Innovation in Mexico: Obstacles and Opportunities

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Introduction

Mexico is currently ranked 79th by the Global Innovation Index, and is ranked 9th out of 20 in Latin America and the Caribbean. Considering the number of developing countries in this group, and the fact that Mexico is tied both geographically and economically to the United States (ranked 7th on the same index), this ranking[1] illustrates the imperative for a deeper examination of the Mexico's national policy for innovation.

While there are numerous ways to promote innovation within a country, based on a background study examining Mexico's socioeconomic characteristics, the following areas will be explored: Research and Education, Intellectual Property, Security, and Energy. These topic overviews and corresponding recommendations are meant as the beginning stages for the development of research and discussions relevant to such public policy.

Research and Education

The development of public policy that fosters a national environment ripe for the creation of new ideas and rich with human capital is a key requisite for a nation to be innovative. In 2002, the Mexican Congress began to push Mexico in the right direction by approving the Science and Technology (S&T) Act, which gave CONACYT, Mexico's science and technology council, the responsibility for coordinating the S&T activities and budgets of all federal agencies. Additionally, CONACYT was moved from under the auspices of the Ministry of Education and

[1] Similar rankings include the World Economic Forum's Global Competitiveness Index (2012-2013), which ranked Mexico 53rd, while the United States was ranked 7th. One bright spot, however is that Mexico is climbing in this index, as in 2011-2012 the country was ranked 58th. For the full GCI 2012-2013 report, visit: http://reports.weforum.org/global-competitiveness-report-2012-2013/

now reports directly to the president. In addition, the law specified committing 1% of GDP to S&T by the end of the administration in 2006.

However, as of 2009, this commitment has not been reached, with a figure of only .44% for Mexico's Gross domestic expenditure on research and development (GERD).[2] In 2005, middle-income OECD had an average GERD of .94%. Compare this to the figure of high income countries: 2.32%. It should also be noted that Mexico's .44% GERD amount is primarily coming from government funding, where, in fact, the share of business sector contributions actually decreased from 44.6% in 2007 to 38.7% in 2009.

CONACYT's new coordinating role was further impeded by the Secretaria de Hacienda, the federal agency in charge of the budget, who often delayed or outright declined outlays for S&T industry projects. This lack of willingness to cooperate was the result of the Hacienda officials placing a greater priority on health and education initiatives, while failing to see the importance of investment in projects that could foster innovation. Furthermore, the Hacienda had in place a procedural system for allocating and distributing funds that could not be easily applied to research, S&T, and other innovation projects.

Mexico places a high priority on public spending for education, amounting to 5.9% of GDP per capita, above the OECD average of 5.6%. However, such large investments do not seem to be paying off, as only slightly more than 8% of the population aged 18 and older holds a bachelor's degree. Likewise, Mexico graduates 3 PH.Ds per million inhabitants per year, compared to 6 in Brazil, and 19 in South Korea. According to the Global Competitiveness Index, math and science education, the area most critical to supporting high tech industries, is ranked lowest of all the education indicators at 126th.

This results in Mexico having one of the lowest concentration of researchers (6 per 10,000 inhabitants) of all OECD countries, puting Mexico closest to India (4.8 researchers per 10,000

[2]OECD Science, Technology and Industry Outlook, 2012 pp. 344-347, http://www.oecd.org/mexico/sti-outlook-2012-mexico.pdf

inhabitants), and well below countries such as Korea and Poland.[3] In 2003, Mexico published 5,783 research papers placing them 21st among OECD countries and second in Latin America, after Brazil.[4]

Recommendations

Follow through with commitment mandated in the 2002 S&T Act to put 1% of GDP towards R&D. Promote direct cooperation between CONACYT and the Secretaria de Hacienda to support appropriate budgeting of R&D, as well as funding for S&T educational programs.

Pass legislation for licensing of publicly funded research to commercial entities. Similar to the United State's Bayh-Dole Act, such a law would apply technology-transfer rules that would encourage new commercial industries and foster better collaboration between public research institutions and the commercial sector. This could potentially lead to greater R&D funding from private industry, as well as offer more opportunity for integrated knowledge between universities and commercial enterprises.

Encourage more integrated collaboration between CONACYT, private industry, and commercial associations through partnerships, expositions, and conferences. Some useful models include: the World Innovation Forum, TEDx conferences, and the Creative Problem Solving Institute.

Intellectual Property Regime

Intellectual property (IP), the innovation-oriented activities that require research and development, along with the necessary laws to protect such endeavors, has become a key factor in the economic development and expansion of a nation. In order to ensure development of regulations and protection of IP rights are most effective for a country, such enforcement must be

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[3] Science & Technology in Mexico, EU International Scientifice Co-operation Policies, http://ec.europa.eu/research/iscp/countries/mexico/mx-doc2.pdf

[4] Doctoral Educaiton in Mexico; Alcantara, Malo & Fortes; http://www.riseu.unam.mx/documentos/acervo_documental/txtid0034.pdf

harmonious with its industrial and technological capacities. In the case of Mexico, while its IP regime is strong, it is not appropriate for the country in its current state of economic development.

While Mexico has taken many steps in line with the recommendations and requirements of NAFTA and the WTO-TRIPS agreement, the Mexican IP regime as it currently stands is not fostering innovation. Since the new IP system was introduced, the absolute number of patent applications made by Mexican residents has increased only 4%, from 564 patents in 1991 to 584 in 2005. Compare this to the fact that the number of patent applications submitted by non-residents had tripled over the same period, it is clear that current IP law places Mexican innovators at a significant disadvantage to their non-native counterparts. Furthermore, net licensing and royalty payments to foreigners increased 109% from 1991 to 2004.[5]

One of the key problems is that the current IP regime is devised to offer protections to rights-holders and patent-holders that go far beyond NAFTA and TRIPS, stymying opportunities for Mexico's developing industries. While Mexico has not taken the steps necessary to develop a scientific and technological base through GDP investment in R&D, as discussed above, the country has introduced a patent system that most resembles that of a high-income OECD country. In other words, Mexico's IP law has been designed as though the country is capable of developing and absorbing innovations rapidly and efficiently, when such dynamics require a well-funded and advanced scientific, technological, and industrial ecosystem. While Mexico's economic potential continues to expand, at present it does not possess the infrastructure to benefit from such restrictive IP law.

Case in point, the pharmaceutical company Abbot prices its patented second-line treatment for HIV/AIDS more than five times higher in Mexico than in Brazil.[6] Such a significant difference

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[5] Shadlen, K. C. (2009). Intellectual property for development in Mexico. *The Future of North American Trade Policy: Lessons from NAFTA*, 53–59. http://www.ase.tufts.edu/gdae/Pubs/rp/PardeeNAFTACh5ShadlenIPNov09.pdf

[6] Shadlen, K. C. (2009). The politics of patents and drugs in Brazil and Mexico: the industrial bases of health policies. *Comparative politics*, *42*(1), 41–58. http://www.ase.tufts.edu/gdae/Pubs/rp/ShadlenPoliticsOfPatentsOct09.pdf

can be traced back to Mexico's overreaching patent laws that make issuing compulsory licenses (CLs) of patented drugs increasingly difficult. By passing such legislation, the Mexican government has severely decreased its ability to leverage price reductions from patent-holding firms. Furthermore, the broad scope of patents, which has a limited definition of "novelty" and "inventiveness," prevents the sharing of inventions for the social good.

And unlike technologically-proficient developing countries such as Brazil and India, where local industrial actors pushed hard for innovation policy reform, Mexico's key industrial-sector associations have dedicated minimal attention to such things as IP policy and S&T infrastructure development. The Association of Directors for Applied Research and Technological Development (ADIAT), a private-sector association that represents R&D based firms in Mexico is considered a surprisingly small and marginal actor in the political economy. Without strong support from the private sector, Mexico will continue to develop IP law based on external forces that may not have the nation's interests as top priority.[7]

Recommendations

Reform the IP regime to a level that is appropriate for Mexico's developing industries. This can be accomplished by lessening restrictions in such areas as compulsory licensing and pipeline patents. Based on Kenneth Shadlen's analysis, Mexico could imitate Brazil in terms of patent laws without violating both NAFTA and TRIPS-Plus requirements[8].

Encourage private-sector associations, such as ADIAT, to become more involved in policy development. Create formal relationships between such associations, CONACYT, and the Mexican IP office to foster serious, internal debate to determine what is best for Mexico's industries and innovation policy.

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[7] Illustrative of this is the fact that the Mexican IP office signed the highly controversial Anti-Counterfeiting Trade Agreement (ACTA) despite the Mexican Congress being adamantly against it. Many critics believe that President Calderon agreed to sign it as a precondition for joining the Trans-Pacific Partnership (TPP), a multi-national trade agreement that includes far-reaching shifts in international IP law.

[8] Shadlen, K. C. (2009). The politics of patents and drugs in Brazil and Mexico: the industrial bases of health policies. *Comparative politics*, *42*(1), 41–58. http://www.ase.tufts.edu/gdae/Pubs/rp/ShadlenPoliticsOfPatentsOct09.pdf

Security

Security for Mexican's citizens and institutions is critical for the nation's economic and social prosperity, and has been a huge burden on the nation's opportunities for growth. Since the beginning of President Calderón's war on Mexico's drug trafficking organizations (DTOs) has involved over 50,000 troops and 5,000 federal police. The cost to the Mexican government was over US $7 billion during one 18 month campaign alone. Between 2007-2010, the US government pledged over $1.4 billion to address security threats from DTOs and other forms of organized crime in Mexico and Central America. As a result of the Mérida Initiative, an agreement between the United States, Mexico, and other Central American countries, the United States has provided specialized equipment and technical assistance to the Mexican government in reducing the supply of illegal drugs and DTO operations.

While huge investments have been made on both sides of the border, the number of drug-related deaths in Mexico has doubled since 2008, totaling over 50,000 people since the beginning of the Mexican war on drugs.[9] The direct cost of insecurity to the government, businesses, and citizens has been estimated at US$6 billion, or 8% of GDP.[10] This amount represents 75% of the total income and sales taxes collected by the Mexican government, and 3.5 times the amount of foreign direct investments.

Given the dire situation, the private security market is approximately 1% of GDP, or US$8 billion. Within Mexico, there are over 10,000 private security firms, but only 10% of these firms are professionalized and invest in training, infrastructure, technology, and analysis. This equates to a workforce of over 500,000, nearly 85% of public security minus the military.

Furthermore, non-security based companies, such as the search engine giant Google, are investing resources in helping fight drug cartels. In July 2012, the company hosted the "Illicit

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[9] Mexican drug war: Waves of violence | The Economist. (n.d.). Retrieved December 14, 2012, from http://www.economist.com/blogs/graphicdetail/2012/11/mexican-drug-war

[10] Drug Trafficking, Violence and Mexico's Economic Future - Knowledge@Wharton. (n.d.). Retrieved December 14, 2012, from http://knowledge.wharton.upenn.edu/article.cfm?articleid=2695

Networks: Forces in Opposition" summit, inviting Mexican government officials, academics, and security professionals to discuss how technology can be used to fight DTOs. One example of utilizing such tools involves tracking the movements and activities of cartels and gangs using Google's News aggregator, which can then mapped to specific sites using Google maps.[11]

Recommendations

Offer tax incentives to security and defense companies to encourage factories and R&D facilities within Mexico. Opportunities to research, develop, and test advanced security products and techniques while creating more stability within the nation can help both private and public sectors achieve their respective aims.

Develop greater partnerships between public and private security organizations through professional associations and training sessions. These will allow for a deeper exchange of knowledge and allow private security firms to be more actively involved and aware of national security issues. A useful model is the British Security Industry Association, which, among other things, analyses how public and private security sectors can work together and share resources.

Convene a national security summit that would include panels, discussions, and workshops involving government officials, law enforcement, military personnel, private security companies, and technology and big data firms, from throughout Mexico and abroad.

Energy

While Mexico is considered a major non-OPEC oil producer and has historically been among the largest sources of US oil imports, the nation's oil production has declined in recent years. Now Mexico is a net importer of natural gas, mostly via a US pipeline, as demand for such fuel for power production has increased. In 2010, Mexico's energy consumption was primarily from oil

[11] Harvard Student Tracks Mexican Drug Gangs Thru Google | Drug War 101. (n.d.). Retrieved December 14, 2012, from http://www.drugwar101.com/blog/archives/3052

(56%) and natural gas (29%), followed by hydroelectricity (~14%), and finally non-hydro renewables (~4%).

The most significant source of non-hydro renewables is geothermal, as Mexico's natural geography makes it a prime region for the development of such resources. As of February 1, 2012, 3% of electricity output came from geothermal means, making Mexico the fourth largest geothermal energy producer worldwide after the USA, the Philippines and Indonesia.[12] In terms of tapping this energy source, Mexico has an estimated geothermal electricity potential of at least 8,000 MWe, second in the world only to Indonesia.[13] While the development costs for a direct-cycle geothermal power plant such as Los Humeros are relatively high, the capacity factor in operation results in a levelized cost of electricity in the region of $58 to $93/MWh, even when taking into account the cost of drilling the wells and building the steam collection system.[14]

One untapped geothermal resource involves the potential to utilize energy from geopressurized deposits, high-temperature, high-pressure water underneath a seabed. In the northern part of the Gulf of California is one such area the is promising – "if fully exploited could supply Mexico with 20 times its current total energy consumption."[15] Such energy projects have been successfully tested on a smaller scale in the United States and Japan, and advanced methods for extracting methane from geopressurized brine are currently being developed.

Recommendations

Prioritize the development of cross-border energy markets between Mexico and the United States. The possibilities for such cooperation have already been demonstrated; in February 2011

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[12] Salazar, M. (2012) Innovation and development in Mexico: The promising road ahead. Woodrow Wilson International Center for Scholars - Mexico Institute. http://www.wilsoncenter.org/publication/innovation-and-development-mexico-the-promising-road-ahead

[13] Energy Overview of Mexico. (n.d.). http://www.geni.org/globalenergy/library/national_energy_grid/mexico/LatinAmericanPowerGuide.shtml

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[14] Environmentally friendly roofing: Geothermal Turning Up the Heat at Los Humeros. (n.d.). http://environmentallyfriendlyroofing.blogspot.com/2011/03/geothermal-turning-up-heat-at-los.html

[15] San Diego Regional Renewable Energy Study Group, Potential for Renewable Energy in the San Diego Region, August 2005, http://www.renewablesg.org

the Federal Electricity Commission in Mexico transferred 280 MW from power plants in Nuevo Laredo, Reynosa, and Piedras Negras to Texas in an effort to offset high demand during an abnormally cold month.[16] Additional opportunities will come from the construction, operation, maintenance, and connection of a 230,000-volt transmission line across the U.S.-Mexico border, which Sempra International was given a Presidential permit to develop by the US Department of Energy in Fall 2012. When completed, the line will supply electricity from renewable energy sources, such as wind farms, to the California market.

Dedicate resources and policy creation to encouraging a renewable energy economy. Mexico has a diverse abundance of clean energy opportunities, positioning the nation to become an ecofriendly alternative to such fossil-fuel based operations as the Canadian Tar Sands and the highly controversial Keystone XL pipeline. All four of the American states bordering Mexico have renewable portfolio standards (RPS), policies designed to increase generation of electricity from renewable sources. The state of California was not able to meet its 2010 state RPS requiring 20% of its energy be from renewable resources. Now the state utilities are under increasing pressure to meet the 2020 goal of 33% green energy. The potential for supplying the United States with clean energy, and positioning Mexico as a world leader in fossil-fuel alternatives, is an opportunity that should be given serious consideration.

Conclusion

It is important to keep in mind that it has only been 12 years since Mexico transitioned to a democracy, and there is much to overcome in terms of outmoded cultural and structural barriers to innovation and global competitiveness. However, the nation also possesses a number of unique opportunities to accelerate development to foster innovation. More deeply exploring the four themes outlined above, along with their policy recommendations, will be critical for the success of Mexico in the 21st century.

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[16] Salazar, M. (2012) Innovation and development in Mexico: The promising road ahead. Woodrow Wilson International Center for Scholars - Mexico Institute.
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