Mexico
Mexico’s Challenge of Knowledge-based Competitiveness
Challenges and Opportunities
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Colombia and Mexico Country Management Unit
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Knowledge for Development Program, WBI
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Mexico's Challenge of Knowledge-based Competitiveness: Challenges and Opportunities

Table of Contents

| Acknowledgments                                | 4 |
| Boxes, Figures, Tables                         | 5 |
| Main Messages                                  | 6 |

I. A Need for Transition to Knowledge-based Economy
   1. New Challenges and Opportunities          | 7 |
   2. Benchmarking Mexico's Position in the Knowledge Economy | 12 |

II. Major Policy Issues
   3. Transforming the Innovation and Enterprise Upgrading System | 14 |
   4. Enhancing Education and Skills               | 15 |
   5. Updating the ICT Infrastructure in Mexico    | 16 |

III. Implementation Options
    6. Toward National Vision and Leadership       | 19 |
    7. Regional Leadership in the Transition to a Knowledge Economy | 24 |
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Boxes, Figures, Tables

Boxes
Box 1. The Republic of Korea’s Transition to a Knowledge Economy: From Vision to Implementation
Box 2. The Fundación Chile Model and its Relevance for Mexico

Figures
Figure 1. GDP per Capita Growth in the Republic of Korea and Mexico, 1960–2003
Figure 2. Four Projections of Mexico’s Real GDP per Capita, 2001–2020
Figure 3. Mexico’s Knowledge Economy Index
Figure 4. Mexico’s Performance on the Four Pillars of the Knowledge Economy
Figure 5. Virtuous Circle of Growth and Reforms
Figure 6. Knowledge Index by Mexican States

Tables
Table 1. From NAFTA to a knowledge-driven (second generation) NAFTA
Table 2. Transition to a Knowledge-based Economy: Four Types of States in Mexico and Policy Agendas
Main Messages

The knowledge revolution offers unprecedented challenges and opportunities for Mexico.
An ongoing knowledge revolution may allow Mexico to escape the low-growth trap and switch to higher growth. Other countries—among them the Republic of Korea, Ireland, and Finland—have recently accomplished such a transformation. To take advantage of new knowledge-based opportunities, Mexico must take concerted action now. The stakes are high. The NAFTA agenda needs to be deepened (Chapter 1 and 2).

Taking advantage of new opportunities is not business as usual. Mexico’s reforms were founded on getting relative prices right. Although this is still an unfinished agenda, a second-generation knowledge-driven policy agenda should focus on getting institutions right. More specifically, Mexico should create institutional capabilities through innovation and enterprise upgrading, improving education and skills, and updating its infrastructure for information and communications technology (Chapters 3-5).

Momentum for change must come from the bottom up and from the top down.
A pragmatic way to move forward is to increase top decision-makers’ awareness of the need for consensus concerning how to overcome key national obstacles. Mexico then can move ahead with concrete and manageable bottom-up approaches that promote national vision and leadership and build on past successes (Chapter 6).

Concerted action among stakeholders is vital for progress.
States and champions in the private sector are important agents of the transition to knowledge-based competitiveness. The heterogeneity of agents can be an advantage. Alliances among dynamic agents at the regional level are the key to creating and benefiting from new opportunities (Chapter 7).
Mexico’s Challenge of Knowledge-Based Competitiveness: 
Challenges and Opportunities

I. A Need for Transition to Knowledge-based Economy

Knowledge and its application are now widely acknowledged to be key sources of growth in the global economy. Driven by the rapid application of new information and communications technologies, as well as by the application of scientific discoveries to production in every sector of the economy, the knowledge revolution has enabled countries to dramatically increase their competitiveness and to achieve rapid growth. However, it has also brought great challenges to countries that want to participate effectively in the knowledge-driven supply chains and markets that now dominate the global economy. If countries fail to position themselves properly in this global, knowledge-based marketplace, then competitiveness will be increasingly difficult to achieve.

The term knowledge as used in this book is emphatically not just about high technology. Putting knowledge to work allows countries to improve everyday life for their people and opens new possibilities for developing regions of Mexico, small and medium-size enterprises (SMEs) and other less-developed actors. Mexico’s service sector (tourism and health services, for example) provides particularly fertile ground for the application of knowledge.

1. New Challenges and Opportunities

Where does Mexico aspire to be twenty years from now? And what will its industrial structure be? These questions are impossible to answer in detail, just as it was impossible to predict, given the debt crisis two decades ago, how truly dramatic Mexico’s transformation would be in the aftermath of the crisis. This book contends, however, that Mexico needs to embark on a no less dramatic transformation than the one that occurred after the 1980s. Although based on the main economic tenets of NAFTA, the effort must go further by focusing on second-generation reforms. These reforms are about dramatic improvements in Mexico’s capacity to generate knowledge and transform it into wealth.

Total factor productivity (TFP) is a proxy for a nation’s ability to put knowledge to work. This capability to adopt, adapt, and create knowledge is critically dependent on countries’ institutions, particularly investment climate and regulatory framework. It is often measured by a so-called residual in the production function that cannot be explained by factor inputs. This ability to put knowledge to work produces a dramatic difference in a country’s wealth. Figure 1 compares the evolution of per capita income of Mexico and the Republic of Korea from 1965 to 2002. While initially lower than Mexico’s, Korea’s per capita income increased more than a factor of eight and is now

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1 Because TFP is a very imperfect proxy, Figures 3 and 4 are merely illustrative and serve to outline qualitative scenarios of development.
about five times that of Mexico. The dashed line represents what would have been Korea’s per capita income if growth was just a matter of the growth of capital and labor inputs. The difference between the dotted line and the actual per capita income for Korea is due to its more effective use of knowledge broadly defined (both technical knowledge and policy knowledge). Korea developed learning capacities in the 1970s and 1980s. Mexico did not.

Figure 1. GDP/capita growth in the Republic of Korea and Mexico, 1960-2003

Knowledge makes the Difference between Poverty and Wealth...

Thousands of 1996 Constant US $

Source: Knowledge for Development Program, WBI
The four projections in Figure 2 suggest how Mexico may be able to utilize its knowledge capacity by the year 2020. As mentioned before, total factor productivity is a proxy for national learning capability. Projection 1 plots the path of real GDP per capita if Mexico's TFP growth rate followed its 1991–2000 average value (−0.13 percent per annum). Projection 2 plots the path of real GDP per capita given a 2 percent per annum TFP growth rate, which is close to 1991–2000 decade average for the Republic of Korea. Projection 3 plots the path of Mexico's real GDP per capita given a 3 percent per annum TFP growth rate, which is close to Finland's 1961–1970 decade average. Finally, Projection 4 plots Mexico's real GDP per capita given a 4.25 percent per annum TFP growth rate, which is the approximate value of Ireland’s 1991–2000 decade average.

Figure 2: Four Projections of Mexico's Real GDP per Capita, 2001-2020

Projection 1 is an inertial scenario; projections 2 and 3 are realistic; projection 4 is an optimistic yet not impossible scenario. The ability to transform knowledge into wealth, quite literally, makes the difference between poverty and prosperity. All things being equal, there is an almost twofold difference in per capita GDP by the year 2020 between the realistically optimistic scenario 3 and the inertial scenario.

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2 For all four projections, capital, labor, and human capital were assumed to grow at the 1991–2000 average growth rates for Mexico—3.32 percent, 2.75 percent, and 0.92 percent, respectively.
Throughout this report, Mexico is compared with the following set of countries:

- United States, a main trading partner of Mexico’s and a paragon of the knowledge economy.
- The Republic of Korea and Ireland, countries that about twenty years ago faced challenges similar to the challenges now facing Mexico and made meteoric progress toward knowledge-based competitiveness. We also make references to Finland’s experience, particularly with regard to the political economy of transition to knowledge-based development.
- China, a new economic powerhouse, competitor, and opportunity.
- Spain and Chile, two dynamic (although obviously very different) Spanish-speaking countries.

Mexico’s transformation in the next twenty years will be shaped by the ongoing knowledge revolution—a revolution that brings unprecedented threats and opportunities. The term knowledge revolution refers to the increased speed in the creation and dissemination of knowledge. The ability to make effective use of knowledge is becoming a fundamental determinant of global competitiveness.

One can already catch glimpses of the prosperous, knowledge-based Mexico of twenty years from now. The engineering centers of GE, GM, and Delphi, employing hundreds of high-skilled knowledge workers, can become springboards for innovation clusters. The provision of health services to retirement communities in San Miguel de Allende or Cuernavaca indicates a potential for cluster communities of highly value-added healthcare services and recreation. These two examples may seem worlds apart, but they both rely on efficient knowledge organizations.

To take advantage of the ensuing knowledge revolution and assure the necessary productivity gains, Mexico needs to develop a strategy of transition to knowledge-based economy. To take advantage of the ensuing knowledge revolution and assure the necessary productivity gain, Mexico needs move up value chains by developing efficient education, innovation, and ICT systems.

While first-generation NAFTA-related reforms were based on low-cost labor, second-generation reforms will be based on lower cost skilled labor (see Table 1). Skilled workers with high school diplomas and engineers will need to become a major comparative advantage. The average income for engineers and researchers in the United States is about 300 U.S. dollars per day, while in Mexico it is about 120 dollars per day.3 R&D links with the United States and Canada—in venture capital and innovation, exchange of researchers and engineers—is at the center of knowledge-based, second-generation NAFTA reforms.

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3 Data provided by CONACYT
Table 1. From NAFTA to a knowledge-driven (second-generation) NAFTA

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<th>Results of NAFTA agenda</th>
<th>Knowledge-driven (second-generation) NAFTA agenda</th>
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<tr>
<td>Trade and capital flows: moving up value chains</td>
<td>FDI, particularly maquilas, as a major source of employment</td>
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<td>Large stock of accumulated FDI with little linkages to the domestic economy</td>
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<td>Labor flows: maximizing benefits of migration</td>
<td>Migration and remittances as an escape valve and shock-absorber</td>
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<td>Remittances as a second source of foreign revenues after tourism</td>
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<td>Large and rapidly growing stock of both low-skilled (largely undocumented) and higher-skilled labor from Mexico in the US</td>
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<tr>
<td>Services: repositioning Mexico’s nature and culture</td>
<td>Mexico as a major tourist destination</td>
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<td>Knowledge-intensive services as a major source of employment:</td>
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<td></td>
<td>- Move to higher-brand tourism</td>
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<td></td>
<td>- Develop engineering and other high value professional services</td>
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<td></td>
<td>- Develop high-quality health services to attract retirees and health tourists from OECD countries</td>
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<tr>
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<td>- Capitalize on Mexico’s history and culture: promote investment into media, movie industry, etc.</td>
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FDI and strategic alliances with knowledge organizations abroad as a source of knowledge-based higher-value added jobs
- Attract knowledge-intensive FDI
- Promote spillovers from the existing FDI stock: supplier and cluster development
- Promote strategic alliances with foreign universities, firms, technology and research organizations

Migration as a source of entrepreneurship, knowledge and capital for Mexico:
- Reach agreement to regularize low-skilled undocumented flows
- Reduce transactions costs of remittances transfer and create conditions for productive use of remittances
- Utilize Mexican professionals abroad: create “brain circulation” and venture capital networks

Source: World Bank Staff

World-wide experience shows that such a strategy can be developed in three steps. First, a benchmarking framework is introduced to measure country’s initial conditions and progress towards knowledge economy. Second, core issues of knowledge economy: necessary reforms of innovation, education and ICT systems are analyzed. This is a question of what should be done (Part II of the report). Third, implementation issues of the knowledge strategy are considered. These implementation issues include political economy considerations, investment climate and other issues. Although not analyzed in detail, they are touched upon to discuss what could be done in terms of transition to knowledge-based competitiveness given the constraints Mexico faces. (Part III of the report).
2. Benchmarking Mexico’s Position in the Knowledge Economy

As a first step to articulate a strategy for moving forward, we disaggregated the knowledge-based economy and competitiveness into four functional areas:

- Economic incentive and institutional regime that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship;
- Effective national innovation and enterprise upgrading system: a system of research centers, universities, think tanks, consulting firms, and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge;
- An educated and skilled population that can create and use knowledge;
- A dynamic information infrastructure that can facilitate the effective processing, communication, and dissemination of information.

On the basis of these four pillars, we developed an aggregate knowledge economy index and other scorecard indicators for Mexico (see Figure 3).

**Figure 3. Mexico’s Knowledge Economy Index**

Source: Knowledge for Development Program, WBI (www.worldbank.org/kam)

*Source: Knowledge for Development Program, WBI – Knowledge Assessment Methodology (KAM) (www.worldbank.org/kam). Note: The distance from 45 degree line indicates the improvement (above the line) or deterioration (below the line) of the selected countries between 1995 and most recent (generally 2002).*
- Economic incentive regime: strong openness to competition, but weak on regulation
- Institutional regime: improving on property rights, but weak on corruption and government effectiveness
- Education: weakest pillar in the longer term, with big challenges in access and quality
- Innovation: very weak for an economy of its size
- ICT: lagging behind leaders in Latin America.

Figure 4 presents Mexico's comparative performance against the four pillars of the knowledge economy framework over time. It shows the relative changes in performance between 1995 and the most recently available data. Mexico has shown some improvement in the pillars of economic incentive regime and education, while in innovation and information infrastructure the country has lost some ground. It is important to note, however, that the changes that occurred are quite insignificant. The improvements in particular are quite small, especially when compared to China, the Republic of Korea, or Ireland.

Figure 4. Mexico's Performance on the Four Pillars of the Knowledge Economy

Source: Knowledge for Development Program, WBI - KAM (www.worldbank.org/kam)
II. Major Policy Issues

Drawing on the previous analysis, we can now summarize the strategy to move forward as follows:

- Finalize broader economic reforms to enhance revenue mobilization and create an even playing field and more contestable markets
- Upgrade and improve the three key functional pillars of the knowledge economy: education, innovation and enterprise upgrading, and ICT systems.

Getting institutions right—creation of organizational capabilities—is central to both prongs. Unlike "stroke of the pen" reforms, these efforts are often time consuming. Much like learning in the sphere of technology, organizational learning relies on adaptation of worldwide best practices to local conditions.

Given existing weaknesses, Mexico faces a challenging policy agenda. We distinguish between long-term actions (what should be done) and the more immediate agenda (what could be done given Mexico’s institutional rigidities and constraints). Recommendations for the short term are informed by Mexico’s Competitiveness Agenda (coordinated by the President’s Office). These recommendations tend to be more specific than for the long term.

The agenda in the area of institutional regime and governance is quite large and has been the object of much analysis. This book does not dwell on it in detail. Reforms in this area are critical to improve Mexico’s overall performance, as well as to provide the appropriate context for the more structural reforms in education, innovation, and ICT. To ensure transition to the knowledge economy, it is particularly important that Mexico provide adequate public resources and enhance the incentive framework for the transition.

In the short run, there is significant room for better use of existing public resources through continuous evaluation of programs and policies and a better link between performance of public programs and the amount of resources allocated to them. In the long run, however, the transformation to a knowledge economy, particularly reform of innovation and education systems, will require more public resources; this creates urgency for tax reform.

In the long run, in order to enhance the framework for transition to a knowledge economy, the following actions are required:

- Create an even and business-friendly playing field by enhancing competition, improving the regulatory framework, and focusing in particular on reduction of costs (including logistical costs) of entry, exit, and doing business.
- Strengthen major factor markets, particularly labor, the financial markets, and the energy market (electricity, gas, petroleum).
- Improve public governance, with a more transparent rule of law, efficient judiciary system, and respect for intellectual property rights.
3. Transforming the Innovation and Enterprise Upgrading System

Mexico's strategic objective should be a dramatic increase in productivity through knowledge-based integration into global value chains and participation in knowledge networks. To achieve this, Mexico would require reform of its system of national innovation and enterprise upgrading. A dynamic and flexible innovation system must be led by private demand, and it must respond to private sector needs. Strong academic-industry linkages are an important part of international knowledge networks. In the short term the policy agenda should focus on formulating a cohesive strategy, improving incentives, and increasing the role of the private sector in public programs.

Formulating a Cohesive Strategy

The government has created myriad policies and policy instruments for scientific research, technological development, and innovation. Diffuse mandates, overlapping functions and bureaucratic considerations have complicated strategy formulation and policy coordination.

There is a need to centralize innovation policy and assignment of funding. Currently, Consejo Nacional de Ciencia y Tecnología (CONACYT) manages about 36 percent of the funds for public R&D and technology upgrading. Out of these funds, less than a third is for productive innovation. Both figures should be increased significantly, making CONACYT a hub for interorganizational and private-public alliances.

As a first step toward greater cohesion, the government should make a thorough evaluation, preferably using cluster analytical concepts, of its policies, programs, and funding. This audit by domestic as well as international experts should be of high technical caliber, independent in order to avoid capture by vested interests; and representative through collaboration of important Mexican stakeholders. The audit should include the locus for effective decision making and alignment of management responsibilities with accountability for results. The budgeting process should be based on clear priorities.

Improving Incentives

To improve incentives for innovation, linkages between business and R&D can be strengthened in four ways. First, the government should restructure intellectual property rights. (Mexico remains the only OECD country where the researcher on a public institution does not have a legal mechanism to claim the upside potential of his or her invention. Second, public institutions should reward staff for success in productive research projects and linkages with the productive sector. Third, rules for the allocation of public funding for R&D should be introduced that favor consortiums between universities and private firms, and between private firms and SMEs. Finally, funding should be targeted to sectors known for excellence and strategic value.

Increasing the Role of the Private Sector

Private sector participation in the design and implementation of public programs must be increased. Although the situation is improving, Mexico's private sector role, both in financing and execution of research and development, is below the standards of comparable countries. The private sector takes a comparatively passive stance on using
product and process innovation as a strategic tool for business development. The reasons for this seem to be weaknesses on the supply and demand sides.

Drawing on Conacyt’s AVANCE and other programs, the government could enhance its catalytic function by (i) supporting research and training linked to joint ventures between international and domestic technology companies; (ii) prompting international technology companies to create research teams in Mexico through staff exchange schemes; (iii) moving science and technology researchers from government institutions to companies through specific public-private incentive programs; (iv) leveraging innovation spillovers from FDI through targeted investment promotion; and (v) expanding programs supporting innovation start-ups with matching grants through private venture capital firms and incubation assistance.

4. Enhancing Education and Skills

Given the level of current educational expenditures, Mexico should be achieving better results for its students in both qualitative and quantitative terms. Among OECD countries, Mexico spends nearly as much on education as a share of its gross domestic product (4.42 percent) as Australia (4.49 percent), Germany (4.64 percent), Italy (4.55 percent), and the United Kingdom (4.47 percent), but these OECD countries produce students with more average years of schooling, higher literacy, and lower rates of repetition. In the longer term, Mexico needs to achieve consensus to reform its education system in a way that would eliminate institutional rigidities and limit self-interest, such as the power of unions.

A reformed education system would be based on principles of lifelong learning and would incorporate successful new approaches and pilots in pedagogy into an integrated system of lifelong learning at the national level. It would also tap private sources to finance the expansion and improvement of educational opportunities. By providing multiple pathways to learning, Mexico will enable its people to learn continuously through life. Its subsystem of tertiary education would have multiple qualified service providers and sources of financing.

In the medium term, actions should focus on three major areas: increasing coverage and quality in basic and secondary education; expanding access to higher education, making it more demand-driven and responsive to the needs of the Mexican economy and labor market; and accelerating the transition to lifelong learning.

A minimum standard of achievement in basic and secondary schools must be ensured and access to upper secondary and vocational education expanded. Through promising programs such as the Escuelas de Calidad program, Mexico can improve the years in school and skills of its labor force. Strengthening incentives to expand enterprise training and to enrich adult education, particularly at the secondary level, will reduce the undereducated adult population.

To expand access to higher education, a dramatic change is required in how the government finances its universities, given the high per student spending at this level and
the regressive and distributional effects that this policy has had on the entire education system. Greater reliance on private financing of higher education could be achieved through income-contingent loan schemes in which repayment is linked to the borrower’s income. Mexico also should strengthen university-industry partnerships and linkages; introduce higher education programs that are flexible and part-time, thus allowing students to leave or re-enter the system as needed; and scale up initiatives at the state and national levels that grant greater autonomy to tertiary schools in managerial, financial, and pedagogical issues.

To accelerate Mexico’s transition to life-long learning, distance education models and pedagogy pilots at the local level should be diversified. Many promising initiatives in this area must be evaluated in order to scale up and spread local innovations. As a next step, we recommend bringing key stakeholders together to design the architecture of an integrated system of lifelong learning. Standards must be developed concerning certification, accreditation, testing, and evaluation, as well as recognition of prior learning. Policy actions should focus on an overhaul of the curriculum and institutional models that are used in adult education, creation of a transparent system that can retrain workers for re-entry into a changing marketplace, introduction of clear regulations and accreditation procedures for long-distance learning programs, and the creation of a coherent and nationwide quality assurance system.

5. Updating the ICT Infrastructure in Mexico

A strategic objective is creating a flexible ICT infrastructure with price and quality of services comparable to those in the United States and Western Europe. This would require creation of a contestable marketplace and incentives for new entrants that would reduce the dominance of Telmex, the main provider of IT services. Legislation to transform Comisión Federal de Telecomunicaciones (COFETEL) into a more independent and effective regulator will also be necessary. In the shorter term, the policy agenda for the information and communications technology infrastructure should focus on the following three areas: (i) creation of an even playing field by accelerating institutional changes; (ii) elimination of entry barriers and efforts to foster competition and promotion equity, and (iii) greater access to ICT infrastructure, particularly in poor areas.

Create an even playing field
Rebuilding the credibility, effectiveness, independence, and transparency of the Comisión Federal de Telecomunicaciones should be a first priority. Despite a promising beginning, the commission is a weak regulator that does not inspire the confidence new entrants need to make investments in this sector. This, along with the filings of amparos, have become the single most important barriers to ICT growth in Mexico. Congress, which has been debating amending the Federal Telecommunications Law for nearly two years,
should focus on adopting amendments to that would make COFETEL as independent and transparent as the Comisión Federal de Competencia (COFECO). Congress should set aside amendments over more technical issues, such as interconnection, tariff, and unbundling—issues that could be better addressed by a more effective and independent COFETEL.

The amendments to the Federal Telecommunications Law should also remove the ability of the Secretaría de Comunicaciones y Transportes (SCT) to review or oversee COFETEL and, equally important, mandate that COFETEL immediately adopts and follows transparent and accountable procedures in decisionmaking. COFETEL should have the power to develop and implement its own regulations and not simply be responsible for implementing those developed and approved by the SCT. The COFETEL chairmen and commissioners, nominated by Congress, should be appointed for fixed terms and should be removed only for gross ethical violations. To send a dramatic and clear signal that there is an institutional break with the past, Congress could direct COFETEL to report to the Secretariat of Economy. This could have an added benefit of increasing coordination between COFETEL and COFECO—the telecommunications and competition regulators. Congress should also make sure that COFETEL has adequate financial resources: the commission should be able to finance itself through fines and license fees. It should also be accountable to the Congress for its annual budget. Making COFETEL a more effective regulatory agency with increased autonomy and transparency will not only strengthen the commission, but it will also reduce the ability of disaffected parties to misuse the judicial system to reverse or delay implementation of equitable decisions.

Eliminate Entry Barriers and Foster Competition
Mexico should put in place incentives for competitors to grow and increase investments. In particular, it could simplify and streamline the licensing regime, eliminate requirements to register contracts with COFETEL for all but companies with market power; and eliminate voice-centric regulation. We recommend automatic review of regulations every two to three years with the goal of fostering competition and increased access.

Promote Equity and Increase Access
There are numerous ways in which Mexico could promote equity and increase access. It could encourage broadband deployment and reduce local loop costs through competition from cable TV and wireless operators; implement an effective and better coordinated universal access program; eliminate cross-subsidies and complete tariff rebalancing; build on the success of e-Mexico Fidecomiso; land implement output-based aid pilots to foster provision of infrastructure in underserved areas. Elimination of the 10 percent tax on mobile operators is advisable. A universal access fund and tax (a 1 to 2 percent tax on operators) could be administered by an independent and transparent authority (either COFETEL or a new ICT agency).
III. Implementation Options

6. Toward National Vision and Leadership

To move forward, Mexico needs to implement major reforms and develop a national vision of Mexico as a knowledge-based economy. The reform agenda is as challenging as the institutional impediments to reforms. The economic agreements (Los Pactos) of the 1980s were good examples of pragmatic institutions to carry out economic liberalization and contain inflation. The new reform agenda built around a concept of knowledge needs a similarly far-reaching mechanism. For lack of a better title, we can call this a Knowledge Economy Pact. It would include consensus on the need to move forward as well as a ranking of priorities and a plan for monitoring progress.

Such an agreement would evolve gradually over time and would entail a combination of top-down and bottom-up policies. Finland, Ireland, and the Republic of Korea are the best-known, best-practice examples—of countries that have engineered successful transitions to knowledge-based economies. In all these cases, national economic crises compelled diverse actors to define and implement a new agenda through explicit or implicit national agreements on goals and mechanisms to move forward. The crises also prompted policymakers and private sector leaders to lengthen the time horizon of the policies adopted. Thus, Nokia—Finland’s first mover toward an innovation-based economy—dramatically increased R&D investments. Finland responded by increasing public R&D and transforming the innovation system to fit business needs. Members of parliament took courses and went on study tours to demonstrate the need for the new agenda. National public innovation organizations played a crucial role by transforming technology into businesses and ensuring a critical mass of demonstration cases.

Ireland also exemplifies a successful attempt to pursue both top-down and bottom-up policies. It invested in education and R&D infrastructure in the 1980s and implemented drastic policy changes beginning in 1987. To complement its top-down policies, Ireland instituted pragmatic bottom-up programs—regional partnerships to mitigate high unemployment and a program to expand national-supplier linkages from foreign direct investment (FDI). The Republic of Korea’s powerful and shared national vision was followed by effective government coordination (see Box 1). A private sector champion provided the crucial impetus for change.
In 1998, in the wake of a financial crisis, the Republic of Korea officially launched a national strategy to become a knowledge-based economy. The initial impetus came from the private sector—the Maeil Business Newspaper—which concluded in 1996, even before the crisis, that there was an urgent need for a more coherent vision of the future of the Korean economy. This newspaper launched the “Vision Korea Project” as a national campaign in February of 1997, and it developed the first Vision Korea Report.

Eventually, the government—the Ministry of Finance and Economy—became the main champion of the policy agenda for the knowledge economy. The Korean Development Institute, a so-called system integrator, coordinated the work of a dozen think tanks. A joint report by the World Bank and the Organization for Economic Cooperation and Development (OECD) outlined concrete steps for reforms in the various policy domains. Progress was monitored closely. As a result, inertia or resistance was identified and addressed. Korea’s knowledge strategy of April 2000 evolved into a three-year action plan for five main areas: information infrastructure, human resources, knowledge-based industry, science and technology, and elimination of the digital divide. To implement the action plan, Korea established five working groups involving nineteen ministries and seventeen research institutes, with the Ministry of Finance and Economy coordinating the implementation.

Source: The authors.

Three lessons are relevant for Mexico. First, simple institutional recipes applicable to all countries do not exist. Mexico will need to devise its own recipe for a knowledge economy. Because of Mexico’s great regional diversity, regional and state-level policy initiatives would be a key entry point for a knowledge-based economy. Mexico has already advanced quite significantly in that direction. Subnational initiatives (such as the Monterrey Knowledge Technopolis) are important springboards for more systemic reform agendas.

Second, even when crises call for urgent economic transitions, countries must “prepare the bases.” The experiences of Korea and Finland teach this valuable lesson. The essential preparatory stage can be seen in the initial Vision Korea Report. It also is seen in Finland’s major effort to facilitate and accelerate business R&D.

Third, although major reform efforts from the top are vital, they may not provide the all-important impetus for transformation. Concerted effort must evolve. Bottom-up experiments in Mexico, which are already well under way, must mature. These transitional stages then proceed to concerted efforts. (Korea’s knowledge strategy is one example.) Drawing on a diversity of best practices, we suggest that Mexico construct a Knowledge Economy Pact in three stages: the immediate agenda, medium-term agenda, and long-term agenda.

The art and craft of policymaking are about sequencing the various horizons of a policy agenda in a virtuous circle of growth and reforms (see Figure 5).
**Immediate Agenda**

Building awareness of the need for innovation; developing a system to monitor progress, and implementing new pilot projects are the main tenets of the immediate agenda. Mexico is already engaged in significant new initiatives on innovation, education, and ICT. Because of the sheer diversity of new programs, priority should be given to monitoring and evaluation. Evaluation should be viewed as a valuable management tool to help improve performance, not a way to assign blame for failures and problems. Such forward-looking evaluations are crucial to proceed to the next stage of consolidation when diverse pilot projects are aggregated at the regional and sectoral levels.

Bottom-up initiatives must be complemented with top-down efforts. A massive campaign should be launched to raise awareness of the urgent need for reforms and the high pay-offs that can follow. The government can champion a search for pragmatic, step-by-step reform strategies and ways to monitor progress and set priorities. Global strategic consultancies could be contracted to lend additional credibility to these efforts. They can help adapt global best practices to Mexican reality.

**Medium-term Agenda**

The agenda at this stage focuses first on pragmatic actions not requiring parliamentary approval that can yield results in the medium term. Mexico’s Competitiveness Agenda elaborated by the government is comprehensive and well thought out. It addresses the
knowledge economy from this medium-term perspective. Particularly in the areas of education and innovation, government programs that have received positive evaluation yet have remained relatively small could be scaled up and consolidated. In collaboration with federal ministries and state governments, CONACYT has established a diversity of sectoral and regional funds. These funds could be consolidated with clearly specified priorities and operating procedures. Interorganizational and private-public projects are to be particularly encouraged. A good example in this context is Tekes, the National Innovation Agency of Finland. It funds industrial projects, as well as projects in research institutes, and especially promotes innovative, risk-intensive projects.

In education, promising programs include Escuelas de Calidad, Consejo Nacional de Fomento Educativo (CONAFE). Income-contingent loans can facilitate private financing of higher education and life-long learning initiatives. The government also should bring key stakeholders together to design the architecture of an integrated national system of life-long learning. Issues to be addressed include the following: accreditation of multiple providers, certification of prior learning, vocational qualifications, vocational counseling and information on career paths and earning streams, quality of different public and private providers, and financing mechanisms.

The successful transitions in Ireland, the Republic of Korea, and Finland (see Chapter 3) indicate that actions designed to yield immediate results should be complemented by longer term efforts. These actions prepare the bases for a major concerted effort—an effort that articulates a shared vision of Mexico as a knowledge-based economy, an effort that has a visible and tangible demonstration effect by consolidating existing initiatives. “Preparing the bases” recalls the Japanese proverb: “A vision without an action is a dream. An action without a vision is a nightmare.”

Collaborating with private sector champions and civil society, the federal government can begin to formulate a compelling yet realistic vision of Mexico as a knowledge-based economy. Its objective is to shift gears from business as usual to a more urgent concerted action. Building awareness would create a vivid image of what is at stake for every Mexican—the poor, the middle-class, and members of national industrial groups and multinational corporations. The experience of Korea (which has a centralized economy) exemplifies how a shared vision can emerge from outside the government as the result of by private sector champions and the media (see Box 6.1)

Piloting a national knowledge agenda at the state level is important. National private-public collective projects can serve as springboards for Mexico as a knowledge economy. For instance, a private-public bridge organization, Foundation Mexico, could scan new opportunities and put them into practice. One model for such an organization is Fundación Chile (Box 6.2). For Monterrey’s leading industrial groups, a vibrant and commercially successful Foundation Mexico could become a flagship organization of knowledge economy, just as the Monterrey Institute of Technology, created in 1943 by Monterrey’s industrialists, was at that time a symbol of Mexico’s industrialization.
Box 2. The Fundación Chile Model and its Relevance for Mexico

One of the most successful attempts in the Latin American region to establish national “antennae” for new technologies is Fundación Chile, originally a joint effort between the Chilean government and the U.S. firm ITT, but now largely autonomous. Fundación Chile uses four main techniques in its technology transfer and dissemination work: (i) it captures and disseminates technologies to multiple users though seminars, specialized magazines, and project assistance; (ii) it develops, adapts, and sells technologies to clients in the productive and public sectors, both in the country and abroad; (3) it fosters institutional innovations and incorporates new transfer mechanisms; and (iv) it creates innovative enterprises, almost always in association with companies or individuals.

The creation of demonstration companies by Fundación Chile has had a mixed record with some successes and some failures, but overall the companies have been effective in disseminating new technologies. The companies are transferred to the private sector once the technologies have been tested in practice, and their economic profitability has been established. One of the most successful cases exemplifies the successful development of a knowledge cluster. The salmon industry, in a period of ten years, grew to become a dynamic export sector.

In the Mexican context, one can think about “Fundacion Monterrey” as part of the Monterrey Knowledge Technopolis championed by the state government and private sector leaders. For Monterrey’s leading industrial groups, a vibrant Fundacion Monterrey could become a flagship organization for a knowledge economy, much as Monterrey Institute of Technology, created in 1943 by Monterrey industrialists, was at that time a symbol of Mexico’s industrialization.

Source: World Bank staff

The central objective of the “preparing the bases” stage is to package isolated efforts to achieve a tangible and visible demonstration effect. At the state level, a knowledge-based competitiveness initiative can be seen as a package of four components:

- Enterprise upgrading; facilitation of clusters and value chains;
- Human capital upgrading, with an emphasis on vocational training, higher education, and life-long learning;
- An investment climate characterized by deregulation and lower administrative barriers;
- Infrastructure investment to reduce logistical costs

Monterrey Knowledge Technopolis is an initiative championed by the state government and private sector leaders to transform Monterrey into a knowledge-based economy. The Monterrey Knowledge Technopolis already meets three important prerequisites as a crucial pilot of the knowledge economy agenda: highly promising institutional experiments in many areas; a sense of urgency for change, and private sector and public sector leadership. The current focus of the Monterrey Knowledge Technopolis is on infrastructure; there are plans, for instance, to create technology parks for companies. While infrastructure is important, so is building an environment for knowledge-based entrepreneurship by improving in the quality and private sector orientation of education systems and facilitating innovation networks between Mexico and the United States. Cross-border ties can be strengthened through research,
technology, and education consortia. Promotion of Diaspora networks can encourage successful Mexicans living abroad to invest and/or set up shop at home.

**Long-term Agenda**

Economy-wide changes at this stage lead to a national accord on the knowledge economy. As we discussed earlier, Mexico requires major reforms in education, innovation, ICT infrastructure, energy, labor, and the financial markets. The reforms will need to create an even playing field to ensure efficient entry and exit of diverse service providers. Strong regulations are needed to maintain service and guarantee conformity with minimum standards. The agenda includes curbing the power of the teachers’ unions; creating greater incentives to reward educational quality; improving standards on certification, accreditation, testing, and evaluation, as well as recognizing students’ prior learning. ICT infrastructure reforms would create a more open marketplace and develop incentives for new entrants, reducing the dominance of Telmex. Labor market reforms would ease employment protection provisions, establish revenue support systems in the case of job loss, and modernize the collective bargaining framework.

Implementation of this agenda requires a major concerted effort. The challenge here is to proceed with major reforms and create a new governance structure for private-public collaboration. A knowledge economy accord (*Pacto*) can be seen as a postcorporatist agreement facilitating cooperation between the national government, the private sector, and subnational entities.

7. **Regional Leadership in the Transition to a Knowledge Economy**

To capture diverse regional agendas for the transition to a knowledge-based economy, we performed a modified knowledge assessment and constructed a knowledge economy index for each state. According to this index (which is closely correlated to the state’s GNP), we divided Mexican states into four groups (see Figure 6):

- **“Fragile leaders”**: the most advanced states in central and northern Mexico, many of which are losing their competitiveness.
- **“Emerging leaders”**: central states with less-developed knowledge infrastructures than the fragile leaders but nonetheless advancing rapidly.
- **“Dormant potential” states**: below average states but higher than the lagging states.
- **Lagging states**: southern states that are the worst three performers.

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5 The knowledge assessment methodology and a construction of an aggregate index follow the national methodology of four pillar framework. It is based on 30 variables such as adult literacy and secondary enrollment for education pillar; patents for 1,000 people for innovation pillar, telephones lines per 1,000 people for ICT pillar. Yet it differs from it in two features. We omitted the incentive regime pillar mainly because we lacked relevant data. We added the economic performance pillar which includes such variables as GDP, FDI per capita, human development index, manufacturing productivity and number of businesses per 1,000 people. As in national knowledge assessment methodology, variables are not weighted. Annex 6 provides more detailed description of the variables.
Source: Staff calculations. Most recent year refers to 2001. Note: The distance from the 45-degree line indicates the improvement (above the line) or deterioration (below the line) of the selected Mexican states between 1995 and 2001. The more advanced regions are concentrated toward the northeast quadrant of the graph.
Table 2 presents the regional policy agendas for each type of state. All four agendas have in common the need to marshal existing knowledge assets (such as universities and research centers) to develop technology and technical assistance for addressing local needs and opportunities.

**Table 2: Transition to Knowledge-based Economy: Four Types of States in Mexico and Policy Agendas**

<table>
<thead>
<tr>
<th>Type of state</th>
<th>Source of growth</th>
<th>Promising institutions</th>
<th>Major issue or threat</th>
<th>Policy recommendations</th>
<th>Entry points a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragile leaders (northern states)</td>
<td>National big business concentrated in mature industries: <em>maquilas</em> industry and multinationals.</td>
<td>Monterrey as an industrial hub of Mexico&lt;br&gt;Monterrey Institute of Technology as a model of private sector-driven higher education and lifelong learning</td>
<td>A threat from low-cost countries: exodus of footloose businesses</td>
<td>Two-prong strategy: To take advantage of geography (proximity to the United States and Canada) improve infrastructure and decrease logistics costs; Increase the knowledge content of exports by developing effective educational, innovation and enterprise upgrading institutions</td>
<td>Develop Monterrey as a knowledge technopolis &lt;br&gt;Supplier development program with big national business and multinationals</td>
</tr>
<tr>
<td>Emerging leaders: (central-north: Querétaro, Jalisco, etc.)</td>
<td>Major multinationals and their value chains Emerging knowledge and service-intensive clusters</td>
<td>Guadalajara as an education, culture and manufacturing center of Mexico&lt;br&gt;Technology development centers of General Motors in Toluca, IBM in Guadalajara, GE in Querétaro and Motorola in Puebla</td>
<td>Exhaustion of cost-based FDI: transition to cluster-based growth</td>
<td>Make a major stride in coverage and quality of higher education&lt;br&gt;Accelerate cluster processes by enhancing academia-industry linkages and efficient ‘bridge’ organizations</td>
<td>Deepening and strengthening of knowledge-based clusters</td>
</tr>
<tr>
<td>Dormant Potential (states of Zacatecas, Michoacán, Hidalgo, Campeche)</td>
<td>Natural resources (in particular mineral wealth)</td>
<td>“Transformando Campeche” as a private-public effort to move up value chains and bring knowledge-intensive business</td>
<td>Volatility and (in states such as Zacatecas) decline associated with the reliance on mineral resources&lt;br&gt;Little pressure to grow and reform reasonably educated labor migrates to the United States.</td>
<td>Diversify the economy and increase value added of natural resources by improving investment climate&lt;br&gt;and engaging in investment promotion and linkage promotion initiatives</td>
<td>Develop infrastructure for a retirement community (health services and leisure industry)&lt;br&gt;Utilize remittances for community infrastructure and micro-enterprise development</td>
</tr>
<tr>
<td>Lagging states (Southern States)</td>
<td>Tourism Isolated industry enclaves</td>
<td>Tourism development&lt;br&gt;Fondo Chiapas as a controversial but promising attempt of concerted action</td>
<td>Increasingly disintegrating from the rest of Mexico</td>
<td>Four-prong strategy: Strengthen the rule of law and increase credibility of a public sector; Strengthen local public institutions through training and twinning arrangements; Improve quality of basic education and reduce <em>rezago educativo</em>; Accelerate local pockets of vitality through careful private sector-driven interventions.</td>
<td>Develop viable local suppliers for public sector and large private firms; eco-tourism based on cultural heritage and natural beauty endowments; Exploit the potential of counter cyclical tropical agriculture</td>
</tr>
</tbody>
</table>
Fragile Leaders
Growth during the past ten years has come from firms taking advantage of NAFTA, using Mexico as an export base to sell to the North American market. However, Mexico has been losing its preferential trade status vis-à-vis other low labor-cost countries. As a result, many of the firms, particularly in the electronics and garment sectors, have been emigrating to countries with lower costs. Fragile leaders (mostly northern states and Distrito Federal) face the challenge of reinventing themselves in the context of growing global competition. They have the most advanced knowledge endowments of any states in Mexico, but some of them are losing their competitive edge. Border states have grown on the basis of low labor costs and proximity to the United States. As the result of growth, they face congestion and higher wages. The exodus of maquilas to China signifies erosion of traditional competitive advantages and calls for a two-prong approach:

- take advantage of geography (proximity to the United States and Canada) by improving infrastructure and decreasing logistics costs;
- increase the knowledge content of exports by developing effective educational, innovation, and enterprise upgrading institutions.

Emerging Leaders
The states categorized as emerging leaders fall into two categories. The states in the first category, such as Jalisco, Guanajuato, Puebla and Queretaro are located in the center and center-north of Mexico. They are characterized by high education and knowledge endowment, yet they face a lower level of industrial and urban congestion than do the northern states. The emerging leaders signal Mexico’s future, as exemplified by the technology development centers of major multinational corporations: General Motors in Toluca, IBM in Guadalajara, GE in Queretaro, and Motorola in Puebla. To take advantage of the presence of these MNCs, the government should put at the forefront of the policy agenda the facilitation of innovation clusters. This implies major advances in the coverage and quality of higher education, and the enhancement of academia-industry linkages and efficient bridging organizations.

Second category is the states such as Quintana Roo, Yucatan and Morelos which have both relatively high educational level and significant natural endowments. Those states were able to capitalise on its endowments by attracting investments into service sector (tourism), agricultural processing and maquila investments.

“Dormant Potential” States
States with dormant potential are the most enigmatic and challenging. The challenge for them is to unlock a virtuous cycle of growth similar to that of Aguas Calientes.

“Dormant potential” states depend almost exclusively on low-value added natural resources. The resources can be abundant, and the states relatively prosperous (such as Tabasco, Campeche, and Veracruz), or in decline (such as mining in Zacatecas). As a consequence of their relative decline, Zacatecas and Michoacan are characterized by very
high labor migration to the United States and very high per capita remittances. Diversification of local economies to move to higher value-added exploitation of natural resources, services, and manufacturing is a main policy objective in those states.

**Lagging States**
Analysis of knowledge endowments shows three southern states (Oaxaca, Guerrero, and Chiapas) to clearly be lagging states. The states face the most basic agenda of building robust institutions. To that end the following four-pronged strategy is recommended:

- Strengthen the rule of law and increase the credibility of the public sector;
- Strengthen local public institutions through training and twinning arrangements;
- Improve the quality of basic education and reduce the “rezago educativo” (educational gap);
- Accelerate local pockets of vitality through careful private sector—driven interventions.

In these states, the issue of leadership, both private and public, looms as the most significant challenge.

**The Challenge Today**
Building on a diversity of innovative local initiatives, Mexico should institute a robust federal mechanism to facilitate, monitor, and scale up those initiatives. The challenge of new governance structures is not unique to Mexico. OECD economies such as Ireland, Finland, or Korea (and emerging economies such as China) are exemplars of so-called pragmatic agendas that put governance innovations at the center of policymaking. One pillar of the new pragmatism is to create a favorable climate for institutional innovation. The creation of evaluation and monitoring tools also is essential. These capabilities will help the government detect early on which programs are succeeding and which are failing. It then can begin to scale up successes as appropriate.

The transition to a system of new capabilities and institutions, consistent with the knowledge-driven NAFTA, is an open-ended process. It involves diverse institutional innovations designed to generate credible commitments among stakeholders. It would be impossible to describe every detail of the second-generation NAFTA architecture. An exciting if pragmatic agenda lies ahead for Mexico.

Such an agenda can only be developed by Mexico itself. This Executive Summary informs the evolving debate by calling attention to the high stakes for Mexico, the major issues needing resolution, and the progress already made. The challenge now is to transform the many promising initiatives into a critical mass of changes that will trigger Mexico’s rapid transition to a knowledge-based economy.