumulation dilemma. Instead, it provides an escape valve in terms of crises for workers who tend to suffer more, but one that could easily be subject to rent-seeking.

3.8 Response to Market and Government Failures

Training programs in Mexico tend to be designed to address social and budgetary objectives rather careful analysis of market failures. While an inadequate educational system creates the need for further training of workers, creating training programs based on the government's failure to provide high-quality educational services does not solve the initial problem. Rather, it serves as a second-best policy.

BECATE was not designed to respond to firms' and workers' underinvestment in training due to concerns with labor mobility and limited access to capital, both market failures. Instead, PAE and BECATE seem to operate as a safety-net mechanism in times of economic hardship (e.g., economic crises and environmental disasters). These training programs probably do provide an effective tool to reduce information costs faced by firms in gauging job-seekers' quality. However, the programs' selection process is not designed to respond to the asymmetrical information market failure.

First, State SNE's advisors have incomplete information on potential beneficiaries' primary motivation for requesting support. SNE might find difficult to determine whether an applicant is interested in training as a means to find a job, or whether he or she is interested in receiving the cash transfer for living expenses, but is not willing to participate in the labor market. The applicant in the second case does not have incentives to reveal the relevant information. In BECATE, this problem might be larger in the self-employment modalities, because this training type requires lower levels of effort than on-the-job training. If this is the case, PAE might be subject to rent-seeking or might be considered as an expensive alternative to provide cash transfers to the needy.

Second, it is not easy for PAE and BECATE implementation officials to identify whether the program leads to hiring of new personnel or to more training. There is not a mechanism to determine whether "host" firms would have hired and trained workers even without the program.

3.9 Effectiveness of the Program

Due to low returns on investment of training for low-skilled and older workers, public investment would yield higher returns in the education of the younger and more productive. In Mexico government spending (6.4 percent of GDP in 2004) and coverage of the national education system have dramatically increased in the past few decades going from 4.5 years of education in 1976 to 8.2 years in 2006 (OECD, 2007a). Nonetheless, only a minority of the population has completed secondary school, and even fewer have completed higher levels. Training programs alone remain a second-best solution to the larger problems faced by the labor force.

3.10 Recommendations

The BECATE training program sets out to accomplish two main objectives: i) improve the quality of human capital (through training); and, ii) reduce transaction costs in the labor market (through its internship program). In reality, the program's outcomes tend to reflect a better fit with the second goal, reducing transaction costs, while only those with a very low-skill base benefit from the kind of training they receive through BECATE. Furthermore, the on-the-job modality tends to work better than the "self-employment" modaility. More importantly, it seems that the program is trying to "make up" for the inadequacies of Mexico's labor environment, acting as a second-best solution to a problem of legal incentives.

The following recommendations should help the Ministry of Labor, as well as the state-level SNEs, look more in-depth at the impact of their programs and consider the possibility of addressing training goals through different means.

- **Re-evaluate BECATE's stated objectives.** As currently stated, the program's goals create incentives for individuals to game the system and access the program several times without being turned down. A look at the data, which are not available to the public, should reveal whether this is happening. Mexico does not offer unemployment insurance, and BECATE seems to be filling that void even when its stated objectives have more to do with improving skills and reducing transaction costs.
- **One-shot impact evaluation of skills attained through the program.** Using a random selection of individuals who participated in the program, perform a skill-based evaluation at six months and at one year after program completion. Though it seems obvious, this type of evaluation does not take place. In fact, program indicators of success do not include "improvement in skills"—though this is difficult to measure—but rather focus on placement rates, even when the program's objective is to increase human capital. BECATE is supposed to be complementary to the SNE placement services—which exist at the federal and state levels—but rather ends up serving the same purpose.

- **The self-employment modality should disappear.** It is not clear whether the abilities obtained through BECATE by microentrepreneurs actually increases their employability, especially since the program is not specialized in creating sustainable microfirms. The Ministry of Labor should consider transferring the "self-employment" modality to either the Ministry of Social Development or the Ministry of Economy, which are better suited to address microenterprise needs.
- **Transform the program to offer general rather than specialized skills.** BECATE's "on-the-job" training provides individuals with the opportunity to acquire skills on-site for at least three months. When training is done by the company itself, it tends to be specific to that company, which means it is hardly applicable to other types of jobs. While this is positive in order to reduce transaction costs of hiring and being hired for employers and workers, in reality, it does not contribute to meeting the program's first goal, which is to increase human capital skills. The deadweight loss to society (from not providing individuals wth general skills) is sufficiently high to transfer money to a program that only seeks to reduce transaction costs, which are created by rigid labor laws. An alternative would provide individuals with more general skills that they can transfer across companies.

4. Innovation

Setting positive conditions for innovation to take off, while creating incentives for the promotion of an innovative entrepreneurial class, must be key features of any country's innovation policy in order to ensure competitiveness, and by doing so, increasing the wealth of its citizens. Many countries have implemented a set of policies that aim to systematize innovation activities; in general, they take the form of a National Innovation System (NIS).

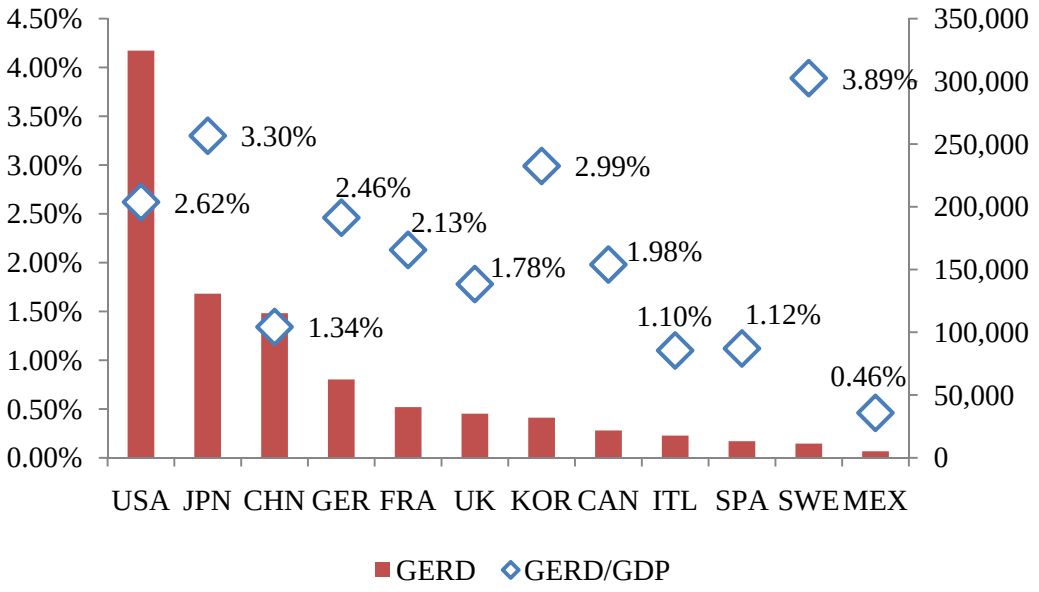
A NIS is defined by Intarakumnerd, et al. (2002). as the "interactive system of existing institutions, private and public, aiming to create, store and transfer knowledge and skills to define new means of Science & Technology (S&T) within national borders. Interaction among these institutions can be technical, commercial, legal, social or financial." National Innovation Systems not only aim to set the conditions for consolidating science and technology and research

& development and innovation (R&D+i) within a country, but also to ensure the products, processes and services developed by the country can compete in global markets.

From 1998 to 2006 Mexico consistently increased its gross R&D expenses (GERD) relative to GDP, with total growth of 46 percent over this period. However, Mexico remains behind its commercial partners, particularly in terms of private sector-sponsored R&D investment. In 2005, Mexico reported 49 percent of total R&D was financed by the public sector, while in the United States the private sector reaches 69 percent, with comparable figures of 74 percent in Japan and 76 in Korea (CONACYT, 2007). Figures 2 and 3 illustrate GERD as a percentage of GDP and source of financing for R&D activities.

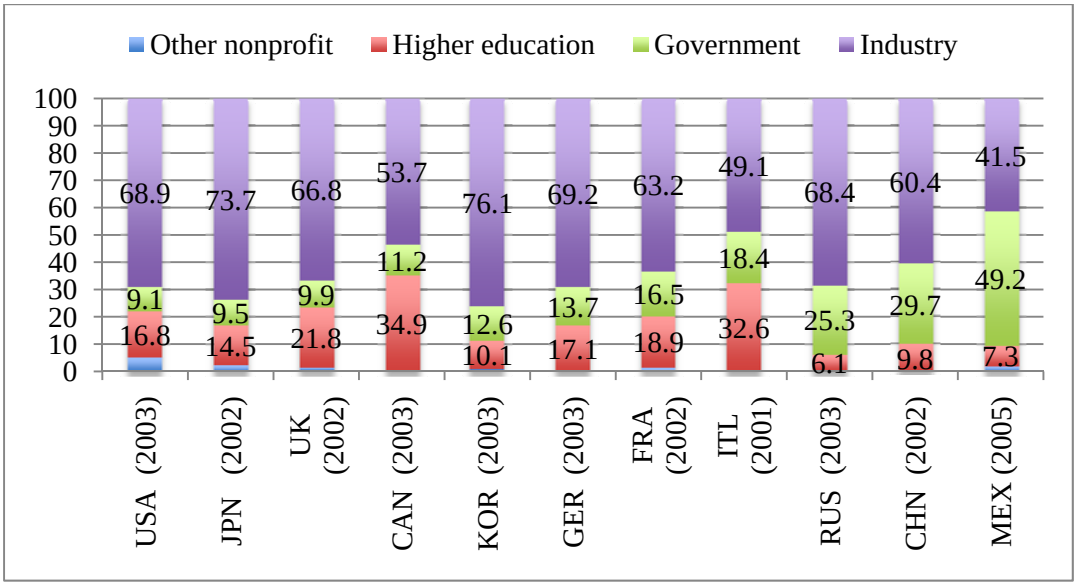
Additionally, indicators related to number of researchers and scientific publications produced in Mexico further illustrate the country's gap with respect to its commercial partners. While there are 1.1 researchers per 1,000 inhabitants in Mexico, Japan boasts 11.1, the United States 9.7, and Argentina 2.3. Only 0.8 percent of the world's scientific publications are produced in Mexico, whereas the US contributes 32.3 percent of the world's total, Korea 2.6 percent, and Brazil 1.9 percent (CIDAC with data from CONACYT).

Figure 2. Gross Expenses in R&D and as Share of GDP



Source: CIDAC with data from CONACYT.

Figure 3. GERD Source of Funding, Selected Countries
(Percentage)

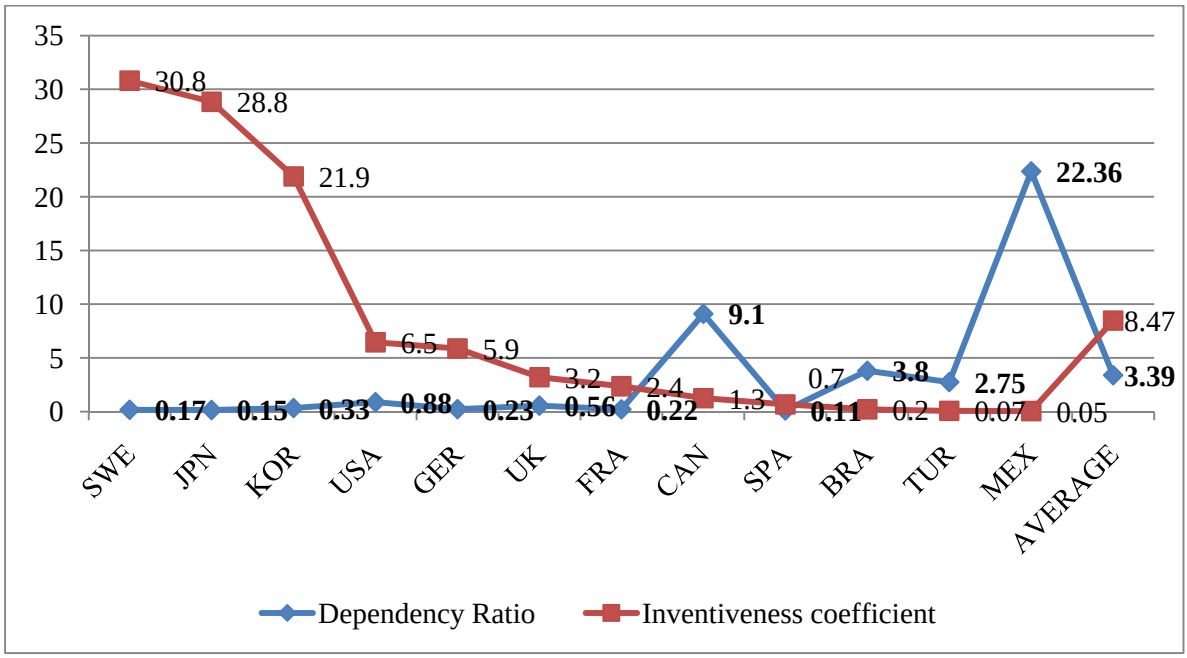


Source: CIDAC with data from CONACYT.

Patents face a similar situation, with Mexico also lagging behind its partners. While Mexico produces 0.05 patent applications per 10,000 inhabitants, in the United States this figure reaches 6.5, with 21.9 in Korea and 30.8 in Sweden (see "inventiveness coefficient" in Figure 4). After NAFTA was implemented in 1994, the amount of patent applications in Mexico grew more than in the prior 20 years (Aboites, 2003). Interestingly, and probably as a result of the surge of imports resulting from market liberalization, patent registration was mostly driven by foreign companies operating in Mexico. While patents by Mexicans grew by 26.7 percent from 1998 to 2006, patents by foreigners grew by 42.3 percent. This figure is more than 20 times higher than that for the United States—as the "dependency ratio"[5] line in Figure 4 illustrates, 22.4 in Mexico versus 0.9 in the United States (CIDAC with data from CONACYT).

[5] "Dependency ratio" refers to the proportion of patents registered by foreigners in each country. As Figure 4 shows, this ratio is much higher for Mexico than for most other countries in the sample, which serves as an indication of the relatively low levels of patents registered by Mexican scientists and companies.

Figure 4. Patent Dependency Ratio and Inventiveness Coefficient(2004)



Source: CIDAC with data from CONACYT.

Relatively low investment in R&D as well as a small private share of R&D funding can result from market and government failures which tend to hinder innovation. Nonetheless, the potential for positive spillovers of correcting these failures represents an important opportunity for improvement in the area of innovation policy in Mexico.

In Mexico, the list of challenges and failures which need to be addressed in order to develop a competitive NIS and therefore promote higher levels of investment in technological innovation and therefore increasing the country's wealth, include the following. (See Table 7 for summary):

- **Uncertain appropriability:** Given that the social benefits of innovating tend to be higher than the returns that can be claimed by the entrepreneur, unless entrepreneurs can ensure the appropiability of their efforts (Hausmann and Rodrik, 2003), investments can remain at suboptimal levels. Many countries opt to use patent registration as the means by which entrepreneurs can appropriate the benefits of their inventions, obtaining protection from competition for a number of years.

In Mexico, this market failure is magnified by low contract enforcement and by uncertain intellectual property rights protection. For example, the Mexican Institute for Intellectual Property (IMPI) is the agency in charge of the registration of all patents, brands, products, and similar designations. IMPI therefore has control and supervision responsibilities over pharmaceutical patents in the country. However, another agency, the Federal Commission for Protection against Sanitary Risks (COFEPRIS), also controls and approves which medicines can reach the market. These two agencies do not necessarily coordinate their efforts and intellectual property rights problems occur. As such, it has occurred that a patent correctly registered through the IMPI, is violated in the market by a generic-brand medicine approved for sale by the COFEPRIS despite the patent's validity. The key problem is that COFEPRIS has the authority of allowing medicines to be sold in Mexico, but it is no obligated to consult the IMPI regarding valid patents. Pharmaceutical companies in this situation can definitely appeal to the justice system; however, this process almost always takes more than 24 months, time during which the patent may expire or time over which the patent holder is losing revenues.

- **Limited access to competitive finance:** Entrepreneurs wishing to invest in innovative products or services face difficulties finding cost-effective financing mechanisms. No market actor is fully capable of recognizing the benefits of a new product or service ex-ante. As a result, financial institutions, in order to provide financing for such innovations would have to raise the price of credit and therefore become unattractive for the firm. A new idea is, by definition, riskier than a proven one, therefore the project has a higher chance of failing and the bank has more strict requirements in order to lend to the entrepreneur. In Mexico, the most frequent requisites include: i) the entrepreneur's company has to be established for at least 2 to 3 years (this leaves no opportunity for start-ups); ii) companies should not have any credit commitments; and iii) companies should have enough assets to guarantee the amount of the loan. This failure is further exacerbated when competition is

limited in the financial market, which also limits incentives for reducing the costs of credit, as is the case in Mexico.

Government programs to encourage innovation activities try to solve this problem through guarantee schemes. Regrettably, the government guarantee asks for almost as many requirements as the banking system. As consequence, many entrepreneurs leave their projects without ever reaching the market.

- **Coordination failure:** Innovation is almost always a collaborative game as it demands ideas, resources and time from many institutions in order to reach optimal levels. Entrepreneurs and firms usually lack incentives to collaborate with each other due to the competitive nature of markets and the probability of not being able to appropriate investments, therefore resulting in suboptimal investments in R&D+i. This failure calls for government intervention, especially in ensuring that investments required upstream and downstream are realized in order for innovation to develop.

In addition to the market failures mentioned above, the Mexican case should also be analyzed taking into account the existence of particular government failures which also limit innovation activities:

- **Limiting regulation of public research institutions:** Countries that are successful in promoting innovation take full advantage of universities and research centers in order to realize synergies between the private sector and academia (OECD, 2007a). This is not the case in Mexico, where most publicly-funded research institutions, which happen to be the most qualified in the country, are prohibited by law from commercializing their research findings.[6]
- **High costs of registering patents:** The cost of regulation can as well be identified in perspective using the *Doing Business 2009* (World Bank, 2009) analysis. For a totally new project, one that requires the set up of a firm in order to go-to-market, in addition to the five processes and 74 days required in

[6] Ley Orgánica de la Administración Pública Federal.

Mexico to register an idea, the entrepreneur will have to complete nine more processes during approximately 28 additional days. The entrepreneur can therefore spend over three months and complete 14 processes to make the new project a reality. Add to this the processes and time required to solicit funding from a government-sponsored innovation supporting program, a private bank or an incubator, and the picture becomes even grimier.

Table 7. Market and Goverment Failures in Innovation

Failure	Type	Description
Uncertain appropiability	Information externality & Government failure: Poor protection of intellectual property rights	- Social benefits > private benefits of innovation - Deficiencies in property rights protection
Limited access to finance	Information asymmetry	- Difficulty of knowing benefits of innovation ex-ante raises cost of credit
Low private-private and public-academia-private collaboration	Coordination failure & Government failure: Regulation prohibits public research institutions from commercializing their inventions	- Competition limits incentives for collaboration among entrepreneurs and firms, which can result in suboptimal investments in R&D+i. - Regulations limits incentives for collaboration and finding synergies between academia and the private sector - Burdensome procedures for opening a business and registering patents, which discourages entrepreneurship and innovation.

Source: Authors' compilation.

4.1 Policy Response: CONACYT and the AVANCE Program

Mexico's efforts to promote innovation activities can be traced back to 1970 when the National Council for Science and Technology (CONACYT) was created in order to articulate a coordinated strategy in science and technology (S&T) promotion. Since then, CONACYT has led the country's innovation policy.

CONACYT's work has been consistent with the country's political and economic reality. During the 1970s and the 1980s, it focused on developing domestic innovative solutions—following the ISI model—for sectors such as the metal, mining, and automotive industries, which

then were considered as priority in the national agenda. During the 1990s, as Mexico became more and more integrated into the global economy, CONACYT's objective shifted towards the support of exports. Then, in 2002, CONACYT became an autonomous agency, now independent from the Education Ministry. The agency maintained its focus on promoting innovation for global markets but gained a new role through finding synergies with other government institutions as well as creating academic networks at a national and international level.

Nowadays, CONACYT promotes innovation using a series of funds to support needs of specific segments along Mexico. These programs are organized into five sets:

- **Formation of scientists:** scholarships, grants, events, etc., oriented to recruit and develop Mexican scientists.
- **Scientific research:** grants and promotion mechanisms to support S&T research in public & private sector.
- **Innovation and technology development:** programs to stimulate and align incentives to promote innovation and investment.
- **International cooperation in S&T:** coordination of global communications in order to integrate Mexican S&T effort world-wide.
- **Information about the country's S&T status:** Increase awareness among domestic and foreign stakeholders of CONACYT's programs and achievements, and also monitor the evolution of Mexican innovation system.

Given this project's interest in understanding activities that promote direct innovation in firms, the focus for analysis will remain on the third set of programs, those in the "Innovation and technology development category."

In particular, this analysis will focus on AVANCE, a program designed to identify new business ideas based on science and technology. The AVANCE program, though very small in coverage and budgetary capacity, seems to be complementary to the accelerator programs for SMEs coordinated through the Ministry of Economy. In practice, while the two programs do not share funds, it is understood, as revealed during interviews, that while the accelerator program for SMEs can include all industries, the AVANCE program focuses on science and technology companies.

AVANCE is an integral program devoted to the detection and promotion of innovation projects based on S&T. To do so, AVANCE is segmented into nine sub-programs, each intended to meet specific needs of entrepreneurs and researchers considering the projects' status and the requirements needed to get these projects to market. Its targets are institutions, universities, research centers, laboratories, and firms related to S&T activities, which are registered in the National Registry of S&T Institutions and Companies (RENIECYT). See Table 8 for a summary of AVANCE's subcomponents.

Table 8. AVANCE's subprogram components

Sub-program	Objective	Support fields
News Businesses	Economic support for proven S&T developments in pre-market phase.	- IPR-related expenses. - Management consulting and support - Funding of feasibility studies - Building of concepts and prototypes - Documentation of projects engineering - Processing of registrations and official certifications.
Entrepreneurship Fund CONACYT-NAFIN	Capital support to S&T SMEs consolidation	- Working capital funding - Fixed assets funding - Development of strategic business plan (commercial, legal, finance & technology) - Management consulting and support - Other related expenses
Guarantee Fund	Trust fund to support commercial expansion of S&T firms in the development of new products, services and increase production capabilities.	- Funding to purchase or maintain fixed assets. - Working capital funding - Support on patents and related rights - Design / re-design of engineering and plants - Management consulting and support - Other related expenses
Patent support	Economic support in patenting process to researchers, institutions and SMEs.	- IPR enforcing expenses - Technical advising in regulation and related processes - Payment of 100% of registration and patent expenses - Other related expenses
Technological Packages	Economic support to public universities and research centers for commercial expansion of proved S&T developments.	- IPR enforcing expenses - Management & legal consulting support - Technical and economic feasibility studies funding - Building of concepts and prototypes - Engineering transfer manuals - Processing of registrations and official certifications - Other related expenses

Table 8. AVANCE's Subpogram Components (continued)

Technology Transfer offices	Economic support to public institutions or S&T private incubators to create offices which facilitate development of S&T projects.	- Initial legal assistance - Adoption of benchmarking projects on licensing, technology & tech transfer. - Office set up and integration consultants - Related travel expenses
AVANCE Business Schools	Economic support for training programs on S&T for businesses.	- Firms: expenses related to training on technology. - Universities & public research centers: expenses related to training to use, manage and development of technology at a firm level.
Strategic Alliances & Innovation Networks for Competitiveness (AERIS)	Support for the integration of innovation networks between firms, research centers and universities.	- Training of human resources according to demand, and support on incorporation of researches to productive sector.
Seed Capital Fund	Promotes the development of firms based on S&T in period of incubation or start-up.	- Seed firms: Temporary recoverable support to innovative firms in pre-market phase - Fund or association: Temporary contribution to risk capital funds in phase of seed capital to support start-up of innovation firms

Source: Authors' compilation.

4.2 AVANCE's Convoluted Design and Implementation

In order to access funds from the AVANCE program, entrepreneurs must first undergo the selection process at the federal level, that is, get approval from CONACYT. All proposals have to be presented during the "c*onvocatoria*" period. Upon receiving each proposal, a group of accredited evaluators (RCEA, for the acronym in Spanish) chosen by CONACYT reviews the project on a technical basis, determining whether it is innovative and has a competitive advantage. If approved by the RCEA group, the project is passed on to the group of membership analysis (GAP for its acronym in Spanish); in essence, the GAP evaluates whether projects are potentially commercially viable. Once approved by the GAP, the project goes on to a final evaluation stage by AVANCE's Technical Council, which is composed of CONACYT staff.

Following approval by CONACYT, state governments (which provide matching funds for AVANCE projects) have the final word, and they may or may not decide to support a project depending on the priorities they have established for development of science and technology projects. While this information should be made public at the beginning of a governor's tenure (through State Development Plans), entrepreneurs indicated in their interviews that it is usually very difficult to obtain this information prior to applying for project funding with CONACYT. As a result, an entrepreneur can undergo the whole process with CONACYT, receive approval from the Technical Council, be ready to work with a specific incubator or accelerator, and finally see the whole project fall if his or her project does not happen to match the state government's priorities.

If a project is finally approved, funds are then transferred to intermediary agencies, which by law should be either public universities or incubators and accelerators which only receive public funding. Since the entrepreneur works with the universities or the incubator or accelerators during the whole application process, by the time funds are transferred from CONACYT to one of these intermediary agencies, they will be able to access their services and start the project.

In theory, the program requires follow-up and performance evaluations for each project. By definition follow-up is carried out at the end of every declared period of the approved project and includes a technical report and a financial report. Reporting is made directly to the AVANCE Technical Council, which has the authority to decide whether to continue providing

support. Support can be provided for a specific project for up to three years under the AVANCE program.

Additionally, an Impact Report is presented at the end of the project to the AVANCE Technical Council; in this report the beneficiary of the support declares the project's results, benefits, and possible additional businesses. This is the information used by CONACYT to report AVANCE's performance. The beneficiary is requested to deliver Impact Reports three years after the conclusion of the project in order to have a follow-up database regarding the supported program's performance. Unfortunately, the data are not publicly available to perform independent evaluations. Finally, AVANCE Technical Council has the authority to conduct an independent ex-post evaluation. We did not find public evidence of any such evaluations undertaken to date.

4.3. Institutional Capacities

The implementation process discussed above reveals the potential for conflicting incentives existing in the design of the program, which can limit entrepreneurs' ability to access funds from the AVANCE program.

In an effort to direct innovation policy to specific sectors, Mexican authorities segmented budgetary resources for innovation activities by ministry. Thus, each agency follows an independent agenda, as the incentives to compete for funding from Congress limit their motivation to coordinate efforts. As a result, entrepreneurs wishing to apply for government programs to support innovation often face duplication in many processes as well as additional restrictions for projects' approval. In addition, segmented budgets limit the government's capacity to support projects that need higher amounts of money, specifically those projects intensive in the use of fixed capital.

CONACYT, responsible for operating programs like AVANCE, depends on the legislative branch's budget allocation to sustain their operations year after year. In addition, the lack of accountability on the part of Congress and the federal government provides incentives for CONACYT to set vague goals and indicators of success so that it can spend all of its resources by the end of the year in order to avoid budget cuts.

Programs like AVANCE are designed to prevent corruption and discretionary resource allocation; thus, rules of operation prevent any authority (federal or local) from delivering

funding directly to beneficiaries. In order to ensure the funds reach selected projects, institutions like CONACYT act through state governments and intermediary agencies (IAs).

Decision-making power was granted to local authorities based on the idea that their proximity to local conditions will inform their actions to stimulate local economic growth. To ensure that state-level governments use their R&D budget in a reasonable manner and prevent free-rider problems, programs also require local authorities to provide matching funds for every project. While this is a positive requirement, which also creates ownership of programs at the local level, entrepreneurs can get caught in political games if a state government decides not to provide funds for a specific project. This can happen if a local authority chooses to favor a particular industry or sector, which does not include the entrepreneur's choice. In this case, the project is rejected at the last minute, even if it has already passed all federal requirements and processes.

Funds are then channeled through IAs, including universities and private incubators or accelerators. Incubators specialize in what is called "seed capital" to support new ventures, while accelerators are oriented toward stimulating ongoing projects. These IAs are charged with the responsibility of supervising the use of the budget as well as supporting the firm through training and consulting services.

Although this procedure seems adequate, it is not shielded against negative externalities. Some private universities have started internal incubators and accelerators in order to obtain government funding for their own R&D budget. Private universities' incubators may tend to give priority to those projects which are directly or indirectly related to their R&D agenda, which may not be the best projects available and could result in a crowding-out effect for independent and/or privately funded companies which could more broadly support R&D+I within the country. There are 322 incubators nationwide, of which 63 percent are registered by universities (Ministry of Economy, 2007), compared to 119 independent incubators. This might be due to the nature of the market; however, this phenomenon deserves further analysis in order to determine crowding-out effects. Table 9 below describes these conflicts.

Table 9. Roles and Incentives in AVANCE & Innovation Programs

Institution	Role	Incentives
CONACYT	- Design Rules of Operation and Manual of Procedures for AVANCE application - Heads Technical Council which approves or rejects projects - Chooses private sector representatives for RCEA and GAP evaluation groups, based on their technical expertise - Approves Intermediary Agencies that receive funds from AVANCE - Oversight of programs, and follow-up	- Set vague goals prioritizing number of supported projects and allocation of entire budget in order to maintain funding levels year after year.
State governments	- Provide matching funds for approved projects	- Promote S&T+I projects according to local development plan –or that of the governor in turn– without necessarily following CONACYT's priorities or coordinating with other state governments.
	- Final word in project approval after CONACYT's review	- There are no incentives to report specific results as CONACYT does not condition budget allocation on results.
Intermediary Agencies (IAs): public & private universities (with own incubators and accelerators)	- Design and operate programs such as incubators and accelerators	- Some universities have started internal incubators and accelerators in order to obtain government funding for their own R&D budget. - University-based incubators have an incentive to prioritize projects related to their R&D agenda, which may not be the best projects available in the market and could result in a crowding-out effect for independent, privately funded companies.

Source: Authors' compilation.

Even though the AVANCE programs seek to encourage and support innovation, at an operational level it fails to address negative externalities generated by an inadequate alignment of incentives in the market. Observations made about the AVANCE program can be extrapolated to the way innovation policy is designed and implemented in the country, resulting in small levels of investment in R&D+I and poorly executed public programs.

4.4 Coordination

Coordination issues arise between ministries. The process of budgetary allocation, through which several ministries carry out innovation-related programs, creates incentives for each ministry and agency to act independently in order to maximize budgetary resources. As a result, several

ministries and agencies can and do actually promote very similar programs without necessarily prioritizing the impact on entrepreneurial activity in terms of R+D+I investment.

In addition, federal and state-level authorities also have few incentives to coordinate their policy agendas regarding R+D+I activities. Although most of the budget for innovation programs is managed by federal agencies, local governments also play a relevant role in the allocation of resources. State and municipal authorities can decide which projects deserve support through "quality local vote" in innovation programs and funds, which is exercised after federal agencies, particularly CONACYT, has decided to support a specific project. As a result, an entrepreneur can undergo the project approval process at the federal level and still be rejected by the respective state government's "quality local vote" in the end. Such a situation highlights the few existing incentives for creating matching agendas, both at the federal and the state level, to the detriment of entrepreneurs.

4.5 Linkage

In developed countries, universities play a double role: (i) they develop human capital and (ii) they produce basic and applied research. In Mexico, most universities do not undertake research. Considering that over 95 percent of firms in Mexico are small, and lack human, financial and technical resources to develop their own R&D+I activities, linking entrepreneurs to universities would create economies of scale and mitigate entrepeneurs' risk in obtaining basic and applied research.

Innovation requires linkages between at least three actors: government, academics and entrepreneurs (OECD, 2007-2008). Mexico's low share of private funding in R&D+I activities, suggests the existence of linkage problems, mainly as a result of incentive misalignment (Helios Feria and Hidalgo, 2008). Very few public universities in Mexico are capable of supporting high-end innovation ideas due to monetary and human resource constraints. As a matter of fact, the only university considered to be capable of producing globally competitive R&D is the Universidad Nacional Autónoma de México (UNAM).

In addition, certain legal restrictions prevent personnel from public institutions, including universities, from commercializing their research findings directly. Universities and private firms in Mexico thus have little ability to collaborate, with consequently low levels of investment in

R&D+I. This is particularly true of small and medium firms that cannot afford to engage in private contracts with universities.

4.6 Planning

While a wide range of programs is intended to support R&D+I in Mexico, there is no consolidated NIS. Some of Mexico's largest challenges in promoting and supporting innovation arise from the misconceptions:

- Innovation is a desirable and fashionable attitude rather than a critical component of the country's development.
- Innovation is possible only in high-end sectors intensive in the use of new technologies.
- Innovation is something that can be done independently.
- Innovation is about new products, not necessarily new services or new processes.

International experience, as demonstrated by the cases of China (OECD, 2007b) and Korea (Solleiro, Castañón, Luna, Herrera and Montiel, 2006) indicate the importance of pushing a clear vision as well as a general understanding of R&D+I activities for success.

The process of strategic planning implies relevant challenges in the design of a NIS in Mexico, as well as in the innovation programs that will be part of this system. Currently, the design processes of programs as well as their operational mandates are not entirely clear:

- **Objectives are set to be qualitative rather than quantitative:** Difficulty to define specific measurable objectives does not mean that it should be avoided or substituted by operational objectives. If this is the case, the main goal of innovation programs may be lost from the beginning. For example, one of AVANCE's main objectives calls for "promoting R&D+I in Mexico to create more value added products." This objective does not define how much value has to be added; therefore the authority cannot objectively evaluate if the program is successful.

- **Strategies tend to be vertically integrated and lack horizontal perspective:** Verticality is observed first, from a ministry perspective, and second, from a sector perspective. It is at this point where innovation programs start to face coordination and linkage difficulties. The ministries of agriculture, economy and education follow independent objectives based on their own innovation needs, and each agency manages their programs separately. The agency responsible for coordinating innovation programs, CONACYT, is not a Ministry and therefore lacks the ability to align incentives within a single vision. In other, more successful countries (e.g., China and Korea) there is a Ministry for Science & Technology in charge of vision and coordination.
- **Strategies do not necessarily match priorities with competitive advantages:** For example, the Ministry of Economy has chosen the areas of biotechnology, mechatronics (robotics), nanotechnology, software, telecom, and alternative energies as priority areas. However, it is unclear how the agency chose these sectors and what actions should be taken to become competitive at a global level.
- **Lack of accountability due to weak follow-up mechanisms:** To support innovation, it is not enough to allow for the provision of financial and technical resources. In addition, monitoring and evaluation should be a constant activity for each program.

Regrettably this is a major shortfall in the definition of innovation support programs in Mexico; actually, objective evaluation mechanisms are weak, and measuring effectiveness and impact is not part of the external evaluations so-far undertaken. This is particularly important given the lack of measurable objectives, uncertainty about chosen sectors' competitiveness and the limited coordination between different implementing agencies.

Despite efforts to integrate program planning among agencies and create a national view of innovation activities (e.g., Mexico is currently working with the OECD in the development of a NIS project; see OECD, 2008), these plans, projects and programs will remain short-sighted until there is an officially-empowered office responsible for coordinating efforts. CONACYT

would be the obvious choice for Mexico; however, it would need the strength to align visions, ministries and programs towards a common NIS.

4.7 Resources

Currently Mexico devotes 0.5 percent of GDP to R&D+I activities (GERD), while its competitors invest on average 2.3 percent of their production (CONACYT, 2007). Considering the difficulty of increasing R&D+I funding to 2.3 percent of GDP in the short-term, the immediate challenge is to make the available budget more efficient. Two actions have proven effective in other countries:

- Looking for economies of scale, synergies and horizontal integration of resources within programs can result in a more effective use of GERD.
- Fiscal discipline is necessary to have better managed and more efficient programs. Discipline is about sticking to the plan; fiscal discipline is about having clear balance sheets, income statements and positive dividends for every program, as well as the ability to integrate new partners when needed (e.g., the private sector), and to change or eliminate programs which are not giving the expected outcome.

Limited access to competitive financing for new projects restricts the ability of entrepreneurs to innovate and therefore requires collaboration between at least three actors: i) federal government, ii) local government, and iii) the private sector. Each one of these parts has a distinct role in the process:

- The federal government manages innovation programs, identifies prospective projects and determines whether they are candidates for funding, sets sunsetclauses and ensures effective use of resources.
- Local governments have a local quality vote, taking into account the project's consistency with their own local innovation agenda, as well as their resource availability, in order to make a decision regarding the project's sustainability.
- The private sector is represented by two actors: first, the entrepreneur itself, who sometimes has part of the money needed to start the project; and second, the financial sector which may or may not have the willingness to support to

the project, due to the degree of risk perceived in the project. Here is where the government's guarantee programs come into play.

In order to realize funding provision for innovation activities, excessive regulation and inefficient communication strategies on the part of government programs can result in suboptimal levels of funding.

Excessive regulation can result in negative incentives for entrepreneurs, limiting their willingness to even start looking for funding. In addition, excessive regulation can result in the creation of additional ineffective markets, such as the contracting of services to go around the government bureaucracy. In Mexico, a specialized service in process management has developed. This service helps the entrepreneur during the whole fund requesting process, although it does not guarantee that the funding will be obtained in the end. As a consequence, the entrepreneur incurs an additional cost, and one that is often not considered at the beginning of the process.

The second concern arises from innovation programs' communication strategies. Lack of effective communication about the programs' goals and requirements will also limit entrepreneurs' access to funding, even if the program exists.

4.8 Response to Market and Government Failures

In general, CONACYT's programs are oriented toward financing S&T projects, as well as promoting linkages between the scientific community and the productive markets. Nonetheless, it is clear that these programs do not address the market failures related to the innovation process. As a matter of fact, CONACYT's responsibilities do not currently include ensuring appropiability through enforcement of property rights.

Therefore, incentives within innovation development are still not adequately aligned to ensure that entrepreneurs can appropriate the rents related to the innovation process. Instead, CONACYT's role is limited to financing projects, thereby tacitly assuming a risk that would normally be the entrepreneur's responsibility.

4.9 Effectiveness of AVANCE Program and Innovation Policy

Even though Mexico started efforts to promote innovation in S&T areas since 1970, it is clear that the policy followed by the country has not been as successful as in other regions and countries. Behind this result is the fact that innovation policy has been used as a part of Mexico's political and economic agenda rather than being a competitive business promotion strategy. In addition, CONACYT's lack of empowerment is one of the critical differences between Mexico and other countries such as Korea and China.

Mexico faces the following challenges: i) increase coordination between government agencies,(ii) promote linkages among government, academia and the private sector, iii) improve program planning by encouraging evaluation and accountability, and iv) align incentives in order to increase financial resources available to R&D+I activities, thereby improving Mexico's position vis-à-vis its competitors.

4.10 Recommendations

The preceding analysis demonstrates the existence of problems of coordination, linkage, planning, and insufficient resources. Due to the lack of coordination between agencies and with state-level governments, it is difficult to ensure the efficiency and efficacy of public resources destined to promote R&D+I. In addition, the lack of coordination implies entrepreneurs have little information about the availability of public funding for their projects, which in turn limits their incentives to engage in innovation activities.

Mexico lacks a clear vision and strategy to encourage innovation; there is no consensus on what a National Innovation System would look like for the country, both at the national and the state level. This is further reflected in CONACYT, which is not a ministry and consequently lacks enforcement power over other ministries, state governments or agencies carrying out public programs to support innovation. The agency is at a disadvantage and lacks sufficient authority to raise funds and promote investment in R&D+I activities.

Thus, the first recommendation calls for CONACYT to be "upgraded" to ministry level, with enough enforcement powers to coordinate the different efforts to support R&D+I throughout the country, while making other ministries, agencies and state governments accountable and constantly reviewing the effectiveness and efficacy of public programs. With planning functions concentrated within a Ministry of Science and Technology, the country could

formalize its NIS, identifying priorities and development opportunities in innovation projects with a national, regional and sectoral vision. That way, projects could be selected based on their potential to exploit the country's competitive advantages at different levels, as opposed to continuing project selection based on independent and political priorities.

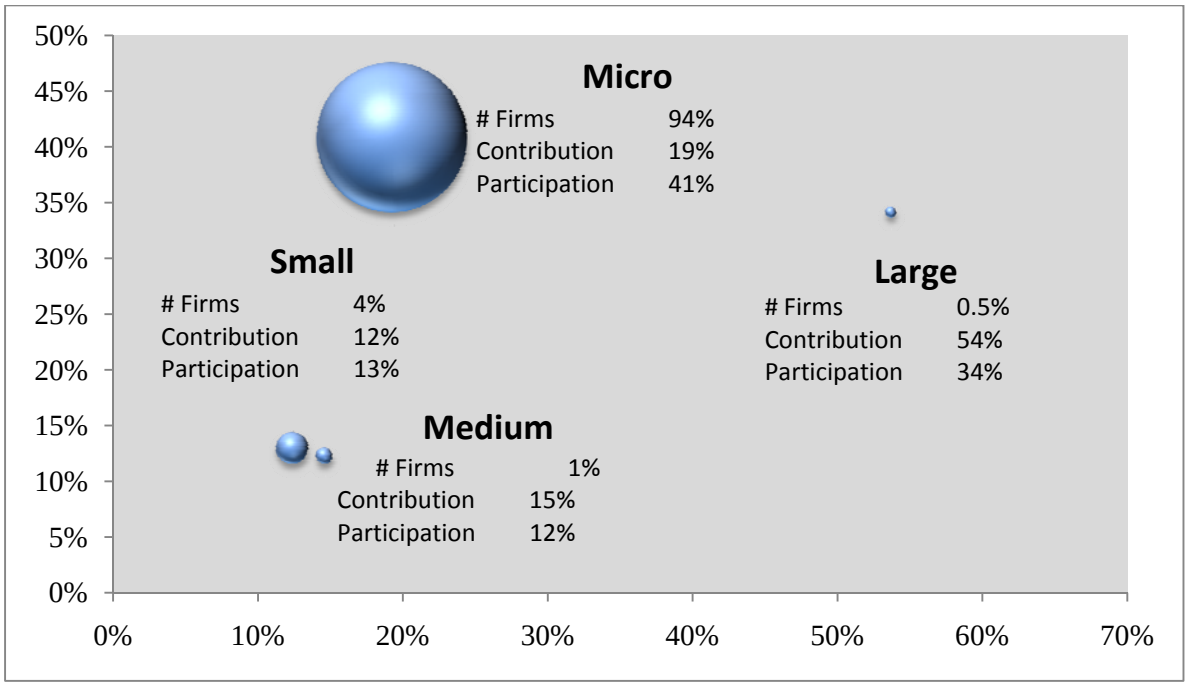
Moreover, a Ministry of Science and Technology could potentially reduce the number of bureaucratic procedures an entrepreneur or firm must undergo in order to obtain public funding for a project. Reducing the time and costs of applying for these programs will create incentives to attract private investment for innovation projects.

Greater coordination among agencies and between the federal and state governments could further resolve issues concerning program design, as well as problems with linkages between private firms and academic institutions, thereby encouraging optimal levels of investment (both public and private) in R&D+I activities.

5. SME Policy

In most countries, small and medium-sized enterprises (SMEs) make up the bulk of the private sector and account for a substantial proportion of the workforce. Mexico is no exception. Approximately 99 percent of a total of four million firms are SMEs, accounting for 46 percent of GDP and providing 66 of jobs in manufacturing, retail and services (See Figure 6). In addition, SMEs account for only 6.7 percent of total exports.

Figure 5. Firms' Contribution to GDP and Employment



Source: INEGI, Censos Económicos, 2004.

The problem is that in Mexico, 90 percent of the approximately 200,000 SMEs created every year operate in the informal sector, and by the second year 130,000 (65 percent) will have disappeared (World Bank, 2007). The high turnover and the inability of most firms to enter the formal sector suggests low productivity levels, which can result from specific constraints or market failures to which SMEs are particularly vulnerable, such as inadequate access to finance and business support services, weak managerial and workforce skills, imperfect information about market opportunities and new technologies and methods of organization. Taken together, these constraints result in low product or service quality. In addition, SMEs are disproportionately affected by bureaucratic procedures to set up, operate, and grow a business (World Bank, 2007, and OECD, 2007b).

Mexico, like most countries, has put in place a set of programs to support SMEs. Government intervention to help SMEs is usually based on their importance for the economy—their contribution to GDP and employment levels—and the fact that smaller firms tend to be more vulnerable to external shocks. In Mexico, the distinction from large firms has to do both with a political calculus as well as the fact that SMEs make up the bulk of the country's firms. This study will highlight limited access to competitive financing schemes as well as information

problems faced by smaller firms to access international markets and engage in innovation as failures deserving government attention. Table 10 provides a summary of the following factors.

- **Limited access to competitive finance** results from misaligned incentives between banks or financial institutions and firms. On one hand, banks are not able to correctly assess risks of smaller firms, which often fail to provide—in in the banks' view—sufficient assets as collateral. This implies that banks are less willing to lend resources precisely to those firms that need financing the most. On the other hand, the monetary and opportunity costs firms face related to borrowing from the financial system is so high that they have incentives to remain tiny or in the informal sector. Thus, in a country like Mexico it becomes almost impossible to resolve the coordination problem between banks and small firms. As a consequence, small firms within the informal sector are obligated to seek for resources through informal arrangements which are more expensive and risky (in terms of interest rates) than borrowing money froman established finance institution. The obvious outcome is that entrepreneurs complain about limited access to formal financing, while banks argue that lending money to smaller firms is not good business.
- **Low levels of innovation and internationalization of SMEs.** It is important for a country to have thriving and innovative firms, especially firms that can become part of the country's export platform and therefore increase the country's competitiveness. Divergence between private and social benefits of innovation in small firms could result in the suboptimal number and growth of technological firms. In addition, smaller firms endure significant fixed costs in surmounting logistical, legal, and cultural barriers to finding new markets, particularly abroad. In other words, even productive SMEs devote their financial and human resources to their main activity, finding difficulties to hire personnel or consulting services that would help them expand their consumer base in domestic and international markets, not to mention incurring associated logistical and marketing costs as well as those related to expanding production. Finally, even though government programs exist to help SMEs

Table 10. Market and Government Failures Faced by SMEs

Failure	Type	Description
Limited access to competitive finance	Information asymmetry	- Banks and financial institutions are not able to correctly assess risk for smaller firms
Low innovation levels and internationalization of SMEs	Information externality & Government failure	- Divergence between private and social benefits of innovation in small firms could result in the suboptimal number and growth of technological firms - Small firms endure significant fixed costs in surmounting logistical, legal, and cultural barriers to exporting. - No one-stop shop (information problems)

Source: Authors' compilation.

5.1 Policy Response: The SME Fund

In 2001 the Government of Mexico created the Under-Secretariat for SMEs within the Ministry of Economy. Since then, the strategy focused on enhancing the competitiveness and scope of SMEs through training, technology upgrading, consulting and technical assistance in market access and internationalization, access to finance through guarantee programs, cluster development, insertion into production chains and promotion in trade fairs (OECD, 2007b). The Under-Secretariat's full array of supported programs thus aims at providing assistance through all the stages of business development, from inception to internationalization, though not necessarily following the same set of firms.

Prior to the creation of the Under-Secretariat the country lacked a comprehensive policy framework for SMEs. The National Development Plan for the period 2001-2006, which included the Ministry of Economy's Entrepreneurial Development Plan, was at the center of the Fox Administration's economic policy. Though results are disappointing, there was an explicit call for promoting greater coordination among public programs that had been created before the year 2000. The spirit of this policy has continued under the administration of President Calderón.

The main instrument to support SMEs, named *Fondo PyME* (the SME Fund), was created in 2004. The Fund consolidated three programs that had been created in 2001 (FIDECAP, FAMPYME and FOAFI). The objective of the SME Fund, as stated by the Ministry

of Economy, is to "support the creation and development of micro, small and medium enterprises through programs and resources that seek to increase their productivity and competitiveness."

In particular, the SME Fund has become the flagship program for both the Fox and Calderón administrations to "advance the country's competitiveness," the main goal of both of their NDPs. More recently, in December 2008, the SME Fund incorporated more funds, which until then operated independently in other areas of the Ministry of Economy. In addition to these changes, President Calderón also announced at the beginning of 2009 an increase in funding for SME programs, particularly those that offer consulting services to firms.

The first part of the analysis will focus on the operation of the SME Fund as a whole. Prior to analyzing one of the programs financed by the Fund, it is important to understand the challenges in terms of program design and evaluation that result from the policy's original design, as well as the rules that guide decision-making within the Ministry of Economy.

The second part of the analysis will focus on accelerator programs, particularly the Technology Business Acceleration Program (TechBA). The TechBA program is considered to be one of the best designed and operated programs within the SME Fund, as pointed out by external evaluations and by the Ministry of Economy itself (UNAM, 2007).

A Ministry of Economy document from 2001 outlines five sets of problems upon which the government initially based its SME policy:

- Lack of internationalization of SMEs, which results in low levels of competition and therefore few incentives for SMEs to become competitive, which is likely the result of the "significant fixed costs each firm must incur to surmount logistical, legal, and cultural barriers to exporting" (World Bank, 2007).
- Lack of linkages with most dynamic sectors in the economy, such as the auto, electronic, machinery and information and communication technologies.
- Limited access to competitive finance, with almost two-thirds of firms obtaining financing from non-institutional providers.
- Inadequate human resources and managerial capabilities, which leads to the disappearance of 65 percent of firms by the second-year of operations
- Imperfect information about new, and more productive, technologies, and few linkages between business and academia

In principle, the SME Fund is designed to meet local needs through subsidies and transfers to Intermediary Agencies (IAs)—which can be state governments or independent organizations—which are closer to local realities and therefore should be better equipped to design effective and relevant programs.

IAs are therefore responsible for designing, implementing, and providing matching funds for different programs, ranging from export promotion to incubation and acceleration, training, access to finance, certification, consulting services, feasibility studies, promotion events, and supplier development (Ministry of Economy interviews). In addition, state governments must sign an agreement with the Under-Secretariat in order to solicit funds, which requires them, at least in principle, to align their SME support strategy to that of the Under-Secretariat. State governments, through their respective Local Economic Development Offices (SEDECOs) can participate in the Directive Council, which is responsible for ultimately approving projects, and as IAs, which then choose and evaluate programs proposed to the Directive Council.

However, interviews with some local government officials revealed that state governments have: i) very little information about SMEs in their states, their size, how much they produce, etc.; ii) virtually no communication with the private sector; iii) unclear processes for designing and implementing their SME programs; iv) erratic programs, changing with each administration and usually benefitting firm owners who are close to the administration; v) little collaboration with academia and research institutions; vi) virtually no evaluation processes.

Moreover, the participation of Intermediary Agencies in the process of design and implementation of SME programs is positive in principle. In reality, however, a small number of IAs control the majority of resources, which could result in rent-seeking. The lack of accountability as well as problems with the design of the process and the lack of clear selection criteria—IAs have vested interests in the program—often lead to the discretionary allocation of funds.

A evaluation published in 2006 by the Auditoría Superior de la Federación (ASF)—Mexico's equivalent of the United States' General Accountability Office—reveals that only 3 percent of the IAs registered within the Ministry of Economy to design and implement programs spent 87 percent of the SME Fund's budget for that year. Another evalution published by the Universidad Nacional Autónoma de México (UNAM) for the 2007 period also highlighted fund concentration in a small number of IAs, with 13 of them spending 72 percent of the budget. In

addition, the UNAM evaluation reports that some of the largest projects funded by these 13 IAs benefited large firms such as Bombardier in Querétaro and General Motors in San Luis Potosí.

Finally, programs financed by the SME Fund suffer from an inadequate design of performance indicators, which makes it difficult for the Ministry of Economy as well as external evaluators to correctly assess the programs' impact on firms' productivity and competitiveness, as stated in the Fund's mission statement. Benchmarks for measuring effectiveness do not lead to an increase in productivity. Criteria for measuring the SME Fund effectiveness within the Under-Secretariat for SMEs includes number of jobs created or jobs kept without indicators that can actually measure productivity growth, or the actual effect of the SME Fund on changes in SMEs over time.

5.2 The TechBA Program

In theory, accelerator programs respond to the coordination failure described above, whereby smaller firms that innovate will bring positive externalities to the economy by introducing more dynamism, but which face various difficulties in the process of introducing innovative products into the market as well as accessing markets abroad.

TechBA was created in 2004 by the Mexican Foundation for Science (FUMEC) with funds from the Mexican government. The first objective of the program was to select the fastest-growing technology-based Mexican SMEs and help them compete in international markets. In addition to traditional export promotion services, TechBA offered these firms access to financial, business, and technological resources from the most innovative regions in the world. Specifically, TechBA established operations in Silicon Valley, California; Austin, Texas; Montreal, Quebec; and Madrid, Spain.

The idea is for companies to send representatives, preferably high-level decision makers, to one of TechBA's offices abroad where they are provided with a space to operate, consulting services, and the opportunity to interact face-to-face with local firms, financial institutions and other organizations. For companies to access these services, they must undergo a selection process, which used to begin with a "convocatoria" organized by the Ministry of Economy but now essentially takes place year-round. TechBA selects the cities and regions where it will solicit projects based on their prior knowledge of existing capabilities in that city or region.

During the process, firms submit their projects for approval and a committee of Mexican and international experts in business, technology, and venture capital select the best candidates based on the following factors: i) quality of the management team, ii) product or service differentiation in terms of its technological relevance, iii) knowledge of the market, iv) quality of their business strategy, and v) financial position of the company for the previous two years. If selected, firms are invited to participate in a "pre-acceleration" process, which begins with a half-day event where they receive guidance on how technology businesses are conducted in international markets and also have the opportunity to have one-on-one interviews with TechBA's staff to validate their proposals. Proposals undergo a further round of evaluations and the whole process is completed in three to four months before selected firms can send representatives to one of TechBA's offices abroad.

Unlike an incubator, which helps entrepreneurs survive during the start-up period, a business accelerator such as TechBA helps SMEs which already have an innovative product or service in hand to overcome the difficulties to access global markets. Thus, the second objective of the program is for companies to contribute to the economic development of their regions once they complete the process. Since participating companies are selected by TechBA from "regions of innovation"—places where TechBA determines an opportunity for the development of innovative clusters in the present or future—TechBA sees cluster development and regional innovation as the ultimate goal of the program.

5.3 Institutional Capacities within the Ministry of Economy and IAs

For the fiscal year 2007, the SME Fund accounted for 95 percent of all available funds to the Under-ecretariat for SMEs, and its budget has steadily increased from an initial budget of US $106 million to approximately US $300 million in 2008. To understand the magnitude and impact these funds could have on the country's SMEs, consider there are more than four million micro-, small- and medium-sized firms in Mexico. If the SME Fund were to be distributed among all of them, it would amount to about US $1,800 per firm, which hardly sounds like a sufficient amount to help these firms overcome the variety of obstacles they face. In reality, for the 2006 (2007) period the SME Fund served close to 160,000 firms, which amounts to 2 percent of the total number of firms in the country. Moreover, close to half of the firms reported by the Ministry of Economy as beneficiaries are firms that attended events like Semana PyME, which is

basically a week-long series of open seminars and informational activities regarding the Ministry's programs.

The inability of the Ministry of Economy to reach a substantial amount of the country's total firms reflects both budget constraints and opposing incentives that derive from the SME Fund's design. The Under-Secretariat for SMEs is responsible for establishing the guidelines for design of local programs but at the same time depends on those programs' ability to meet specific goals to sustain its funding from Congress. Thus, the Under-Secretariat has incentives to: i) receive increasingly larger budget allocations from Congress, and therefore spend it all; and ii) set basic goals, such as number of firms served, as their primary indicator of success. In practice, only a few IAs (in 2006, 3 percent of the total registered) receive and spend more than 80 percent of the SME Fund budget (UNAM, 2007).

The TechBA case helps draw some conclusions about the incentives IAs face in the fund allocation and program design process. TechBA receives a budgetary allocation from the SME Fund, which has grown at an annual rate of over 35 percent since 2005, reaching approximately US$ 4.7 million in 2007 (http://www.fondopyme.gob.mx/#). In order to obtain funds, TechBA submits a budget proposal to the Under-Secretariat for SMEs, based on their estimate of project cost multiplied by the number of firms they plan to serve in a particular year. Since funds are allocated based on a specific budget proposal that aims to serve a precise number of firms (an indicator required by the Under-Secretariat for SMEs), TechBA only has an incentive to attend firms without necessarily evaluating the quality of its impact on the firm or on regional development once the firm completes the process. Indicators for measuring effectiveness are not well designed, and there is no system in place to constantly evaluate the impact of programs financed by the SME Fund on supported firms and on the economy.

Additionally, TechBA seems to be providing a service companies value, as take-up rates for the program increase year by year along with the budget. However, given the focus of the process on "serving firms" rather than creating impact, it is not clear whether TechBA will ever have an incentive to become operational on its own, especially given that the SME Fund does not include a sunset clause for IAs. Interviews with government officials, firm owners and personnel from various IAs revealed that the lack of sunset clauses for programs operated by IAs tends to create perverse incentives. In many instances these agencies are heavily dependent on transfers from the SME Fund for survival. This dependency, combined with the lack of real monitoring

and evaluation on the part of the Ministry of Economy, gives IAs an incentive to create programs that do not necessarily have an impact on firm productivity and competitiveness. Table 11 provides a summary of the roles and incentives for each actor.

Table 11. Roles and Incentives in SME Programs

Institution	Roles	Incentives
Under-Secretariat for SMEs	- Design Rules of Operation and Manual of Procedures for SME Fund application - Heads Directive Council which approves or rejects projects - Approves Intermediary Agencies which design and implement SME programs - Oversight of programs through state delegates	- Receive larger budget allocations for SME Fund - Set goals prioritizing number of supported firms and allocation of entire budget in order to maintain funding levels year after year.
Intermediary Agencies (IAs)	- Design and operate programs such as incubators, accelerators, export promotion agencies, etc. - Can be public, private, academia	- Some IAs are heavily dependent on these transfers for survival which reduces incentives to create programs based on impact.
TechBA	- Design and operate accelerator programs - Choose participating companies from "regions of innovation"	- Without a sunset clause for IAs, TechBA has incentives to remain a government-sponsored program rather than evaluating the opportunity for selling its services

Source: Authors' compilation.

5.4 Response to Market Failures

SME policy in Mexico is not necessarily designed to respond to market failures. Rather, the policy seems to be motivated by a combination of realizing SMEs had never been supported as a sector before 2001 and the political returns this kind of support can yields. Some of the programs are designed to meet specific market failures, such as the guarantee programs and some of the training programs offered to SME personnel. However, the overall policy does not consider differences among sectors, regions and size of firms that can somehow induce

Intermediary Agencies—which actually implement the programs—to base their program design on the existence of market or government failures.

TechBA provides an example of a program that in principle is designed to correct a market information failure. However, the program's design does not make this justification explicit. Additionally, TechBA is apparently responding to market needs. Perhaps there is a real need for this service and, while accelerators might actually solve a market failure for smaller firms wishing to penetrate technology markets, there might be an opportunity for the private sector to pay for some of these services. Further evaluation of the program and its contribution to firms' productivity is needed.

5.5 Effectiveness of the SME Fund and the TechBA Program

The SME Fund evaluation published by the Auditoría Superior de la Federación in March 2008 highlights the following results for the 2006 period:

- The SME policy did not contribute to the main objective of the NDP 2001-2006 to "Increase and Extend Competitiveness" since Mexico's position in the WEF rankings fell 16 places from 2001 (when it ranked 42nd) to 2006 (when it ranked 58th).
- The Under-Secretariat for SMEs does not have an evaluation system in place to measure the efficacy and technical and economic efficiency of the programs implemented under the SME Fund.
- Control and supervision mechanisms for the SME Fund are nonexistent. Accountability of implementing agencies is deficient, and the Ministry of Economy has not applied legal and administrative sanctions to implementing agencies that have not met program objectives.
- Indicators measure process and activities (creation of new firms, employment generated, firms that now export, firms integrated to productive chains, and granted microcredits) but do not measure technical and economic efficiency, quality or social impact, even though providing such indicators is required by law.

- Financing mechanisms were not in fact created by the Under-Secretariat. All funds are reported as "Subsidies and Transfers"—with 98 percent for the SME Fund.
- Only 2.9 percent of the IAs registered with Secretaría de Economía spent 86.8 percent of the resources available for the SME Fund.
- Only one of the SME policy's six objectives was met during the 2001-2006 period: the number of "supported" firms reached the desired level. However, the SME Fund fell short of increasing the production value of SMEs, reducing value of imports as a percentage of GDP, increasing the use of domestic inputs for export production, creating sufficient productive employment (in fact unemployment rates increased during this period), or consolidating support networks for SMEs across all states in the country.

As for TechBA, between 2005 and 2008, TechBA has registered 350 beneficiaries. However, according to TechBA staff interviewed for this project, it is too soon to evaluate the program's effectiveness in firms' performance as well as in the development of regional innovation systems as a result of returning companies' efforts. TechBA's website (http://www.techbasv.com/) offers the following results for the 2005-2008 period:

- Companies have secured investment or closed deals for around US$ 28.36 million.
- 48 companies have incorporated in the United States.
- High-value direct jobs created by supported firms following their affiliation with TechBA represent 8 percent of those firms' total employment.
- Companies' income related to each new job is US$ 70,000.

There is no specific evaluation of the TechBA program. The SME Fund does not require its IAs to submit detailed expenditure reports, and when impact evaluations measure SME programs they focus on the fund itself rather than IAs. With that caveat in mind, interviews with TechBA staff, Ministry of Economy officials and some firm owners enabled us to draw a few conclusions and cautionary points:

- Accelerators supported by the SME Fund, including TechBA, submit their budget proposals based on an estimate of their own costs of each project

multiplied by the number of projects they wish to complete each year. This process and the lack of accountability create incentives for increasing budget allocations without undergoing a cost-benefit analysis of the public resource's impact.

- In order to undertake further evaluations, indicators of program effectiveness should shift from "number of firms served"—which creates incentives for increasing budgets without necessarily increasing impact—to more value-driven indicators.
- One of TechBA's goals is to ensure that firms that complete the program help develop the regions of Mexico in which they are located. However, there is no indication—judging from interviews with TechBA's staff—that the follow-up process necessary to determine regional impact of firms' increased productivity is taking place.

5.6 Recommendations

SMEs are highly varied in nature, they operate across very different sectors of the economy and the conditions they face tend to reflect their local realities. Most of them are not competitive; though they constitute almost the entirety of the country's firms, they account for only a little over half of the country's production. Less than 10 percent of them are able to export and prove their competitiveness in international markets.

These firms face a variety of obstacles that large firms do not. One is limited access to competitive finance, and another is their inability to innovate and internationalize. Though SMEs in part lack competitiveness due to their internal deficiencies, the business environment in which Mexican firms operate is cumbersome and costly, therefore magnifying existing market failures. The government's response has had little to do with addressing such market failures. Instead, the main policy instrument to serve firms' needs, the SME Fund, is plagued with problems of design and implementation.

The first recommendation thus seeks to address design problems within the SME Fund. The Rules of Operation published each year by the Ministry of Economy do not provide clear enough guidelines to encourage Intermediary Agencies to design their programs based on existing market failures. Including clear selection criteria within the Rules of Operation should

help tackle this problem. Currently, selection criteria for beneficiaries remain vague, therefore granting greater discretion over selection to IAs, which often results in rent-seeking or leads to SME programs serving large firms. In addition, IAs which are not fully accountable to the Ministry of Economy should be required to undertake impact evaluations and set credible goals for improving firm productivity.

Secondly, the Ministry of Economy should establish more specific impact indicators in its guidelines before even disbursing resources to IAs. Though the lack of specific goals responds in part to the rules behind program design and monitoring on the part of the Comptroller, it is crucial for the programs' success to have indicators based on their impact on firm productivity—the policy's original objective.

Finally, interviews with local officials revealed ongoing talks between the National Statistics Office (INEGI) and state governments in order to improve data collection for SMEs. In reality, though, SME policy is actually enacted at the local level, and state offices often lack the most basic data about the number of SMEs in their locality and the sectors in which they operate. Thus, a third recommendation is directed at the Ministry of Economy to accelerate negotiations on data collection efforts between INEGI and state authorities.

6. The IT Sector: PROSOFT

The information technology (IT) sector in Mexico[7] represents about 3.1 percent of total GDP, compared to 5.3 percent of Latin America's total GDP, 7.1 percent of GDP for high-income countries, and 8.8 percent of GDP for the United States (World Bank, 2006). Despite this lag, in Mexico the industry has grown significantly, recently posting 15 percent growth over seven years. In 2007, Mexico's IT sector produced a total of US$ 4.1 billion, up from US$ 2 billion in 2000, and is expected to reach production of US$5 billion in 2008 (Secretaría de Economía, 2007). Moreover, since the IT sector was liberalized in the early 1990s, exports have grown eightfold from US$ 100 to US$ 800 million in 2008 (Zavala, 2008).

As a result of this takeoff, Mexico has gained credibility as a provider of software and IT services in international markets. AT Kearny ranks Mexico as the tenth-best global service location among the top 50 offshoring destinations (AT Kearney, 2007). In addition, the country

[7] Includes software development and packaging, IT services and offshoring and Business Process Outsourcing

is now a growing *nearshore* services destination for the United States and is seen as a viable provider for Latin American countries.

However, to take advantage of the country's strengths, firms in the Mexican IT sector must tackle a variety of external and internal challenges that limit their growth. The market failures faced by firms in innovative sectors such as IT are listed below. See Table 12 at the end of this subsection for a summary of the following issues:

- **Low levels of innovation, resulting from information failures:** facing increased competition from countries with relative lower costs in simpler outsourcing activities, in order to remain competitive Mexico needs to figure out how to move into higher value-added services in the IT sector. However, given that the benefits to society of discovering these opportunities are higher than those for the private sector, the upgrade in productive capacities might never take place without some intervention from the government to support innovation activities.
- **Limited access to competitive finance:** as a result of information asymmetries between financial institutions and small- and medium-sized IT companies, firms often have trouble meeting the requirements to obtain loans. Interviews with firms of all sizes as well as with government officials revealed that the IT industry lacks adequate financing. Many firms in the IT sector are very small and highly inefficient, and as a result lack the ability to access competitive financing for their activities. However, it seems that firms in the IT sector face greater financing constraints than in other sectors, basically because they cannot provide physical collateral for their loans, as their main asset is in human capital. A study by the World Bank (2008) indicates that on average, financing for working capital in the IT sector amounts to 14.4 percent while for other service sectors it reaches 22.2 percent.
- **Missing public inputs:** telecommunications infrastructure development is very low throughout the country, and limited access to this kind of infrastructure presents an obstacle to firms in the IT sector. Moreover, in the case of Mexico, the monopoly structure of the telecommunications sector further exacerbates this problem, since the social benefits of investing in

infrastructure development are higher than the private benefits of doing so. Additinally, the current regulatory structure and political considerations within the telecommunications sector in Mexico have made it difficult for governments to build or rent additional networks.

- **Low availability of qualified human capital, resulting from information asymmetries:** due in part to a lack of coordination between the private sector and academia, which given the rapid process of technological cjamge in the industry can often remain behind in their curricula. Mexico's low educational levels affect the industry's ability to find readily available human capital to satisfy its needs. Firms often complain about not finding enough trained personnel to hire, and university graduates often complain about not finding work. IT companies claim to spend up to US$60,000 for a period of 18 months to train each new engineer, usually needing specialized courses and English-language training. In addition, several studies indicate there are neither enough network and computer technicians nor enough high-quality managers in information technology SMEs (World Bank 2008).

There is a caveat, however, to this assertion. An analysis of the majors chosen by university students since 1978 reveals that by 2003 the number of students graduating with Computing and Systems Engineering degrees had grown from 50,000 to over 200,000 graduates, as shown in Figure 10 below. In this sense, firms' frequent complaint regarding the lack of qualified personnel to hire could result from the existence of an information asymmetry in which firms are unable to correctly assess the quality of new graduates in Computer and Systems Engineering. It could also be that, even though the number of graduates on the subject has quadrupled over the last 30, it is still insufficient to meet industry needs.

Table 12. Market and Government Failures for IT Firms

Failure	Type	Description
Low levels of innovation	Information externality	- Benefits to society of discovering these opportunities are higher than those for the private sector; the upgrade in productive capacities might never take place.
Low availability of qualified human capital	Information asymmetry	- Low levels of coordination between firms and academia can result in suboptimal levels of qualified personnel for the industry.
Limited access to competitive finance	Information asymmetry	- Human capital remains an inadequate collateral for obtaining loans, which limits individuals' access to credit for pursuing further training.
Low availability of telecommunications technology throughout the country	Missing public inputs & Government failure: monopoly structure of the telecommunications industry	- Social benefits for providing telecommunications infrastructure throughout the country are higher than the private benefits of doing so for companies. - For the case of Mexico, the monopoly structure of the telecommunications sector further exacerbates this problem. - Obstacles in forming "clusters," which imply constant and effective collaboration among firms and with academia and can encourage a virtuous cycle of innovation.

Source: Authors' compilation.

6.1 The Now-Defunct PROSOFT Program

In 2001, the Fox Administration's National Development Plan deemed the Information Technologies (IT) industry "strategic"due to its "transverse effect on the entire economy, [and] its [potential] positive impact on competitiveness for all sectors" (NDP 2001-2006). In order to take advantage of Mexico's proximity to the US, cultural affinity and extensive trade network to become a leader in the global IT industry, the Ministry of the Economy in coordination with

industry organizations designed the Program for the Software Industry Development, PROSOFT. The basis for this policy response, at least in name, boiled down to one theme that cut across the Fox team's economic policies: to increase competitiveness.

Therefore, PROSOFT, coordinated by the Ministry of Economy, represented a grouping of PDPs geared towards improving and promoting the IT sector's competitiveness both at home and abroad. Up until 2008, PROSOFT was managed by the Under-Secretariat for Industry and Commerce within the Ministry of Economy. However, during restructuring plans for the Ministry that took place early in 2009, the PROSOFT Fund was absorbed by the Under-Secretariat for SMEs under the SME Fund.

Despite this caveat, it is important to consider the PROSOFT Program's design process in order to identify potential lessons for programs operating under the SME Fund. Some components of PROSOFT were designed to respond to identified market failures, though others catered to needs reported by firms and industry associations. Though not necessarily negative, responding to firms' needs might draw the program away from its objectives and result in spending on activities that could potentially be provided by the market without government support.

PROSOFT's design process deserves special attention. It was one of the few sectoral programs that from the beginning systematically integrated private sector stakeholders into the negotiations in order to help determine the program's goals and objectives. There is no public documentation available to perform a thorough analysis of these negotiations. However, there is a document developed by AMITI (the Mexican IT Industry Association), which makes specific recommendations for strengthening the IT sector and which served as the basis for PROSOFT's design (see Table 13).

Table 13. Instruments Proposed by AMITI (2001) and Actual Elements of PROSOFT

Instrument	Proposal AMITI	PROSOFT
Financing		
Angel capital program		
Seed capital program	X	X
Venture capital program	X	X
Guarantees program	X	X
Subsidies		X
Human Resources		
Training	X	X
Certification	X	X
Technology Quality Centers for software products	X	
Private sector integration with academic institutions		
- Curricula		X
- Teaching methods		
- Specialization		
English-language learning		X
Business Services		
Legal advice for international contracts	X	
Promotion in international markets (including diagnostics and coaching through process)	X	X
Promotion of IT sector in domestic market		X
Creation of IT Parks and EPZs	X	
Regulation		
Regulatory framework for the industry	X	X
Fiscal recognition for "Integrator Firms"	X	
Entrepreneurship		
Encouraging firms to specialize		X
Encouraging firms to develop of hubs and firm groupings		X

Source: AMITI (2001) and PROSOFT 2.0, Secretaría de Economía (2007).

Interviews with current and former public officials as well as industry representatives were helpful understanding the process. The Ministry of Economy coordinated working groups that included public officials, industry associations, and members of academia. At this stage, state governments did not participate in the design process. Instead, once the program was established they were encouraged to align their own objectives for IT firms in their states with those proposed by PROSOFT.

This first process lasted a little over a year, upon which the resulting strategy outlined specific objectives in a 10-year framework, spanning from the end of 2002 to 2013. It was the

first time a program of this kind established mid- and long-term goals. The program was set to operate through the proposed PROSOFT Fund, but Congress did not earmark funds for the program until 2004, two years after it had been established.

In 2007, the program underwent a thorough review by the Ministry in conjunction with the same industry associations and academic organizations who had previously participated in the design of the program. Interested state governments also participated. Once again, working groups were convened in order to re-evaluate the direction of the program, its objectives and new components. As a result, PROSOFT 2.0 was born.

The need to reevaluate the program came with the arrival of a new administration. The new government decided to maintain several of the former government's economic policies, including support for certain industries like software, based on their potential to advance the country's competitiveness. However, the industry had evolved and the focus on software was no longer considered relevant. Thus, the working groups that reconvened in 2007 decided to expand the program's focus from software to include IT services and business process outsourcing (BPO). The new objective became to "create the necessary conditions for Mexico to have an IT services industry that is internationally competitive and has long-term growth prospects, as well as to promote IT use in productive processes across the economy" (PROSOFT 2.0, Ministry of Economy). Table 14 below shows the changes from PROSOFT to PROSOFT 2.0.

Table 14. Changes from PROSOFT to PROSOFT 2.0

PROSOFT	PROSOFT 2.0
Main Objective	
Create the necessary conditions for Mexico to have a software industry that is internationally competitive and has long-term growth prospects.	Create the necessary conditions for Mexico to have an IT services industry that is internationally competitive and has long-term growth prospects, as well as to promote IT use in productive processes across the economy.
Main Goals	
- Achieve annual production of US$ 5 billion; - Increase expenditures on IT to reach world average; - Become the leading software Spanish digital content development in Latin America.	- Achieve annual production of US$ 15 billion; - Create 625,000 jobs in IT sector; - Increase expenditures on IT to reach an average of 2.3%; - Become industry leader in Latin America.
Activities	
- Export promotion and investment attraction - Education - Legal framework for the industry - Development of local markets - Strengthening of local industry - Adoption of internationally recognized processes - Physical and telecommunications infrastructure development	- Global market: exports and FDI - Human capital: increase quantity and quality of talent in software and IT services development - Legal framework for the industry - IT diffusion: promote use of IT services in local market - Local industry and clusters: increase firm competitiveness and promote cluster creation - Quality: encourage firms to reach international levels of certification - Financing: increase financing options and resources (Fondo PROSOFT)

Source: Authors' compilation.

The 10-year vision adopted in 2002 provided not only long-term goals, giving a degree of certainty to firms in the industry, but also an opportunity to revise the program halfway through the process. The main changes brought about in PROSOFT 2.0 include a commitment to help firms achieve sustained growth levels through consultancy and coaching services, an emphasis on certification of employees and firms to improve their credentials in international markets and new forms of financing.

Prior to the 2007 revision, the PROSOFT Fund was synonymous with the policy. Since 2007 the Ministry of Economy has attempted to emphasize that the Fund is just one of the policy instruments used to support the sector, as the Fund operated through subsidies, credit lines for specific firms, and risk or seed capital for new firms in the industry.

PROSOFT was designed to target micro, small and medium enterprises as well as large firms that either produce IT services and software or need support adopting information technologies. It targeted individuals, firms, industry associations, non-governmental organizations, academic institutions, entrepreneurs, and IT users.

State governments and sometimes industry associations such as CANIETI and AMITI, acting as Intermediary Agencies (IAs), were in charge of reviewing the first round of applications responding to the the "convocatoria" (which took place twice per year). These entities selected beneficiaries based on a thorough application and then made recommendations about potential beneficiaries to the program's Board of Directors, which was composed of public officials from the Ministry of Economy. The Board then evaluated each case and selected beneficiaries from applications meeting the following criteria:

- Generate and keep formal employment opportunities;
- Increase competitiveness in IT sector firms;
- Denote project's technical, commercial, economic, and financial viability;
- Contribute to regional economic and sustainable development;
- Establish or strengthen incubators of software and related services;
- Contribute to the development of an entrepreneurial culture in the IT sector;
- Strengthen human resources and processes used by firms in the IT industry;
- Is aligned with the action-goals determined by PROSOFT;
- Integrate IT firms into the market and into production chains;
- Generate improvements in productivity and competitiveness in IT sector firms.

Once they were approved, beneficiaries could receive subsidies for up to 50 percent of the value of their projects. In general, 25 percent was provided by the federal government and 25 percent by the state governments. The remaining 50 percent had to be provided by the firm. Projects with a training and/or certification component specifically for microenterprises could receive up to 70 percent of their funding from PROSOFT. In essence, PROSOFT followed a similar program design and implementation process to the SME Fund, where IAs design and operate programs as well as contribute matching funds.

6.2 Institutional Capacities

Fund allocation to PROSOFT followed the same process as that of other earmarked government expenditures. In this case, the Ministry of Economy presented a budget proposal, including earmarked funds for PROSOFT, which then became part of the Executive's budget proposal to Congress. Once in the hands of the legislature, the Chamber of Deputies negotiated adjustments to the whole budget and presented a final version to the Senate, which then had to approve it.

Table 15 below shows funds earmarked for PROSFOT from 2004 to 2008. Despite the increase in funding for the program, interviews with both Ministry of Economy officials and firms revealed complaints that the amounts given for the PROSOFT program were still not enough to help boost the industry. On the other hand, conversations with legislators who have supported earmarking funds for PROSOFT revealed that even when they found the program useful for firms in the IT sector, they were skeptical of how much "bang for their buck" they were getting every time they voted to increase the program's monetary allocation. In fact, the lack of evaluations ex ante and ex post is a recurrent problem for most government programs, and PROSOFT was no exception. For the first time, in 2008 PROSOFT presented its evaluation framework, with indicators ranging from jobs created to investments by firms and state governments to industry growth.

In addition to budget allocations, the Ministry of Economy reported that IAs and firms through their matching contributions together practically tripled funds provided by PROSOFT. From 2004 to 2007 investment from the PROSOFT Fund amounted to $4,145 million pesos—28 percent from the Fund itself, 16 percent from state governments, and 55.3 percent from firms, academia and other participants (Ministry of Economy, 2007).

Table 15. PROSOFT's Budget Allocation 2004-2008

Year	Budget Allocation (US$ Million)	Annual Percentage Increase
2004	10.4	-
2005	12.3	18%
2006	33.0	168%
2007	35.6	8%
2008	50.0	40%

Source: Ministry of Economy.

Both the process of initial design and the 2007 revision demonstrate willingness on the part of the Under-Secretariat for Industry and Commerce to adapt the PROSOFT program to identified industry needs. While some parts of the program do reflect existing market failures, identifying them was never the focus of the design process. In addition, the Under-Secretariat faced similar incentives as those described for other entities throughout the study. In order to receive more funding each year, and taking into account that any unmet commitments could result in legal actions against public officials, they had incentives to focus program goals on operational issues. As such, indicators for success included reaching a particular number of beneficiaries or raising a certain amount of matching funds as opposed to focusing on the program's impact on firm productivity and competitiveness.

Perhaps the incorporation of the PROSOFT Fund into the SME Fund makes sense from a coordination perspective. Throughout this study, there is evidence of lack of coordination within and among Ministries as well as duplication of programs and activities. Thus, merging the Funds makes sense in principle.

However, interviews with public officials from the Ministry of Economy revealed this process has not been easy, nor has it seemed to respond to coordination concerns. The SME Fund is plagued with problems of design and implementation and, while the PROSOFT Fund also faced some of these problems, it was designed closer to beneficiaries' needs. Ideally, SME Fund operators would incorporate not only the Fund's but also the program's best practices. According to interviewed officials, this does not seem to be the case so far.

Table 16. Roles and Incentives within PROSOFT

Stakeholder	Role	Incentives
Under-Secretariat for Industry and Commerce	- Design Rules of Operation and Manual of Procedures for PROSOFT and oversight - Heads Board of Directors which approves or rejects projects - Approves Intermediary Agencies which design and implement PROSOFT programs - Coordinate members of industry, academia and the public sector to discuss changes to the program	- Receive increasingly larger budget allocations for PROSOFT operation - Set goals for Fund operation, focusing on number of beneficiaries and number of jobs created
Under-Secretariat for SMEs (in the future Enterprise Development)	- Operate SME Fund	- Receive increasingly larger budget allocations · Not negotiate with former PROSOFT operator to maintain program's operative record
Industry Associations	- Provide up-to-date industry information - Guide design process based on industry needs	- Receive budget allocations for program operation - Benefit member firms
State governments that act as IAs	- Intermediaries in selection of beneficiaries, adopting the rules of operation of PROSOFT 2.0	- Receive budget allocations for program operation - Attend to local constituent needs

Source: Authors' compilation.

6.3 Outcomes

The Ministry of Economy outlines a number of positive outcomes of PROSOFT's first phase:

- **International positioning** of Mexico as a country with capacities to develop technology-based products and as an outsourcing destination. Gartner recently classified Mexico as the second choice, just behind Ireland, for IT service outsourcing (Ministry of Economy, 2007).
- **Certification** of 56 firms in MoPROSOFT, a locally designed norm that meets international standards, as well as Capability Maturity Model Integration (CMMI) process. In 2002, only four firms had this certification.
- The creation of 24 **IT clusters** and 17 **integrators** focused on improving local competitiveness and firm productivity.

- Over 100 **universities aligned** their curricula with PROSOFT's strategies.
- The existence of **abundant talent** for IT services. According to a McKinsey study, which designates Mexico as having the world's ninth-largest reserve of human resources for IT services, the country has approximately 550,000 professionals currently working in IT services delivery, integrating approximately another 65,000 per year into the labor force.
- **Legal reforms** have been promoted to increase demand for IT services as well as to expand electronic purchases through the use of electronic firms and certifications.
- Inclusion of **PROSOFT's strategy in development plans for 30 states** across Mexico. This means that states are not only receiving federal funds from the program but also contribute funds themselves for the development of IT projects in their entities.
- **Identification of 8 IT parks**.

The software and IT sector's increased growth in the last few years indicate there is an opportunity for Mexico to become a leading provider and service location. The government has taken an active approach in the promotion and strengthening of firms in the sector since 2002. Partly as a result of PROSOFT and the programs implemented within it, Mexico has been able to position itself strategically.

An external evaluation performed by UNAM (2007) outlines the following results:

- **Design:** even though the program has correctly identified the problems faced by the industry, they found problems with the indicators set out for the project as well as with their means of verification means.
- **Strategic planning:** the short- and mid-term strategies were correctly designed and match the goals and objectives of the program. However, there is no long-term strategy since current legal requirements do not call for long-term planning.
- **Coverage and Focalization:** coverage at the state level is adequate and the program was found to be well focused.

- **Operation:** the methods for selecting beneficiaries, the estimates of demand for supports and the efficiency of application processing are congruent with the legal requirements. In addition, the evaluation found satisfactory results with respect to efficiency in resource allocation, process improvements, adequate organization and adequate financial planning.
- **Perception of target population:** beneficiaries are found in general to have a positive perception of the program. The evaluation points out that PROSOFT itself has no means to measure satisfaction levels of program beneficiaries.
- **Results:** the program collects adequate information to monitor its performance as well as progress towards the program's goals and objectives.

6.4 Response to Market Failures

The policy is adequately designed to attend to the challenges faced by firms in the sector, though not necessarily to respond to relevant market failures. It seems that collaboration between the government, the private sector and academia has been well established, but there are no tangible measures of the impact of this coordination, at least as reported by relevant institutions and stakeholders.

Finally, the PROSOFT Fund seemed to face obstacles similar to those of the SME Fund. Funds were disbursed from the Ministry of Economy to IAs that evaluated and chose potential projects, causing potential conflicts of interest. In the case of PROSOFT it seemed that the Ministry was able to guarantee a certain degree of homogeneity regarding the support strategies of state governments and IAs. However, there was very little accountability of local governments and IAs, and a complete lack of impact evaluation procedures to measure the program's effectiveness.

6.5 Recommendations

All in all, the PROSOFT program was a relatively well-designed program. The Under-Secretariat for Industry and Commerce showed institutional capacity for renewal, as demonstrated by the changes included in the 2007 revision. However, it is no longer clear whether this can be maintained under the merged SME Fund. It is important to keep in mind the following caveats in order to avoid similar mistakes in the design of new programs under the SME Fund, including the following:

- While some of the program's components are designed to respond to market failures, such as the training component and the provision of international certifications for firms, identifying and attacking market failures was not necessarily the focus of the program.
- The program was originally designed as a response to software industry lobbying. In fact, PROSOFT's first version is based almost in its entirety on the AMITI document published a few months before the program became operational. The dialogue between the private sector and the government is positive. However, there was not any form of evaluation ex-ante to determine what kind of resources provided by the public sector could in fact have the most impact on firms.
- Despite the Ministry of Economy's emphasis that the PROSOFT Fund was only one part of the program, the two were in fact synonymous. The Fund served a channel for subsidies from the Ministry to IAs, in a similar manner the SME Fund subsidizes IAs, facing also many of the same conflicts of interest.
- Conversations with legislators revealed that, despite their overall positive regard for the program, they were not convinced of the impact these funds are having on the competitiveness of firms in the sector. Though they would not necessarily oppose funding the neither PROSOFT nor the SME Fund –it is politically attractive after all– their voiced concerns indicates the design and implementation process certainly deserves further monitoring and evaluation.

Indicators were used to measure progress in process and activities (job creation, increase in sales for the whole sector, etc.) and were not adequate to measure actual impact on beneficiaries. The Ministry of Economy claims that since PROSOFT began, the software and IT sector started growing at a faster pace than before the program's existence. However, this claim is hardly an indication of the direct effect of the program on firms, as a number of external factors could have been responsible for this growth.

7. FDI in the Aerospace Sector

The aerospace sector[8] was designated one of Mexico's strategic sectors during the 2000-2006 administration of Vicente Fox (PND 2001-2006). Given Mexico's strong record in the electronic, metal-mechanical, and automotive industries, aeronautics and aerospace are probably natural developments for the country's manufacturing base.

Over the past 10 years, the aerospace industry has been in the process of reorganizing operations, becoming increasingly more like the automotive industry where global supply chains are the norm. The industry's restructuring has been brought about by a variety of factors, including the following: i) the events of September 11, 2001 and the decline in global travel that had begun even before that date; ii) the privatization of some state-owned companies; iii) the increased market share of low-cost airlines; iv) new government purchasing policies; v) new players such as Embraer from Brazil; and vi) companies' desire to restructure their onerous labor arrangements. These circumstances led companies to become more profit-oriented, bringing a whole new area of opportunities for countries that could host some segment of the production process at a lower cost.

Several factors make Mexico a relatively good strategic location for global firms in the industry and enable it to take advantage of this new industry conformation. Its geography, its border with the United States, its property rights protection (strong compared to China), and the evolution of the maquiladoras, the electronic sector, and the automotive sector have been determinant factors in making Mexico an attractive destination for offshoring certain processes of aerospace-related production.

Establishing an aerospace industry, however, which is a new activity for Mexico, represents challenges for both local and foreign firms in terms of finding out which processes Mexico can excel at and become increasingly more productive. Hausmann and Rodrik (2003) describe this phenomenon as "self-discovery" externalities, whereby the learning process of a country's firms implies huge risks that they are not necessarily willing or ready to undertake, given that the social benefits of innovating and moving on to new activities are higher than the ones they could potentially appropriate. As such, governments can choose to intervene not only

[8] The difference between *aerospace* and *aeronautics* is that the former includes devices that can operate outside the atmosphere of the Earth. In Mexico, the industry is basically referred to as *aeronautics*, which encompasses from R&D to manufacture, operation and service. However, because the government refers to the industry as *aerospace*, we decided to do the same in this section.

to solve existing market failures for firms but also because any actions taken today will have large repercussions in the productive structure of the country in the future.

Justification for government intervention in the aerospace industry is usually compared in Mexico to PDPs for supporting the auto industry. It is true that policies to promote the auto industry were developed in the context of a closed economy, one very different from the current economic context of globalization. However, over the years PDPs for the automotive industry have evolved and most importantly have helped Mexico become a global player, even if challenges remain in promoting local value-added and developing local firms so they can integrate into global value chains. The recognized success of PDPs implemented to support the auto industry suggests there is some room for public intervention to encourage the development of the aerospace industry, particularly in terms of ensuring positive conditions for investment attraction, such as the following (which are summarized in Table 17):

- **The provision of missing public goods:** The private benefit of providing these goods and services is low compared to the social returns. In the absence of decentralized incentives and mechanisms for making accurate decisions in terms of providing and investing in socially beneficial infrastructure, sectors such as aerospace face difficulties in providing airport and customs infrastructure at a pace that matches the industry's needs and growth rates.
- **Low availability of qualified human capital for further complicated processes:** low coordination levels between the private sector and academia, as well as the still slim and often nonexistent connection among research institutions, universities, and the private sector in Mexico, results in a limited pool of high-skilled workers necessary to scale up the sector's activities in the long run.
- **Positive externalities of FDI from the aerospace industry:** these include demonstration effects, whereby local firms can adapt technologies introduced by MNCs; labor mobitliy, which encourages the transfer of skills from MNCs to local firms; and vertical supply chain integration, through which local suppliers can receive technology transfers from the MNCs to which they sell their products.

- **Lack of coordination in FDI attraction policies at the federal and state levels:** The federal and state governments design policies to attract investment for the aerospace almost independently of each other. There is very little coordination between the two levels of government and among state governments in order to increase the development potential of their regions. This results from a failure on the part of government to define a standardized FDI attraction policy.

Table 17. Market and Government Failures for the Aerospace Sector

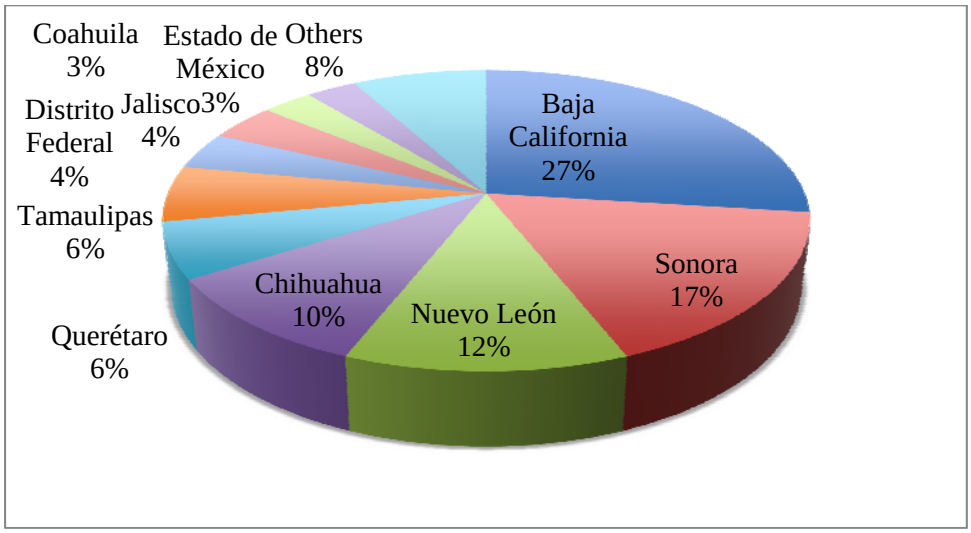
Failure	Type	Description
Insufficient airport and other logistics infrastructure	Missing public inputs	- Social benefits for providing infrastructure throughout the country are higher than the private benefits of doing so for companies.
Low availability of qualified human capital	Coordination failure	- Low levels of coordination between firms and academia can result in suboptimal levels of qualified personnel for the industry.
Unrealized positive externalities (FDI)	Information externality	- So far, local supplier development has failed to take place.
Lack of coordination at state and federal levels	Government failure	- Results from a failure on the part of government to define a standardized FDI attraction policy.

Source: Authors' compilation.

7.1 Federal and State Policies for Attracting FDI into the Aerospace Sector

For the case of the aerospace industry in Mexico, it is likely that border states such as Baja California, Nuevo León, Chihuahua, and Sonora—where most of the country's maquila industry is located—would become attractive locations for incoming firms. Figure 11 demonstrates this is certainly the case for border states. In addition, Querétaro, which is located in Mexico's central region and is close to states with high automotive activity, has captured 6 percent of firms operating in the country.

Figure 6. Geographic Distribution of Aerospace Firms



Source: Producen (2007).

Much has been said regarding the continuity between the automotive and the aerospace industry (see Table 18 below for a summary). Indeed, while there are important differences between the aerospace and the automotive industry, in the case of Mexico one can conclude that the automotive industry was an important predecessor. Many companies in Baja California, for example, have stated that they are involved with both the automotive and the aerospace industries. In addition, decades of success in the automotive industry led Mexico to develop important human capital, supply chain management capabilities and the ability of local governments to attract investments and create a reputation that is important in an industry where quality, coordination, and safety are the main concern (AT Kearney, 2003).

The beginning of Bombardier's operations in Mexico represent another example of the importance of installed capacity in the auto and electric-electronic industries. Bombardier established its first plant in Mexico in the late 1990s, producing harnesses and cables for its planes (Producen 2007), manufacturing with which Mexico already had experience because of the presence of the automotive sector. In addition, interviews revealed that Mexico provides logistical advantages for aerospace firms such as having engineers and managers who already understand how to deal with providers and participate in global value chains, and state governments with experience attracting and supporting, through different instruments, large plants in their states. Finally, just as the existence of auto and electronic industries generated

positive externalities for the establishment of aerospace firms in the country, moving along the value chain in the aerospace sector can produce positive externalities for other industries as well.

Table 18. Differences and Similarities: Auto and Aerospace

Differences	Similarities
Complexity. A car has 7,000 parts while an airplane has 6 million.	Its assembly is highly complex. It requires supply chain management capabilities.
Automakers have higher production volumes, providing more chances to implement improvements.	Products can be broken down fairly easily into modules and systems (related to electronics, mechatronics and mechanics).
Horse power in an airplane is dramatically higher.	Small number of manufacturers that rely on many suppliers.
Cycle times are shorter in the automotive industry (product life in the automotive industry is 3 to 6 years versus 25 in an airplane)	Companies have to choose in between becoming system integrators or pursue opportunities as indirect suppliers. Integrators assume responsibility for all technical tasks.
Historically there has been a strong relationship in between the aerospace industry and tgovernments.	

Source: AT Kearney (2003).

So far, the industry consists mostly of the manufacture of parts and components (77 percent). A small part is dedicated to repairs and maintenance (13 percent), and only a few companies, accounting for the remaining 10 percent, focus on engineering and design Consejo Mexicano de Educación Aeroespacial (Comea). Even if the most complex processes are not yet being implemented in Mexico, however, when compared to other economic sectors within the country, the aerospace industry stands out for its sophistication, potential for value-added, and synergy with other industries and thus deserves attention in terms of government intervention to solve general market failures.

While aerospace companies that first arrived in Mexico produced only small components in labor-intensive, high-volume production activities, lately these activities have shifted towards more complex ones. To take only example, a plane has six million parts, and the industry is unusual in the sense that integrator firms such as Boeing and Bombardier do not design the planes on their own. Instead, they require participation from every supplier that ever participates in the process, therefore creating the potential for Mexican suppliers to become increasingly integrated into the design process. This also entails that suppliers must acquire the highest

certification levels, such as AS9100 (as found during interviews with the Ministry of Economy), which implies an expensive process and can often discriminate against incoming supplier firms.

Although aerospace has been a designated strategic sector since 2001, it is not clear whether this means anything in terms of policymaking or the aerospace sector's operations. In practice, according to interviews with officials from the Ministry of Economy as well as former state-level ministers of Economy, the sector was selected as strategic when the government perceived global industry leaders' interest in Mexico. The efforts to promote Mexico as a hub for the aerospace sector were in fact led by one person from the Under-Secretariat for Industry and Commerce at the Ministry of Economy. Then, in 2006, when ProMéxico was created, the agency took charge of promotion activities for the sector.

In theory, ProMéxico is the agency responsible for establishing goals to promote the aerospace sector and coordinate state-level efforts in order to encourage optimal levels of investment. During the current administration (2006-2012) of President Felipe Calderón, ProMéxico has set objectives regarding representation at international fairs and industry events by well-trained, professional staff who spoke on behalf of nationwide industries and not just in favor of specific states—which occurred whenever state governments sent their own representatives to such events (Ministry of Economy, 2007). In practice, however, states still send their own representatives to international fairs to promote their entities without necessarily coordinating either with ProMéxico or with other states.

FDI attraction policies, however, still lack standardization. The federal government does not offer fiscal incentives unless, as stated by the Ministry of Finance, investments exceed US$ 500 million. In fact, Mexico has never undertaken a policy of offering fiscal incentives at the federal level.

In turn, the federal government through the Ministry of Economy has used other instruments to support firms in the aerospace sector. In particular, the Ministry was responsible for dropping all customs duties on aerospace components, something that was not done from the beginning for the auto and electronics industries. Through the SME Fund it is also possible to support large companies that establish supplier development programs for local firms. In fact, companies like Bombardier do receive support from the SME Fund (www.fondopyme.gob.mx).

One policy which seems relevant and solves an information problem for the industry, therefore contributing to effective promotion, is the certification program put in place by the

Ministry of Transport and Communications. The Ministry was responsible for negotiating and obtaining approval was the Bilateral Aviation Safety Agreement (BASA), which allows procedures in Mexico to be certified within the country instead of in the United States (Hunt and Greene, 2005). Though it seems minor, solving and information problem of this sort should go a long way in increasing the local industry's competitiveness. Unfortunately, very little information was available regarding the process by which these negotiations took place so as to determine whether the Ministry had identified a potential market failure and was willing to solve it.

Even though Mexico has 30 states, the options for investing in any particular industry narrow down to only a few, depending. States in Mexico vary widely in terms of services, location, infrastructure and qualified workforce availability. For example, the state of Michoacan has received large amounts of FDI thanks to its port, while Chihuahua, Nuevo León and Baja California enjoy the geographical advantage of being close to the US. Other states, such as Estado de México, Querétaro and Puebla highly benefit from being in the center of the country and from their proximity to Mexico City.

For some state governments, particularly those in border states, the aerospace sector seems a natural continuation of their industrial development. For others, such as the case of Querétaro, Bombardier would probably not have established operations there had it not been for that state government's efforts to attract the company. This section outlines Queretaro's efforts in this regard.

State governments compete to attract investment by offering various incentives to foreign investors. Those states that set aerospace as a priority sector are offering various forms of assistance, including: (i) fiscal incentives in the form of exemptions from property taxes as well as granting real estate at little or no cost; (ii) funding for high technology companies, through their budget allocations from the SME and CONACYT funds; (iii) investment in training and in new or upgraded educational and research institutions; (iv) assistance in recruiting staff, as well as dealing with legal and administrative matters; (v) infrastructure development, such as airports and highways; and (vi) discounts for public services such as water and electricity.

The case of Bombardier in Querétaro is illustrative because they received one of the largest incentive packages given by local governments for the industry. Benefits reported by Bombardier itself include:

- US$ 7 million of investment for the Querétaro airport
- Government investments in supplier development programs for the industry
- Free services (water, electricity, gas, and water)
- A US$ 50 million investment to create the Universidad Tecnológica del Estado de Querétaro (UTEQ) specifically focusing on aerospace engineering and related subjects

In principle, three out of these four benefits seem to respond to existing market failures: provision of public goods, positive externalities of encouraging technology transfer, and solving coordination issues to increase human capital availability. It is also worth noting that in this case Bombardier responded well to Queretaro's efforts. For the new universities, the company hired the first six professors for the university and collaborated with the university's management in the elaboration of curricula. Another successful case of collaboration comes from Honeywell which established operations in Baja California and developed a division responsible for training suppliers in Latin America in Monterrey, the Aerospace Electronic Systems (AES) site location (Hualde and Carrillo, 2007).

Still missing from the whole process, however, is a formal ex ante cost-benefit evaluation of the potential impact of these incentives on the state or even the regional economy. Interviews revealed that, given states' limited capacity to raise revenues—and therefore grant substantial benefits to companies—a race-to-the-bottom phenomenon seems to be taking place regarding state-level FDI attraction policies.

7.2 Institutional Capacities

In general, PDPs for aerospace—even though it is considered a strategic sector—remain fragmented. There is no national level strategy to find and encourage synergies between states in order to ensure optimal levels of investment. Instead, a multiplicity of actors and instruments are used during the process without any evaluation of whether incentives and support mechanisms are necessary for the industry.

According to interviewed state-level and Ministry officials, states have developed a race-to-the-bottom game when it comes to investment attraction. In this game, investors have more complete information than states, and due to the lack of internal coordination on the part of the

federal government, states end up offering either what they do not have or what they should probably not give out without a careful cost-benefit analysis. Thus, it is a game of perverse incentives where states privilege new flows over potentializing existing investments by ensuring technology transfer to local firms and developing a business base.

At the federal level, ProMéxico has set specific objectives for the sector regarding investment amounts and origin. Thus, the agency should be the natural institutional choice for coordinating federal and state efforts in attracting investment for the aerospace sector. However, interviews with ProMéxico officials and state government representatives indicate a lack of both information and institutional empowerment. ProMéxico does reach out to states in order to obtain their catalogues of potential exports as well as the incentives they are willing to provide for new investors. However, states usually do not have this information up to date. In addition, they are unwilling to provide existing information to the federal agency, fearing their strategy will be outperformed by another state, which could ultimately coerce ProMéxico into revealing their information. While there is no clear evidence of this process, however, these are the perceptions of interviewed government officials. In sum, ProMéxico does not seem to be solving the coordination problems that exist among states as well as between states and the federal government (see Table 19 for a summary of institutional capacities).

Table 19. Institutional Roles and Limitations in the Aerospace Sector

Stakeholder	Function	Limitation
Ministry of Economy	- Coordinate design and implementation of PDPs for the aerospace sector, though not necessarily in practice	- Stating goals and metrics is not an obligation and, if not achieved, can have legal consequences. This limits having clear goals. - Does not have a clear way to select sector (strategic) and evaluate policy needs
ProMéxico	- Attract investments. Represent Mexico abroad. - Obtain and Provide up-to-date industry information - Guide design process based on industry needs - Also, coordinate design and policy goals - Coordinate state governments' initiatives to support the sector	- Because investments take place at a local level, many states are not willing to collaborate with ProMéxico, especially if the party governing the state is not from the same party that the executive power is. - States are competing against each other; they do not want to share information with the government at a federal level.
Universities	- Public universities such as the Politecnico have an incentive to prepare students for this industry. However, they do not obtain all the funds they require. - Private universities such as the Tecnologico de Monterrey see an opportunity; however, it has been difficult to recruit teachers that specialize in the sector.	- Public Universities lack funds. The best programs are in Mexico City and most of the aerospace industry is in the north. - Coordination problems exist particularly regarding the lack of capacities within universities to obtain information from the private sector - The process of adapting university curricula tends to be too slow and is often outpaced by the industry's progress
State governments	- Attract investments. Give benefits to the companies. Regarding taxes, the property, and services such as water.	- They have limited information regarding what other governments are offering. The risk of offering more benefits than the optimal level is high.

Source: Authors' compilation.

7.3 Response to Market Failures

At the federal level, policies to attract investment in the aerospace sector and encourage development of this new activity, while fragmented, do tend to respond to existing market failures—even if those policies do not always derive from a conscious identification process. Providing public inputs and certification definitely help to provide certainty for investors. Other programs, like coordination at the state level and promotion activities, seem to serve as a second-best solution to an original government failure to standardize FDI attraction policies and laws.

At the state level, some of the implemented policies also make sense in principle, particularly those that seek to solve the coordination failure between the private sector and academia. Others, like offering fiscal incentives, can also solve some uncertainties for investors. Yet, as noted above, the process for deciding which incentives to offer does not include a thorough cost-benefit analysis, nor does it imply a process for identifying existing market failures.

7.4 Effectiveness of Policies to Attract FDI at the Federal and State Levels

The Mexican Aerospace Industry has gained enormous relevance in the past 10 years. However, much more coordination will be needed for the industry to begin to move toward higher-value activities.

In interviews with public officials at the federal level, there did not seem to exist any clear information regarding their goals and how they plan to pursue them. There is a clearer strategy at a state level—though not without its caveats—particularly in states such as Querétaro, which recently attracted Bombardier, and Baja California, where almost a third of the industry operates. At the federal level, ProMéxico and state governments lack incentives to establish of clear goals and measure results.

Regarding infrastructure, federal resources have traditionally been allocated particularly for highways, while airports are often—and erroneously—not seen as a trigger of economic activity. Therefore, efforts remain isolated instead of taking part in a more general strategy aimed at connecting aviation activity (airports) with highways and the development of the aerospace industry itself. As a result, the effectiveness of policies to provide infrastructure, as well as training and linkages with universities, is reduced due to the non-existence of a global strategy.

States operate on their own and in competition with each other, and it is not clear that states and the federal government are collaborating in a coordinated way.

Finally, members of academia interviewed for this project claim that their research in the aerospace sector is not being used to strengthen the industry; collaboration between academia and the private sector coordinated by the government remains very low. They claim that if there is not a connection in between research and the sector Mexico will not be able to giver higher value to the industry and manufacturing versus design will prevail.

7.5 Recommendations

So far, the aerospace sector sees to have developed without much need for government intervention, attracting large amounts of FDI and growing at a relatively quick pace year after year. However, given Mexico's competitive advantages (location, certification, related industries, costs), it remains important for the government to tackle existing market failures in order to allow the industry to develop further.

Designating a sector as "strategic" could reflect an effort to focus government programs on fast-growing industries that have the potential to contribute to the country's development. However, it seems this categorization of sectors within the National Development Plan does not entail any particular strategy for the industries thus identified. Instead, what remains is a collection of disorganized programs and initiatives that often result in misuse of existing funds—such as the use of the SME Fund by large MNCs in the aerospace sector—or in a race to the bottom where states offer all sorts of incentives without necessarily evaluating their impact on the state or region.

Certain recommendations follow from the analysis:

- **Develop a mechanism to perform ex ante and ex post cost-benefit evaluations** whereby ProMéxico can determine, along with interested states, the impact of benefits used to attract FDI on the whole economy (at a state, regional, and national level). Interviews with officials from the Ministry of Economy and ProMéxico indicate that a process to define criteria for cost-benefit evaluations is taking place. However, there is no evidence that this sort of mechanism is being applied so far. In particular, this process should take into account the existence of market failures.

- **Develop specific criteria for designting "strategic" sectors.** Today, this categorization seems to be done randomly, taking into account the opinion of entrepreneurs and a few experts but without a thourough analysis of the reasons behind it or what the classification entails in terms of public policy.
- **Provide ProMéxico with enough faculties to enforce a national-level FDI attraction strategy.** ProMéxico is a new agency, created by the current administration to take charge of FDI attraction and export promotion activities. It is modeled after successful insitutions like ProChile; yet, so far it has failed to live up to its expectations. The agency's inability to coordinate agendas with the Ministry of Economy (upon which it depends) and with states and other agencies for the development of its main goals, limit its scope and impact.

8. Conclusions

Mexico has the potential to grow at accelerated rates. However, economic growth for the past three decades has remained low. Neither openness nor macroeconomic stability has proved sufficient to promote productivity increases in the country's firms. Mexico has liberalized its economy and achieved macroeconomic stability, two key conditions for firms to remain competitive. However, microeconomic conditions are still deficient: multiple non-trade barriers remain an obstacle to take full advantage of commercial treaties, while the country's regulatory framework has failed to create the correct incentives for entrepreneurship to take off and inject dynamism into the economy.

Out of the eight strategic sector sectors identified by the National Development Plan, this study focused on the IT services and aerospace sectors, given their potential for helping Mexico to scale up the production ladder. In addition, the analysis focused on PDPs targeting SMEs, R&D and innovation activities and training.

For each of these areas there are market failures that justify government intervention, ranging from missing public inputs, to externalities, to information asymmetries and coordination failures. Table 20 below provides a typology of market failures for the sectors analyzed throughout the study.

Table 20. Market Failures across Sectors

Market Failure	Training	R&D + Innovation	SMEs	Information Technology	Aerospace
Information externalities	X			X	X
Coordination failures	X	X			X
Information asymmetries	X	X	X		
Missing public inputs				X	X

Source: Authors' compilation.

In addition, most of these sectors also face government failures that might justify intervention, even when these interventions can only serve as second-best policy choices. These range from a low-quality educational system, to poor protection of intellectual property rights, to poorly designed regulation, to lack of coordination across government agencies.

None of the programs analyzed throughout this study are designed based on a careful analysis of existing market or government failures. Moreover, when they do their effectiveness is questionable and hard to measure. Instead, programs seem to be designed to respond to alternative goals, such as social and budgetary objectives and industry demands. In addition, none of the programs analyzed perform impact evaluations, while some even lack data about beneficiaries that could allow them to monitor programs effectively. Finally, all programs suffer from a misalignment of incentives. Sometimes program design creates perverse incentives for program operators and beneficiaries, such as the cases of training, SMEs and PROSOFT. For other programs, it is the lack of coordination between and among agencies, which results in poor planning and even race-to-the-bottom attitudes, especially among states.

Below are general conclusions and recommendations for each of the sectors and programs analyzed.

8.1 Training and the BECATE Program

In Mexico government spending (6.4 percent of GDP in 2004) and coverage of the national education system have dramatically increased in the past few decades, going from 4.5 years of education in 1976 to 8.2 years in 2006 (OECD,2007a). Yet only a minority of the population has completed secondary school, and even fewer have completed higher levels. Training programs alone will not solve this situation but can make important contributions. Careful analysis of one

of the country's main training programs reveals that there are serious issues regarding its objectives (responding to a market failure) and what the program actually does in practice. In addition, it is not clear that, due to the population's low skill levels, firm-specific training programs solve these failures.

The following recommendations are made for BECATE:

- **Re-evaluate BECATE's stated objectives.** Program goals create incentives for individuals to game the system and access the program several times without being turned down. BECATE seems to be compensating for the lack of unemployment insurance instead of focusing on its stated objectives, which have more to do with improving skills and reducing transaction costs.
- **One-shot impact evaluation of skills attained through the program.** Though the need for it seems obvious, this type of evaluation does not take place. In fact, program indicators of success do not include "improvement in skills"—though this is difficult to measure—but rather focus on placement rates, even when the program's stated objective is to increase human capital.
- **The self-employment mode should disappear.** It is not clear whether the abilities microentrepeneurs obtain through BECATE actually increase their employability, especially since the program is not specialized in creating sustainable microfirms. The Ministry of Social Development and the Ministry of Economy are better suited to addressing microenterprise needs.
- **Transform the program to offer general rather than specialized skills.** The deadweight loss to society from not providing individuals wth general skills is sufficiently high to transfer money to a program that only seeks to reduce the transaction costs created by rigid labor laws. An alternative would provide individuals with more general skills that they can transfer across companies.

8.2 Innovation and Research and Development

As a middle income country, Mexico needs "efficiency enhancers" in order to boost its growth substantially and head towards an innovation stage of development (Porter, 2003). Investment in R&D and innovation is low in Mexico, however, signaling problems of access to competitive

financing and risks of appropriability (Hausmann and Rodrik, 2003). CONACYT, Mexico's center for science and technology policy, exists since 1970 to promote scientific and technological development through training high-level researchers and implementing research programs in specific areas, but this organization alone cannot compensate for constraints elsewhere in the operating environment. Industries that should act as leverages for innovation development, such as energy, biotechnology and pharmaceuticals, are severely restricted either by legal constraints or by lack of both physical and human capital. Investment levels, both by the public and private sectors, remain well below the regional and OECD averages. The lack of an innovation policy framework for the country renders CONACYT's efforts mostly ineffective.

Some recommendations follow from this analysis:

- **Upgrade CONACYT to Ministry level.** With planning functions concentrated in a Ministry of Science and Technology, the country could formalize its NIS, identifying priorities and development opportunities in innovation projects with a national, regional and sectoral vision.
- **Revise program goals to address current market failures.**
- **Reduce number of bureacuratic procedures for the AVANCE program.** Reducing the time and costs of applying for these programs will create incentives to attract private investment for innovation projects.
- **Induce greater coordination among agencies and between the federal and state governments.** Greater coordination could further resolve issues concerning program design, as well as problems with linkages between private firms and academic institutions, thereby encouraging optimal levels of investment (both public and private) in R&D+I activities.

8.3 SME Policy, Now Including PROSOFT Funds

The main instrument to support SMEs is Fondo PyME (the SME Fund), which was created in 2004. For Fiscal Year 2007, the SME Fund accounted for 95 percent of all available funds to the Under-Secretariat for SMEs. The Fund deals only with local governments and intermediary organizations (public or private institutions) and offers no direct funds to SMEs. Programs supported by the fund tackle a number of activities which include export promotion, incubation and acceleration, training, access to finance, certification, consulting services, studies and events.

However, since most of these programs are locally implemented and subject to intermediary organization, they have design shortcomings, selection criteria are nonexistent or deficient, and the benchmarks for measuring success do not lead to an increase in productivity. In fact, success in the SME Fund is measured according to the number of jobs created or kept and not according to productivity indicators, even the causal relationship is, to say the least, difficult to imply). The analysis of TechBA, though helpful to understand how a well-designed program can be potentially beneficial, also coincided with many of the criticisms for the SME Fund, including lack of accountability and a failure to measure impact.

Recommendations include the following:

- **Revise selection criteria in Rules of Operation.** Currently, selection criteria for beneficiaries remain vague, therefore granting greater discretion over selection to IAs, which often results in rent-seeking or leads to situations in which SME programs assist large firms. Currently, guidelines and selection criteria do not entail a technical analysis of the market failures faced by small and medium-sized firms. In addition, IAs which are not fully accountable to the Ministry of Economy should be required to undertake impact evaluations and set credible goals for improving firms' productivity and competitiveness.
- **Establish specific impact indicators focused on increasing firm productivity and competitiveness.** Indicators are currently set to measure progress in process and activities (job creation, increase in sales for the whole sector, etc.) and do not serve to measure actual impact on beneficiaries. Though the lack of specific goals results in part from the Comptroller's rules on program design and monitoring, the success of programs depends on selecting indicators according to how much impact they have on firm productivity—the policy's original objective.
- **Improve data collection on SMEs at the local level.** While Most SME policy is actually enacted at the local level. Yet, state offices often lack the most basic data about the number of SMEs in their locality and the sectors in which they operate. Thus, a third recommendation is directed at the Ministry of Economy to accelerate negotiations on data collection efforts between INEGI—the national statistics agency—and state authorities.

- **Improve dialogue with the private sector.** Very few SME programs entail constant dialogue with private sector representatives. In order to better identify and tackle market failures and issues firms face. Valuable lessons can be adopted from the process PROSOFT followed to establish its goals and objectives, taking care not to overemphasize firm concerns without a thorough technical evaluation.
- **Undertake impact evaluations and replace progress indicators.** Interviews with decision-makers revealed that, despite their overall positive regard for SME programs, they were not convinced of the impact these funds are having on the competitiveness of firms.

8.4 FDI in the Aerospace Sector

Policies addressing the manufacturing sector, particularly *maquiladoras* and especially companies in the automotive industry, have paved the way to develop higher-level industries such as in aerospace sector, which is intensive in technological innovation and promises to become one of the highest growing in the country. Clusters for the automotive industry have created virtuous growth cycles and numerous business and job opportunities, produced a skilled workforce, and set up the basic infrastructure to move on to higher value-added activities. However, PDPs for the manufacturing sector have failed to i) spur the the creation of a more sophisticated labor force and ii) develop innovative and highly specialized local suppliers in order to enhance the sector's economic spillovers. More than 40 years after the first PDPs for this sector were implemented, domestic suppliers provide less than 4 percent of the *maquiladoras'* inputs (Baz, 2008). Essentially, local producers have not been able to compete with global suppliers for even a small fraction of the market. The aerospace industry could face a similar fate if PDPs are not correctly targeted and adopt the lessons learned from the *maquila* and automotive industries. The following recommendations are thus made for this sector:

- **Develop a mechanism to perform ex ante and ex post cost-benefit evaluations** whereby ProMéxico can determine, along with interested states, the impact of benefits used to attract FDI on the whole economy (at the state, regional, and national level).

- **Develop specific criteria for designting "strategic" sectors.** Currently this categorization seems to be made randomly, taking into account the opinion of entrepreneurs and a few experts but without a thorough analysis of the underlying reasons or what the classification entails in terms of public policy.
- **Provide ProMéxico with the resources it needs to implent a national-level FDI attraction strategy.** The agency's inability to coordinate agendas with the Ministry of Economy—upon which it depends—and with states and other agencies for the development of its main goals, limits its scope and impact.

In conclusion, there is no consensus on the development path Mexico wants to follow, or on what it needs to do in order to achieve specific goals. As a result, PDPs are often incongruent with each other, redundant and uncoordinated. The PDPs analyzed throughout this study provide evidence of the kind of redundancies and inefficiencies in program design and application that result from the lack of consensus regarding the country's development path. In addition, none of the programs analyzed during this study have well-established accountability mechanisms, which makes it difficult for stakeholders, such as members of civil society and Congress—to evaluate the impact of PDPs on the country's productive structure, a recurrent problem in the PDPs analyzed for this project.

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