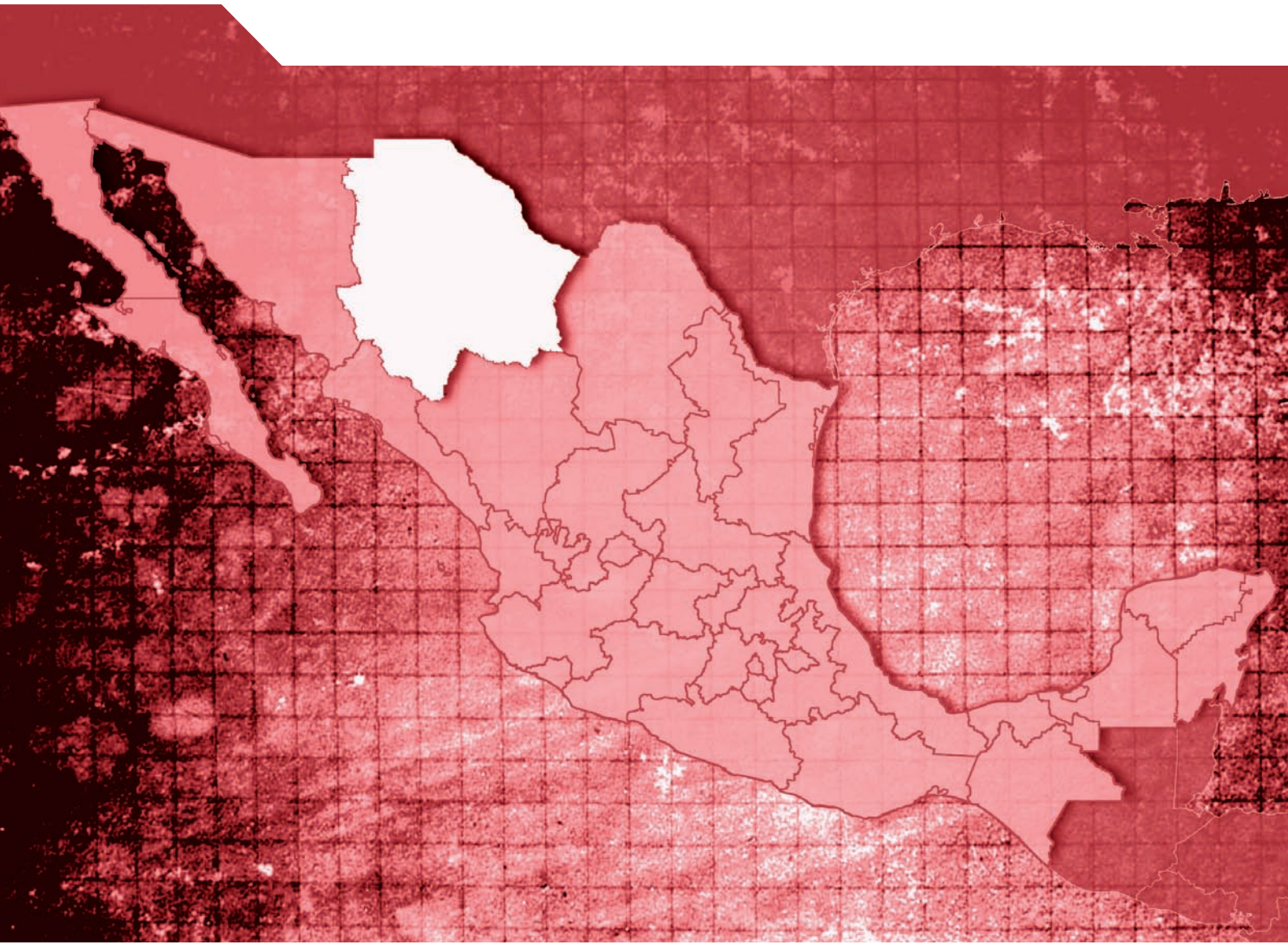
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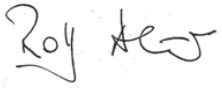
Foreword

In a world marked by economic slowdown, ageing, migration, climate change and increasing inequality, policy makers are looking for new development paths. International debate since the crisis has called traditional economic models into question and the search is on for new approaches that can better reconcile economic growth with other social and environmental objectives. This crucial debate is focusing attention on the role that regions play in national economies, both as sources of underexploited potential and as the places where different policies can be most effectively integrated. Indeed, policy trade-offs are best addressed at the regional level, where it is often possible to identify the ways in which economic, social and environmental policies can be mutually reinforcing, rather than antagonistic, thereby optimising use of scarce public funds.

The search for a new, more sustainable path to economic recovery is a global challenge, but also very much a regional concern. The State of Chihuahua is at a crossroads. After a period of remarkable success in attracting foreign direct investment and advancing up the technological ladder, it has been losing growth impetus for a number of years. As in many other regions, the crisis has exacerbated weaknesses that were already present. Now, with limited resources and pressing economic and social challenges, the state has to develop a new vision for its future. This review aims to support the government in its efforts to find new paths for development and to reduce inequality, while at the same time providing ideas for other regions in Mexico and elsewhere that are facing similar challenges.

The recommendations that the OECD makes in this review are relevant for other regions that have been successful at benefiting from an outward-oriented development model, but that now need to strike a better balance with more endogenous sources of growth. The review's recommendations can be grouped in three broad categories. First, to strengthen inter-relationships among economic agents that can be, for instance, generated by policies to create innovation networks. Second, to further seek the integration of policies that can generate complementarities between economic, social and environmental objectives, such as the link that needs to be established between policies for FDI and for local-firm development. Third, to foster the inclusion of other actors in policymaking and the inclusion of vulnerable groups in society.

We at the OECD hope that the analysis and recommendations presented in this Review will help policy makers in Chihuahua and elsewhere to devise and implement policies that can make their economies stronger, cleaner and fairer. The challenges are enormous, but so is the potential.



Rolf Alter,
Director of Public Governance and Territorial Development

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The *OECD Territorial Review of Chihuahua* belongs to a series of *OECD Territorial Reviews* produced by the OECD's Regional Development Policy Division (RDP), directed by Mr. Joaquim Oliveira Martins within the Organisation's Directorate for Public Governance and Territorial Development.

This *Review* was co-ordinated and drafted by Javier Sánchez-Reaza, under the supervision of Ms. Lamia Kamal-Chaoui, Head of the Urban Development Programme (RDP), with contributions from Aziza Akhmouch, José-Luis Álvarez-Galván, Michael Donovan, Jacobo García-Villarreal, Karen Maguire, Ernesto López-Córdova (IDB), Carlo Pietrobelli (IDB), Joan Prats (IDB) and Raffaele Trapasso. Vicente Ruiz, Daniel Sánchez-Serra and Julien Vavasseur provided very useful help with statistics. Key comments were provided by José Antonio Ardavín in the early stages of the review, and William Tompson during the drafting phase. Ms. Jeanette Duboys prepared the manuscript for publication.

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Acronyms and Abbreviations

ALA	Austrian Leadership Academy
AMAC	*Asociación de Maquiladoras, A. C.* *Maquiladora* Association NPO
AMEAC	*Asociación de Maquiladoras del Estado de Chihuahua, A. C.* The State of Chihuahua's *Maquiladora* Association NPO
ANEAS	*Asociación Nacional de Empresas de Agua y Saneamiento de México, A.C.* National Association of Water and Sanitation Companies NPO
BOT	Build, Operate, Transfer
CAE	*Centro de Atención a Empresas* Business Information Support Centre
CANACINTRA	*Cámara Nacional de la Industria de la Transformación* National Chamber of Manufacturing
CANACO	*Cámara Nacional de Comecio* National Chamber of Commerce
CANIRAC	*Cámara Nacional de la Industria de Restaurantes y Alimentos Condimentados* National Chamber of Restaurants and Processed Foodstuffs
CCIJ	*Consejo de Cámaras Industriales de Jalisco* Jalisco's Council of Industrial Chambers
CEDEM	*Centros de Desarrollo Empresarial* Enterprise Development Centres
CEDEP	*Centro para el Desarrollo de Proveedores* Suppliers Development Centre
CENALTEC	*Centro de Entrenamiento de Alta Tecnología* High-Tech Training Centre
CIMAV	*Centro de Investigación en Materiales Avanzados* Advanced Materials Research Centre
CMIC	*Cámara Mexicana de la Industria de la Construcción* Mexican Chamber of Construction
CODECH	*Consejo para el Desarrollo Económico del Estado de Chihuahua* Council for Economic Development of the State of Chihuahua
CODER	*Consejo para el Desarrollo Regional de Chihuahua Centro* Chihuahua Centre's Regional Development Council
COECYTECH	*Consejo Estatal de Ciencia, Tecnología e Innovación de Chihuahua* State of Chihuahua's Council for Science, Technology and Innovation

COFEMER	*Comisión Federal de Mejora Regulatoria* Federal Commission for Regulatory Reform
COMCE	*Consejo Empresarial Mexicano de Comercio Exterior, Inversión y Tecnología, A.C.* Mexican Business Council for Foreign Trade, Investment and Technology NPO
COMERJAL	*Consejo para la Mejora Regulatoria del Estado de Jalisco* Council for Regulatory Improvement of the State of Jalisco
CONACYT	*Consejo Nacional de Ciencia y Tecnología* National Council for Science and Technology
CONAGUA	*Comisión Nacional del Agua* National Water Commission
COPARMEX	*Confederación Patronal de la República Mexicana* Mexican Employers' Confederation
COTA	*Comités Técnicos de Aguas Subterráneas* Technical Groundwater Committees
COVAP	*Consejo de Vinculación Académico-Productivo* Council for Academic-Productive Linkages
CTM	*Confederación de Trabajadores de México* Confederation of Mexican Workers
DECJ	*Desarrollo Económico de Ciudad Juárez, A. C.* Juarez's Economic Development NPO
DESEC	*Desarrollo Económico del Estado de Chihuahua, A. C* Economic Development of the State of Chihuahua NPO
FAIS	*Fondo de Aportaciones para la Infraestructura Social* Fund for Federal Transfers on Social Infrastructure
FDI	Foreign Direct Investment
FIDEAPECH	*Fideicomiso Estatal para el Fomento de las Actividades en el Estado de Chihuahua* State's Trusteeship to Foster Activities in Chihuahua
FISE	*Fondo para la Infraestructura Social Estatal* Fund for State's Social Infrastructure
FISM	*Fondo para la Infraestructura Social Municipal* Municipal Infrastructure Fund
FOMIX	*Fondos Mixtos* Mixed Funds
FONADIN	*Fondo Nacional de Infraestructura* National Infrastructure Fund
GATT	General Agreement on Tariffs and Trade
GVP	Gross Value of Production
HDI	Human Development Index
HEI	Higher Education Institution
ICATECH	*Instituto de Capacitación para el Trabajo del Estado de Chihuahua* Training Institute of the State of Chihuahua
IDB	Inter-American Development Bank
IMAGEN	*Programa de Mejora de Imagen y Propiedad Industrial* Image Improvement and Industrial Property Programme

IMCO	*Instituto Mexicano para la Competitividad* Mexican Institute for Competitiveness
INADET	*Instituto de Apoyo al Desarrollo Tecnológico* Institute to Support Technological Development
IOF	*Imposto sobre Operações Financeiras* Tax on Financial Operations
ISI	Import-Substitution Industrialisation
ITCH	*Instituto Tecnológico de Chihuahua* Technological Institute of Chihuahua
ITCJ	*Instituto Tecnológico de Ciudad Juárez* Technological Institute of Juárez
ITEM	*Instituto Tecnológico y de Estudios Superiores* Technological Institue of Higher Studies
ITESM	*Instituto Tecnológico y de Estudios Superiores de Monterrey* Monterrey Institue of Technology and Higher Studies
JCAS	*Junta Central de Agua y Saneamiento* Chihuahua State Water Utilities
JMAS	*Junta Municipal de Agua y Saneamiento* Municipal Water Utilities
MaRS	Medical and Related Sciences Centre
MNE	Multi-National Enterprise
NAFTA	North American Free Trade Agreement
NPO	Non-Profit Organisation
PIADET	*Programa de Apoyo a la Investigación Aplicada y el Desarrollo Tecnológico* Applied Research and Technological Development Programme
PIIT	*Parque de Investigación e Innovación Tecnológica* Technological Research and Innovation Park
PROATEC	*Programa de Apoyo a la Innovación y Mejora Tecnológica para la Micro y Pequeña Industria* Innovation and Technological Improvement Programme for Micro and Small Manufacturers
PROCAMPO	*Programa de Apoyos Directos al Campo* Programme of Direct Funding to Rural Areas
PROFIN	*Programa de Financiamiento al Pequeño Industrial* Financing Programme for the Small-Manufacturing Enterprises
PROSOFT	*Programa para el Desarrollo de la Industria del Software y Servicios Relacionados* Software Industry and Related Services Development Programme
PSD	Private Sector Development
PYME	*Pequeña y Mediana Empresa* Small and Medium Enterprise
PYMEXPORTA	*Centros de Promoción de Exportaciones para PYMEs* SME's Export Promotion Centres
R&D	Research and Development
RDA	Regional Development Agency
REDCO	El Paso's Regional Economic Corporation

RENIECYT	*Registro Nacional de Instituciones y Empresas Científicas y Tecnológicas* National Registry of Science and Technology Institutions and Firms
RES	Regional Economic Strategies
SARE	*Sistema de Apertura Rápida de Empresas* Quick Start-Up Business System
SDUE	*Secretaría de Desarrollo Urbano y Ecología (del Gobierno del Estado de Chihuahua)* Secretariat of Urban Development and Ecology (Chihuahua State Government)
SEDESOL	*Secretaría de Desarrollo Social* Ministry of Social Development
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales Ministry of Environment and Natural Resources
SEPROE	*Secretaría de Promoción Económica - Gobierno de Jalisco* Secretariat for Economic Development (State of Jalisco)
SFS	*Secretaría de Fomento Social de Gobierno de Chihuahua* Secretariat for Social Development (State of Chihuahua)
SIAPA	*Sistema Intermunicipal de Alcantarillado y Agua Potable de Jalisco* Jalisco's Inter-Municipal Water System
SME	Small and Medium Enterprises
SNI	*Sistema Nacional de Investigadores* National System of Researchers
TL2	Territorial Level 2
TL3	Territorial Level 3
TOD	Transit-Oriented Development
UACH	*Universidad Autónoma de Chihuahua* Autonomous University of Chihuahua
UACJ	*Universidad Autónoma de Ciudad Juárez* Autonomous University of Juárez
UNIDO	United Nations Industrial Development Organisation
UTCH	*Universidad Tecnológica de Chihuahua* Technological University of Chihuahua
VUG	*Ventanilla Única de Gestión* One-stop Shop

Assessment and Recommendations

Chihuahua has been benefiting from Mexico's free trade policy and its geographic location…

Chihuahua has benefited from Mexico's trade policy change and its geographic position by thus creating a successful economic development model. Chihuahua sits right at the centre of the US-Mexico border sharing one-third of it, giving it direct access to both east and west coast markets in the US. Over the years, this intense international trade gave rise to one of the world's most dynamic border communities. This advantageous geographic location was the perfect ingredient for Chihuahua to be able to benefit from three different external stimuli. First, in a closed-economy context, the *Maquiladora* Programme enabled tax-free offshoring operations in border municipalities, which meant that Chihuahua had a key initial advantage over the rest of the country to industrialise. Second, after two decades of successful foreign direct investment (FDI) attraction to the region, Mexico opened up to trade by accessing the General Agreement on Tariffs and Trade (GATT), bringing additional impetus to the region through offshoring operations. Third, in 1994 Mexico signed the North American Free Trade Agreement (NAFTA), which expanded FDI opportunities for Chihuahua and other border states. The region was growing at average annual growth rates exceeding 9% in the 1990s and has become the largest FDI-based manufacturing employer in the country.

Free trade, geographical location and a long tradition in FDI-based manufacturing, have led over time to an economic transformation towards more technological activities in the state and the formation of some clusters with high value added. Chihuahua is increasingly moving towards medium-high to high-tech activities that imply capital-intensive processes and both semi-skilled and highly skilled labour. Part of the state's success in climbing up the technological ladder lies in geographical location; many of the companies producing bulky items (e.g. electrical appliances such as fridges or engines for automobiles) that incur high transport costs, see location as one of the key assets of the region. However, the stock of human capital accumulated over decades of FDI in these industries might also explain a large part of Chihuahua's attractiveness. Clusters in Chihuahua are key because they contribute with a higher value added than elsewhere in the country. Four of the main clusters in Chihuahua (i.e. automotive, electrical, electronic and IT) yield higher value added than other states. Value added per worker in Chihuahua was the second highest in electronics and third in IT in 2004. In the electrical and automotive industries Chihuahua is the largest employer displaying one of the highest specialisation levels in the country and among the top states in value added per worker. However, the main challenge to further develop manufacturing in the region remains in connecting local firms to global value chains, which would enable to increase value added and create channels through which technological spillovers generate innovation.

Free trade and increasing flows of FDI have led the region to build useful assets in terms of human capital and innovation which could be a second-nature advantage for the region. Chihuahua is the only state in Mexico with ten technological institutes which provide the manufacturing industry with at least 1 000 engineers every summer. Many of these professionals work directly in manufacturing plants, but some others work on design and engineering centres and some others in laboratories on telecom, environment, advanced materials and renewable energy. Such strong human capital flowing into industry is also supported by high quality education in the state. Chihuahua is third in the country's 2009 PISA results. Research and development (R&D) centres have appeared in the region since the mid 1990s and more recently design and engineering centres in global companies have set up operations in the state. High-quality professionals and innovation capacity are developing assets that the region can tap into as a second-nature competitive edge.

…but the successful economic model has also rendered the region vulnerable to external shocks…

Chihuahua's growth rates have fallen dramatically during the past decade largely due to external shocks. The first of these shocks took place due to the US recession of 2001 and 2002, which led to deep annual contractions, particularly in 2001 that led to a -3.7% growth rate. For Chihuahua, the 2001-02 recession was partly due to lower demand from the US through the *maquiladora.* In addition, job losses were due to technological progress in electronics and mergers and acquisitions in the automobile sectors that resulted in streamlining process, closure of plants and massive layoffs. Chihuahua lost 107 000 manufacturing jobs between October 2000 and June 2002. The 2008 financial crisis became the second external shock to reveal Chihuahua's vulnerability. As Chihuahua's economy is intimately linked to US demand, the largest crisis since the Great Depression was bound to hit the region. After solid annual growth rates of around 4% between 2004 and 2006, Chihuahua's annual growth rate halved in 2007. By 2008 growth stagnated yielding a -10% growth rate in 2009.

…and also brought about new challenges

An outward development model poses a number of challenges. The high influx of FDI to the state has dominated employment creation. FDI has also influenced policy objectives and strategies, as well as entrepreneurs' activities. As a result, the government has made FDI attraction a core development objective and a number of local entrepreneurs have geared their activities towards investment attraction. However, the effects on the local economy are mixed. It is unquestionable that FDI has delivered the promise of generating jobs and has also raised wages in the north of Mexico. There are also clear benefits in terms of human capital development as FDI increases demand for skilled labour. However, there are still challenges in connecting these plants to local firms, to upgrade overall stock of human capital and to get the most of knowledge and technological spillovers. In addition, FDI inflows lure migrants from rural areas, migration increases land and housing demand, as well as urban sprawl. Such self-reinforcing mechanisms can lead to environmental problems and increase the cost of providing services. In addition, while the government runs the risk of overlooking local firms' development, the number of entrepreneurs innovating is reduced as market incentives could encourage them into attracting FDI instead.

Structural challenges such as lagging productivity growth, employment rates and high young-population inactivity affected performance even before the financial crisis

Chihuahua is among the many other Mexican states that are not making the most of their assets. Productivity is the key untapped potential for the state, as it alone can dramatically change performance in the short and medium terms. Productivity has been lagging with respect to the national average, and as a result, has contributed negatively to explaining GDP per capita differences between the state and the nation. In fact, the labour input was a factor that determined negative growth rates between 2004 and 2009. A more thorough economic growth analysis in this review shows that labour productivity and technological progress are areas of opportunity to trigger and sustain growth. Another factor contributing to a lower-than-expected performance is employment rates. Chihuahua, due to the recession during 2001-03 and the recent financial crisis, has not been able to create as many jobs as it would require to boost GDP per capita levels. Like most leading states, Chihuahua has a demographic bonus. Although the size of the potential labour market and the participation rates are factors positively influencing Chihuahua's GDP per capita, Chihuahua had in 2004, the nation's seventh largest inactivity rate and the second among border-states. Although a portion of those not studying, nor working (*NiNis*) are stay-at-home parents, such high inactivity rates could signal fewer opportunities for the younger population.

Sluggish economic growth is also related to the need for more resources in infrastructure and to foster private investment under an integrated approach to regional development

Although Chihuahua's public investment has been growing fast since 2005, it is lagging behind those being made elsewhere in Mexico. The state and municipal governments have certain capacity to determine infrastructure expenditures that has not been fully exploited in order to foster growth. A large part of regional and local funds are earmarked transfers from the Federal Government but there is some self-determining capacity that may be underutilised: five out of every six Mexican pesos in public investments made in 2010 were regional or local funds. In addition, infrastructure projects have not been targeting economic activities. Connecting regions within the state through roads and motorways is a strategy that can open new markets and bring about progress to peripheral regions in the state. However, policymakers need to be aware that infrastructure provision requires an integral approach for regional development that leads to a co-ordinated policy on infrastructure, private investment, human capital development and innovation. Road and motorway building, while having a short-term positive impact, may lead to a leaking-by-linking effect, so the unintended consequence of an unco-ordinated policy could be a brain drain and a concentration of private investment in the main urban centres of the state. Therefore, the state should consider mechanisms that ensure that infrastructure, education, private investment and innovation policies are co-ordinated at the local level to ensure regional development and overall growth.

Chihuahua has experienced solid investment growth rates even during a crisis period, but assets are still heavily concentrated in a few sectors and clear opportunities emerge in primary activities. Two-thirds of assets are in two sectors: utilities (electricity, water and gas); and manufacturing. Private investment shares follow a power law, which has important implications for policymaking. If investment can spur growth, but the former is heavily biased by a few sectors, easing investment in low-share sectors is an opportunity

that can reduce overall risk in the economy by diversifying it and can boost investment levels by paying attention to opportunities. One such opportunity lies in agriculture, cattle-raising, forestry and fisheries. Although this sector had the strongest asset growth between 2003 and 2008, it also had the second lowest share of total assets with only 0.04%. Given Chihuahua's natural advantages to grow a variety of crops, particularly perennials, and for cattle-raising and forestry, the sector is but one example of where Chihuahua can focus to foster investment and growth. It is also a sector that can help bridge the gaps between urban and rural areas in terms of employment and income.

Progress has been made at improving education quality and reducing the skills mismatch, but there is room for improvement

Tertiary education skills are scarce and concentrated in a few municipalities. Educational attainment in the state is lagging, not only by OECD standards, but also in relation to the rest of Mexico. In 2008, only one in eight people in the labour force (15-64 years old) in Chihuahua had a tertiary degree. Chihuahua's education system seems to be relatively more effective than that of most Mexican states, although the average is poor. Failure to complete higher studies requires attention: for every 100 students enrolled in Chihuahua's universities, less than 13 graduate. Tertiary education skills are not only scarce in the state, but they are also extremely concentrated. In 2010, three in four graduates lived in either Chihuahua City or Juárez and nine in ten lived in only six municipalities. While skills concentration is a common process, concentration of skills in Chihuahua is higher than any other OECD country or than in Mexico.

Although the quality of education has greatly improved, high dropout rates are an endemic problem in the Chihuahua educational system. The 2009 PISA results for Mexican states show that Chihuahua has moved to third place up from tenth in 2006. However, quality of education can still be improved as scores for Chihuahua are still below the OECD average. In basic education, the state has the sixth largest drop-out rate, with 12.3% of students not concluding primary instruction compared to the average for Mexican states at 8.6%.The current administration is making a great effort to open up opportunities for students to stay longer hours in school, and for enrolment in university when they decide to do it. However, emphasis should be placed on making it possible for students at all levels to finish their degrees whilst further improving the quality. Although the benefits of multi-national enterprises' (MNEs) presence for human capital enhancement are commonly accepted, it is equally clear that their importance is significantly less than that of general (public) education. The beneficial effects of training provided by FDI can supplement, but not replace, a generic increase in skill levels.

The new government's efforts in education are paying off in terms of coverage, but there is still room for improvement by focusing on increasing terminal efficiency. Currently the focus is on access to education by building 12 new universities which is as much as the state has built in the last 40 years. The new administration has also built three technical colleges and will build five more in 2012, as well as ten new upper high schools (*Colegios de Bachilleres*). In addition, new full-time primary and secondary schools will make children stay more time in school rather than on the street. The new administration has already managed to bring secondary education coverage to 68% in 2011, up from 64% in 2009 and has increased university coverage from 29% to 38% during the same period. These will all be very beneficial actions. However, for these to have a positive impact on productivity and growth, the government should also pay attention to terminal efficiency (the proportion of students graduating).

Improving educational outcomes requires a systemic approach that touches upon most elements in the system. The key problem is not a lack of resources. Chihuahua spent 52% of the 2011 budget on education. However, inefficiencies and misallocation of spending together with weak incentives for education professionals to perform well, have curtailed performance in the past. The new administration should nevertheless, be aware of some guiding principles that could be taken into account in reforming education policy for better performance. It is advisable to focus on a limited number of measureable, ambitious and plausible educational goals and commit to achieve them. These goals should be easy to understand to the public and resonate with professional educators. Commitment should be reflected in publicly announcing goals such as:

1. *Raising educational attainment*.
   - *Raising secondary education attainment levels*. Although 28.3% of population aged 12 and older had some secondary instruction, those that had a degree stood at 19.9% of population 12 years and older in 2005. A number of measures such as introducing the Quality Schools Programme (*Programa de Escuelas de Calidad*), can be introduced. It is also likely that the Full-Time Schools Programme that the State Government started in 2011 with 200 schools will have a positive impact on raising secondary attainment levels.
   - *Raising upper secondary educational attainment levels*. Almost one-quarter of those aged 12 and older had some upper secondary schooling in Chihuahua which is higher than the 19% at national level, but well below the OECD average of 44%. However, only 10.3% of total population aged 12 or older had an upper secondary degree. In 2011, Chihuahua was the first Mexican state to offer upper-schooling opportunities to every student wishing to study. While this in itself is a great achievement, ensuring those new students finish school should be one of the main policy focuses in order to seize such a newly acquired asset and turn it into educational attainment that can have an impact on the labour market and productivity.
   - *Raising tertiary education attainment* (14.2% in 2006, lower than the national average at 14.7%, and lower than the OECD average for TL2 regions at 24.3%). This remains key if Chihuahua wishes to compete internationally.
2. *Increasing the coverage of early education* (currently at 70% of total population aged between three and five). This will not only have an impact on student performance at later stages of education, but also will increase female participation rates as women are able to engage in productive activities. While improving coverage at pre-school age will have definite impact, the three-year old group shows a particular lower coverage at 46% which contrasts with the 86% for four-year old group and the 78% for those aged five.
3. *Increasing quality of education*.
   - *Raising test scores at ENLACE and PISA tests*. Chihuahua has already taken strides at improving the PISA score, but further improvement is necessary.
   - *Reduce repetition rates*. During the 2010-11 academic year, upper-secondary repetition rates stood at 37.4%. Repetition rates can be improved by introducing the Quality Schools Programme.

4. *Broadening educational goals to include an integral approach to human development and incorporate arts, humanities and civics*.
5. *Emphasise the role of developing educators.* Recruiting, educating, training, developing and supporting educators is paramount in a human capital development strategy. The quality of teachers is the single most important school-level predictor of student learning.
6. *Place strong financial and professional incentives to attract young and highly skilled people to become educators*. Smaller classrooms (lower pupil-teacher ratios) and better teacher wages that are linked to performance are associated with higher returns to schooling in the labour market.
7. *Place a similar emphasis in life-long training for educators to continuously improve the quality of teaching*.
8. *Strike the right balance between encouraging innovativeness and autonomy at school level and exercising monitoring mechanisms that promote accountability*. Schools with greater autonomy tend to have better student performance, but only if autonomy is aligned with accountability measures.

Technical training linked to firms and universities are key to Chihuahua's progress. The Council for Academic-Productive Linkages (COVAP) has been instrumental in enabling curricula redesign, productive reconversion programmes and designing of new degrees. However, COVAP's very successful work should continue to concentrate on removing market failures such as asymmetric information and avoid funding activities that can be financed by private firms themselves. Chihuahua should also continue to foster technical degrees that are highly connected with labour market requirements. Technical university degrees have been a successful vehicle to address the skills mismatch in the labour force and this new state administration is further investing in technological universities outside of Chihuahua City and Juárez which will also help reduce inequality in access to technical training. It would be advisable however, to look into transferring programmes to the four big public institutions for students wanting to take their studies to tertiary education as the Technical Metropolitan University of Mérida in Yucatán has done. In addition, high-tech training institutions such as those co-ordinated by the Institute to Support Technological Development (INADET) could look at ways in which to co-operate with COVAP to upgrade the technological level of their activities.

Innovation is taking place in multinationals, but the rest of the economy is not linked to regional innovative capacities due to limited resources and institutional obstacles

Despite that the state has developed private and public R&D institutions that are unique in the country, they are seldom used by firms, so the potential benefit is wasted. Chihuahua is lagging behind not only most OECD regions, but also many Mexican states regarding inputs for innovation. Chihuahua comes 17th among Mexican states in its share of high-calibre researchers. As a result the local supply of innovation inputs is curtailed by a low level of human capital in relation to the production of R&D. Not surprisingly, Chihuahua produces an extremely low level of patents: one patent application annually per million of inhabitants – lower than the Mexican average. Links for co-patenting are few and mainly local or domestic and the international character of Chihuahua is under-utilised to foster innovation.

Scanty resources for innovation are a limiting factor for innovation. Chihuahua should take advantage of federal funding, but matching such resources to local needs and cluster-development objectives. In addition, Chihuahua should seek to further involve the private sector, develop an innovation plan and create state-level programmes to foster innovation. Low levels of funding attracted by the state could be partly related to low involvement from the private sector. It is important for Chihuahua to start proposing Mixed Funds (FOMIX) resources on the basis of firms' needs and strategic cluster-development objectives.

Institutional obstacles for innovation can be attributed to a bias towards pure scientific research, which might be limiting entrepreneurial potential in Chihuahua. The State's Council for Science and Technology should develop a clear plan with measurable objectives that have an impact on firms. Like many Mexican states, Chihuahua has a Council for Science and Technology, as well as a law, but no plan for innovation. In order to have an impact on market-oriented innovation, Chihuahua could consider having the State's Council for Science and Technology being co-ordinated by the Secretariat of Economy which is in a better position to link up with the private sector. Linking the Council to the productive sector will be a way to foster innovation networks and spur productivity through innovation in firms.

Innovation capacities can be better exploited by linking actors, developing networks, and taking advantage of FDI flows and the international character of the region

Chihuahua can also take advantage of high-tech clusters and local R&D capacities to provide market-oriented innovation. In particular:

- *Chihuahua should consider establishing mechanisms to link HEIs and R&D centre's innovative capacities to firms' needs.* Higher-education institutions (HEIs) and R&D centres are key to developing a regional innovation system. HEIs have already played a crucial role in producing a qualified and specialised labour force for Chihuahuan local markets. However, they can also be the source of market-oriented R&D by providing firms with innovation inputs, through consulting contracts, joint projects or help generate new innovative SMEs through incubators. In the case of Chihuahua, there are few examples of firms' innovation through support stemming from HEIs or R&D centres. Despite some attempts from the Secretariat of Industrial Development in previous administrations in co-operation with one of the state's most important business associations, DESEC, to link CIMAV's patents and research to potential investors, virtually no benefits have been derived locally. In contrast, businesses in Monterrey in the State of Nuevo León, have been very active in asking for practical solutions for their plant-level problems to CIMAV working from Chihuahua.
- *Chihuahua should consider developing innovation networks around developing high-tech clusters*. Non-HEI research could be an alternative that complements academic R&D. For example, the Jalisco Institute for Information Technologies supports initiatives in the IT sector. Guanajuato created a state innovation observatory as well as innovation networks linked to the state's strategic sector priorities. Querétaro trains firms in innovation processes, partly funding innovation seminars and grants financial resources for firms seeking to attend innovation-related events.

- *Chihuahua could find complementarities in aligning its FDI strategy with an innovation policy*. Inward R&D-intensive FDI is a powerful mechanism for technology transfer. Receiving regions as a result can develop specialised clusters and integrate local firms in global value chains. Chihuahua is already successful in attracting FDI and some innovation capacity is already in place. In fact, some design and engineering centres in the automotive sector already have a base in one of the two largest cities in the state. By partly focusing the FDI-attraction effort towards R&D-intensive activities, Chihuahua can generate technological spillovers through international technology transfer. However, R&D-intensive FDI alone won't necessarily bring about the expected benefits if the links between local HEIs and R&D-intensive FDI are not made. The relatively recent case of Visteon being located physically contiguous to the ITESM Campus Chihuahua is an ideal model to follow.
- There are clear opportunities in encouraging co-operation in R&D both locally and internationally (particularly in neighbouring US states). Knowledge spillovers can be fostered by encouraging co-patenting and other forms of co-operation in R&D locally. In addition, being a border state, Chihuahua can take advantage of international knowledge and benefit from spillovers which can act as local externalities.
- Chihuahua should upgrade the government's role in fostering incubators by taking stock of HEIs and R&D centres, as well as by setting up clear strategies and objectives.

Policies to foster productive activities should aim at linking local and global firms with a strategy that focuses on maximising the benefits of FDI

The State Government places an overwhelming emphasis on FDI attraction, but the strategy can be improved by striking a balance between inward investment and local firm development. There is no question of the benefits that FDI has brought about to the state in terms of employment and capital deepening, but the effects of knowledge and technological spillovers are less evident. Overall the manufacturing development strategy is overly focused on FDI attraction. The first nature advantages of the state such as geographical location that reduces transport costs and takes advantage of lower operational costs are powerful FDI magnets. Further developing skills, seizing R&D capacities and preparing local firms to become suppliers can become second nature advantages that will increase the region's attractiveness whilst fostering endogenous growth and partly addressing the region's vulnerability to external shocks. As state-level SME-related programmes for manufacturing are underfunded, do not particularly target access to finance, and are disconnected from an FDI strategy, long-run economic performance can be strengthened by allocating greater resources to programmes aiming at financing SME development and linking them to global value chains (e.g. FIDEAPECH and CEDEP). As the state's finances are already under strain due to increasing indebtedness, programme and department duplicities and cumbersome administrative costs, some programmes can be sources of savings to increase resources for actual productive-development support. However, even with these savings, a clear need to reflect local firm development support in strategy and budget is likely to remain. Chihuahua should consider strategies such as connecting local firms to global value chains by:

- *Fostering cross-agency cluster working groups*. The Suppliers Development Centre (CEDEP) can join the *maquiladora* associations (AMAC and AMEAC) along with CANACINTRA (the National Chamber of Manufacturing) and other actors to create teams that foster the creation of cluster-specific teams that address particular issues such as the aerospace cluster that has been working with ITESM (Monterrey Institute of Technology Campus Chihuahua), DESEC and the State Government to attract and develop the cluster. Cluster-specific working groups can then decide on a number of issues such as the benefits of *branding and marketing* the cluster. Again, making the most of the fact that the Council for Economic Development of the State of Chihuahua (CODECH) is already in operation could also be a potential partner for CEDEP or alternatively let the Council lead the *working groups* with the participation of CEDEP.
- *Support export networks*. CEDEP can also join forces with PYMEXPORTA to identify and help develop export-potential firms.
- *Promote the establishment of technology standards among potential suppliers*.
- *Help establish and co-ordinate public procurement for groups of firms*. Clusters and SMEs can also be strengthened by public procurement policies such as providing financial resources to enable SMEs to participate in public procurement as long as this is done in consortia. Chihuahua could be interested in studying the Polish Agency for Enterprise Development which provides financial assistance to consortia of SMEs to get engaged in public procurement or Brazil's State of Ceará.
- *Promote spin-offs through designing incentives*. This is a key component of developing suppliers. The 40-year-long manufacturing experience boosted by the *Maquiladora* Programme should have been a crucial asset for spin-offs from FDI-based companies to be generated. Instead very few cases of spin-offs have been identified in the 40 years that *maquiladoras* have been installing operations in the state. Incentives that ease start-ups, facilitate access to finance (see above), and grant similar benefits as those for FDI should be a few of the examples that should be explored. Infrastructure for spin-offs is also crucial as the experiences from the UK (Cambridge and Oxford clusters), Finland and Norway show. Training and guidance of entrepreneurs is also key for spin-offs as in the cases of Georgia in the US, Japan and Korea.
- *Liaising with firm-development funds to support the creation of pre-seed venture capital funds*. CEDEP could liaise with State's Trusteeship to Foster Activities in the State of Chihuahua (FIDEAPECH) or the Federal Fund for SMEs (*Fondo PYME*) and generate innovative mechanisms to offer pre-seed venture capital for firms that have the potential of becoming suppliers.
- *Seek the integration of innovative firms or R&D actors in the cluster*. Innovation is another key ingredient in cluster development and thus supplier development programmes such as CEDEP should seek liaising with the State's Council for Science and Technology (COECYTECH) and research centres to foster the innovation content of local clusters.
- *Seek local firms' productivity growth through training and quality control by MNEs*. MNEs in other countries have used two mechanisms that can lead to local firms'productivity growth. First, training of engineers and technical workers at

MNEs' headquarters; and second, MNEs' visits to local firms to analyse and suggest ways in which efficiency can be increased and improve quality.

Institutionalising regulatory reform can also help foster local and foreign investment

Competitiveness in Chihuahua's main urban centres is being challenged by deficiencies in regulatory reform in particular for start-ups. Starting a business and dealing with construction permits are areas with particular room for improvement. These two factors can be improved through policies since both are fully or partially competencies of local and state governments. Chihuahua should strengthen the role being played by the Quick Start-up System for Enterprises (SAREs) in different municipalities and continue to couple their efforts with those provided on advice and guidance by the Enterprise Development Centres (CEDEMs). Integrating services related to fiscal, labour and environmental obligations would be key to speeding up and facilitating the way in which start-ups take place in the region. As SAREs are municipal efforts guided by the Federal Government (COFEMER) and with the support of the State Government, municipal involvement is essential. One way of achieving this is by creating the right local incentives. CEDEMs can continue to house SAREs, but should also look at ways to further integrate services, such as providing a physical space for municipalities' local economic development directions as well as the local Councils for Economic Development that stem from CODECH. As a result, entrepreneurs would have in place most of the services and support needed to start-up and operate, and have different bodies interacting with the local councils that can provide a strategy.

Chihuahua must also consider moving into the institutionalisation of regulatory reforms. In addition to resolve pending issues concerning insecurity and improving regulatory reform in certain areas, a challenge in Chihuahua is to embed regulatory reform and best practices in the regional governance system. The institutionalisation of regulatory reform requires clear political leadership that puts the regulatory and competitiveness factors as interdependent and as a priority of regional governments. Chihuahua's Congress could consider creating a law for regulatory reform or alternatively, make reforms to the existing Law for Economic Development to include this aspect as the State Development Plan suggests. In addition to what the Legislative Power could do, the Executive could consider creating a decentralised entity or take advantage of an existing structure that can push the regulatory reform.

The elements might be there, but what is missing are the links in the economic system

Chihuahua has many of the elements to reignite growth and sustain it over the long-term, but an effort of connecting policies, actors and institutions is key to boosting growth and development. Productive-sector development policies in Chihuahua should aim at increasing productivity and value added through SME support, as well as linking local companies to MNE value chains. Policies oriented towards infrastructure, private-sector development, education and innovation need a better link that improves co-ordination and achieves regional growth. FDI policy requires the link with local supplier development policies that help maximise the benefits of free trade and the four-decade long manufacturing development experience in Chihuahua. Opportunities in primary activities can also be realised if the links with manufacturing that enable higher value added are made possible. Quality of education has improved, but converging towards OECD

standards requires that the school-family links are strengthened. In this way goals are set at a neighbourhood level with strong state-level guidance. It also requires that socio-economic conditions affecting attainment and leading to high dropout rates are addressed. The already significant innovation infrastructure needs linking education, innovation and private sector actors and in particular helping establish the link between local entrepreneurs and R&D capacity. R&D can also be spurred by making international connections across the border possible. An economic policy that addresses inequality is also possible if social concerns are brought to the table when designing economic policies and if the urban-rural linkages are strengthened.

Chihuahua's inequality is manifest in larger regional disparities than the OECD or among Mexican states, marked gender inequality and the widest inter-ethnic inequality in the country

Chihuahua's regional disparities are larger than what any other OECD country – including Mexico—experiences. If Chihuahua was a country, it would be the place where the greatest regional disparities would be found. Although Mexico is the OECD country with the largest regional average household income inequalities, Chihuahua's range of income is wider than the one that can be observed among Mexican states. Such a wide income gap is fuelled by the types of occupations. Four in every ten employees in Chihuahua are performing unpaid work or earn less than twice the minimum wage (roughly USD 8.80 per day); the proportion expands to two-thirds of total employment for those earning less than three minimum wages (USD 13.20) per day. Marginalised neighbourhoods are present in some rural communities, but they concentrate in urban areas. Six out of ten marginalised inhabitants in the state are urban dwellers of one of state's largest cities. Chihuahua also experiences gender inequality in income. While 36% of men earn less than twice the minimum wage, the proportion reaches 48% for women. In fact, almost eight out of ten women earn up to three times the minimum wage compared to seven out of ten men. But gender inequality is not limited to income; it also includes their role in the family and society. Nearly half of the 635 000 Chihuahuan females with over 15 years old that had a partner living with them, experienced some sort of violence. Chihuahua is also the Mexican state with the largest inter-ethnic inequality. The human development index (HDI) levels for Chihuahua's non-indigenous population stood in 2006 at 26% more than the levels for indigenous groups. Inequality is particularly acute in municipalities with difficult geographical access where the vast majority of indigenous people live.

Federal programmes are being instrumental in helping fight poverty and marginalisation, but complementarities between social and economic policies should be sought as the Chihuahua Vive *Programme has started to do…*

Federal and state governments are providing useful help to address inequality, particularly for women and children development. Social policies can be complementary to those that seek efficiency just as economic growth can reduce inequality. Central-level programmes such as *Oportunidades* and *Estancias Infantiles* are having real impact in the lives of people. These are policies that not only have a social benefit, but also can influence economic performance. The former can be linked to lower dropout rates and better academic achievements that improve skills' levels in the region. The latter can be argued to help mothers get economically active while improving children's attainment.

The state-level Community Centres are good, yet underfunded initiatives that are empowering women and allowing children to achieve better grades and get the most out of education. However, training programmes are needed for personnel in these community centres, which could have an enormous payoff in terms of achievement at school. Reading improvement programmes can also be put in place in these centres linked to an overall strategy to improve overall educational quality. Ethnic inequality can also be addressed by linking Secretary of Economy's programmes, in particular the Employment in Marginalised Areas, to the social work that the *Coordinación Estatal de la Tarahumara* is likely doing.

However, for complementarities to be effective, a long-term vision and strategy is needed. One-shot redistributions cannot have long-lasting effects. Short-term aid does not affect the unique invariant distribution of income. The State of Chihuahua can evaluate how a long-term strategy can have a durable effect on income and growth. Perhaps current programmes in different departments can be redesigned to include economic and social aspects. For example, the Secretariat of Social Development and the Secretariat of Economy can constitute a task force to look at employment, poverty and health aspects of their programmes so that they are linked and mutually reinforce.

Under such a scenario, the new administration created the *Chihuahua Vive* Programme, which is a suitable mechanism to make actors and programmes converge and provide a vision not only for social but for overall wellbeing. *Chihuahua Vive* along with federal-state level co-ordination on social policies can lead to complementarities with economic strategies (e.g. policies to increase participation rates and upgrade skills) and can result in the inclusion of women, disadvantaged groups and ethnic minorities. *Chihuahua Vive* seems to be an effective tool to foster policy complementarities that other Mexican states could emulate. Chihuahua also has already in place a Programme for Employment in Marginalised Areas, which needs to establish links with *Chihuahua Vive* and that needs to further seize funds from the federal government (as they are currently underexploited), which can be used to test other social aspects that can be incorporated or mechanisms in which the programme is linked to other social requirements.

...but complementarities are better exploited at the local level when an integrated approach to regional development is adopted

Growth-enhancing and efficiency-seeking economic policies can be complementary to equity-seeking social policies; but complementarities can better be exploited at the local level. Space matters for policy complementarities. On the one hand, traditional views on regional policy related to the old paradigm saw regional policy as a compensatory mechanism to foster convergence. On the other hand, some national governments can regard investing in lagging regions as sub-optimal as cities make the best use of skills, ideas and knowledge. However, lagging regions represent unrealised potential for growth that is not in detriment to urban dynamism. Enhancing growth in lagging regions can produce a convergence trend so equity is addressed. Growth in rural areas complements urban growth as specialisations are different and comparative advantage enables exchange and efficiency. Similarly, tackling underserved neighbourhoods in urban areas directly addresses inequality, but as a consequence leads to better urban mobility if transport infrastructure is provided and increased productivity, to name a few positive effects of complementarities that can better be realised at the local level. Inequality is not only related to income, but to the overall environment in which communities thrive. Place-based approaches to policymaking (e.g. Federal *HÁBITAT*

Programme or *Microrregiones*) that transform the built-up environment can reduce inequality and deliver efficiency at the same time.

Chihuahua's new government administration is aiming at liking rural communities and small and medium-sized cities in the state by building or rehabilitating ten airports and airfields, and doubling motorway infrastructure. Some of the airports are located in the mountainous regions which would help better link rural communities and provide better access to ethnic minorities, whilst potentially boosting tourism in those areas. Chihuahua's road infrastructure is currently the 9th in the country in terms of absolute length, but it is the last one if the size of the state is taken into account (length of roads with respect to total area). The 7 109 km long road infrastructure includes the second largest four-lane motorway system in the country that connects 80% of the population in the state. The new administration aims at connecting remote rural areas with small cities through paved rural roads, the construction of secondary motorways and seven large inter-state motorways. In addition, border-crossings are being modernised.

Chihuahua's objective of doubling motorway infrastructure by 2016 should take into account that local economic development requires integral place-based policies that include human capital development and business environment. The new administration has worked on 80 different motorway axes since it took office in October 2011. Four-hundred additional kilometres are also being modernised (Duarte, 2011). Motorway links are expected to improve connectivity with neighbour states Sonora (to the west) and Sinaloa (to the southwest) in an effort to gain access to seaports and thereby access to Asian markets (Duarte, 2011). The ultimate goal is for all municipal government seats to be connected through paved motorways (Chihuahua State Government, 2011). Nine marginalised municipalities will be connected through roads by the end of the administration. While in themselves these actions are well-intentioned since they aim at opening regions to markets and to reduce marginalisation and extreme poverty, transport infrastructure alone is unlikely to provide long-run growth. Providing infrastructure alone can lead to a leaking-by-linking effect. As infrastructure will reduce transport costs, these in turn will make it more profitable to concentrate production in main urban centres and ship it from there to more remote areas. Providing human capital development while very positive, would likely accelerate the outmigration tendency from remote and rural areas to urban centres and abroad. These two policies (infrastructure and human capital) require an integral strategy at local level that spurs local firm development that benefit from lower transport costs and skills in the labour market.

Such complementarities can appear by fostering a city-region approach that nurtures partnerships and co-operation

Chihuahua has an enormous breadth of urban planning efforts that need political support at the local level particularly in the cases of Chihuahua City and Juárez. Given the low density levels, rising urban sprawl and the cost of providing services to a growing population, Chihuahua's urban planning can focus on four vital areas: *i*) improving urban land regulation, *ii*) linking an evaluation of deviance from official plans to better enforcement of approved land policies, *iii*) adopting a city-region perspective that supports inter-municipal partnerships and co-ordination, and *iv)* making planning institutes more inclusive, expert-based and metropolitan:

- *Improving urban land regulation in Chihuahua*: A split-rate property tax, which places proportionally higher taxes on land than on built structures, could support the City of Chihuahua's objectives to reduce vacant land. This could also be useful in

Juárez whose density and sprawl is even more acute. Alternative densification tools beyond density thresholds could also be deployed, such as dynamic height control for areas surrounding its downtown core. Increasing the number of building and land inspectors, as currently done in Chihuahua City, would reduce the deviance from official land regulation. The bus rapid transit programmes could help create a more dense urban form if they supported transit-oriented development (TOD) that permits higher densities along a mass transit corridor.

- *Supporting ex-post evaluation and monitoring*: It is not known whether strategic urban and regional plans in Chihuahua have their intended impact. Mexican urban planning has traditionally lacked attention to monitoring and implementation, e.g. there are often few explicit statements about timing and sequencing of development and public facility provisions. The Chihuahua State Government and local municipalities could consider *integrating monitoring and evaluation as permanent features of their urban plans.* The Federal Government could also *provide technical assistance and capacity building for local officials* to measure plan implementation and compliance. Monitoring land policy merits specific attention given the proliferation of informal settlements, the evidence of illegal land sales, and the role of urban planning for supporting economic activity and safeguarding environmental resources.
- *Facilitate city-region networking to improve service delivery*: Co-operation among local governments in functional areas remains limited in Chihuahua. Voluntary modes of co-operation among adjacent municipalities could be encouraged and policy frameworks could explicitly acknowledge city networks and develop delivery agreements at the metropolitan or "micropolitan" levels. Given the proliferation of small, tightly connected municipalities in Chihuahua, a "micropolitan" scale would be helpful for organising inter-municipal partnerships. Additional projects and funding would be needed to integrate sister city agreements into the region's long-term common strategic goals and to build a stronger policy framework to support an interconnected urban system. A contract covering an entire metro-region would allow policymakers in Chihuahua to increase policy coherence across the city-region area.
- *Make planning institutes more inclusive, expert-based and metropolitan*. There is a need to increase planning institutes' effectiveness, encourage co-operation and overcome political obstacles and politicisation of these bodies. Urban experts from academia can join council boards and planning institutes should incorporate their views. In order to increase inclusion and strengthen the potential benefits of having experts' views, citizens and civil society representatives should join these councils and should be decision makers in cities' plans. Moreover, these plans should go beyond administrative boundaries and incorporate the functional area where applicable. This will not only increase the relevance and effectiveness of plans, but will balance power within the institutes.

Rural development requires better linkages with urban areas, a better management of land and water resources, access to credit and the further introduction of processing as the means to higher value added and jobs

Urban areas are currently play a leading role in state economy, but there is great potential for rural areas to contribute more to the economy and for levels of rural income and employment to significantly improve. With increased urbanisation and the growth of the *Maquiladora* Programme, the role of farming in the economy of Chihuahua has

declined. While the rural economy encompasses more than farming (e.g. mining, renewable energy), in Chihuahua it is currently the backbone of the rural economy. Thus, rural development in Chihuahua requires a transformation of agriculture as a fundamental first step to rural development.

Chihuahua is well positioned to further penetrate North American markets, but increasing value added in agriculture remains a key issue. It has easy access to the US border and the infrastructure to accommodate exports. The high productivity larger farms in Chihuahua are already competitive with US and Canadian counterparts in terms of scale and productivity and they have the advantage of a different growing season and much cheaper labour. But low-cost labour is of limited value in the production of low-value commodities. For grains and other bulk commodities, capital in the form of farm machinery and transport and storage facilities more than offsets labour as a source of productivity. Canadian and US grain producers also have a huge advantage because they largely avoid irrigation expenses due to higher precipitation levels. As water becomes scarcer and eventually more expensive in Chihuahua, the competitive position of cereal producers will decline. Although Chihuahua's agricultural sector is among the most productive, specialisation on the part of small farmers on low value-added crops entails low output per hectare.

An improved rural economy in Chihuahua depends upon improved economic performance of the market towns in the state. The two dominant cities in Chihuahua now account for the majority of the population and are the focus of policies to stimulate urban growth. However, there are real opportunities to enhance the role of the other urban places in the state, but by following a different strategy. While food and agriculture is seen as a growth opportunity for Chihuahua, it can best be achieved by a conscious and systematic effort to couple improved farm-level productivity with agricultural processing. Processing is important to expand foodstuffs' market and as a source of local jobs and income. Processing expands the market for farm output by expanding both, the geographic reach of farm products and longer shelf life. For expanded processing to take place in the market towns of Chihuahua it will be necessary for the state to make investments in improving local infrastructure. The road network that connects many smaller towns to outside markets needs improvement. Within towns, sites for processing facilities should be identified and these sites should have guarantees of assured access to basic electricity, water and sewer services if there is private interest in developing them. Chihuahua may also want to explore the possibility of providing matching funds to entrepreneurs who are willing to invest in processing, or other industries, in market towns. This would in a sense replicate the *Maquiladora* Programme, but rely on small and medium-sized firms that have strong supply-chain links to the local community instead of multinationals.

There is a need to reinforce the public-private-academic co-operation mechanism to achieve a regional development strategy that aims at fostering growth by diversifying the economy and balancing regional development

Vulnerability to external shocks in the economy can be addressed by further taking advantage of the opportunities in other sectors. In addition to farming activities, there are clear opportunities by diversifying the economy, in particular by supporting mining, forestry and tourism activities. These are all, activities with a strong rural context; mining and forestry take place in rural areas, and the eco-tourism character of Chihuahua's mountains and desserts are clear examples. However, all these activities can be

potentially harmful to the environment. Although off a small base, mining activities' impressive growth has recently led to a fivefold increase in its share of state's GDP. Mining's strong performance is being chiefly fuelled by FDI in the sector. However, the State Government could aim at linking local miners to global-value chains. Mining can become an enclave in the economy, producing few jobs – as the mining process has become capital-intensive – almost no backward and forward linkages to local firms and few fiscal benefits as a result of it. One way to avoid the enclave economy and maximise the potential of mining activities is that the public sector partners with the private sector on the initiatives to develop local mining suppliers in metal-mechanics. In addition, environmental regulation should reflect the potential harm to the environment of gold, silver, lead, zinc and copper mining and enforcement of it should take a central role. Forestry requires also strong regulation, but most importantly its enforcement. Chihuahua's Ecology Direction is promoting sustainable behaviour and actively seeking to enact regulation, but lack of resources impinges on enforcement. Institutionalising the approach based on payments for environmental services already in place, and extending it to forest sustainability can yield not only economic and environmental benefits, but also social ones since marginal groups (e.g. ethnic minorities) can get a remuneration by conserving them. It is important that the state government ensures forestry firms that regulation that seeks sustainability is a way of protecting the environment, but also gives them long-term security on their own activities. Diversifying the economy without enforcing environmental regulation can result in unsustainable development. Tourism development can perhaps look into ways to attract FDI in the sector that can serve as a catalyst for private-sector-led promotion.

Making a more resilient regional economy depends on balancing regional development in the state. Diversification can also be achieved by exploiting opportunities in every region and thereby balancing regional development. The already constituted Council for Economic Development (CODECH) along with its regional councils (CODERs) are key to unleashing growth in lagging regions and in further boost competiveness and address social challenges in both successful and lagging regions in the state. The strength of CODECH is in its core expertise and experience of the operations and strategic roles of a regional development agency (RDA). A strategic role, co-ordinating and facilitating co-operation across the main economic development players appears to be an appropriate role for the foreseeable future. It is not advisable that CODECH is burdened with the role of implementation, and acting as a catalyst and facilitator are critical functions that a central and trusted organisation needs to be focused on. Stakeholders can take advantage that CODECH already is in place and that is empowered by the State's Economic Development Law to serve as a co-ordination mechanism to foster economic development. CODECH has already managed to make the public, private, academic sectors and civil society converge into regional councils. However, there is a need for further resources to be devoted to CODECH and its CODERs, as well as to upgrade competencies. The council also needs ensure that the interests of the local concerns are heard not only in the CODERs, but also in industry networks. Without a strong indigenous presence among the commanding heights of the economy and in the leading sectors especially, plans for improved networking and clustering would fail to deliver the anticipated outcomes.

Chihuahua must consider developing a document that brings the academic, private, public and social actors together on a shared vision for competitiveness and development. The vision can serve as a basis to develop an inclusive agenda for competitiveness and

development that takes into account recommendations in this review and beyond and set responsible actors to carry them out on different time horizons (short, medium and long).

Municipalities also require more time to plan and implement initiatives seeking long-run growth. Despite that Mexican legislation prevents re-election, state-level legislation can accommodate slightly longer administration periods that while preserving the national legislation, allow local governments to have greater impact on development.

There is an urgent need for water prices to reflect scarcity, to change farm management practices, and to better manage water systems by allowing local regulation and better co-ordination through a multi-level governance approach

Chihuahua is currently experiencing a severe drought that extends well into the southern United States. Climate change is expected to increase the frequency and severity of drought in the larger region of northern Mexico and the south-western US. If it does, then the consequences for agriculture will be severe. Pressure on aquifers will increase as farms try to offset missing precipitation with increased pumping, and aquifer recharge rates will decrease. There will be major consequences for the livestock sector if forages are depleted and cattle herds have to be reduced. Competition for scarce irrigation water for crops will require new water allocation schemes if the water supply is not to be exhausted.

The lack of *local* regulation in Chihuahua threatens the sustainability of the water governance system over the long run, with tremendous externalities on other policy areas including agriculture. Given the importance of local actors, stakes and specificity in the water sector, policymakers should not avoid *complexity* by favouring traditional top-down policies but instead, find ways to maintain coherence while preserving diversity, so as to reflect the heterogeneous concerns of stakeholders on the ground. A multilevel approach integrating international, national and local actors can help diagnose inherent governance challenges in water policymaking and to formulate possible policy responses.

In the case of Chihuahua, the focus should also be on avoiding subsidies so that prices reflect scarcity, and on the need for further decentralisation of water policymaking and a strong *local* regulation in the water sector. On the one hand, prices should not be influenced by subsidies so that scarcity can influence both the crops being cultivated and the technologies employed. On the other hand, this also implies setting up legislative frameworks devoting regulatory powers to the state authorities, especially for extraction permits in order to better manage water supply and limit pollution (due to over-extraction) of aquifers. Decentralisation also means giving more prominent role to the *Technical Groundwater Committees* (COTAS) in aquifer management, strengthening the organisation and functioning of the *River Basin Councils* and their auxiliary bodies, and consolidating the governance functions and regional organisation of the CONAGUA. Besides, future reforms should involve further civil society, associations of irrigations users and *Technical Groundwater Committees* in driving for the saving of water and the technification of irrigation, formulating regulations for the distribution of surface water by catchment and by aquifer, and catalyzing financial resources for modernisation and technification of irrigation infrastructure.

For economic and environmental reasons it is vital that farm-management practices in Chihuahua be improved. For these improvements to occur farmers will have to make significant investments in equipment and in altering how they produce crops and livestock. This will require access to credit and access to the technical knowledge

associated with better farm-management practices. The types of crops that Chihuahua is specialising on are not only crucial to determine the lower value of output per hectare, but also determine incentives to conserve water. The regulatory framework for water management and the incentives that the state provides, prevent market mechanisms from correctly reflecting water scarcity and depletion. Irrigation mainly comes from groundwater and aquifers in the state have low recharge rates. Aquifer depletion requires deeper wells and more electricity for pumping. In principle this should lead to higher costs for irrigation, but the state provides electricity subsidies that offset higher pumping costs which continue to encourage low-value water uses and water-wasting technologies. Currently there are few limits on water extraction: water meters are not compulsory and are not regularly monitored, water charges are not common, water rights are not enforced, nor are restrictions on drilling. A second reason that prevents the incentives to conserve water from operating is lower financial wealth of field crop producers who may lack the money or access to credit to upgrade their irrigation system.

But ultimately policies will be subject to the state's financial capacity; with two crises leading to lower regional revenue, rising spending partly to tackle insecurity, and still low fiscal autonomy levels, the state has been relying on debt to finance development

The combination of rising spending and the challenges posed on the revenue side by the recent crisis have left the state´s government with little resources to finance public investment. Indeed, the government estimated that in 2011 there was no fiscal space left for that purpose. As a result, the government has relied on debt financing to sustain its investment programme. The State of Chihuahua stands out relative to other Mexican states in terms of how its local public finances are managed. Local revenue collections are relatively higher than in any other state and public spending is fairly open to public scrutiny. Despite such strengths, the decline in public revenues associated with the recent economic recessions, combined with structural factors that put pressure on public spending and limit investment outlays, has resulted in an increasing reliance on debt financing to carry out investment projects. While, at present, the risk that the state might not be able to uphold its debt obligations is not a concern, it could become an issue in the medium term if actions to increase local revenues and to rationalise public spending are not put in place. The current situation has also brought attention to the need to strengthen local public finances. In particular, local revenues are deemed to be too low, with excessive reliance on federal transfers, and resources devoted to investment projects too limited.

Chapter 1

Chihuahua's Economic Model and Challenges

This chapter examines the economic growth and productivity trends in Chihuahua and Mexico. It starts by showing the reader Mexico's slowdown in economic growth and lagging productivity levels. The reader will be able to see Chihuahua's contribution to national performance; thus, Chihuahua's challenges are relevant not only for regional progress, but for Mexico's overall performance. The chapter shows that Chihuahua has gone from being a region that was fast approaching OECD average levels of per capita GDP to be part of the groups of regions that can be considered as lagging and underperforming. Growth decomposition and growth-accounting techniques are used to pinpoint the main factors holding Chihuahua back from fully exploiting its growth potential. Despite being one of North America's leading manufacturing hubs and the lead exporter in Mexico, Chihuahua's outward development model has rendered the region vulnerable to external shocks. The chapter then analyses each of the three long-run economic growth determinants in Chihuahua and pinpoints the main challenges to improve investment, human capital and innovation levels in the state. The chapter ends with a discussion on foreign direct investment trends in the world and Chihuahua and relates multinational enterprise development with specialisation and cluster development in the region and sheds some light on the lack of integration of local firms to global-value chains.

Overview

Chihuahua has benefited from Mexico's trade policy change and its geographical position by creating a successful economic development model that nevertheless raises challenges. Chihuahua, and in particular border municipalities such as Juárez started benefiting from the introduction of the *maquiladora* programme in the late 1960s as a response to northern Mexico's de-integration from the centre, and the cancellation of the *Bracero* programme.[1] Offshoring operations started to locate in Chihuahua attracted by tax incentives, cheaper labour force and minimal transport costs to goods shipped to the US. In the mid-eighties, after a long period of industrialisation based on an import substitution model, the country experienced a trade policy shift by accessing the General Agreement on Tariffs and Trade (GATT) which brought barriers to trade down in a relatively short period of time. The North American Free Trade Agreement (NAFTA) also confirmed investment and international market opportunities for the state. Chihuahua became the main destination in the country for Foreign Direct Investment (FDI) from manufacturing firms and enjoyed the highest share of employment in Mexico's *maquiladora* industry. Chihuahua's outward development model is a common strategy that other OECD regions are following, so the challenges of how to attract FDI, how to maximise its benefits and link local firms to global value chains are also common.

Free trade and increasing flows of FDI has led the region to build useful assets in terms of human capital and innovation that remain somewhat unexploited. Chihuahua is the only state in Mexico with ten technological institutes which provide the manufacturing industry with at least 1 000 engineers every summer. Student enrolment in engineering fields target mostly industrial, electronics and electro-mechanic programmes, but new fields such as aero-space have recently developed. Many of these professionals work directly in manufacturing plants, but some others work on design and engineering centres and some others in laboratories on telecom, environment, advanced materials and renewable energy. Such strong human capital flowing into industry is also supported by high quality education in the state. According to the 2009 PISA results, Chihuahua has the third highest reading score just after Distrito Federal and Nuevo León. Chihuahua is also third in the country in sciences and math. Chihuahua has also the largest share of strong performers in the reading PISA test (12% of the sample just behind DF with 14%) and it is also second in reasoning skills. Despite the presence of institutions for innovation and high-quality human capital development in the state, innovation has not developed in the same way. Chihuahua comes 8th among Mexican states in terms of patent applications and manufacturing firms invest well below national average on R&D. Manufacturing activities could benefit from a greater interaction between research centres and firms. In addition, local firms can seize innovative capacities in the state to engage in global value chains and thereby raise state value added.

The two waves of liberalisation of trade spurred growth, but the outward model followed by Chihuahua and two crises in less than ten years have rendered the region vulnerable to external shocks. After contracting at an average annual growth rate of almost 3% between 1980 and 1985 when Mexico's economy was still under a closed-economy model, the country's accession to GATT resulted in an average growth rate of more than 23% between 1985 and 1993 for Chihuahua. NAFTA brought about growth to levels of almost 9% per year between 1993 and 1998. As the positive impact of the external shock created by Mexico's trade policy change waned, rates slowed down to an annual average of 3.7%. Between 2004 and 2008 annual growth rates averaged just 0.25%.

Relatively lower growth rates since 1998 were partly the result of international competition, multi-national enterprises' (MNEs) organisational changes and technological change prior to the 2001 recession in the US. China's emergence as a global FDI and manufacturing hub provided competition for labour-intensive processes that did not require proximity to the US. At the same time, mergers and acquisitions in the automotive sector render some industrial plants redundant partly affecting Chihuahua which was already struggling to compete on costs with other emerging markets. Nevertheless, the manufacturing sector continues to dominate the state's economy with around one-quarter of state's GDP (Table 1.1). Real estate, which is intimately linked to FDI attraction and manufacturing development, has grown in importance to become the third largest sector in the state with a share of over 12% of GDP. Mergers and acquisitions in the automotive sector also had short-term implications for Mexican plants. Finally, technological change in some of Chihuahua's exports such as electronics were affected by technological change such as the emergence of flat screens and plasma that render old plants based on TV sets redundant. Despite Chihuahua has been able to capture some of the new electronic markets such as flat screens and video-games consoles, job losses have been inevitable as the region moves into relatively more capital-intensive activities.

Table 1.1. **Chihuahua's economic structure, 2003 and 2009**

Sectoral share of the state's GDP (current prices) and employment

	2003	2009	Employment 2009
Agriculture, cattle raising, forestry and fisheries	5.6%	6.4%	0.1%
Mining	0.4%	1.6%	1%
Electricity, water and gas	1.3%	1.5%	1.1%
Construction	9.9%	7.4%	3%
Manufacturing	25.6%	23.9%	44%
Wholesale & retail	15.1%	15.0%	22.6%
Transport	4.8%	4.4%	3.2%
Media	2.3%	2.9%	2.4%
Financial services	1.4%	1.7%	0.4%
Real estate	11.9%	12.1%	1%
Professional services	4.9%	5.4%	1.7%
Business management	0.01%	0.01%	0.1%
Business services	1.5%	1.3%	4.5%
Education	4.5%	5.2%	1.8%
Health and social services	3.2%	3.2%	2.7%
Cultural, sport and recreational services	0.2%	0.2%	0.6%
Accommodation and catering	2.9%	2.7%	5.5%
Other services	2.1%	2.1%	4.5%
Government	3.4%	3.7%	n/a

Source: INEGI (2011), *Banco de Información Económica*, accessed online at *http://dgcnesyp.inegi.org.mx/cgi-win/bdieintsi.exe* on August 24th 2011, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico.

Local firms can hold the key to further benefits from free trade and FDI. The recent economic crises have shown the vulnerability of the region to external changes. In addition and despite past economic success, few local firms have been able to engage in global value chains and thus value added and local content have remained meagre in the region. Although the state is slowly moving into a "third generation *maquiladora*" basing their processes more on design and engineering than on assembly, and in spite of world-class technological centres such as CIMAV, Chihuahua could gain a lot by further supporting human capital development, entrepreneurship and the missing links between

local and global firms. Although Chihuahua is already successful in many primary activities, the sector's shares of total assets are very low and could also improve its contribution in state's GDP currently at just over 6% (Table 1.1). Easing investment, providing financing and helping local firms move up the value chain in the sector represent some of the actions that can help seize missing opportunities. Greater financing and value added in agriculture, cattle raising, forestry and fisheries are not only a sensible strategy for capital deepening and growth, but also to help reduce urban-rural inequalities in the state. However, success in farming largely depends among other things, on water management due to high scarcity levels that have very recently created a crisis for many in rural areas after a sustained drought.

The region's relative economic success and the outward development model have raised new challenges in terms of urban sprawl and missed opportunities in rural areas. The state's population is estimated at 3.2 million and around two-thirds of those live in only two urban areas: Ciudad Juárez and Chihuahua, and since 93% of population growth takes place in these two municipalities, the future seems increasingly urban. Juárez is ranked 8th most populous city in the country and Chihuahua City, 16th. Chihuahua is the only state in Mexico having two cities ranked in the top 20 most populated. El Paso and Ciudad Juárez comprise one of the largest bi-national metropolitan areas in the world with a combined population of 2.4 million people. However a number of urban challenges are present in Chihuahua such as urban sprawl, inadequate public transportation systems and insecurity. Fast population growth in Ciudad Juárez can be explained partly to economic success in the city attracting firms and workers. Population figures in that city almost tripled between 1980 and 2009; in less than 20 years, Juárez went from just over half a million people to almost 1.4. Such population growth has meant urban sprawl as the surface of the city multiplied almost seven times – one of the largest sprawling phenomenon in Mexico according to Mexico's Ministry of Social Development (SEDESOL). As a result, urban centres in Chihuahua have very low density levels. Juárez with almost 1.4 million people has a density of 3.7 inhabitants per square kilometre which is low when compared to OECD cities of a similar size such as Oslo with 206, San Antonio with 98 or Kansas City with 95. The current urbanisation pattern renders population disconnected from main economic areas, excluded from the provision of public services and leads to increased environmental costs. Crime is also an increasing concern.

Recent insecurity issues pose a real social and economic challenge. Insecurity can be linked to social inequality and the region's geographical position. At 144 murders per 100 000 inhabitants, Juárez is arguably one of the most dangerous places in the world. This homicide rate is beyond the average for the countries with the world's highest rates such as Jamaica (59), El Salvador (53), Venezuela (52), Honduras (43) or South Africa (38), and well above the national average at 11. Large inequality levels among municipalities (rural-urban divide), within urban areas and other ethnic and gender expressions of inequality have led Chihuahua to experience inactivity rates among the young that become the target population for organised crime to recruit new members. In addition, Chihuahua's geographical position as an ideal location to ship goods to East and West coast regions in the US, also works for drug trafficking. President Calderon's strategy has been strong on crime leading to several captures. However, the sustained high insecurity levels could represent a constraint for competitiveness and represent a pending social development aspect in the state.

The review is structured to let the reader see the complementarities between efficiency-seeking economic policies and equity-seeking social ones, but arguing that these complementarities are better done at the local level. By fostering each urban and rural areas' economic potential and linking employment opportunities to educational ones, economic strategies can bring about greater equity. Local economic development can be achieved by introducing infrastructure that brings people to jobs, but also strategies for employment and education that bring jobs to people where they are. Regional policy principles can be useful in making the most of local assets to upgrade skills, link people and firms to markets, foster local investments and attract foreign ones, and establish the missing value-chain links, as well as those between researchers and entrepreneurs.

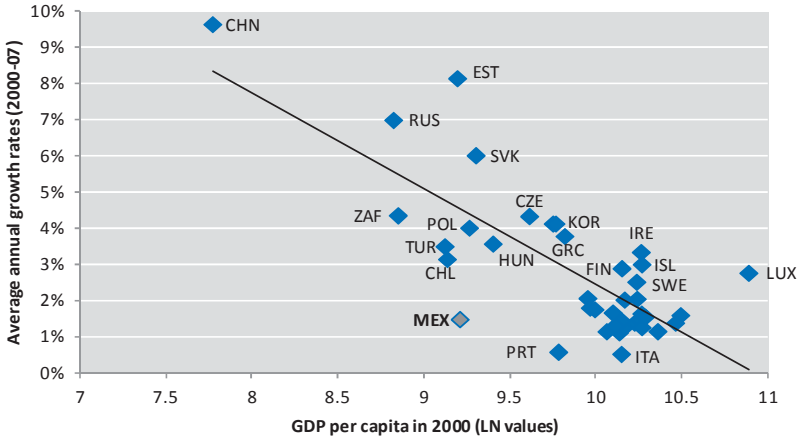
1.1. Economic growth and productivity

Chihuahua's economic growth trends

Mexico's economic growth has been lagging behind the OECD average and outpaced by other emerging economies due to sluggish productivity growth. At an annual average rate of 1.5% between 2000 and 2007, Mexico's economic growth falls behind the average for OECD countries at 1.7% (Figure 1.1).[2] The rate is considerably lower for the same period, than that of some Eastern European economies: Czech Republic (4.3%), Estonia (8.2%), Hungary (3.6), Poland (4%), Russia (7%) and Slovak Republic (6%). Other emerging economies outperforming Mexico are China (9.7%) and Chile (3.2%). Mexico's distance from OECD income levels, the largest income gap in the Organisation (Figure 1.2), are essentially due to lagging labour productivity (OECD, 2011b). Mexico's labour productivity growth is one of the lowest in the OECD. Growing at an annual average of 1.3% between 2000 and 2007, Mexico's productivity growth was even lower than during the 1995-2000 period and in both cases lower than the OECD average (Figure 1.3). On average OECD countries are becoming more efficient than Mexico at twice the speed.

Figure 1.1. **Economic growth, 2000-07**

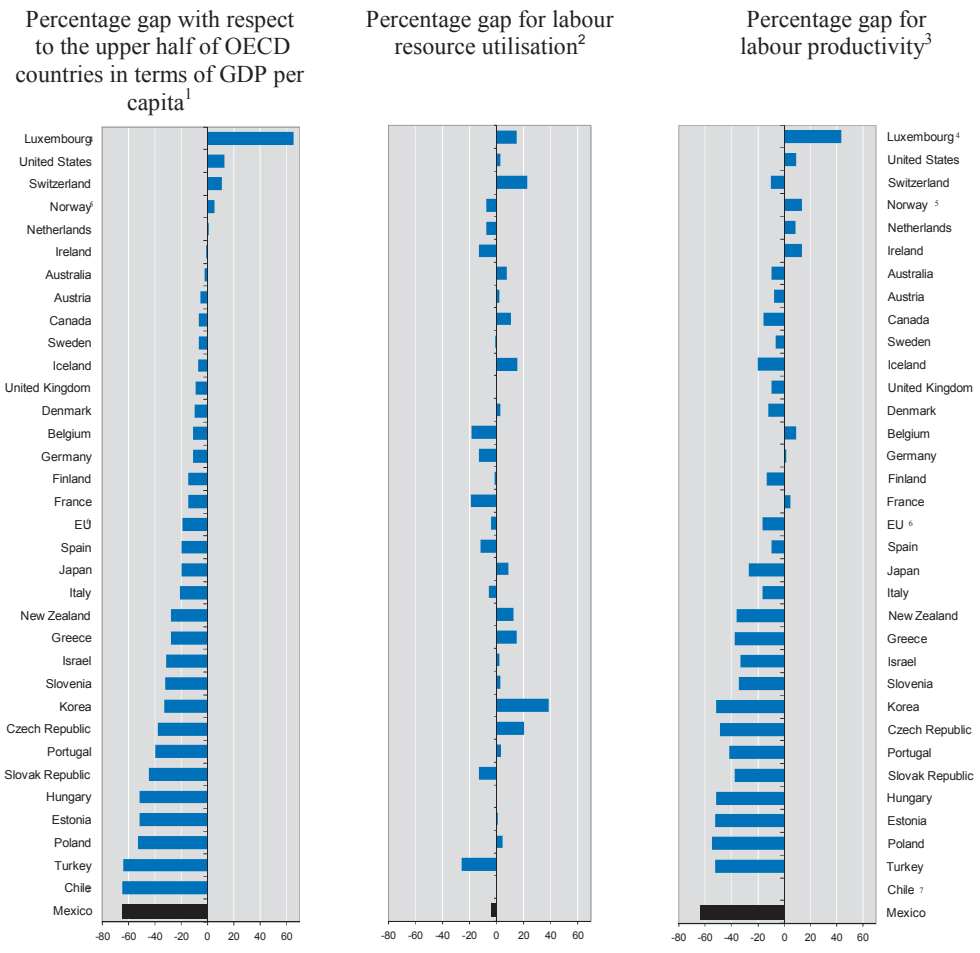
Average annual growth rates for GDP per capita



Note: Due to lack of data initial GDP per capita values for South Africa refers to 2003. Average annual growth rates have been adjusted accordingly.

Source: OECD (2011) *National Accounts*, accessed online at OECD.Stat on June 15th 2011.

Figure 1.2. **Sources of real income gaps in the OECD in 2009**



1. Relative to the simple average of the highest 17 OECD countries in terms of GDP per capita, based on 2009 purchasing power parities (PPPs). The sum of the percentage gap in labour resource utilisation and labour productivity do not add up exactly to the GDP per capita gap since the decomposition is multiplicative.

2. Labour resource utilisation is measured as total number of hours worked per capita.

3. Labour productivity is measured as GDP per hour worked.

4. In the case of Luxembourg, the population is augmented by the number of cross-border workers in order to take into account their contribution to GDP.

5. Data refer to GDP for mainland Norway which excludes petroleum production and shipping. While total GDP overestimates the sustainable income potential, mainland GDP slightly underestimates it since returns on the financial assets held by the petroleum fund abroad are not included.

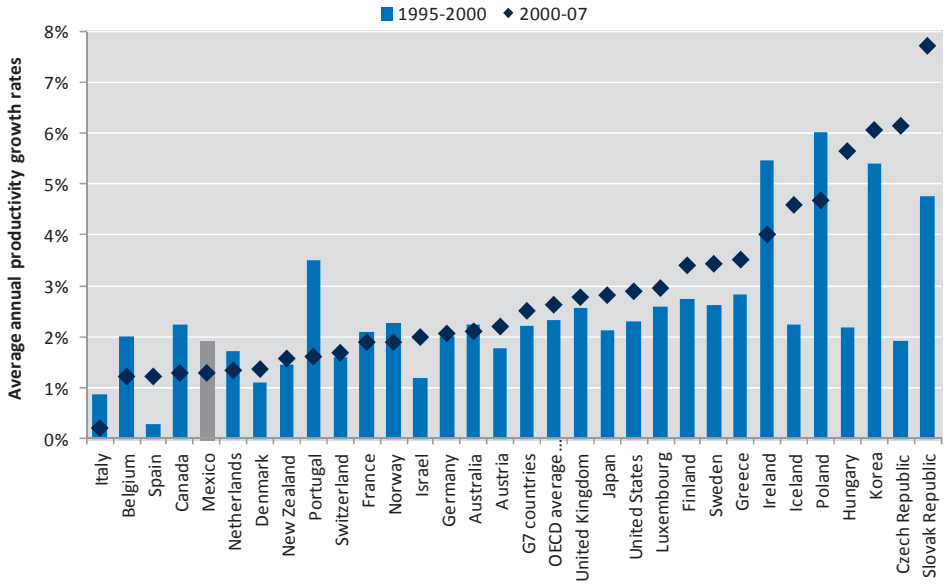
6. EU brings together countries that are members of both the European Union and the OECD. These are the EU15 countries plus Czech Republic, Estonia, Hungary, Poland, the Slovak Republic and Slovenia.

7. Data on hours worked are not available for Chile.

Source: OECD (2011) *Going for Growth*, OECD Publishing, Paris.

Figure 1.3. **Productivity growth in the OECD**

Average annual productivity growth rates (1995-2007)



1. Productivity is defined as GDP per hour worked.

2. OECD average (30) refers to the average annual productivity growth rates in 30 OECD countries excluding Chile, Estonia, Israel and Slovenia.

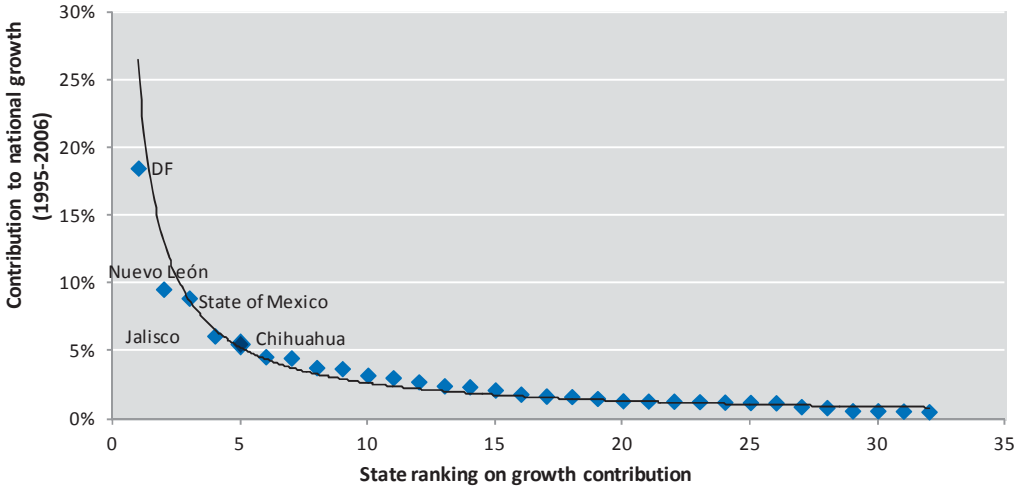
Source: OECD (2011) *Productivity Database*, accessed online at OECD.Stat on June 15th 2011.

Mexico's economic growth is highly geographically concentrated and Chihuahua is one of the main contributors. Almost half of all economic growth experienced between 1995 and 2006 in the country took place in only 5 of the 32 states: Distrito Federal, Nuevo León, Edo. de México, Jalisco and Chihuahua. Chihuahua was the 5th largest contributor to national economic expansion with 5.5% of all national growth (Figure 1.4). The three largest metropolitan areas in the country are clearly driving national growth. Distrito Federal and Edo. de México each contained about half of the population of Mexico City. More than 85% of Nuevo León's population in 2010 was located in one of the 10 municipalities onto which the Monterrey metro-region sprawls. Almost 60% of Jalisco's population was located in the Guadalajara metro-region. Chihuahua comes after these three metro-regions, but growth in the state has been concentrated in two municipalities that already hold two-thirds of population: Chihuahua City and Juárez. These two urban centres concentrated 93% of the state's population growth between 1990 and 2005.

Despite its sizable contribution, Chihuahua's growth has dramatically fallen in the last decade. After being one of the OECD's most dynamic regions between 1995 and 2000 (Figure 1.5), the state's GDP per capita growth moved into the group of lagging regions in terms of income and underperforming in terms of growth between 2000 and 2006 (Figure 1.6). The outstanding average annual growth rate of 7.1% that Chihuahua achieved during the late nineties (1995-2000), was slashed to an annual average rate of just 1.5% between 2000 and 2006. Largely, the reason for slower growth rates lie in vulnerability to external shocks that the model brings about and the two crises that the region had to face in less than ten years.

Figure 1.4. **State contribution to national growth**

Ordinal ranking of state's share of national increase in GDP (2006 with respect to 1995)

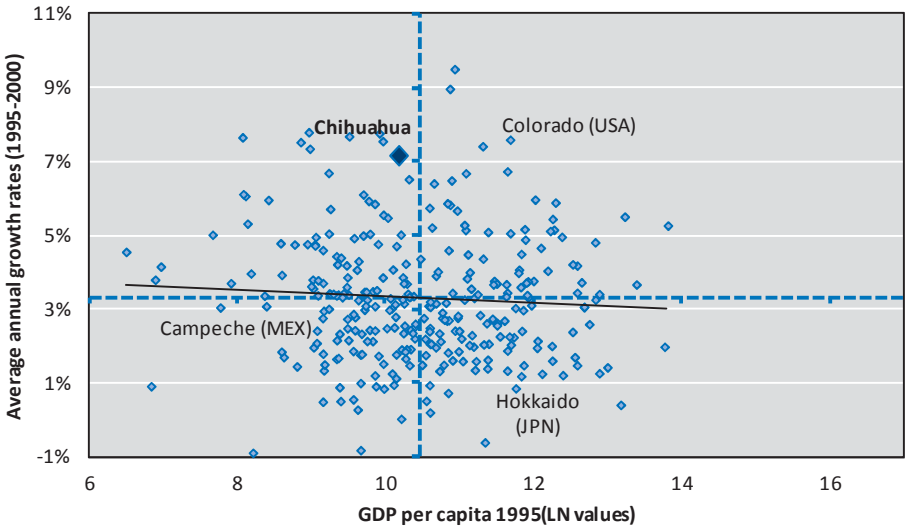


Note: States' are ranked on the horizontal axis according to their growth contribution.

Source: OECD calculations based on OECD (2011) *Regional Database* accessed online at OECD.Stat on June 22nd 2011.

Figure 1.5. **Regional economic growth, 1995-2000**

Average annual growth rates for OECD TL2 regions (1995-2000)



1. Excluded countries due to lack of data at regional level: Iceland, New Zealand and Switzerland.

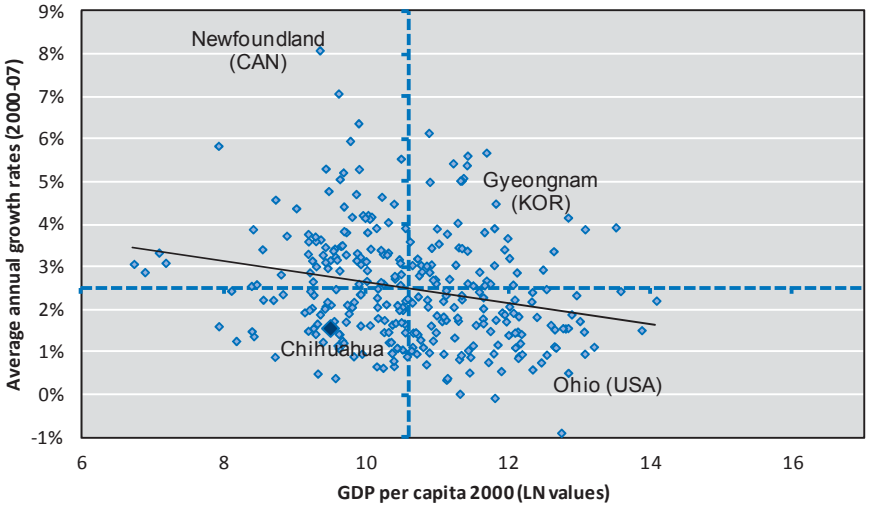
2. Different period for Norway (1997-2000).

3. Turkey was excluded from the sample as it experienced large negative growth rates during the period.

Source: OECD calculations based on OECD (2011) *Regional Database* accessed online at OECD.Stat on June 22nd 2011.

Figure 1.6. **Regional economic growth, 2000-07**

Average annual growth rates for OECD TL2 regions



1. Excluded countries due to lack of data at regional level: Iceland and Switzerland.

2. Different periods for: Japan (2000-06), Mexico (2000-06), New Zealand (2000-03).

3. Turkey was excluded from the sample as it experienced large negative growth rates during the period.

Source: OECD calculations based on OECD (2011) *Regional Database* accessed online on 22 June 2011.

Chihuahua's strong economic performance after Mexico joined NAFTA is related to FDI attraction and export levels. Since the late 1960s, firms have been attracted to northern Mexico as the country implemented the Border Industrialisation Programme and encouraged FDI through the *maquiladoras* (Box 1.1). FDI flows and employment related to *maquiladoras* grew steadily in Mexico and in particular in Chihuahua, but accelerated with Mexico's accession to GATT in the mid 1980s and again with economic integration through NAFTA in the mid 1990s and thanks to its proximity to the US market. openness and proximity were key factors that shifted the relevant market in Mexico from the old industrial belt in and around Mexico City to the border (Krugman and Livas Elizondo, 1996). As a result, Mexico's regional disparities amplified particularly after NAFTA (Sanchez-Reaza and Rodríguez-Pose, 2002). The impact was so vast that Mexico's industrial structure changed completely. In 1990, the gross value of production (GVP) in the *maquiladora* industry represented one-quarter of all manufacturing and the remainder by domestic firms.[3] Ten years later the shares were inverted: three-quarters of the GVP was produced by *maquiladora* plants and the remaining one-quarter by domestic firms (Sánchez-Reaza, 2009). In Chihuahua, FDI flows led to an explosion in the volume of exports and made the state the leading region in Mexico in terms of trade. In 2000, exports represented more than 60% of the state's GDP (Figure 1.7). However, the industry has been accused of a number of shortcomings such as low value added that leads to low paid jobs and lack of linkages with domestic firms despite enjoying a preferential regime.

Box 1.1. **The development of the *Maquiladora* industry in Mexico**

The *maquiladora* industry is what some authors have called export oriented zones, which were introduced in Mexico in 1965 under the Border Industrialisation Programme. The relatively isolated development experienced in border-states attracted immigrants who demanded services, generating social problems (SPP, 1985). Even in 1961, the relative dynamism of border-states and their lack of integration with the rest of the country motivated the government to set up the *Programa Nacional Fronterizo*. In addition, the programme was also an attempt to win over the border area's growing market for domestic firms (SPP, 1985). Further to what the government perceived as the region's de-integration, the situation was aggravated by the decision taken by the US Government in 1964 to suspend the Bracero Programme (García y Griego and Verea Campos, 1988). US participation in the Second World War reduced the labour supply, increasing demand for Mexican migrant workers. Thus, in 1942 the US Bracero Programme allowed temporary non-immigration stay of Mexican workers. The Programme carried on until 1964 (García y Griego and Verea Campos, 1988).

The Mexican Government foresaw a massive return of workers demanding employment and services. Therefore, the Border Industrialisation Programme's scheme allowed foreign-owned firms to operate along its border with the US on a duty-free basis (Sklair, 1990). A large number of firms took advantage of US tariff rules on the re-import of assembled semi-finished goods that incorporated US components. Although Mexico allowed almost unrestricted inflows of US investment in the North, it continued to protect the rest of the country in line with ISI principles. However, the industry eventually became an important source of foreign currency and employment and attained considerable shares of manufacturing production under trade liberalisation. Despite the 1972 regulation, which allowed *maquiladoras* to locate anywhere in Mexico, the industry has remained heavily concentrated along the border with the US.

Source: Sanchez-Reaza (2009), *Trade, Proximity and Growth: The Impact of Economic Integration on Mexico's Regional Disparities*, VDM, Berlin.

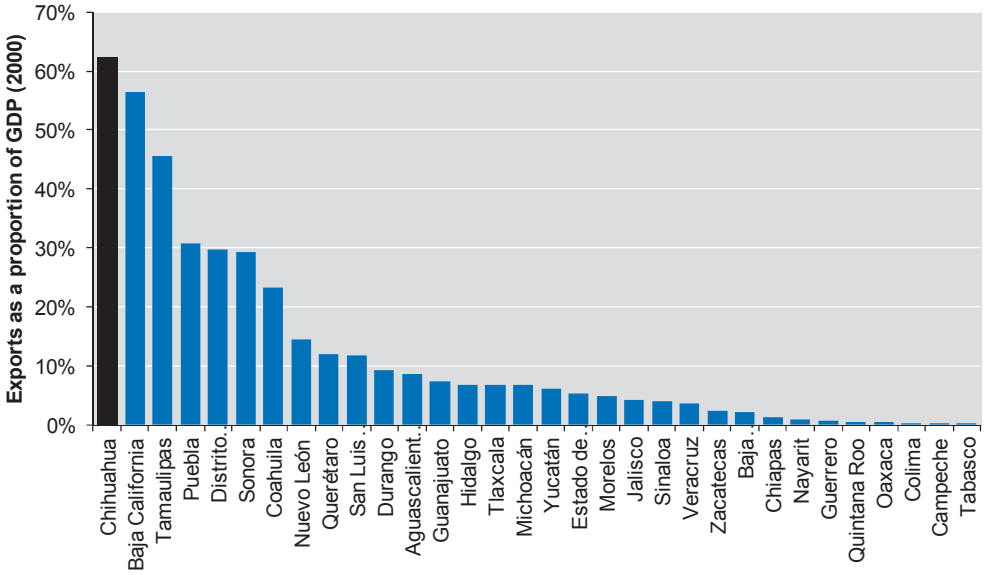
Productivity emerges as the key untapped potential for the state, as it alone can dramatically change performance in the short and medium terms. Per capita GDP levels in leading states in Mexico can be largely explained by productivity, as in the cases of Campeche in the South where most of the oil production in Mexico is located, DF that holds the core of Mexico City's metro-region or Quintana Roo that is heavily based on tourism in Cancún and other attractions. In the case of Chihuahua, productivity is lagging with respect to the national average, and as a result, contributes negatively to explaining GDP per capita differences between the state and the nation (Figure 1.8). Another factor contributing to a lower-than-expected performance is employment rates. Chihuahua, due to the recession in 2001-03 and the recent financial crisis, has not been able to create as much jobs as it requires boosting GDP per capita levels.

Chihuahua is among the many other Mexican states that are not making the most of their assets. Chihuahua, like most leading states, has a demographic bonus. The size of the potential labour market (the proportion of population in their working age) and the participation rates are the sole factors positively influencing Chihuahua's GDP per capita (Figure 1.8). The actual pooled labour market expressed in the size of active workers (participation rates) at 65.6% is larger than the national average (64.5%) in 2007. Such larger participation rate means a smaller inactivity rate (inactive population as a proportion of working-age population) than the national average. Inactive population are in the working-age population group (15 to 64 years), but not employed and because they

are not seeking employment they are neither unemployed. Chihuahua had in 2004, the seventh largest inactivity rate and the second among border-states. At 36.9% of working age population, Chihuahua's inactivity rate was larger than the national average by 3.6 percentage points in 2004. Although inactivity rates have decreased to 34.3% by 2007, they are still high by OECD standards.4 Inactive population includes students, but also other young population and stay-at-home parents. Recently, Mexico has experienced a rise in inactive young population that are neither studying nor working ("ni estudian, ni trabajan") that Mexicans have called the NiNis (Spanish acronym for "neither studying nor working"), and those employed (employment rates). In 2010, 18.4% of those aged between 15 and 19 and one-quarter of those 20 to 24 were NiNis. Among OECD countries, only Turkey and Israel experienced larger inactivity for their young population (OECD, 2011e). Arceo-Gómez and Campos-Vázquez (2011) estimated that some 8.6 million people, which represent almost 29% of population aged between 15 and 29, were NiNis. Moreover, Arce-Gómez and Campos-Vázquez also found that Chihuahua was among the only four states that experienced an increase in NiNis between 1990 and 2010. Although a part of those NiNis are stay-at-home parents, such high inactivity rates could signal fewer opportunities for younger population.

Figure 1.7. **Exports by state in Mexico, 2000**

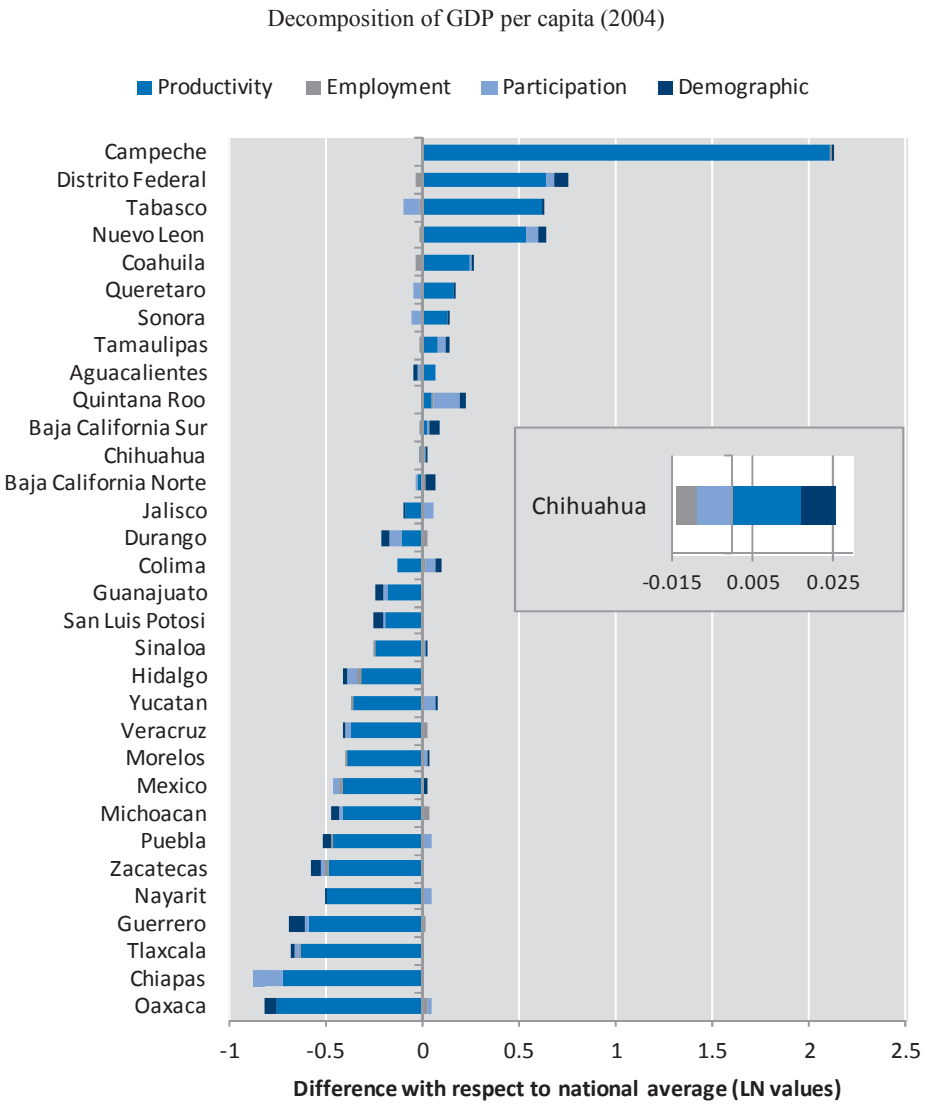
Exports as a proportion of GDP



1. Figures for exports of non-oil activities refer to the latest available year (2000). 2. As data for exports excludes oil, the two main oil-producing states (Campeche and Tabasco) display poor performance. 3. Data for exports stems from Bancomext (2002) *Estadísticas de Comercio Exterior, Mexico*, Banco Nacional de Comercio Exterior, Mexico. Data for GDP in 2000 was taken from INEGI (2007) *Banco de Información Económica*, accessed online in March 2007 at *http://dgcnesyp.inegi.gob.mx*, Instituto Nacional de Estadística, Geografia e Informática, Aguascalientes.

Source: OECD (2007) *Territorial Reviews: Yucatán, Mexico*, OECD Publishing, Paris.

Figure 1.8. **Factors influencing income differences across Mexican states**



Note: GDP per capita can be disaggregated into four components: productivity, employment, participation and demographic. The demographic component represents the size of the pooled labour market of each region compared to the national average. Labour market pool is calculated as the proportion of the working-age population over the total population.

Source: Author's calculations based on OECD (2011) *Regional Database*, accessed online at OECD.Stat on 22 June 2011.

Chihuahua's economic development model

Chihuahua has been following an outward development model that has encouraged foreign investment and created jobs. The state's outward development model is based on FDI attraction. There is an explicit government policy to attract foreign businesses to create jobs and some revenue for the state through the payroll tax. Local entrepreneurs have also become very successful in attracting businesses to land they own in and on the outskirts of cities. With nearly 500 plants that employ almost one quarter of a million

people, Chihuahua is the state with the most *maquiladora* employment and the second in number of plants (CIES, 2010). However, total value added for the industry has remained low, ranking Chihuahua eighth in the country. With average annual flows approaching USD 1.4 billion, Chihuahua is also third in the country in attracting FDI behind only Mexico City (DF) and Nuevo León.

However, an outward development model poses a number of challenges. A high influx of FDI to the state has dominated employment creation. FDI has also influenced policy objectives and strategies, as well as entrepreneurs' activities. As a result, the government has made FDI attraction a core development objective and a number of local entrepreneurs have geared their activities towards FDI attraction. However, the effects on the local economy are mixed. It is unquestionable that FDI has delivered the promise of generating jobs and has also raised wages in the north of Mexico as a result and the regional wage premium has persisted (Hanson, 2003). It is also true, as will be explored below, that there are clear benefits in terms of human capital development as FDI increases demand for skilled labour (Feenstra and Hanson, 1997). However, there are still challenges in connecting these plants to local firms, to upgrade overall stock of human capital and technological spillovers although are arguably made possible by MNEs, this is still not confirmed.

Such an outward development model for Chihuahua has lead to a number of challenges:

- labour demand becomes so important that workers from other states and from Chihuahua's rural areas are attracted to urban areas where *maquiladoras* are located;
- migration increases land and housing demand,[5]
- urban sprawl created by migration, by land and housing demand, as well as by firm location, leads to environmental concerns and increased costs of providing services;
- younger population in rural areas migrate and often their plots of land are abandoned hindering the development of agricultural activities;
- the government runs the risk of overlooking local firms' development; and
- the number of entrepreneurs that could create and innovate new products and services is reduced as market incentives encourage them into attracting FDI instead.

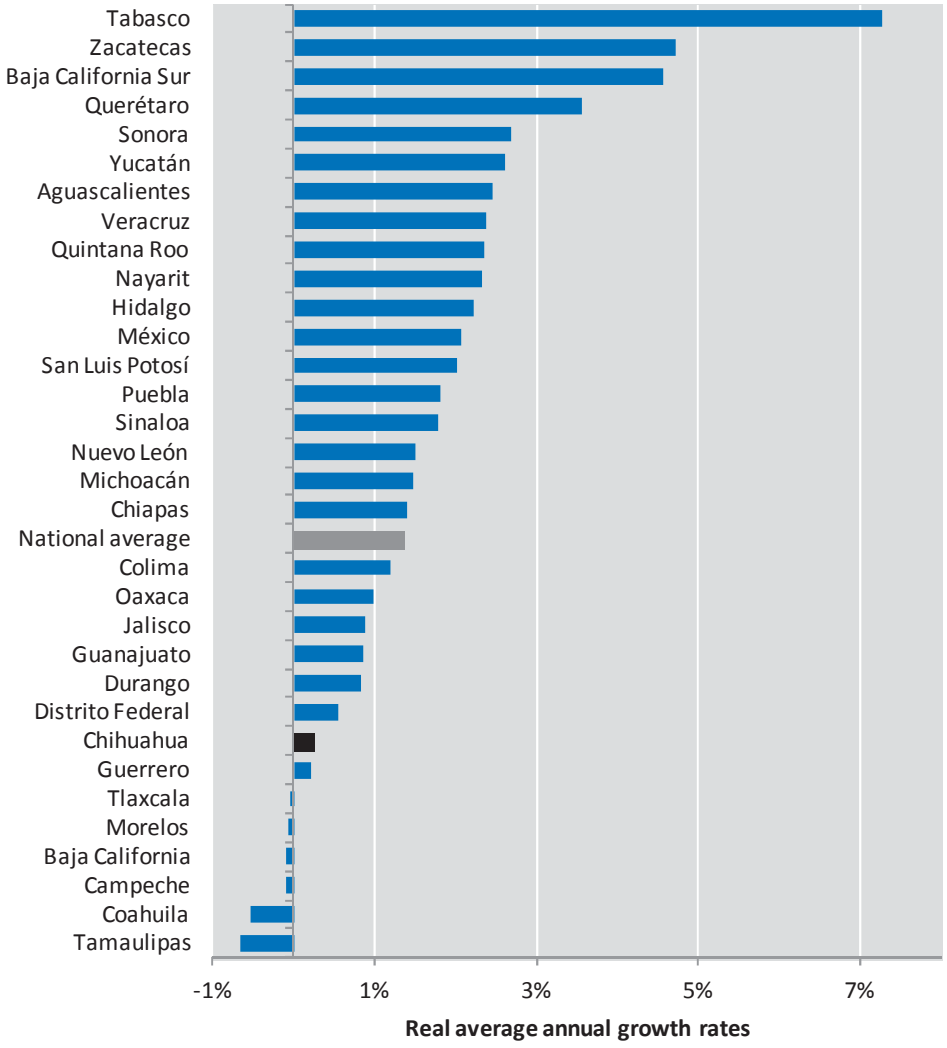
External shocks play a major role in explaining slower economic growth in Chihuahua. The state is among the Mexican states with lower economic growth performance (Figure 1.9). Chihuahua's real GDP (at 2000 prices) was MXN 200 billion in 2004, and five years later output increased in real terms by only MXN 2.5 billion. The economy grew by 1.24% over the 2004-09 period, or at an average annual rate of 0.25%. Mexico's growth over the same period stood at an average annual growth rate of 1.34%, which is more than five times the speed of growth in Chihuahua. The state economy had the seventh lowest performance among Mexican states (Figure 1.9).

Chihuahua's success in attracting FDI has been largely reflected in its long-term economic growth, but has also shown to be a source of potential vulnerability from external shocks. The first of these shocks took place between 2001 and 2002, which led to deep annual contractions –particularly in 2001 that led to a -3.7% growth rate—but overall the period (1999-2004) brought about some growth for the first part of the decade (Figure 1.10). For Chihuahua, the 2001-02 recession was partly due to lower demand from the US through the *maquiladora.* In addition, job losses were due to technological

progress in electronics and mergers and acquisitions in the automobile sectors[6] that resulted in streamlining process, closure of plants and massive layoffs (Sanchez-Reaza, 2009). Chihuahua lost 107 000 manufacturing jobs between October 2000 and June 2002 and although GDP contracts in 2001 and 2003, overall in the period it was still able to grow.

Figure 1.9. **Economic growth among Mexican states, 2004-09**

Real average annual growth rates using GDP (2000 prices)



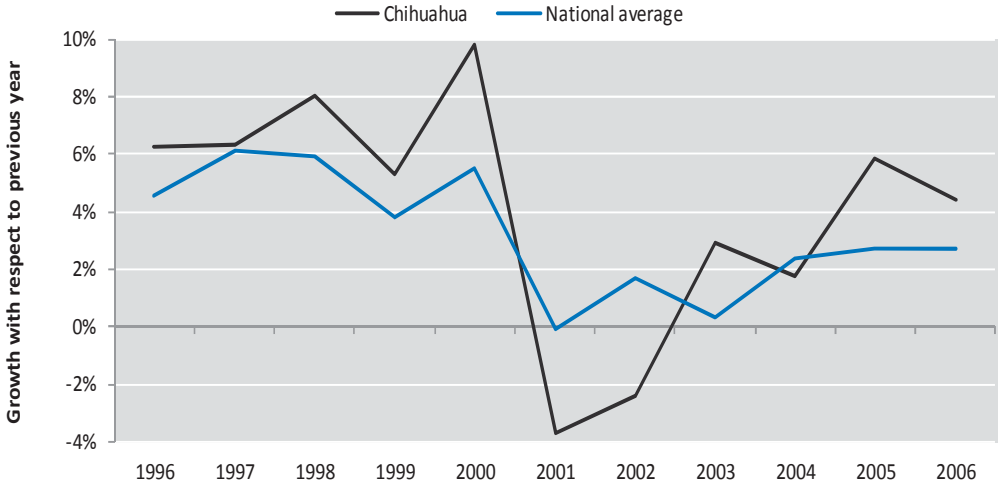
Source: Author's calculations based on *Banco de Información Económica*, accessed online at *http://dgcnesyp.inegi.org.mx/cgi-win/bdieintsi.exe* on August 24th 2011, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico.

The financial crisis of 2008, became the second external shock to reveal Chihuahua's vulnerability. As Chihuahua's economy is intimately linked to US demand, the largest crisis since the Great Depression was bound to hit the region. After solid annual growth rates of around 4% between 2004 and 2006, Chihuahua slowed down in 2007

(Figure 1.11). The growth rate in 2007 with respect to the previous year was halved. By 2008 growth stagnated and 2009 growth rates plunged by almost 10%. Since the recovery from the first external shock in 2001-02, Chihuahua underperformed with respect to the national average. Chihuahua's vulnerability becomes a critical issue in the current world context of crises and sluggish growth (Box 1.2). As most of the world's economic expansion will come from emerging economies like the BRICS (Brazil, Russia, India, China and South Africa) in the coming years, Chihuahua could consider diversifying its economy on markets and on sectors. On the one hand, the new government should partner with the local entrepreneurs to open new markets in emerging economies and on the other, it should look at ways in which to support as well other sectors with potential for growth such as primary activities (see Chapters 2 and 4).

Figure 1.10. **Real annual economic growth in Chihuahua, 1995-2006**

Real GDP growth rates with respect to previous year (2000 prices)

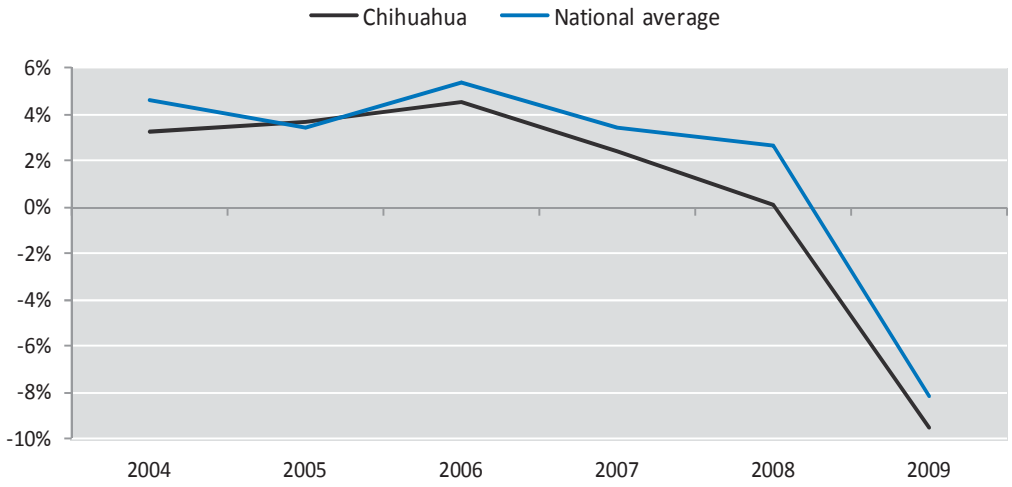


Source: Author's calculations based on OECD (2011) *Regional Database*, accessed online at OECD.Stat on June 22nd 2011.

Chihuahua's economic growth was due to capital deepening chiefly as a result of FDI flows. In order to carry out a growth accounting exercise (see Annex A for the methodology), growth was divided according to dates when the economic census were carried out (1999, 2004 and 2009) since the data for investment is only available in those census and not as annual series. The 1999-2004 period observed an overall growth rate of 8.4%, which is annually an average rate of almost 1.7%. The main driver of such growth was the labour input due to employment growth. Capital deepening not only played a positive role, arguably thanks to FDI, during the 1999-2004 period, but also in the 2004-09 period (Figure 1.12). Technological progress played a negative role during the 1999-2004 period, perhaps due to the initially adverse effects of plant closures in the electronics industry (see above).

Figure 1.11. **Real annual economic growth in Chihuahua, 2003-09**

Real GDP growth rates with respect to previous year (2000 prices)



Note: Data from Mexico's INEGI (2011) was taken in current prices and converted to constant prices of 2000 using OECD reference series for Mexico. Growth was then calculated on the logarithmic quotient of the current and the previous years.

Source: Author's calculations based on INEGI (2011), *Banco de Información Económica*, Instituto Nacional de Estadística, Geografía e Informática, *http://dgcnesyp.inegi.org.mx/cgi-win/bdieintsi.exe,* accessed 24 August 2011.

Box 1.2. **OECD's Economic Outlook**

The recovery is projected to strengthen in the near term, but there are concerns about the longer-term legacy of the financial crisis, particularly because of the emergence of unsustainable fiscal imbalances as well as the possible damage to long-term growth prospects. Nearly all OECD economies are expected to improve their fiscal balances over the course of 2011 and 2012. However, for many this will still leave fiscal balances too weak to stabilise government debt and for others, where debt is stable, it will be at levels which remain too high. The crisis could have a long-lasting adverse effect on the growth rate of output, particularly as a consequence of large fiscal imbalances or continuing financial fragilities, and so lead to a prolonged period of stagnation. An alternative risk of "stagflation" – stagnation combined with inflation – might arise as a consequence of continuing upward pressure on oil and other commodity prices. These risks are examined in the context of previous historical episodes of stagnation and the implications for policy are considered.

Fiscal consolidation requirements for many countries are substantial. In Japan and the United States, stabilising the debt-to-GDP ratio would require an overall improvement in the underlying primary balance of 10 to 11 percentage points of GDP from the 2010 position, implying a protracted period of fiscal tightening. Other countries for which consolidation requirements are large include Greece, Ireland, Poland, Portugal, the Slovak Republic and the United Kingdom, which all require consolidation of about 6 to 8½ percentage points of GDP from the 2010 position. In addition, for a typical OECD country, additional offsets of 3% of GDP will have to be found over the coming 15 years to meet spending pressures due to increasing pension and health care costs. Consolidation requirements would be much more demanding if the aim were to return debt-to-GDP ratios to their pre-crisis levels. For the OECD area as a whole the improvement in the underlying primary balance from the 2010 position that

Box 1.2. **OECD's Economic Outlook** *(cont.)*

would be required to reduce the debt ratio to pre-crisis levels by 2026 would be more than 13 percentage points of GDP, compared to seven percentage points to simply stabilise debt.

Many countries will be undertaking fiscal consolidation over a prolonged period and there is a risk that the sustained adverse effect on demand could delay the recovery and even risk stagnation. In this respect, countries face a difficult choice between front-loaded fast consolidation and more gradual consolidation. Fast consolidation has the advantage that it may reduce the overall scale of required consolidation and reassure financial markets, but it also increases the risk of adversely affecting the recovery particularly if monetary policy is constrained. To improve the terms of this trade-off, countries should put greater weight on measures which will improve long-term fiscal sustainability – for example raising retirement ages or containing future increases in health costs – but which have relatively limited immediate negative effects on demand. To reassure financial markets, it is also important to have a clear medium-term fiscal plan specifying objectives and the instruments that will be used. Consolidation should also avoid measures, such as reducing public investment or support for R&D, which weaken the supply side and instead target measures which strengthen it.

From 2013 onwards, the growth rate of OECD-wide potential output recovers to average about 2% per annum, below the average potential growth rate of 2.25% per annum achieved over the seven years preceding the crisis. Most of the difference is due to slower growth both in participation rates and in the working-age population, mainly reflecting demographic trends rather than additional effects from the crisis.

Given the assumption that negative output gaps close by 2015 in most countries, and despite slower potential growth, area-wide GDP growth averages almost 3% per annum over the period 2010-15, compared to 2.5% per annum over the period 2000-07. Unemployment is falling in all countries, with the area-wide unemployment rate down from 8.25% in 2010 to a rate of just over 6.25% by 2015 and just under 6% in 2026, reflecting both the recovery and, perhaps also optimistically, the reversal of post-crisis hysteresis effects. However, growth prospects rely heavily on non-OECD countries continued strong growth – particularly China, India, Russia and Brazil. Strong growth in these regions continues to be a major source of export demand in some OECD economies such as Germany and Japan.

The Mexican economy has embarked on a strong recovery from the recession of 2008-09. Initially driven by exports, activity is expected to be increasingly supported by domestic demand. After a strong rise in 2010 to 5.5%, GDP growth will ease in 2011 (4.5%) and 2012 (3.8%), as the expansion of exports will normalise. The government started fiscal consolidation in 2010 with tax increases and a partial withdrawal of stimulus measures. The projection assumes that the government will implement its plans to return to a balanced budget, based on the national definition of the deficit, by 2012. Oil production has stabilised for now, but the government should reduce its dependence on this volatile source of revenues by implementing further tax reform and withdrawing energy subsidies more quickly. Meanwhile, the central bank can wait to raise interest rates, as slack in production capacity remains large, core inflation has fallen throughout 2010 and inflation expectations remain well anchored. Thus recent food price increases are not expected to lead to important second round effects.

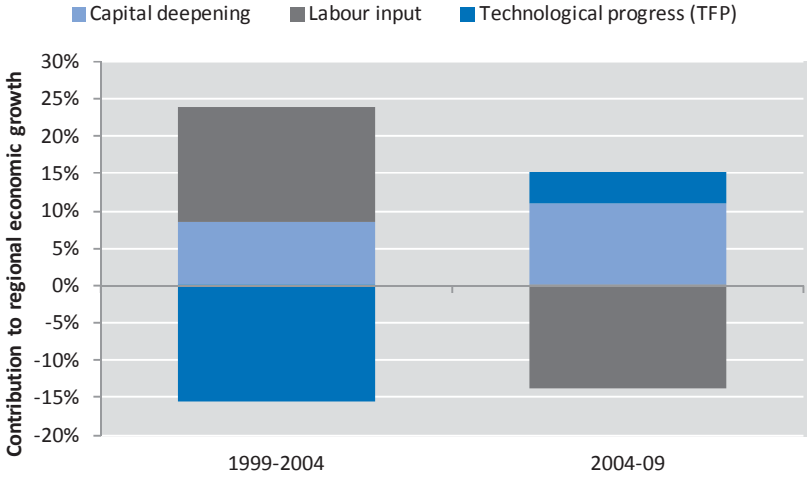
Source : OECD (2011) *Economic Outlook Volume 2011/1*, OECD Publishing, Paris.

The 2004-09 period is affected by another external shock and under those circumstances, capital deepening and to a lesser extent technological progress are leading to, even if meagre, some growth. Capital deepening and the positive effects in terms of total factor productivity of a technological change, led to some growth. FDI accompanied by more capital-intensive processes and even design and engineering centres might be

playing a role in that more recent period. However, the financial crisis led to a severe contraction that made employment contract by almost 14%. In fact, the labour input was a negative factor of growth during the 2004-09 period across all Mexican states (Figure 1.13). Mexican states are in many cases benefiting from technological progress, but its effect in Chihuahua was meagre. It is also possible that insecurity might have deterred capital formation in Chihuahua.[7] As technological progress was the result of an external shock, unless such shocks are sustained –and there is no certainty in that— attention should be geared towards improving labour productivity, attracting FDI and fostering entrepreneurship to increase capital deepening and spark innovation.

Figure 1.12. **Chihuahua's growth factors**

Growth accounting for Chihuahua in different periods



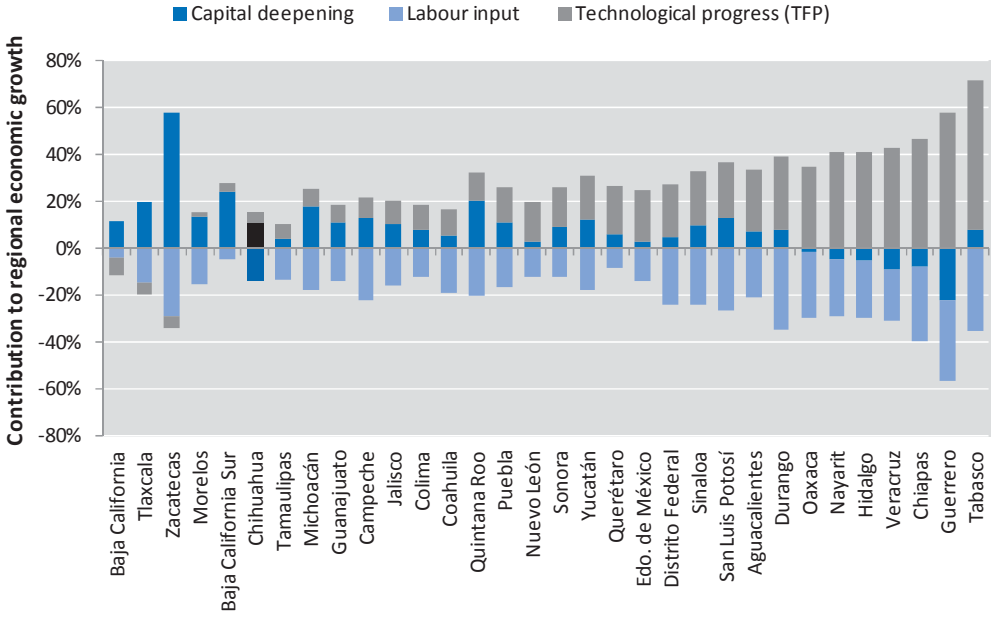
1. Growth accounting followed the methodology in OECD (2008) *Productivity Compendium*, OECD Publishing, Paris. See Annex A for a full description.

2. The 1999-2004 and 2004-09 periods are not necessarily comparable as GDP data for both stems from different sources. The former uses data from the OECD Regional Database, whereas the latter uses INEGI data.

Source: Author's calculations based on different sources. GDP data for the 1999-2004 period: OECD (2011) *Regional Database*, accessed online at OECD.Stat on 22nd June 2011. GDP data for the 2004-09 period: INEGI (2011), *Banco de Información Económica,* Instituto Nacional de Estadística, Geografía e Informática, *http://dgcnesyp.inegi.org.mx/cgi-win/bdieintsi.exe*, accessed 24 August 2011. Data for capital stocks and employment levels from: INEGI (1999) *Censos Económicos 1999*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico; INEGI (2004) *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico; INEGI (2010) *Censos Económicos 2009*; Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico.

Figure 1.13. **Growth factors in Mexican states**

Percentage contribution to real GDP growth (2004-09)



Note: Growth accounting followed the methodology in OECD (2008) *Productivity Compendium*, OECD Publishing, Paris. See Annex A for a full description.

Source: Author's calculations based on different sources. GDP data from INEGI (2011), *Banco de Información Económica*, Instituto Nacional de Estadística, Geografía e Informática *http://dgcnesyp.inegi.org.mx/cgi-win/bdieintsi.exe*, accessed 24 August 2011. Data for capital stocks and employment levels from: INEGI (2004) *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico; INEGI (2010) *Censos Económicos 2009*; Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico.

1.2. Determinants of growth

Long-run growth is driven chiefly by the expansion of capital, skills and innovation. Comparative evidence of economic growth paths across countries shows that often takes very little to get growth started (Rodrik, 2007). Such periods of economic growth spurts albeit short-lived, are not something that should be overlooked. In fact, countries do not need a full range of economic reforms to get growth started (Rodrik, 2007). But once started, the policy challenge is to sustain it in the long-run. OECD research shows that capital, including infrastructure, is a necessary but not sufficient condition for long-run economic growth. Infrastructure provision is an important part of policymaking and often government officials opt to provide it as it is needed to connect communities and people, to enable activities or simply to save lives; it is also thought as an element that triggers long-run growth. While it is possible that short to medium-term growth spurts are possible with a strategy based on building infrastructure, the truth is that to get a long-term positive effect out of infrastructure, the economy requires other key elements in place. And if such spurt does take place, the effect of infrastructure on growth wanes over time (OECD, 2009b). It is also possible that by providing transport infrastructure to connect places, capital would find it easier and more efficient to concentrate in one or few places and ship production through the new transport system that reduces costs. This

'leaking by linking' effect should not discourage governments from providing better transport infrastructure and connecting communities. The idea is that governments should not only focus on that. For a regional economy to grow, human capital development is also crucial. By providing people with skills new jobs are possible and businesses can be attracted or developed locally. However, if governments only pursue skills development, sooner or later skills would migrate, leading to a brain drain. For these two factors to work positively in the regional economy, an adequate business environment and in particular, innovation is paramount (OECD, 2009c).

Investment

One of the most important applications of public investment is infrastructure provision. Infrastructure building can have short-term impacts through hiring of construction workers and demand for raw materials which has been proven to have strong multiplier effects in the economy. Medium to long-term economic growth can be also positively influenced by the efficiencies that new infrastructure can provide e.g. a road that reduces times or transport costs, or the new markets they can open. Despite long-run growth requires infrastructure to be in place, it is always a necessary but not sufficient condition for growth.

Chihuahua's public investment is lagging behind other states in Mexico. Although Chihuahua's public investment has been growing fast since 2005, it is lagging behind those being made elsewhere in Mexico. Chihuahua invested more than MXN 7.5 billion in 2009, the 10th largest investment effort made by a Mexican state that year (INEGI, 2011a). On average allocations to investment projects and assets in the state have been growing at 12.6% every year since 2005 (Figure 1.14). Yet that is not enough to keep to growth in gross fixed capital accumulation at almost 15% that on average Mexican states make. Nor is it enough to match other northern states such as Coahuila (23.8%) or Tamaulipas (26.6%). Having said that, Chihuahua is investing much more than the leading northern state of Nuevo León (3.8%).

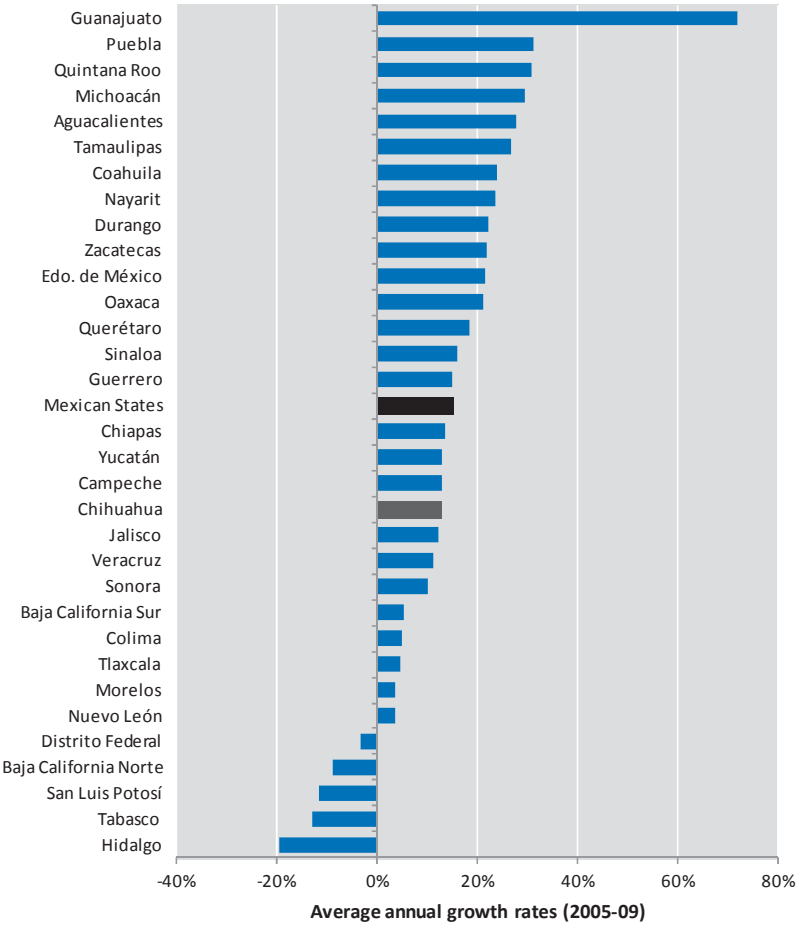
The state and municipal governments have certain capacity to determine infrastructure expenditures that has not been fully exploited to make the most of them to foster growth. According to the sixth and last *Informe de Gobierno* (the regional State of the Union Address) of former Governor Reyes Baeza, MXN 9.8 billion were programmed to be invested during 2010. Almost half of those resources were own, 4.4% coming from federal sources and over one-third being municipal. That is, five out of every six Mexican pesos in public investment were regional or local funds. Although, as will be explored in Chapter 3, a sizable share of those regional and local funds are earmarked transfers from the Federal level, there is certain self-determining capacity of infrastructure projects that may be underutilised. Resources for infrastructure have been underutilised as they are not targeting economic activities.

Chihuahua's public investment growth may have led to better infrastructure, but have not been targeting economic activities. Nearly one-quarter of that investment went to transport and communication projects such as over 200 kms. of motorways and rural roads, as well as improvements to existing motorways, telecommunication stations, completing regional airports and building bridges. The former administration (that ended in October 2010) built 1 138 kms of roads. In 2010, the state government spent more than three times more on urban infrastructure than on building motorways. Chiefly those investments were targeting Juárez and to a lesser extent Chihuahua. Aqueducts, wells and water system maintenance as well as sanitation absorbed MXN 1.7 billion which

represents 17% of all investment in the state. The government spent also that year: MXN 917 million on education and MXN 591 million on security. However, municipalities have spent less in infrastructure (public works) than the national average for municipalities (Figure 1.15). Rural development was a priority concentrating 8% of total investment (Chihuahua State Government, 2010). The new state government headed by Governor César Duarte, has set the commitment with neighbouring states to connect Chihuahua to the wider region through the *Plan Maestro de Infraestructura y Desarrollo Económico Regional del Norte* (Northern Master Plan for Infrastructure and Regional Economic Development). Governor Duarte has also set goals for infrastructure on health and education (Duarte, 2011).

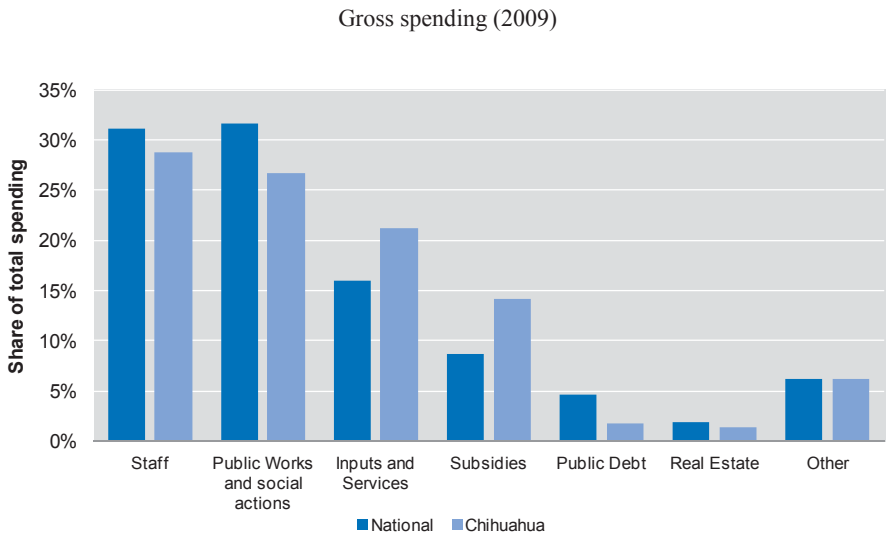
Figure 1.14. **Public investment by Mexican states**

Average annual growth rates for grossed fixed capital formation (2005-09)



Source: Author's calculations based on INEGI (2011) *Gobiernos Estatales y Acumulación de Capital y Cuentas de Producción por Finalidad 2005-09*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

Figure 1.15. **Public expenditure by municipalities in Chihuahua and Mexico**



Source: Author's calculations based on INEGI (2005) Sistema Estatal y Municipal de Bases de Datos (SIMBAD), accessed online at *http://sc.inegi.org.mx/sistemas/cobdem/* on June 15th 2011, Instituto Nacional de Estadística, Geografía e Informática, Mexico.

Chihuahua has experienced solid investment growth rates even during a crisis period. Overall, private investment as measured by total fixed assets grew by an average of 12.6% annually from 2003 to 2008 (Table 1.2). Despite the financial crisis, most sectors still experience some growth. Growth rates for agriculture and other primary activities were solid at 41% average annual growth (Table 1.2). Investment grew also fast in mining at an average annual growth rate of 34%. Investment in all other sectors ranged from average rates between 5 and 15% annually, except for real estate that declined by 12% annually. It is possible that primary-sector activities were modernising during the period. The fact that real estate was the only sector to see its assets contract, may signal the effect of the financial crisis.

However, assets are still heavily concentrated in a few sectors and clear opportunities emerge. Investment grew faster in sectors that had the lowest investment levels following a convergence trend (left-hand side in Figure 1.16). However, only two sectors in Chihuahua's economy concentrate nearly two-thirds of the state's assets: electricity, water and gas (35%) and manufacturing (30%). Investment shares follow a power law (right-hand side in Figure 1.16), which has important implications for policymaking. If investment can spur growth, but the former is heavily biased by a few sectors, easing investment in low-share sectors is an opportunity that can reduce overall risk in the economy by diversifying and can boost investment levels by paying attention to missing opportunities. One such opportunity lies in agriculture, cattle raising, forestry and fisheries. Although the sector had the strongest assets' growth between 2003 and 2008, it also had the second lowest share of total assets with only 0.04%. Given Chihuahua's natural advantages to grow a number of crops, particularly perennial, and for cattle-raising and forestry, the sector is but one example in which Chihuahua can focus to foster investment and growth. It is also a sector that can help bridge the gaps between urban and rural areas in terms of employment and income.

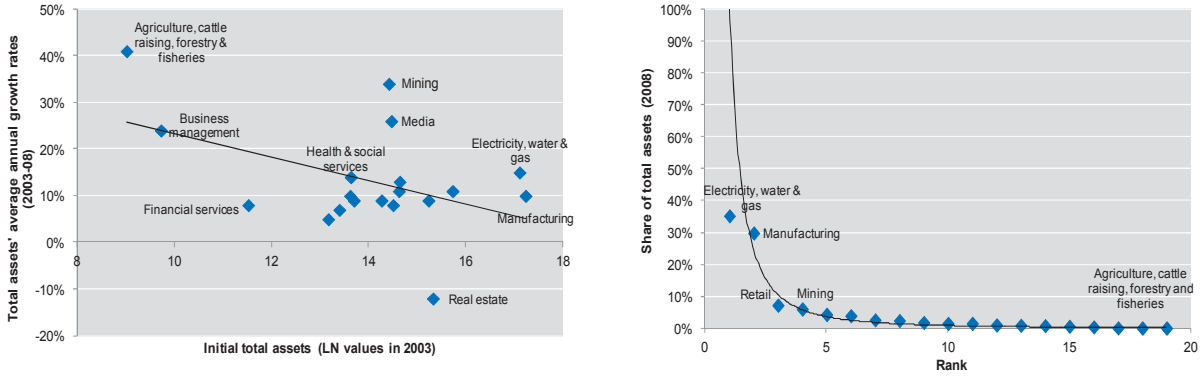
Table 1.2. **Private investment in Chihuahua by sector**

Total fixed assets (2004 and 2009)

Sector	Gross fixed assets MXN 000s at constant prices of 2000 2003	2008	Real average annual growth rates % (2003-08)	Share of total assets % (2008)
Agriculture, cattle raising, forestry and fisheries	8 332	64 341	41%	0.04%
Mining	1 841 990	10 017 897	34%	6.0%
Electricity, water and gas	27 181 812	58 933 508	15%	35.2%
Construction	2 008 806	2 978 742	8%	1.8%
Manufacturing	30 711 106	49 912 311	10%	29.8%
Wholesale	2 301 628	4 406 988	13%	2.6%
Retail	6 837 212	12 018 948	11%	7.2%
Transport	4 160 767	6 506 585	9%	3.9%
Media	1 936 774	7 237 238	26%	4.3%
Financial services	101 889	153 460	8%	0.1%
Real estate	4 566 858	2 498 643	-12%	1.5%
Professional services	664 605	953 699	7%	0.6%
Business management	16 880	56 356	24%	0.03%
Business services	529 238	673 856	5%	0.4%
Education	897 076	1 424 620	9%	0.9%
Health and social services	840 423	1 655 872	14%	1.0%
Cultural, sports and recreational services	828 002	1 398 143	10%	0.8%
Accommodation and catering	2 263 503	3 949 271	11%	2.4%
Other services	1 583 961	2 516 499	9%	1.5%
TOTAL	89 280 862	167 356 975	12.6%	100%

Source: Author's calculations based on INEGI (2005), *Sistema Estatal y Municipal de Bases de Datos (SIMBAD)*, Instituto Nacional de Estadística, Geografía e Informática, *http://sc.inegi.org.mx/sistemas/cobdem/,* accessed 15 June 2011; and INEGI (2007), *Censo Ejidal 2007*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

Figure 1.16. **Sectoral investment growth and shares**



Note: Shares and growth rates were calculated using fixed total assets by sector in Chihuahua on the basis of Economic Census.

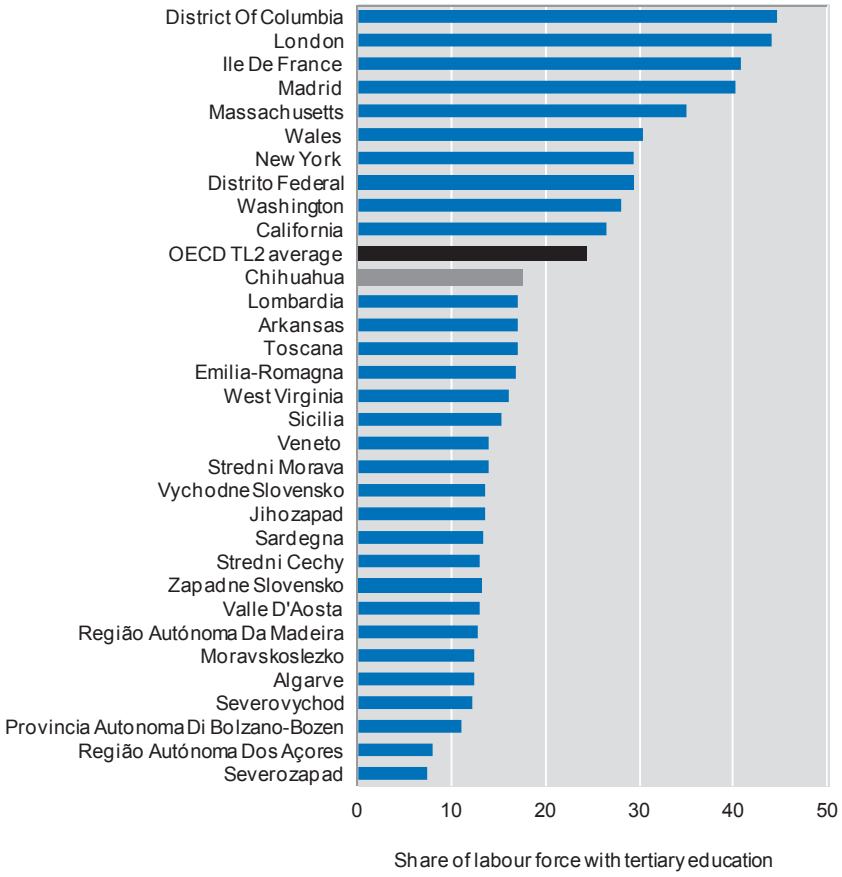
Source: Author's calculations based on data from: INEGI (2004) *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico; and INEGI (2010a) *Censos Económicos 2009*; Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico.

Human capital

Educational attainment in the state is lagging, not only by OECD, but also by Mexican standards. Educational attainment, as measured by the proportion of the labour force with tertiary education, in Chihuahua stood in 2008 at 14.2%, ten percentage points below the OECD average of TL2 regions (Figure 1.17) and slightly lower than the Mexican average for states of 14.7% (Figure 1.18). Skills are important enablers of technology adoption in firms and thereby needed to sustain productivity growth. Skills have an important spatial condition that magnifies their effect more than proportionally. Urban areas become more productive through agglomeration economies and one of the crucial micro-elements of these agglomeration economies is learning through knowledge generation, diffusion and accumulation (Duranton and Puga, 2004). Declining labour productivity since 2004 could be reversed by not only further increasing the quality of education, but also by making it more available to the population thereby increasing economic growth and addressing social inequality.

Figure 1.17. **Skills in selected OECD TL2 regions**

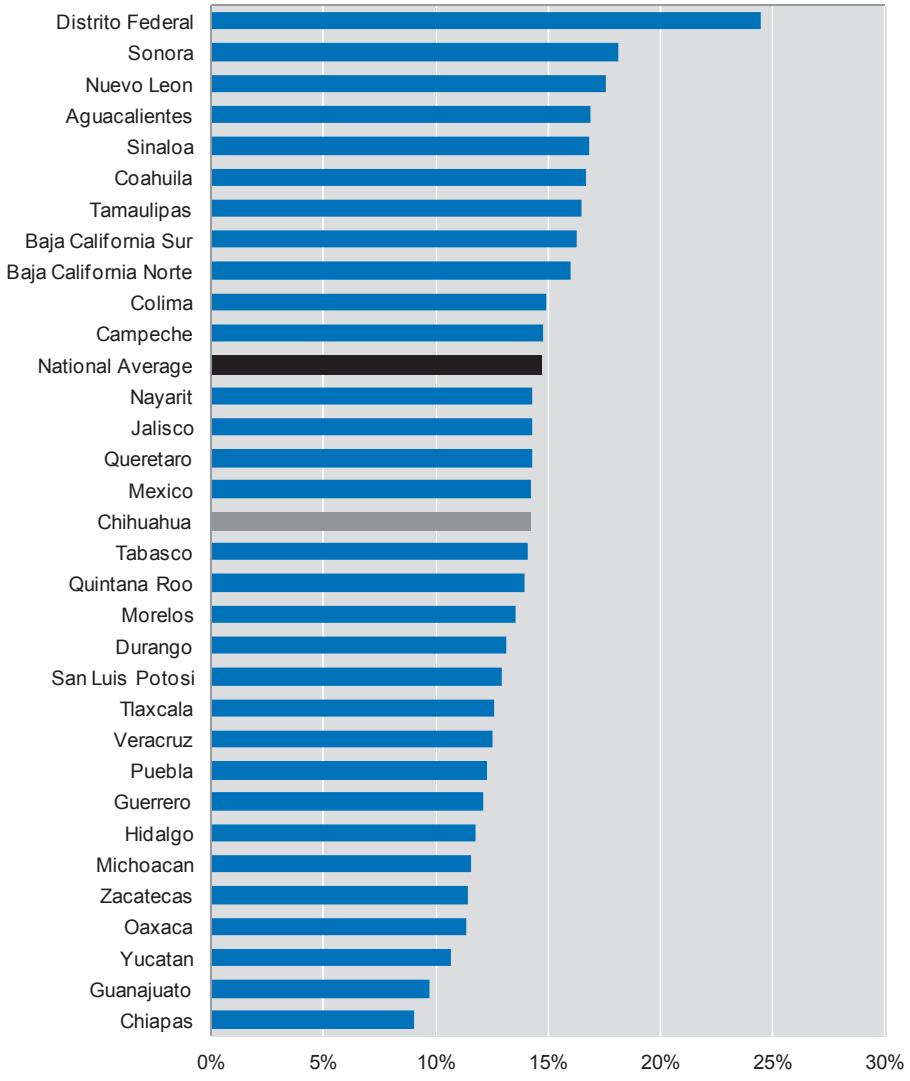
Proportion of the labour force with tertiary education (2008)



Source: OECD (2011), *Regional Database,* accessed online at OECD.Stat on 22 June 2011.

Figure 1.18. **Educational attainment in Mexican states**

Percent of labour force with tertiary education (2007)



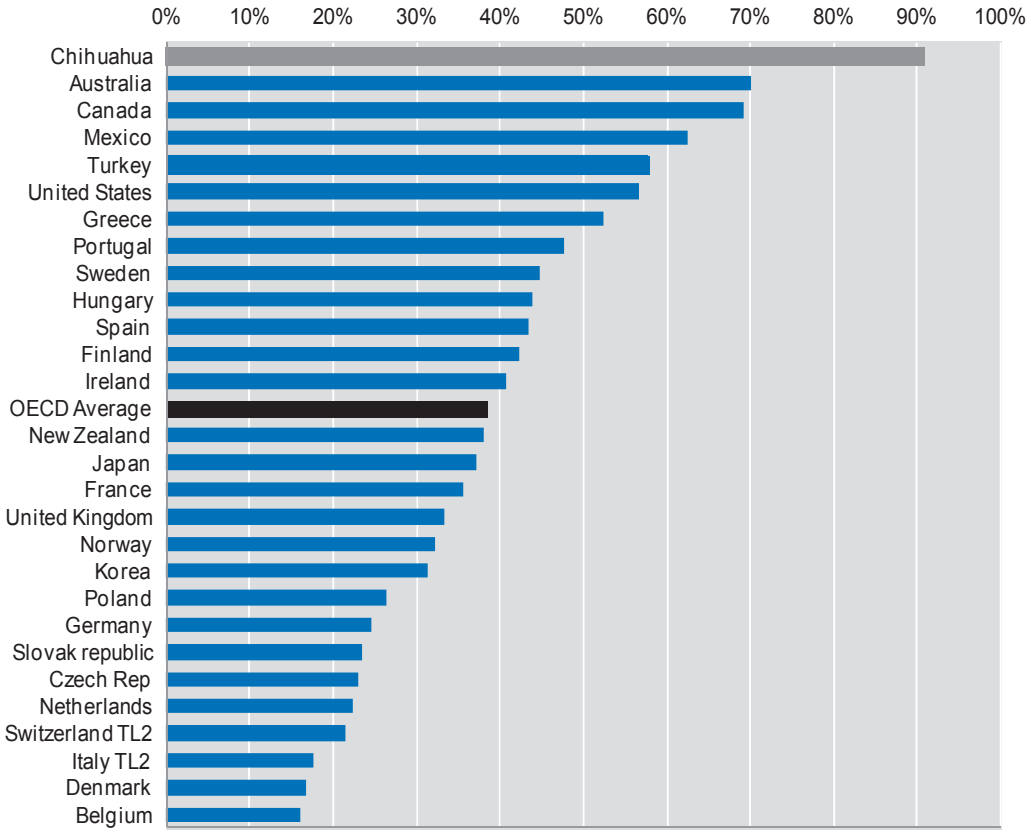
Source: OECD (2011), *Regional Database*, accessed online at OECD.Stat on 22 June 2011.

Skills in Chihuahua are not only relatively scarce, but they are highly concentrated in a few municipalities. Knowledge has been historically concentrated in few places as knowledge production and application are place and societal-specific and cannot be produced nor applied everywhere (Meusburger, 2000). Concentrating skills can have positive effects as demand for highly skilled workers is greater in areas that because of their size enable production and consumption externalities and allows firms in these places to pay wage premiums. Human capital externalities in the form of knowledge spillovers are a driving force for wage premiums being paid in urban areas where skills are concentrated (Halfdanarson, Heuermann and Südekum, 2008). Human capital externalities increase also the efficiency of the labour market by improving job-skills matching (Heuermann, 2009). In fact, because in reality markets are imperfect, activities tend to concentrate as space is heterogeneous (no place is the same) and concentration

brings about positive externalities not only for production, but also for consumption (Fujita and Thisse, 2000). The downside to this natural tendency is that with concentration of knowledge, typically economic disparities are either created or reinforced. Taking into account OECD TL3 level data (groups of municipalities in the case of Mexico), no OECD country – including Mexico – display a higher concentration than Chihuahua. Over 90% of Chihuahua's university graduates are located in 10% of its municipalities (i.e. Chihuahua City, Juárez, Delicias, Parral, Cuauhtémoc and Nuevo Casas Grandes), higher than the 38.2% for the OECD average (Figure 1.19). Skills often tend to agglomerate as they are attracted by higher returns in high productivity places i.e. cities. However, high-return countries driven by innovation such as Finland, South Korea and Sweden display an even lower concentration of skills.

Figure 1.19. **Concentration of skills in the OECD and Chihuahua**

Concentration of population with a university degree in 10% of the regions



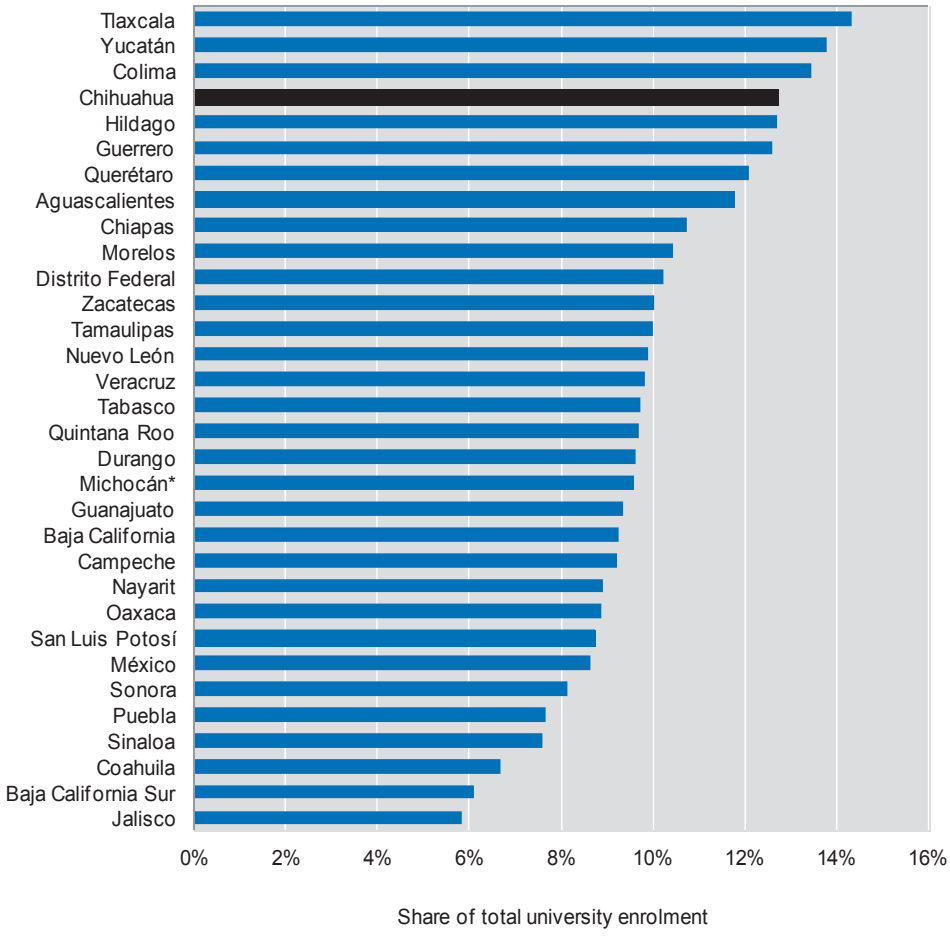
Source: OECD (2009) *Regions at a Glance*, OECD Publishing, Paris; and INEGI (2005) *Sistema Estatal y Municipal de Bases de Datos (SIMBAD)*, *http://sc.inegi.org.mx/sistemas/cobdem/,* 15 June 2011, *Instituto Nacional de Estadística, Geografía e Informática*, Mexico.

Chihuahua's education system seems to be relatively more effective than that of most Mexican states, although the average is poor. As a percent of total university enrolment, Chihuahua graduates 12.7% of its students (Figure 1.20). Only Tlaxcala, Yucatán and Colima had higher outturns than Chihuahua in 2010. Still, failure to complete higher

studies requires attention given that more than 87% of students enrolled for a college degree do not actually conclude. In fact, high dropout rates are an endemic problem in the Chihuahua educational system. In basic education, the state has the sixth largest drop-out rate with 12.3% of students not concluding primary instruction compared to the average for Mexican states at 8.6% (Figure 1.21). Only in Sinaloa and in some of the poorest states in the country such as Chiapas, Guerrero, Michoacán and Oaxaca are dropout rates higher.

Figure 1.20. **Degrees awarded by Mexican universities by state**

Percent of total university enrolment (2007-08)



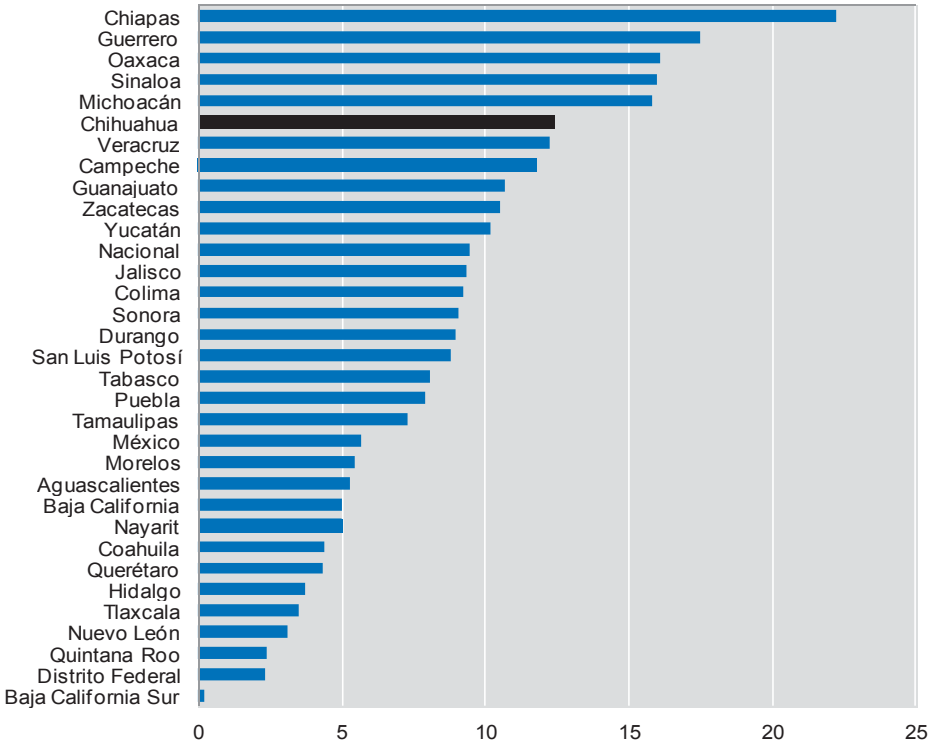
Source: ANUIES (2010), *Estadísticas de Educación Superior*, Asociación Nacional de Universidades e Instituciones de Educación Superior, *http://www.anuies.mx/servicios/e_educacion/index2.php*, accessed 6 July 2011.

Lower-than-average educational attainment rates reflect poor performance in most Chihuahuan municipalities. As a percent of total population – different from the proportion to labour force – Chihuahua City based on the municipality of the same name has the highest rate of tertiary education attainment. Thus, 12.7% of total population in the municipality of Chihuahua has a university degree, which is significantly above the

state's average (7.5%) (Figure 1.22). Other municipalities with above average trends are Delicias (8.7%) and Parral (8.5%). Juárez (7.3%), the largest population centre in the state and one of the largest cities in the country, falls short of the average. Out of the 67 municipalities in the state, 56 show rates lower than 5%. The fact that urban areas display higher educational attainment rates, is related to the wage premium more productive activities in urban areas are able to offer to high skilled workers, resulting in the attraction of that type of skills.

Figure 1.21. **Basic education among Mexican states**

Total dropouts as percent of total enrolment in primary education (2006/2007)

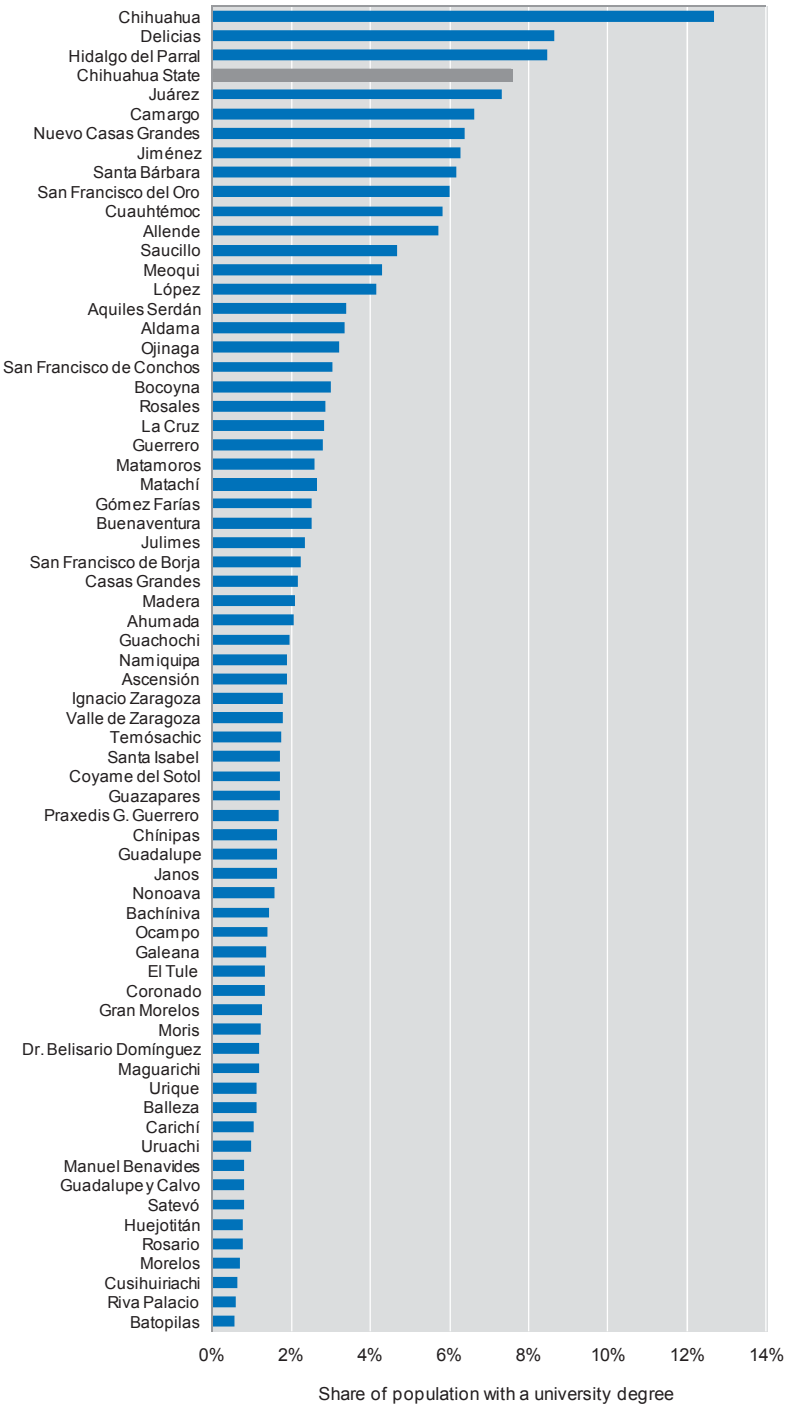


Source: INEE (2008), *Estadísticas Continuas del Formato 9111*, Secretaría de Educación Pública and Instituto Nacional para la Educación Educativa. Mexico.

Chihuahua places an important emphasis on skills demanded in manufacturing. Forty percent of total university enrolment chooses an engineering or technology degree, higher than the 33.7% for the nation (Figure 1.23). Social sciences and management still account for the highest share (41.4%) even if lower than the average for the nation. More worryingly for innovation is the fact that natural sciences or math degrees account for less than 1% of the total.

Figure 1.22. **Skills in Chihuahua by municipality**

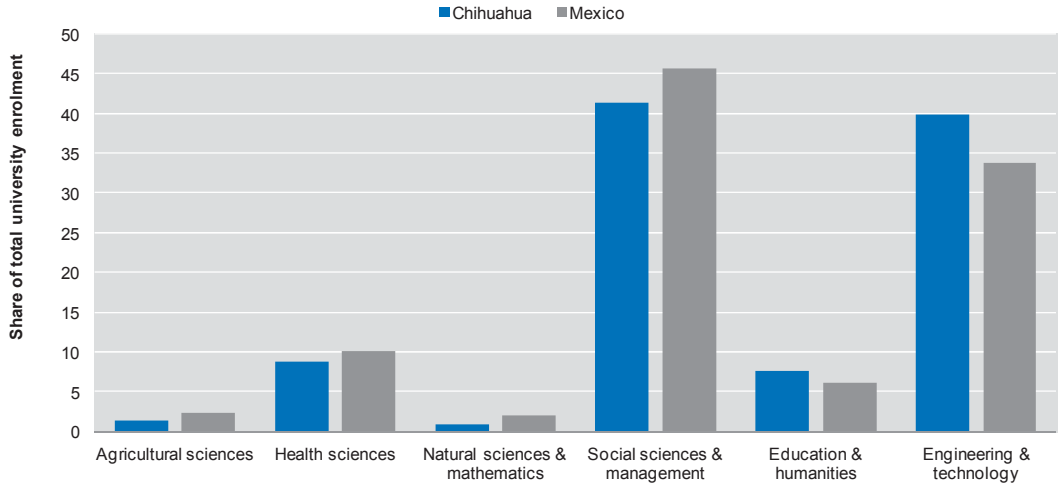
Population with a university degree as a percent of total population (2005)



Source: INEGI (2005) *Sistema Estatal y Municipal de Bases de Datos (SIMBAD)*, Instituto Nacional de Estadística, Geografía e Informática, Mexico, *http://sc.inegi.org.mx/sistemas/cobdem/*, accessed 15 June 2011.

Figure 1.23. **University enrolment in Mexico and Chihuahua by field of study**

Percent of total university enrolment (2007-08)

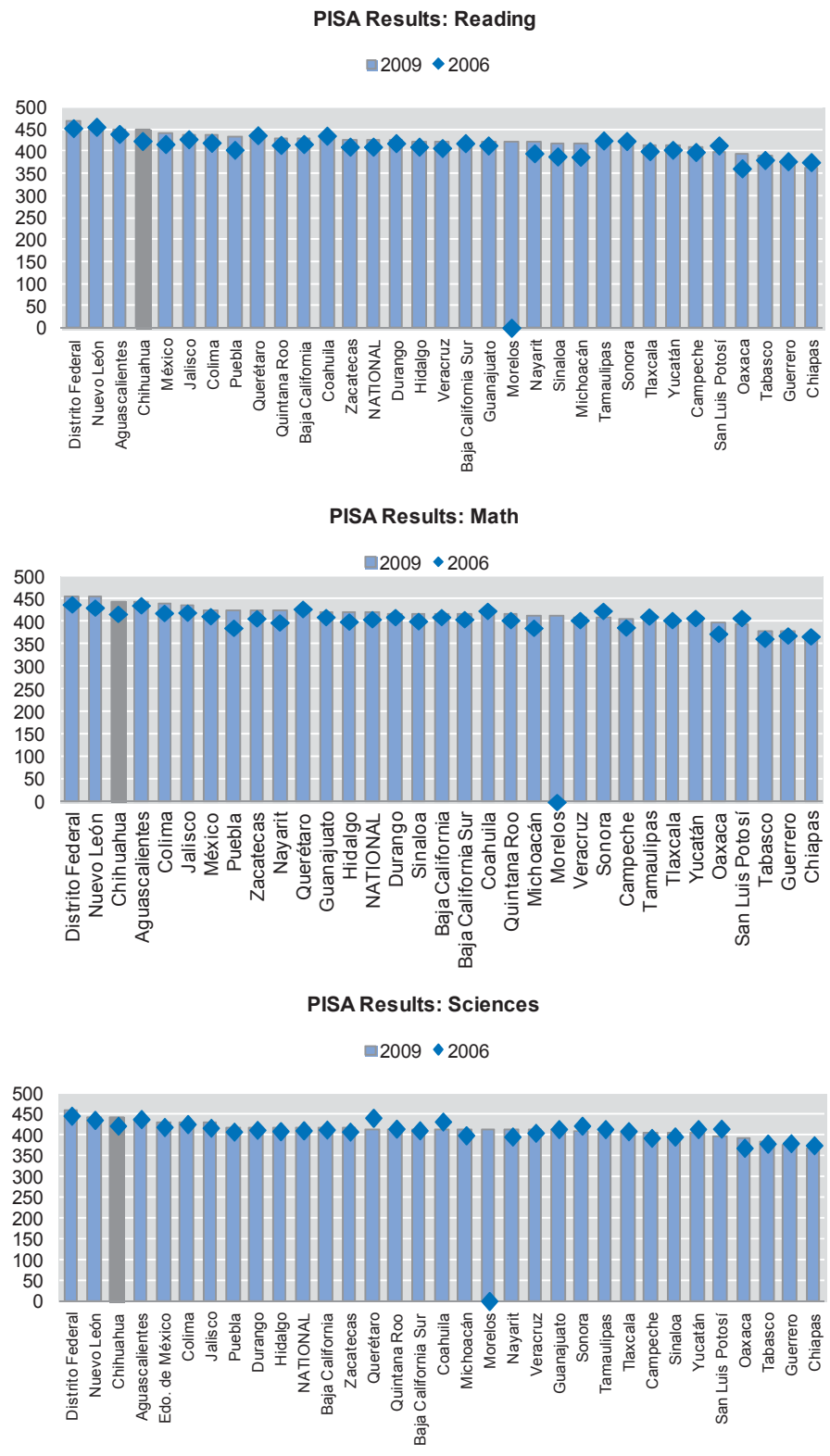


Source: ANUIES (2010), *Estadísticas de Educación Superior*, Asociación Nacional de Universidades e Instituciones de Educación Superior, Mexico, *http://www.anuies.mx/servicios/e_educacion/index2.php,* accessed 6 July 2011.

A key asset for the region is the high quality of schooling. It is not only important to raise the number of graduates, but also to improve the quality of schooling, where some progress has been made. Chihuahua has taken strides at improving the quality of schooling. When secondary schooling students are tested for their abilities on reading, math and sciences through the PISA examination, Chihuahua comes among the top performers in the country. In reading Chihuahua scored 423 points which made it tenth in the country in 2006, three years later, the state moved to third place scoring 449 (tied with Aguascalientes and barely one point behind second place Nuevo León) (Figure 1.24). The trend is even better for math, the scores for which the 2006 PISA results put Chihuahua in tenth place with 418 points; the 2009 PISA results showed Chihuahua in second place behind DF and Nuevo León (tied for first place). In sciences, Chihuahua was eighth in 2006 and climbed to third place by 2009, trailing Nuevo León (second place) by one point.

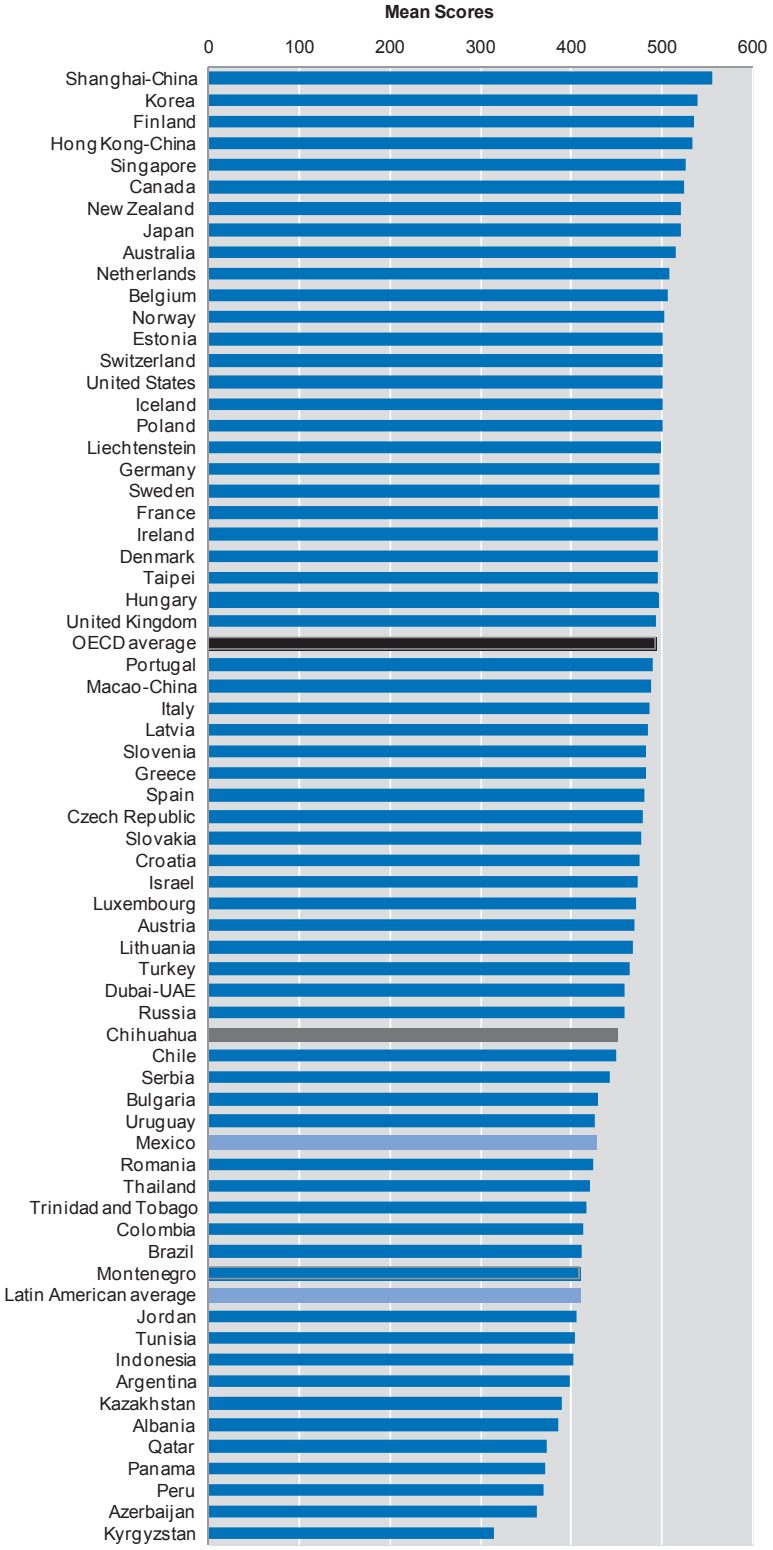
However, Chihuahua is at the top of a low-performing country and therefore is at a disadvantage compared to most competing countries. Even though Chihuahua scores higher than Mexico, it comes consistently well below the OECD average in all three PISA tests. Mexico's students show reading competences (425 points) which are above the Latin American average (408 points). However, Mexico's ranking is in the range of those for Thailand (421 points), Romania (424 points), Uruguay (426 points) and Bulgaria (429 points) (Figure 1.25). The OECD average lies far higher than Mexico's score at 493 points. Results are very similar for the math and sciences tests. In reading skills, Chihuahua outstrips Mexico's results with the same score as Chile and close to the results in Russia, Dubai and Turkey.

Figure 1.24. **Quality of schooling in Mexican states: the PISA test**



Source: INEE (2011) *México en PISA, 2009*, Instituto Nacional para la Evaluación de la Educación, Mexico.

Figure 1.25. **PISA results, 2009**



Source: INEE (2011), *México en PISA, 2009*, Instituto Nacional para la Evaluación de la Educación, Mexico.

Innovation and business environment

Innovation[8] is clearly recognised as the driver of economic growth and a key element that fosters progress in developing regions. A growing body of literature acknowledges the role of innovation as the only factor that allows long-run growth in the presence of decreasing returns to scale (Barro and Sala-i-Martin, 1995; Aghion and Howitt, 1998). That is, as the marginal contribution of capital and labour to economic growth diminishes over time, the only way of expanding the value of output is via innovation. Both the OECD and the European Union (EU) have recently emphasised the crucial role of innovation and the importance of appropriate institutions, policies and governance to support it (OECD, 2010a; European Commission, 2009). Technology and innovation are typically characterised by increasing returns to knowledge adoption and diffusion (Box 1.3). And knowledge has characteristics as both a private as well as public good. It is the differences in knowledge, accumulated learning processes and technical competences (either embodied, in a skilled labour force, in firms or in collective systems, or disembodied, codified in patents, or acquired through external R&D services and technical assistance), that explain the major differences in growth patterns and living standards of different countries and regions (OECD, 2011g).

The 2008 financial and economic crisis reinforced the consensus that innovation, as well as investment in the capacity to innovate, is central for recovery and other social goals. There is greater recognition of the need to move towards new, more inclusive and environmentally sustainable models of growth. It is not only the rate of technical change (i.e. intensifying the introduction of new technologies and devices) but also its direction (in applications and solutions) that can help address societal challenges (OECD, 2011c).

It is well established that innovative activity is not evenly distributed across regions. Evidence shows that almost half of total OECD research and development (R&D) investment is performed in around 13% of its regions, and half of patenting in the top 20%. In addition, OECD growth is concentrated in a handful of large regions. The top 4% of OECD regions accounted for one-third of aggregate OECD growth during 1995-2005. Two-thirds of growth is from the remaining 96% of regions. Improving innovation capacity outside of global hubs, beyond technological R&D support, is therefore vital (Box 1.4).

Despite the progress Chihuahua has made on both attainment and quality of schooling, the state is lagging behind not only most OECD regions, but also many Mexican states in inputs for innovation. Chihuahua comes 17th among Mexican states in its share of high-calibre researchers. Only 1.2% of all researchers inscribed in the *Sistema Nacional de Investigadores* (SNI), were located in the state in 2010 (Figure 1.26).[9] The proportion is the second lowest among states bordering the US and is almost one-third of the proportion in Nuevo León. As a result the local supply of innovation inputs is curtailed by a low level of human capital relevant to the production of R&D. Not surprisingly, Chihuahua produces an extremely low level of patents: one patent application annually per million of inhabitants (Figure 1.27). Such a low level places Chihuahua 11th in the country behind states like Yucatán, Morelos or Baja California Sur that have a lower level of economic development and are also behind the Mexican average. At an average of almost 99 patents per million of inhabitants in other TL2 regions in the OECD, Chihuahua stands very far from developing inputs for innovation that are crucial for economic growth.

Box 1.3. **The meaning of innovation**

The term innovation is used to describe many different phenomena, from scientific discoveries to simply "thinking outside of the box" through creativity and design. The OECD identifies four types of innovation in firms: the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Such innovations are technological (product or process), as well as non-technological (marketing and organisational). Note that an innovation may have different degrees of novelty. It does not have to be new to the world; it may be new to a market/sector or simply new to the firm/institution. The OECD is considering extending guidelines for innovation measurement to public sector innovation and innovation for social goals.

The latest data on innovation reveals several trends that the tri-state region should bear in mind for policy action:

- ***Intangible assets and innovation beyond R&D:*** innovation results from a range of complementary assets beyond R&D, such as software, human capital and new organisational structures. Investments in these intangible assets is rising and overtaking investment in physical capital (machinery and equipment) in Finland, Sweden and the United States for example.

- ***Mixed modes of innovation:*** firm-level innovation data reveal complementary strategies. Most innovative firms introduce both product and process innovations, as well as marketing or organisational innovations. This is true for firms in both manufacturing and services. There are, of course, differences by sector and firm size. For instance, a larger share of firms in services than in manufacturing introduce only marketing or organisational innovation.

- ***Collaboration and networks are essential:*** firms that collaborate on innovation spend more on innovation than those that do not. This suggests that collaboration is likely to be undertaken to extend the scope of a project or to complement firms' competences more than to save on costs. Collaboration is used in innovation processes whether firms perform a lot of R&D, a little R&D or no R&D at all. In this respect, policies that stimulate collaboration and network initiatives will have an impact on the entire spectrum of innovative firms. Higher rates of collaboration are also observed in the sciences. Production of scientific knowledge is increasingly shifting from individuals to groups, from single to multiple institutions, and from national to international arenas.

- ***Convergence of scientific fields and multi-disciplinary/interdisciplinary research:*** there is evidence that increasingly innovations are achieved through the convergence of scientific fields and technologies. For example, nanoscience research has arisen from the interaction of physics and chemistry and is interdisciplinary in character. Environmental research is one example of multi-disciplinary research. This convergence requires spaces for interaction and cross-fertilisation of different knowledge domains.

Source: OECD (2010), Ministerial report on the OECD Innovation Strategy: Innovation to strengthen growth and address global and social challenges: Key Findings, OECD Publishing, Paris; OECD and Eurostat (2005), Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data, OECD Publishing, Paris; OECD (2010), Measuring Innovation: A New Perspective, OECD Publishing, Paris.

Box 1.4. **Innovation's spatial dimension**

The level of innovation in a country is influenced by the generation and diffusion of new technology and knowledge, which is in turn a function of investment in basic and applied R&D, the technology transfer effort made by the government (and others) and the success of the education system in producing science and engineering graduates. The absorptive capacity of firms is also crucial for innovative ideas to be translated into productivity gains by firms that are not themselves technology generators. Absorptive capacity, in turn, is closely linked to the level of technical and general education of the workforce, as well as cultural traits relating to entrepreneurship and inter-firm collaboration.

Technology and innovation are not usually created in isolated organisations but, rather, where competent organisations and skilled individuals interact in a constructive and complementary way. First, innovation depends on the scientific capacity of actors and institutions (their ability to acquire existing knowledge and concepts, their openness to new knowledge and their ability to assimilate, etc.). But the technological and entrepreneurial capacity of actors (their capacity to perceive usefulness and applicability of knowledge) is also important. And, finally, industrial capacity plays a role (the capacity of actors to transform concepts and ideas into useful, commercially viable products). The focus of policymakers on the concept of innovation "systems" is an example of how the issue of spillovers and inter-linkages is now central to understanding how innovation is generated. The application of concepts of social capital to innovation is another example.

In this context, the importance of place (innovation's spatial dimension) becomes clear. The idea that productivity gains are generated on the back of region-level interaction is supported by a large body of literature. Research into the sources of productivity advantages in successful regions has focused principally on the circulation of people and knowledge, the generation of innovative ideas and the development of new products and technologies. In the past, academic work considered knowledge as a public good and technological progress as an exogenous factor to the economic system that affects all companies, regions and countries in the same way. However, more recent "evolutionary" theories have challenged this basic view, recognising that the generation, adoption and diffusion of new technologies is a complex process and therefore endogenous to growth models (Romer, 1990). This change in thinking is visible in the range of public policies in the science and technology field that have developed a strong geographical and relation-building focus into policy strategies.

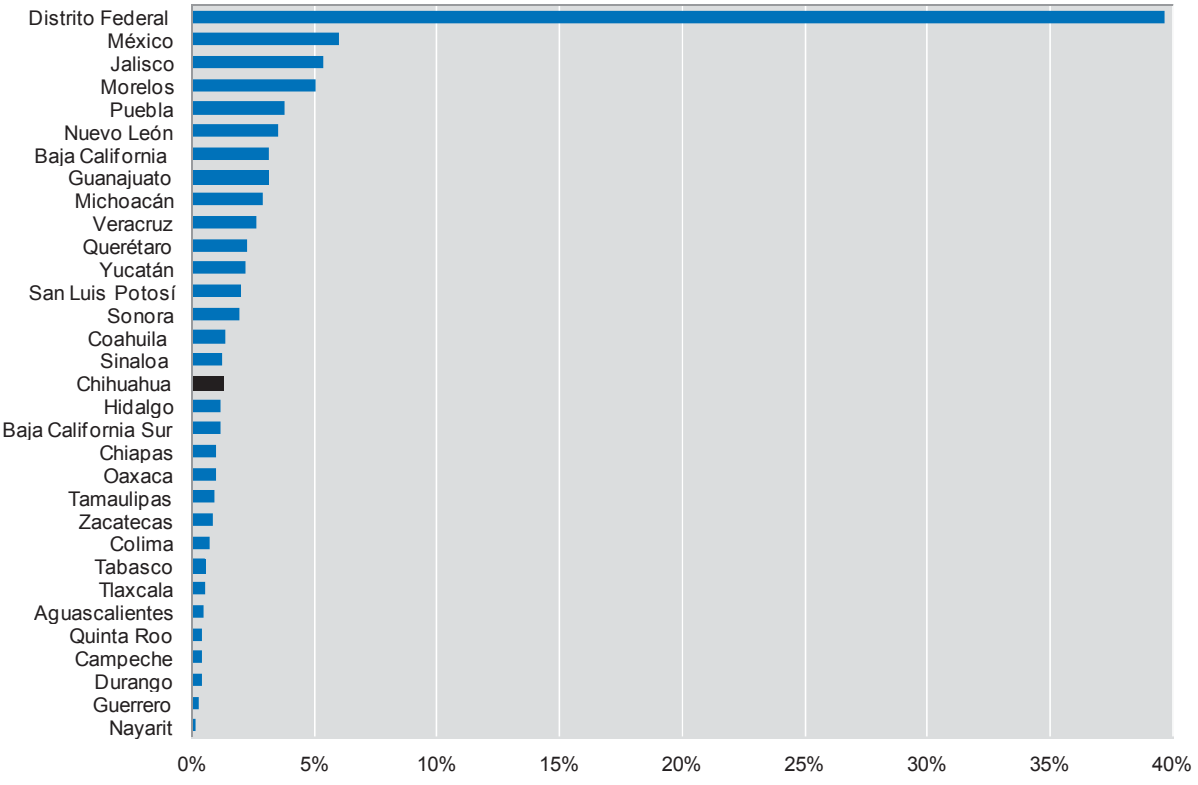
Source: OECD (2008), OECD Reviews of Regional Innovation: North of England, OECD Publishing, Paris.

Skills and knowledge spillovers generated by proximity and human interaction are key to fostering innovation. Intra-national knowledge spillovers are stronger than international ones (Branstetter, 1996). Within nations, regions and more specifically, urban areas are ideal places for innovation to thrive as they bring together people and skills and their interaction produces knowledge spillovers that are essential for greater agglomeration economies (Rosenthal and Strange, 2004). Human capital development produces positive external effects on society through greater productivity (productivity spillovers). On the one hand, individual improvements of human capital increase regional productivity through increases in productivity across workers through learning and sharing (technological externalities). On the other hand, pecuniary externalities can arise due to the complementarities between physical and human capital (Acemoglu, 1996). As a greater accumulation of human capital increases the amount of physical capital, productivity and economic growth tend to increase. The kind of knowledge spillovers that can take place from co-patenting can be inter- or intra-national. In the case of

Mexico, like in many OECD countries, the links in co-authorship for patenting is primarily local, then national and then international. Chihuahua benefits from local and national knowledge spillovers derived from the R&D process through co-patenting. The stronger co-patenting links for Chihuahuan inventors have been located since 1990 in Mexico City and Nuevo León (where Monterrey is located) (Figure 1.28). International links are incipient and mostly focusing on Texas and to a lesser extent other US states such as California, Florida, Massachusetts, Ohio and New Jersey. The only notable European region that is actively co-operating with Chihuahuan inventors is the German region of Bayern. Although face-to-face relationships largely determine knowledge spillovers from R&D in Mexico, the US has a strong influence in determining inventing activity in Mexico and other Latin American countries (Montobbio and Sterzi, 2010). The number of patents and co-patents remains very small compared to neighbouring US states, but in addition to the amount of R&D needed to make any significant contribution to growth, the international scope of knowledge spillovers have been largely overlooked. Being a border region, international spillovers may well mean local spillovers in the case of Chihuahua.

Figure 1.26. **Human capital in science and technology in Mexico by state**

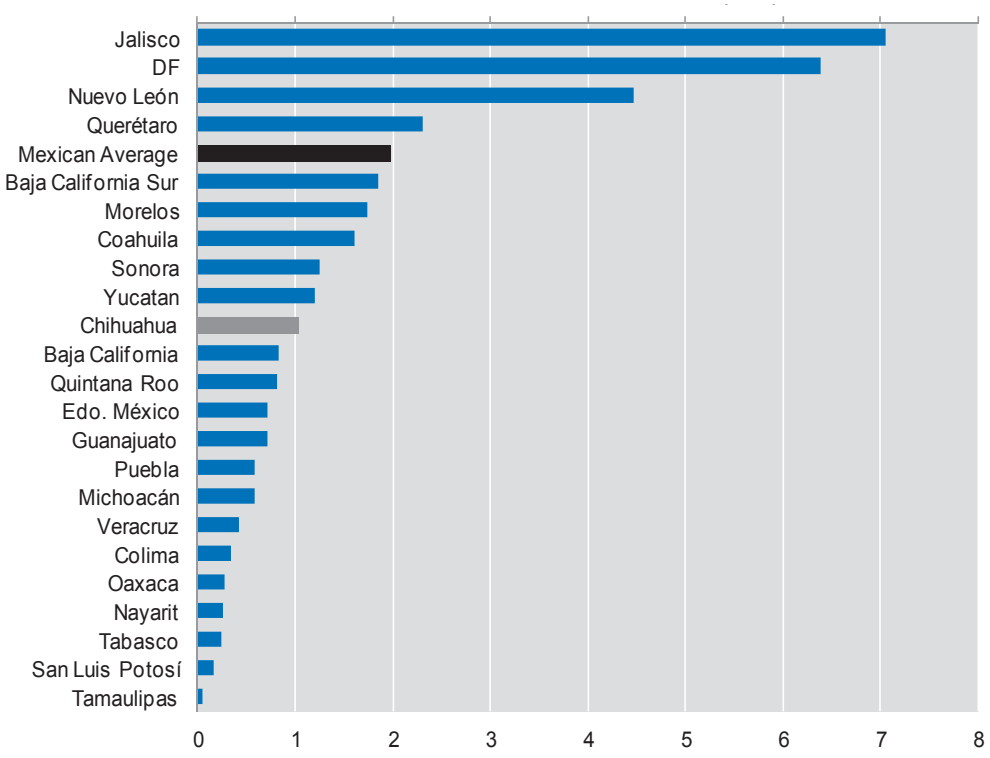
Percent of researchers affiliated to the National Researchers System (2010)



Source: CONACYT (2010), Sistema Nacional de Investigadores, Padron de investigadores vigentes 2009, Consejo Nacional de Ciencia y Tecnología, Mexico.

Figure 1.27. **Patent applications by Mexican states**

PCT patent applications per million inhabitants (2007)



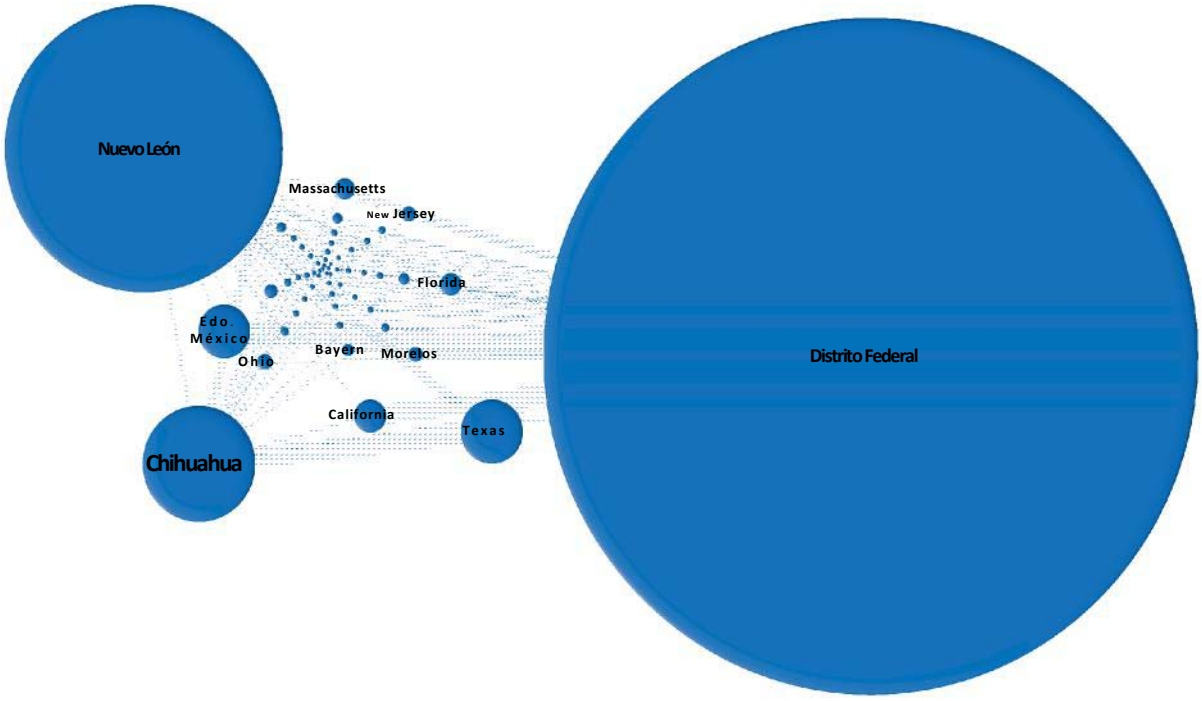
Note: OECD TL2 average (2007) = 98.9 PCT patent applications per million inhabitants.

Source: OECD (2011) *Regional Database*, accessed online at OECD.Stat on 22 June 2011.

FDI has contributed to upgrading Chihuahua's human capital stocks but the need to provide formal schooling remains a challenge. While the benefits of MNE presence for human capital enhancement are commonly accepted, it is equally clear that their importance is significantly less than that of general (public) education. The beneficial effects of training provided by FDI can supplement, but not replace, a generic increase in skill levels. The presence of MNEs may, however, provide a useful demonstration effect, as the demand for skilled labour by these enterprises provides host-country authorities with an early indication of what skills are in demand. The challenge for the authorities is to meet this demand in a timely manner while providing education that is of such general usefulness that it does not implicitly favour specific enterprises. To that effect, the government that took office at the end of 2010 has set the goal of a twofold increase in technological universities and has already managed to offer registration to any student wishing to undertake a university degree (Duarte, 2011).

Figure 1.28. **Chihuahua's links for innovation**

Chihuahua's co-patenting activity with other regions (1990-2009)



1. Co-patenting is defined as a patent with more than one inventor.

2. The width of a bubble represents the number of co-patents.

3. The line connecting bubbles represents the existence of a inter-regional link through co-patenting. The width of such line represents the number of inventors from the Mexican states of Chihuahua, Distrito Federal and Nuevo Leon involved in co-operating activities with other inventors from other regions.

Source: Author's calculations based on the OECD REGPAT Database.

1.3. FDI and clusters

An FDI-based development model: benefits and challenges

Foreign direct investment flows have many benefits that go beyond capital accumulation. FDI is a key component of a well-functioning and open international economic system and a catalyst to development (OECD, 2002a). FDI can bring about several benefits for investment, innovation, skills, internationalisation of production chains, improvement in the business environment, competition, employment and wage improvements. Although these benefits are not automatic and in many cases require certain policies and institutions to be in place in the host country, FDI can be an effective tool for development (Box 1.5). By the same token, a stream of literature has focused on the drawbacks of FDI which can include social polarisation, environmental impacts, destruction of local competitors, as well as the lack of linkages with the local economy and repatriation of profits. The benefits of FDI in terms of economic growth can accrue to host economies through three different channels: capital deepening, technological and knowledge spillovers, and the impact on structural factors. The first of the channels is fairly straightforward as investment leads to augmented capital stocks that lead to productivity and growth. The second of these channels refers to the positive externalities

that are created with the introduction of new technologies and processes. By allowing new technology, local companies can benefit from a technology transfer and the labour force can learn new and more productive ways of doing things which through turnover can lead to learning in other local organisations. The third channel can be related to benefits to the economy when FDI brings about competition and reduces monopolistic behaviour by local firms.

Box 1.5. **FDI effects on developing economies**

The largest proportion of foreign direct investment (FDI) flows in the world is undertaken between developed countries (ECLAC, 2007). This proportion is indicative that FDI is attracted by relatively high skilled labour and strong local institutions. The role of FDI on local economies in developing countries has been more controversial and subject of extensive debates in academic and public policy circles.

In general, the debate about FDI effects on local developing economies focuses on four dimensions: a) local competition; b) prices; c) labour standards; and d) local suppliers. In this respect, it is possible to identify at least three different arguments. On the one hand, it is argued that local markets in developing countries might benefit from the participation of foreign companies as these organisations usually bring superior managerial practices, updated technology and give access to financial resources that might be scarce in the local economy. Due to their superior organisational skills, foreign firms might produce goods and services more efficiently and at lower cost, providing local customers with quality products at lower prices and paying higher salaries to attract local workers. In sum, the impact of foreign corporations on local economies is perceived as an upgrading factor for local competition and labour standards and a strong incentive for local suppliers and better prices and quality products for local consumers (Aspe, 1993).

On the other hand, there is also a more critical perspective on the effect of foreign corporations on local developing economies. In general, this position emphasises the potential problems of asymmetric interactions between large multinational corporations and less powerful local competitors, consumers, workers and institutions. As a result of this, FDI's participation would be less likely to provide substantial benefits in terms of technology or managerial transfers (linkages with local suppliers), upgrading labour standards, or driving down prices for local customers (Cowie, 1999; McMichael, 2004).

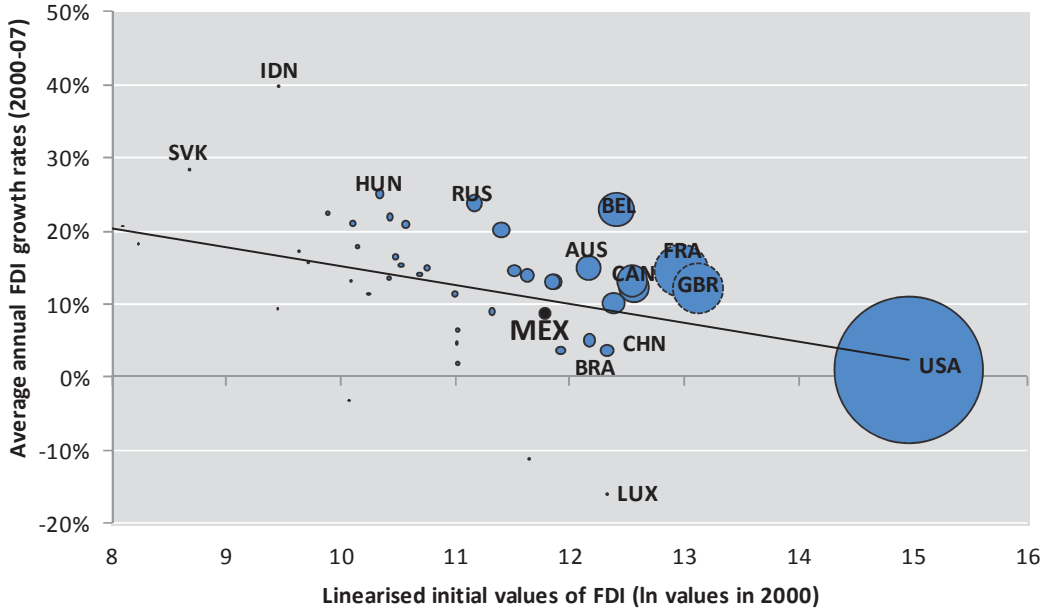
Finally, there is a third or middle point position that argues that the effect of FDI on local developing economies largely depends on the local institutional setting (Álvarez-Galván, 2010). Specifically, it is argued that FDI's potential contribution to improve labour standards, local competition, prices, and bargaining conditions for local suppliers largely depends on how foreign organisations adapt themselves to local institutions. This is to say that FDI might offer substantial contributions to local development if a strong institutional setting is designed to give incentives to such a contribution. To the contrary, if there is no a solid institutional setting, FDI effects on the local economy can be just of minimal benefit (Álvarez-Galván, 2012).

The effects of FDI on local developing economies might be shaped by the aim of the investment either as *efficiency-seeking inward FDI* destination (a type of investment geared towards exports to third markets, especially those of the United States) or a *market-seeking inward FDI*. In 2006, for instance, Mexico received US$18.9 billion of FDI and 38% was invested in services (ECLAC, 2007), a proportion that has been stable over the last few years (about 40%), apart from 2001 when 79% of the FDI in Mexico was spent on services, due to the effect of the acquisition of the Mexican bank Banamex by Citigroup (ECLAC, 2007).

Mexico and Chihuahua have been benefiting from FDI flows but seem to face strong competition. Although by 2000, around 85% of world FDI flows were going to OECD countries, flows going to Mexico have grown at an average annual growth rate of almost 9% since then (Figure 1.29). Mexico's strong FDI growth has nevertheless fallen short of performance in most emerging economies: stronger growth rates between 2000 and 2007 were recorded in Indonesia (40%), the Slovak Republic (29%), Hungary (25%), Russia (24%) and India (23%) among others. Mexico has been lagging behind other OECD countries with already large FDI stocks growing at faster rates: Japan (25%), Belgium (23%), Italy (13%), France (15%) and the UK (12%). Mexico's progress in attracting FDI can be seen in an increase in its share of FDI to GDP. FDI stocks in Mexico went from 15% of GDP in 2000 to almost 27% of GDP in 2007 (Figure 1.30), a share that is comparable to those of Argentina, Colombia or Uruguay. However, the weight of FDI in Mexico is far from those in many OECD countries, where FDI represents between one-third and two-thirds of GDP: Sweden (65%), Denmark (52%), New Zealand (52%), Portugal (51%), France (48%), Austria (44%), the UK (44%), Australia (41%), Spain (41%) and Canada (36%).

Figure 1.29. **Evolution of FDI stocks around the world**

FDI stocks 2000-07

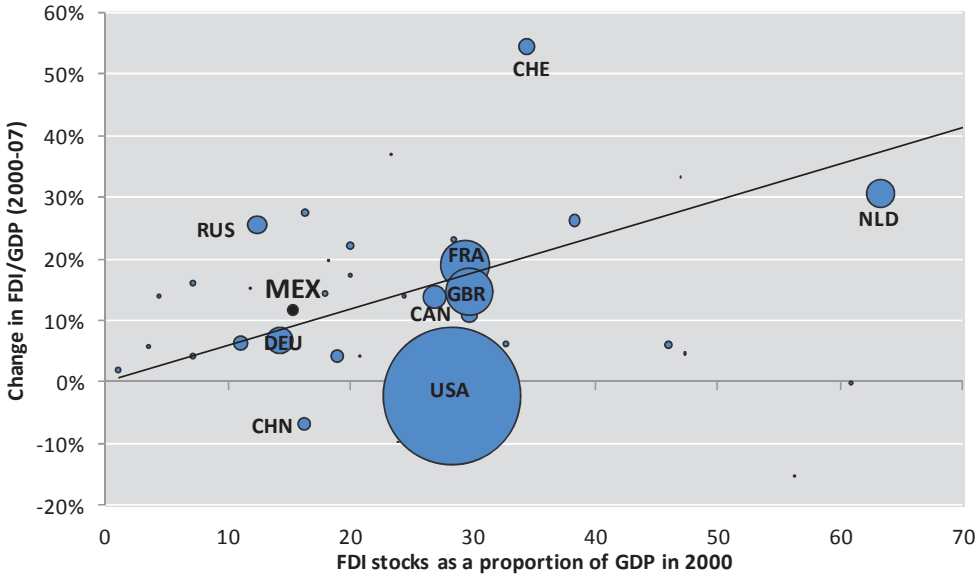


Note: Bubble size represents the stock volume in 2007 for each country.

Source: OECD calculations on the basis of UNCTAD (2011) UNCTADstat.

Figure 1.30. **Relative importance of FDI**

FDI stocks as a proportion of GDP (2000-07)



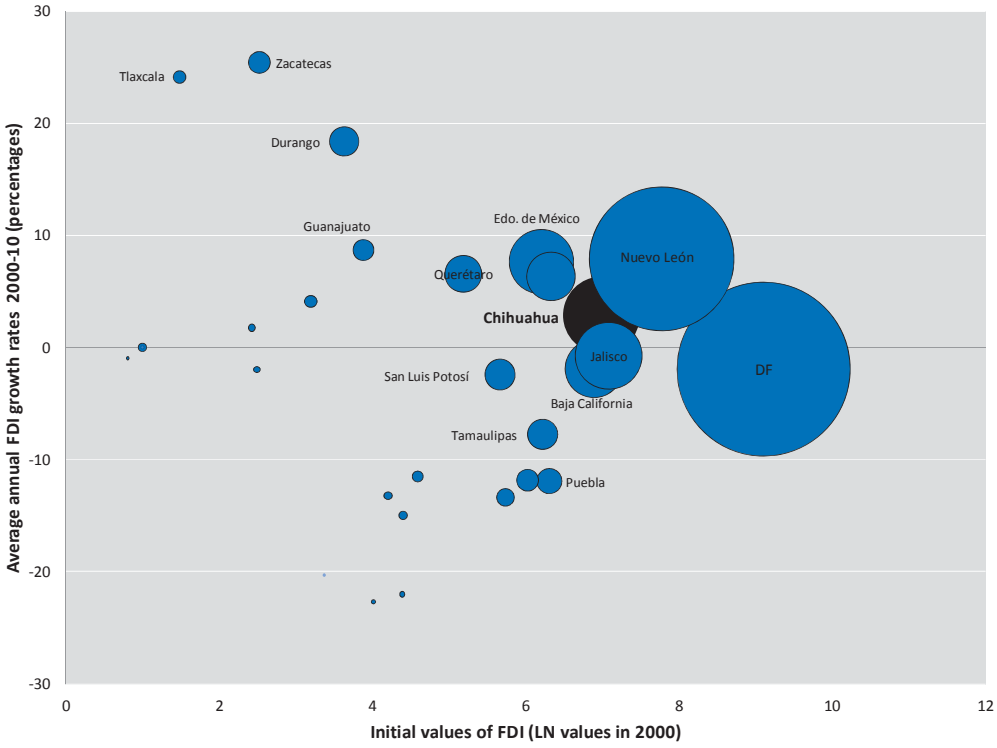
Note: Bubble size represents the stock volume in 2007 for each country.

Source: OECD calculations on the basis of UNCTAD (2011) UNCTADstat.

Chihuahua and other border-states receive the largest share of FDI in Mexico. History matters as more than 80% of *maquiladora* firms remain in border-states where the programme started. Chihuahua contributes with the highest employment figures in the sector. FDI inflows are most important in border-states, DF, Jalisco and the state of Mexico (Figure 1.31). FDI flowing to Chihuahua totalled USD 1.4 billion which placed the state as the third largest recipient in the country just after Mexico City (DF at USD 7.5 billion) and Nuevo León (USD 5.1 billion). However, stronger FDI growth rates were achieved not only in the competing state of Nuevo León (7.9% average annual), but also in non-border states such as Tlaxcala (24%), Zacatecas (25%), Durango (18%), Guanajuato (9%), the state of Mexico (8%) and Querétaro (7%). Mexico City receives the highest share of FDI flows with almost 40% in 2010, but its share could be overestimated due to the fact that the Ministry of Economy in charge of FDI does not necessarily register flows where the actual investment goes, but rather where offices report them. In addition, the financial sector is chiefly based in Mexico City. Despite data issues, the six border-states represented 42% of all flows in 2010 with the remaining 18% distributed in the rest of the country.

Figure 1.31. **Evolution of FDI flows in Mexican states**

Average annual growth rates and initial values (2000-10)



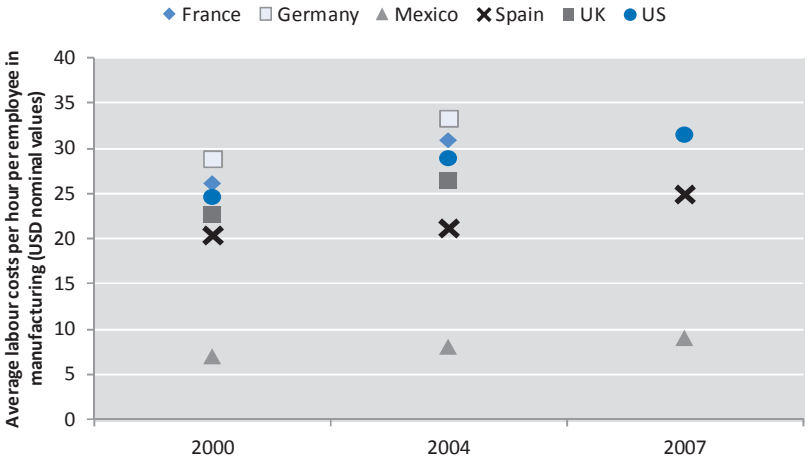
Note: In Mexico, FDI statistics are accounted as the sum of new investments, transactions between firms, and profits re-investment.

Source: Author's calculations based on Secretaría de Economía (2011), *IED Trimestral por País de Origen y Entidad Federativa*, Secretaría de Economía, Dirección General de Inversión Extranjera.

Mexico's attractiveness to FDI is mostly based on its proximity to the US and the relatively lower labour costs, but further progress is curtailed by regulatory restrictions. The attractiveness of the border for manufacturing FDI is based on lower logistics costs due to proximity to the US and lower labour costs. Excluding transport costs, labour costs were reported as the main location determinant for FDI firms until 2003 (Dussel Peters, et al., 2007). Labour costs in Mexico have remained distant from OECD levels. In 2000, manufacturing-sector labour costs stood at an average of USD 7 per hour per employee, which represented around one-quarter of the cost in European countries such as France (USD 26.1), Germany (USD 28.9), Spain (USD 20.4) or the UK (USD 22.7) in that sector. Mexico's average manufacturing labour costs were 28% of the typical US labour costs in that sector (Figure 1.32). The gap has been sustained between Mexico and these countries despite wage increases in Mexico. The country has been experiencing an increase in wages in manufacturing, but such growth is smaller than some of its competitors. Between 2005 and 2008, South Africa's wage increase in manufacturing was almost double that of Mexico (Figure 1.33). Similarly, wages' growth in Costa Rica was approaching three times the speed of increase in Mexico and China's wages increased more than 50% which is more than a fourfold increase compared to that experienced by the manufacturing sector.

Figure 1.32. **Labour costs compared**

Average labour costs per hour and per employee (manufacturing sector in USD nominal values)

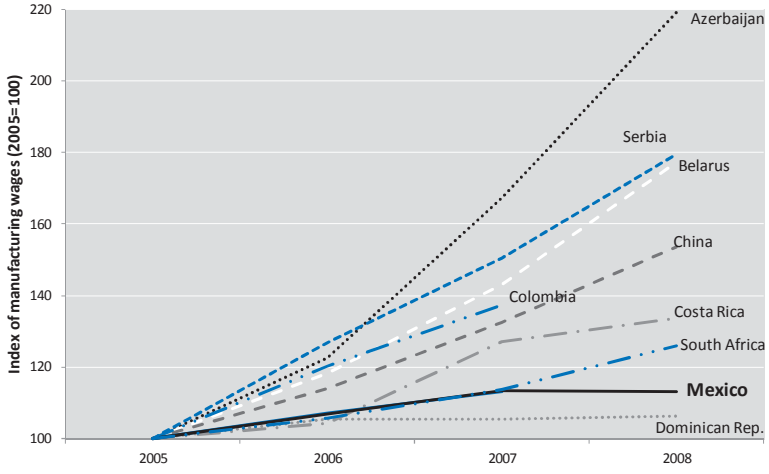


Note: Labour costs are expressed in current nominal USD using ILO labour costs data and the OECD exchange rate series. Labour cost is defined in the Resolution adopted by the Eleventh International Conference of Labour Statisticians (Geneva, 1966): "For the purposes of labour cost statistics, labour cost is the cost incurred by the employer in the employment of labour. The statistical concept of labour cost comprises remuneration for work performed, payments in respect of time paid for but not worked, bonuses and gratuities, the cost of food, drink and other payments in kind, cost of workers' housing borne by employers, employers' social security expenditures, cost to the employer for vocational training, welfare services and miscellaneous items, such as transport of workers, work clothes and recruitment, together with taxes regarded as labour costs" (ILO, 2011).

Source: Author's calculations based on: ILO (2011) *Labour Statistics Database*, http://laborsta.ilo.org/, accessed 7 September 2011, International Labour Organisation; and exchange rates from the OECD reference series at OECD.Stat.

Figure 1.33. **Wage growth in the manufacturing sector**

Index of manufacturing labour costs (2005=100)

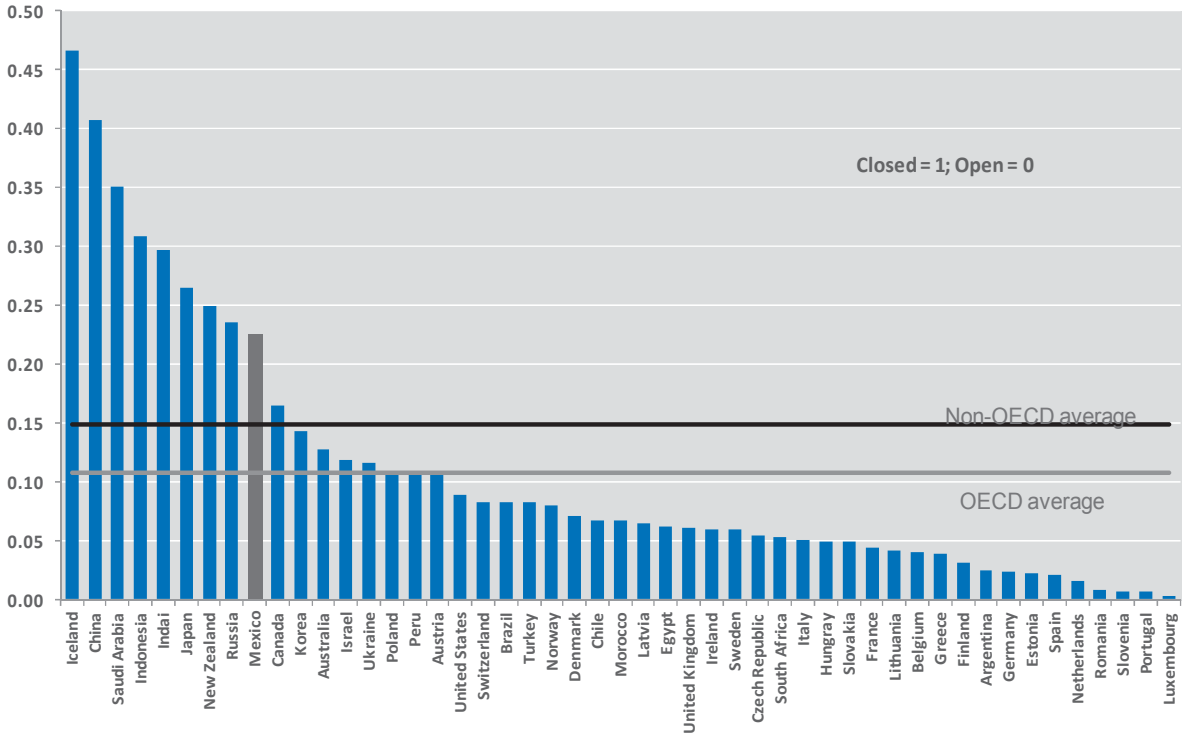


Note: Manufacturing wages' growth are expressed using an index that makes costs in 2005 the base year.

Source: Author's calculations based on ILO (2011) *Labour Statistics Database*, *http://laborsta.ilo.org/*, accessed 7 September 2011, International Labour Organisation; and exchange rates from the OECD reference series at OECD.Stat.

Although proximity to the US will continue to play an important role in Chihuahua's success in attracting manufacturing FDI, it will be limited by Mexico's restrictions on foreign investment. Mexico ranks as the ninth (out of 50) most restrictive country by the OECD FDI Restrictiveness Index (Figure 1.34). Only three OECD countries (out of 34) have a more restrictive framework than Mexico (Iceland, Japan and New Zealand). Scores achieved by Mexico in such an index show that the country's restrictions to FDI are more than twice as strong as the OECD average and more than one-third of those of Brazil. Mexico is particularly restrictive to investments in agriculture, forestry, fisheries, transport (air, maritime and surface), media (radio and TV broadcasting) and communications (fixed telecoms) (OECD, 2011h). In particular, restrictions on agriculture might be preventing the state from accessing higher value-added levels. In addition, restrictions on transport and communications are an important burden for the economy as they are network industries that enable other activities and trade.

Figure 1.34. **OECD's FDI restrictiveness index, 2010**



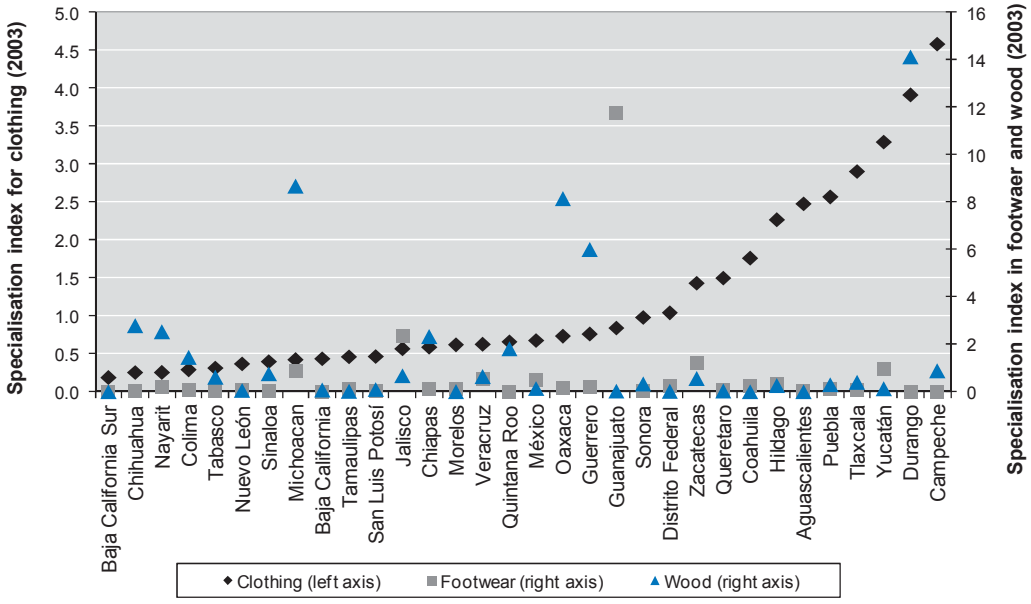
Note: The OECD's FDI Restrictiveness Index measures the restrictiveness of a country's FDI rules by looking at four main types of restrictions: foreign equity limitations, screening or approval mechanisms, restrictions on employment of foreigners as key personnel, and operations restrictions such as restrictions on branching and on capital repatriation or on land ownership.

Source: OECD (2011), *FDI Restrictiveness Index*, *http://www.oecd.org/document/45/0,3746,en_2649_34529562_47216237_1_1_1_34529562,00.html,* accessed 7 September 2011.

Specialisation and clusters

Low-tech activities with labour-intensive processes have been moving away from Chihuahua. There is a long tradition of textile manufacturing in many of Mexico's southern states such as Yucatán and Oaxaca, and perhaps this one reason why those states display higher specialisation levels than northern states. It is also possible that as FDI flows in to northern states, wages are driven up and migration has been insufficient to tapper them down. Wage differentials can persist for decades; Scotland has experienced lower wages than England for well over a century. Hanson (2003) found wage differentials increasing in Mexico over the years and in particular since NAFTA. As clothing manufacture and other textile activities are labour intensive, operating costs in northern states could have driven textiles out to southern states and indeed to Central America. By 2004, Chihuahua recorded one of the lowest specialisation levels in clothing and footwear (Figure 1.35). In contrast, Yucatán and Campeche that represent two-thirds of the peninsula that once thrived on *henequen* (sisal) are among the top states in clothing. States near Mexico City such as Hidalgo, Puebla and Tlaxacala that in 2004 displayed high specialisation indices in clothing could have also benefited from congestion in the country's once main manufacturing belt. Manufacturing activities were traditionally concentrated in Mexico City during the import-substitution industrialisation (ISI) model followed by Mexico until the mid-1980s, but free trade with GATT and NAFTA shifted the relevant market towards the US enhancing industrialisation in border-states (Krugman and Livas Elizondo, 1996; Sanchez-Reaza, 2009).

Figure 1.35. **Specialisation in low-tech activities by state, 2004**



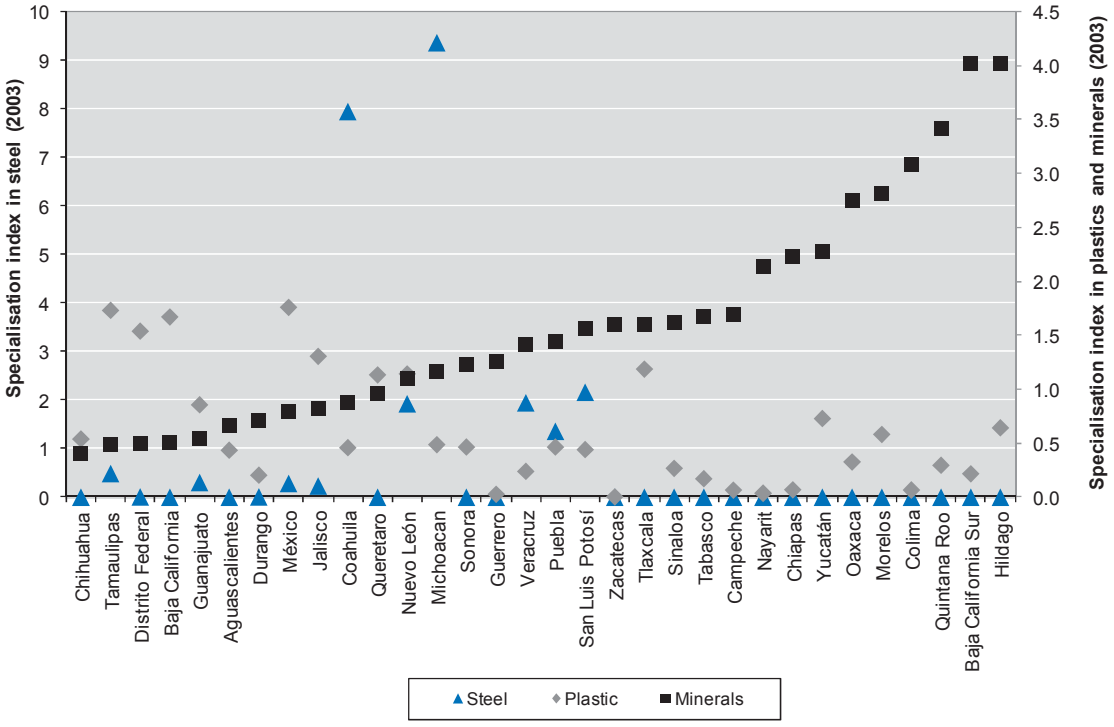
1. Specialisation indices calculated as the share of employment in industry *i* with respect to state's manufacturing employment with respect to national industry *i's* share of national manufacturing employment: (L*ij*/L*j*)/(L*i*/L) where L stands for employment, *i*=state, *j*=manufacturing 4-digit industry.

2. Technological levels were attributed to 4-digit industry following the criteria in the OECD Structural Analysis Database.

Source: Author's calculations based on INEGI (2004), *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

Free trade, geographical location and a long tradition in FDI-based manufacturing, have led to an economic transformation to more technological activities in the state. In addition to low specialisation in low-tech activities, Chihuahua also recorded, the lowest specialisation levels for medium-low tech activities such as steel, minerals and plastics in 2004 (Figure 1.36). In contrast, medium high tech activities have thrived in the state. In 2004, Chihuahua showed the highest specialisation level in the country in automotive and the second highest in electric industries respectively (Figure 1.37). Regarding high-tech activities, Chihuahua was also second in ICT just behind Jalisco and it ranked fourth in electronics (following other border-states such as Baja California, Sonora and Tamaulipas (Figure 1.38). Chihuahua is increasingly moving towards medium-high to high-tech activities that imply capital-intensive processes and semi-skilled and highly skilled labour. Part of the state's success in climbing up the technological ladder lies in geographical location as many of the electric companies producing bulky items (e.g. electric appliances such as fridges and the like) or engines for automobiles among others that incur in high transport costs see location as one key asset. However, the stock of human capital accumulated over decades of FDI in these industries might also explain a large part of Chihuahua's attractiveness.

Figure 1.36. **Specialisation in medium-low tech activities by state**

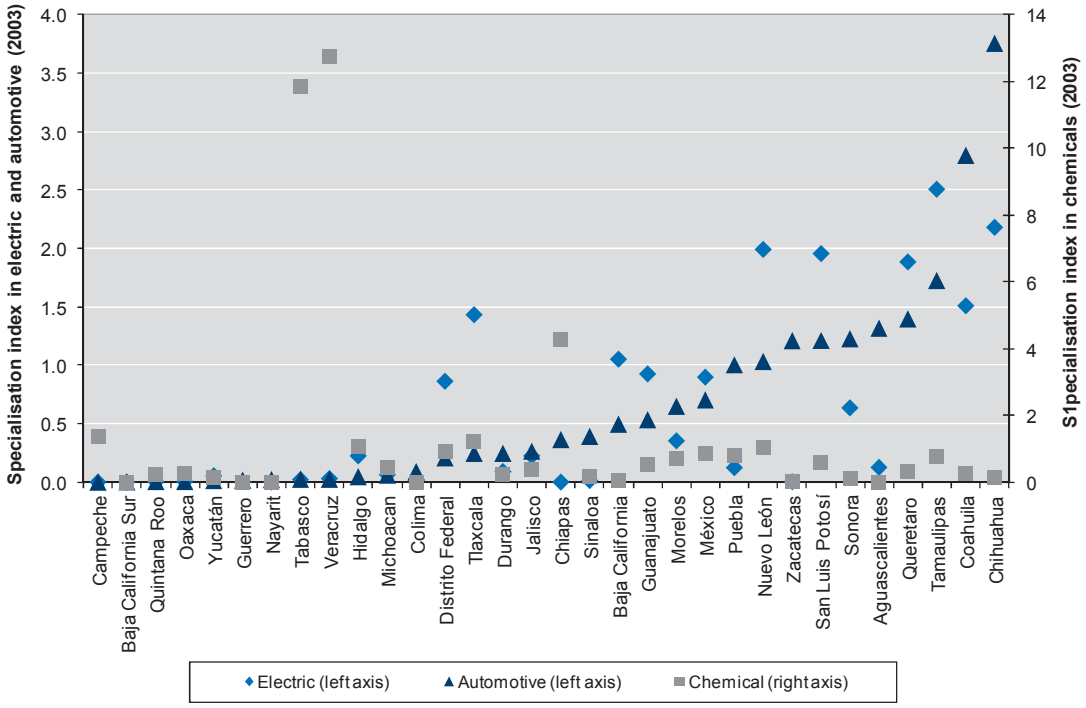


1. Specialisation indices calculated as the share of employment in industry *i* with respect to state's manufacturing employment with respect to national industry *i*'s share of national manufacturing employment: (L*ij*/L*j*)/(L*i*/L) where L stands for employment, *i*=state, *j*=manufacturing 4-digit industry.

2. Technological levels were attributed to 4-digit industry following the criteria in the OECD Structural Analysis Database.

Source: Author's calculations based on INEGI (2004), *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

Figure 1.37. **Specialisation in medium-high technology by state, 2003**



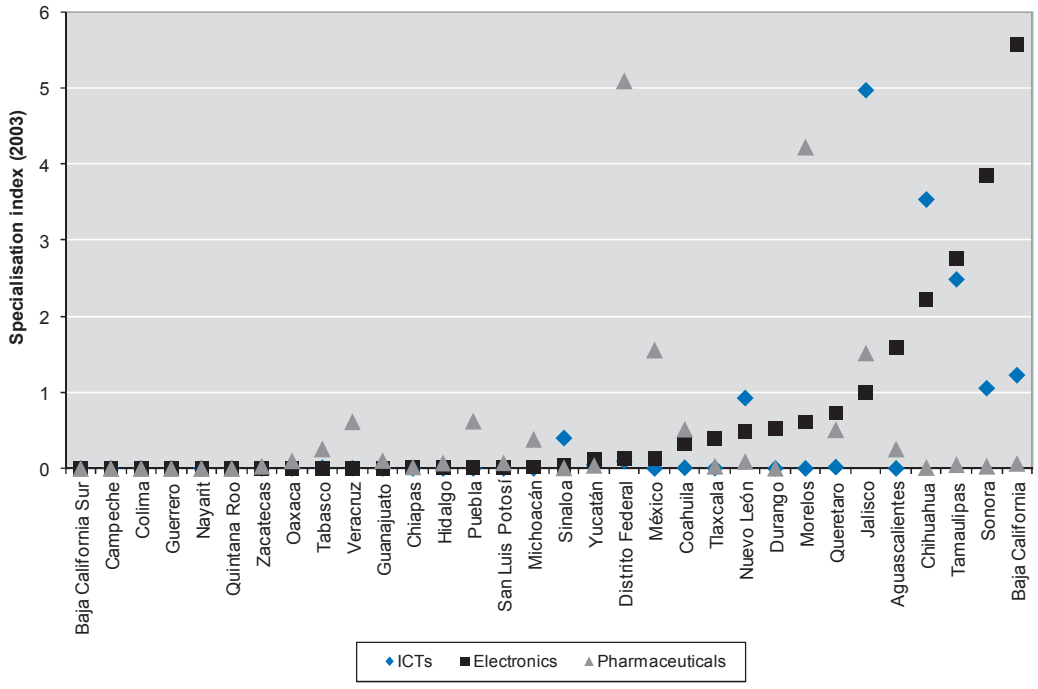
1. Specialisation indices calculated as the share of employment in industry *i* with respect to state's manufacturing employment with respect to national industry *i*'s share of national manufacturing employment: (L*ij*/L*j*)/(L*i*/L) where L stands for employment, *i*=state, *j*=manufacturing 4-digit industry.

2. Technological levels were attributed to 4-digit industry following the criteria in the OECD Structural Analysis Database.

Source: Author's calculations based on INEGI (2004), *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

Specialisation levels have led to the formation of some clusters in Chihuahua. The state has been increasingly specialised in higher value-added activities, but recently some key industries have began to show problems. The main manufacturing employer in the state is the automotive industry (Figure 1.39). Although that industry continues to grow and yield higher specialisation levels, other key industries such as electric, electronics, medical equipment and measurement instruments have in 2009 shown lower specialisation levels than in 1999. It is very likely that shrinking employment in those industries due to dwindling US demand after the financial crisis might have led to lower specialisation levels. Interestingly, IT manufacturing continue to expand in spite of the crisis which might signal that there might be competitiveness issues that are specific to the electric and electronic activities. There has been a noteworthy rise in forestry-related activities (e.g. lumber and veneer) that utilise natural resources from the mountains.

Figure 1.38. **Specialisation in high-tech activities by state, 2003**



1. Specialisation indices calculated as the share of employment in industry *i* with respect to state's manufacturing employment with respect to national industry *i*'s share of national manufacturing employment: (L*ij*/L*j*)/(L*i*/L) where L stands for employment, *i*=state, *j*=manufacturing 4-digit industry.

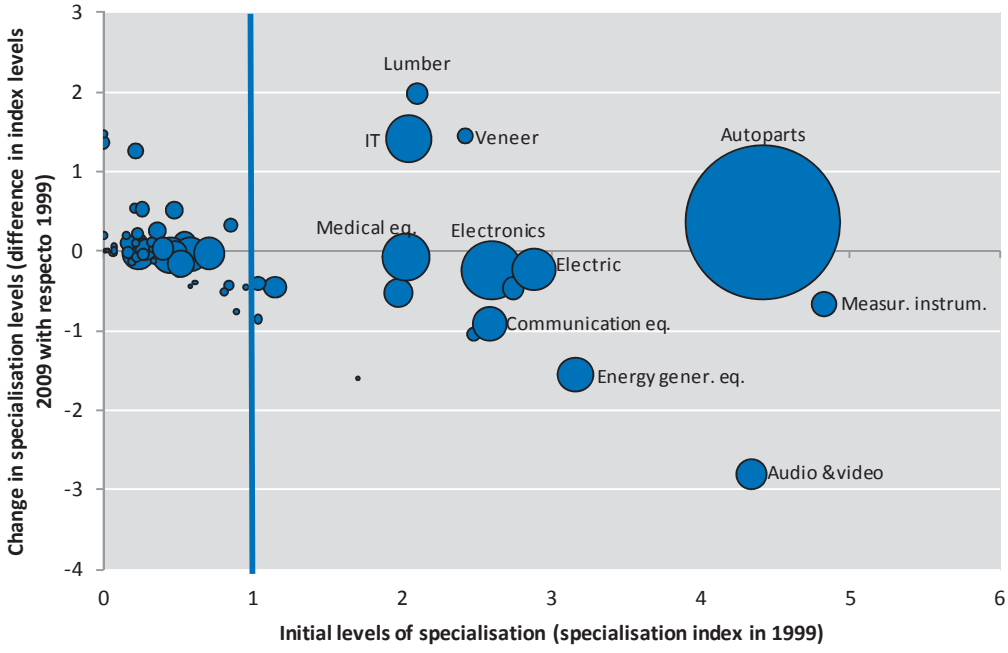
2. Technological levels were attributed to 4-digit industry following the criteria in the OECD Structural Analysis Database.

Source: Author's calculations based on INEGI (2004), *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

The automotive cluster is economically the most important. In 1999, almost one-third of the state's manufacturing GDP took place within the cluster (Unger, 2003). Typically, automotive clusters in Mexican border-states are strongly supported by electric-motors firms' activity. Taking into account the assembly of engines and chassis, as well as the production of different auto-parts, the electric-motor assembly and parts account for the largest share of the clusters' GDP with almost one-fifth of all production (Unger, 2003). However, as final vehicle assembly is not carried out in the state, the value of electric-motor assembly and parts is likely to play a larger role in Chihuahua's automotive cluster compared to most other border states where final vehicle assembly is carried out.

Figure 1.39. **Industrial change in Chihuahua, 1999-2009**

Changes in specialisation indices and employment



1. Specialisation indices calculated as the share of employment in industry *i* with respect to state's manufacturing employment with respect to national industry *i*'s share of national manufacturing employment: (L*ij*/L*j*)/(L*i*/L) where L stands for employment, *i*=state, *j*=manufacturing 4-digit industry.

2. Changes in specialisation indices represent the difference in index levels in 2009 with respect to 1999.

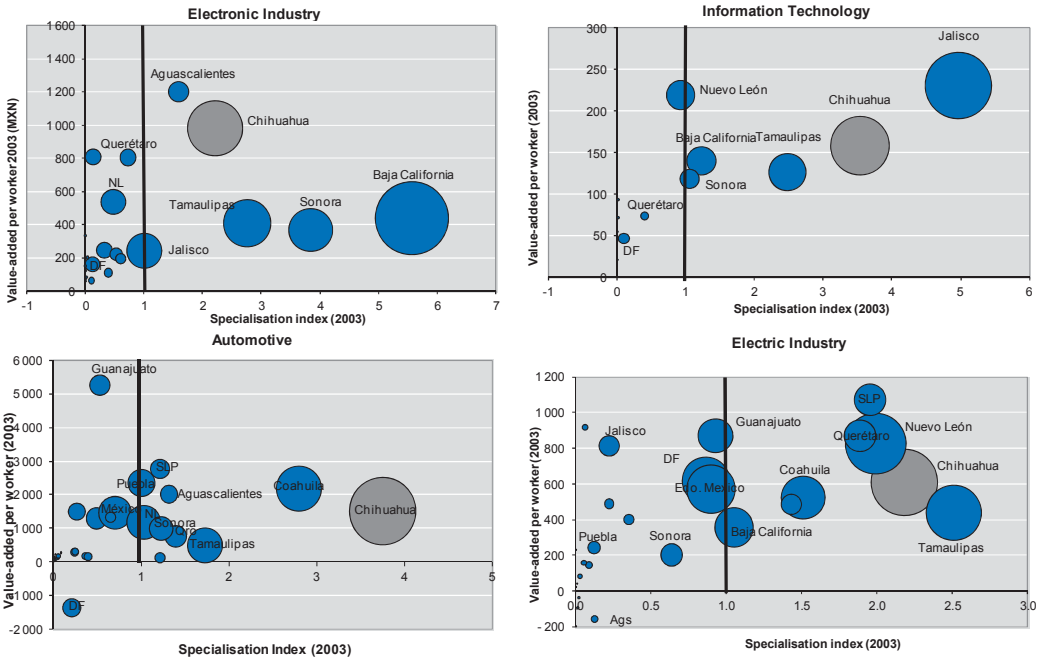
3. Bubble size represents the size of employment by manufacturing branch in 2009.

Source: Author's calculations based on INEGI (1999), *Censos Económicos 1999*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, and INEGI (2010), *Censos Económicos 2009*; Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

Clusters in Chihuahua are key because they contribute with higher value added than elsewhere in the country. Four of the main clusters in Chihuahua, namely automotive, electric, electronic and IT, generally yield higher value added than in other states. Value-added per worker in Chihuahua was the second higher in electronics and the third in IT in 2004 (Figure 1.40). In the electric and automotive industries Chihuahua is the largest employer displaying one of the highest specialisation levels in the country and among the top states in value added per worker.

Figure 1.40. **Chihuahua's main manufacturing industries compared**

Value added and specialisation in Mexican states (2003)



1. Specialisation indices calculated as the share of employment in industry *i* with respect to state's manufacturing employment with respect to national industry *i*'s share of national manufacturing employment: (L*ij*/L*j*)/(L*i*/L) where L stands for employment, *i*=state, *j*=manufacturing 4-digit industry.

2. Bubble size represents the size of employment in electronics in 2003.

3. Value-added per worker is the quotient of gross census value added and total employment.

Source: Author's calculations based on INEGI (2004), *Censos Económicos 2004*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes.

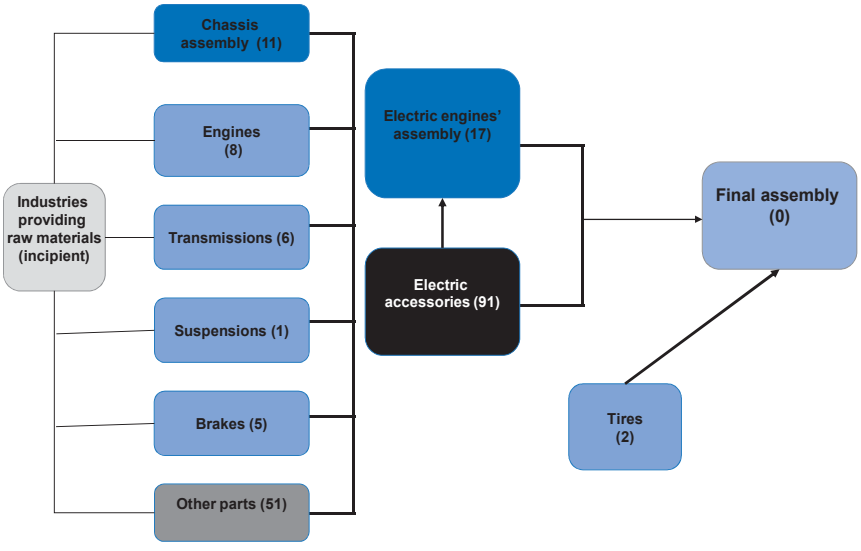
Backward and forward linkages

The benefits stemming from technological spillovers require local linkages among the supply chain and with competing firms in addition to conditions on the labour market and innovation. Technology transfer and diffusion operate via four interrelated channels: vertical linkages with suppliers or purchasers in the host countries; horizontal linkages with competing or complementary companies in the same industry; migration of skilled labour; and the internationalisation of R&D. The evidence of positive spillovers is strongest and most consistent in the case of vertical linkages, in particular, the backward linkages with local suppliers in developing countries. MNEs generally are found to provide technical assistance, training and other information to raise the quality of the suppliers' products. Many MNEs assist local suppliers in purchasing raw materials and intermediate goods and in modernising or upgrading production facilities (OECD, 2002a). However, in Mexico, technological gap between local and MNEs' levels limit the benefits of technological spillovers (Dussel Peters et al., 2007).

However, one of the main constrains to fully reaping the benefits of FDI lies precisely on the lack of local suppliers connected to global firms. Dussel Peters et al. (2007) found that Mexico's raw materials from domestic firms had a negative elasticity to FDI which

suggests national producer's limited ability to integrate to global value chains. The cluster with the largest employment in the state is automotive and its development constrains are similar to other activities. Lack of data on actual sales among firms, or employment data at the local level, prevents us from knowing the size and the direction of commercial flows locally. However, according to Ríos Ramírez and Pico Herrera (2005), there is an incipient provision of raw materials to the rest of the chain. There is a modest presence (one to ten firms) of firms producing key vehicle components such as suspensions (one firm), tires (two), brakes (five firms), transmissions (six firms) and engines (eight firms) – albeit some of them are large and emblematic such as Ford's engine plant in Chihuahua City. A larger number in chassis assembly (11 firms) and electric motors' assembly (17) were located in the state. There was an important presence of other autoparts (up to 75 firms). However, the majority of firms were producing electric accessories, where some vertical integration seems to be taking place as 91 firms produce electric accessories to then be assembled by the 17 companies dedicated to electric motors. As there is no final vehicle assembly, and virtually no raw materials are provided locally, the cluster is made of autoparts. With the notable exception of electric motors industry, the rest of the chain seems to be disconnected: there seems to be no relationship between chassis assembly, brakes, suspension and transmission production and engine assembly (Figure 1.41). A survey of automotive companies located in the state revealed that, in addition to market pressures given the declining US demand, as well as the desire to obtain better incentives and regulation from the government, there were raising pressures to cut operational and input costs that in their opinion can be done through identifying local suppliers (Piedras, 2004). The survey also found that the top problem area lied in labour relationships linked to Federal legislation.

Figure 1.41. **Firms in the automotive value chain in Chihuahua, 2005**



1. Number of firms in each stage of the value chain in brackets.

2. Intensity of colours indicate a greater number of firms.

Source: Adapted from Ríos Ramírez, A. and L. Pico Herrera (2005), *Modelo de Desarrollo Regional Sustentable: Cadenas Productivas del Mueble, Automotriz y Electrónica*, Instituto Tecnológico de Estudios Superiores de Monterrey (ITESM) Campus Chihuahua.

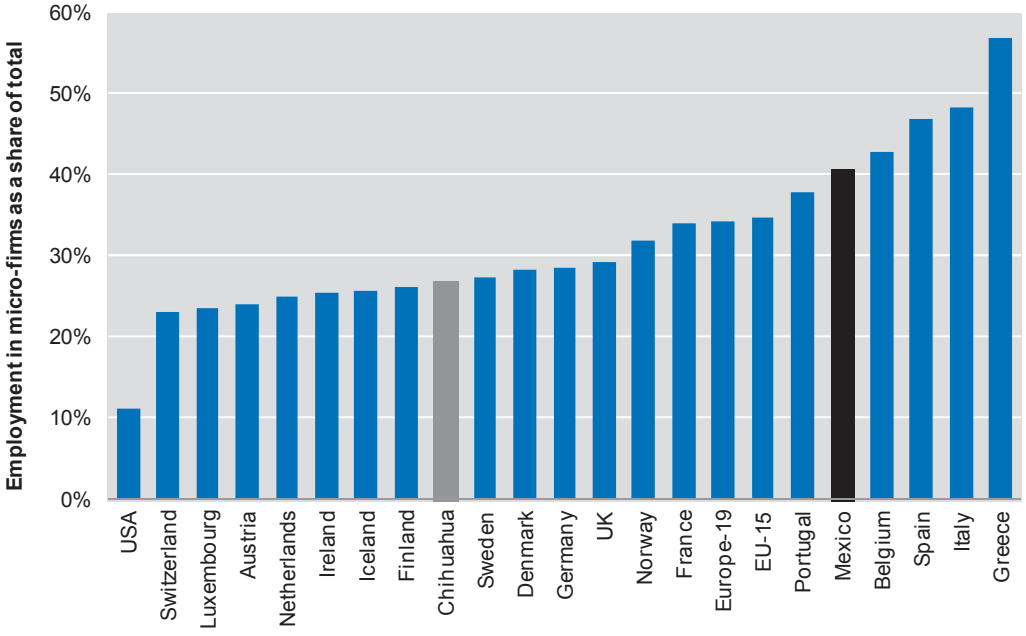
Although vertical integration is still low in Chihuahua, it remains above national levels, particularly in municipalities away from the border. The degree of national integration (the proportion of the value of production that is due to domestic inputs), has over the years been estimated at 2% of total value of production (Carrillo, 1997). Chihuahua's degree of integration has oscillated between 4% and 6% of value of production since 2007. However, while Juárez's ranges between 3% and 4% during the same period, Chihuahua City's has stood at levels above 9%. Moreover, other municipalities' degrees of integration have varied between 16% and 20% of value of production (CIES, 2010).

A model of development in some primary activities can be followed by other firms and other sectors. Dairy farms in Delicias, display a high degree of technological sophistication that has led the region to become the second largest producer of milk in the country. Dairy has been an industry that has acquired technological progress through own means and has successfully positioned itself. Perhaps the industry could benefit from the development of an industrial park for dairy products that integrates the chain from alfalfa to dairy farms and milk plants that can better articulate producers and reach further value-added levels. The dairy industry is an example, but not the only one, as processing of perennial crops such as apples can also be helpful to draw similar conclusions. These industries can further create a sizable amount of jobs at reasonable wages.

The problem of integrating local firms to global value chains in Chihuahua lies, like in the rest of Mexico, on firms' size, access to finance and levels of entrepreneurial development. Micro-firms (firms with up to ten employees) account for 27% of total employment in Chihuahua. Not only is such a share lower than the national level in Mexico (41%) but stands at similar levels than countries like Sweden or Finland (Figure 1.42). However, Chihuahua's level of micro-firm employment contrasts with that of the US (11%) a country where approximately 90% of FDI in Chihuahua comes from. When it comes to number of small and medium enterprises (SMEs that include micro-firms) Chihuahua (92%) trails Mexico (95%) in the share of total firms (Figure 1.43). Micro-firms are characterised by non-standarised processes that often lead to lower productivity levels and an inability to benefit from economies of scale as capital is too expensive to introduce in smaller firms which face problems of access to credit. Only 13% of the 5.1 million Mexican firms had access to credit in 2009 (INEGI, 2010a). While access to credit is a key obstacle for firm development in Mexico, the problem seems to be less acute in Chihuahua's manufacturing sector. Only 5.9% of total employment in manufacturing in Chihuahua takes place in micro-firms in contrast to 23.2% in the country. Weak financial intermediation hits local firms much more than competition from multinational enterprises (MNEs) (OECD, 2002a), and no doubt micro-firms in the state may face similar constraints in access to finance to elsewhere in the country, but the problem for manufacturing in the state could lie in poor levels of entrepreneurial development.

Figure 1.42. **Micro-firms in OECD countries and Chihuahua**

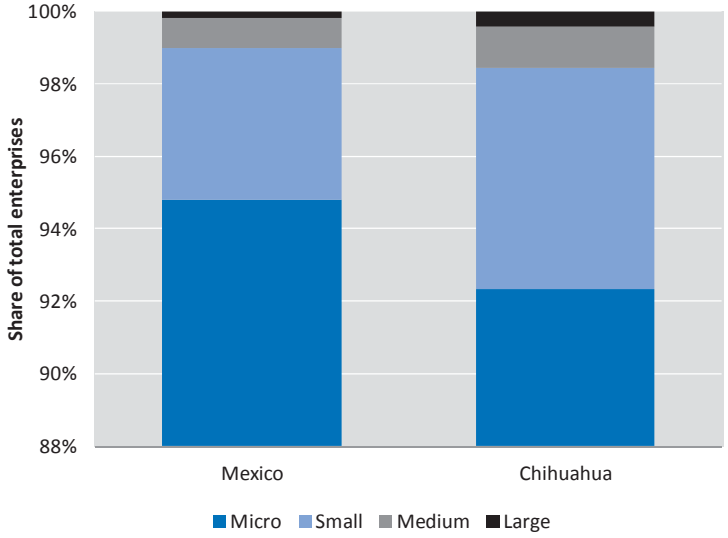
Employment in micro-firms as a proportion of total employment



Note: Micro-firms employ less than 10 workers in all countries.

Source: EU (2007), Observatory of European SMEs; US Census Bureau (2004) 2002 US Economic Census; INEGI (2010) Censos Económicos 2009.

Figure 1.43. **SMEs in Mexico and Chihuahua, 2009**



Source: INEGI (2010), Censos Económicos 2009, Instituto Nacional de Estadística, Geografía e Informática.

Chihuahua might be wasting a golden opportunity to benefit from the knowledge that FDI firms are bringing. *Maquiladora* firms bring about not only employment, but also knowledge and technological spillovers that are reflected in higher productivity levels. Knowledge creation and diffusion has been linked with high-growth entrepreneurship particularly in OECD countries reflecting increasing knowledge intensity. Regardless of firm size, entrepreneurship levels depend on innovation and R&D. Business R&D is particularly important as it is closely related to the creation of new products and production techniques. In addition, it is not only important to foster R&D, but also to seek collaboration. Innovation strategies even for SMEs, are increasingly looking at ways in which they can collaborate and increase their knowledge and success in new products. This new trend can be explained as continuing technological progress, the cost of investments and the difficulty of integrating multidisciplinary research, make collaborating on innovation more attractive and in many cases necessary. Around one in ten of all firms (or one in four innovating firms) in Europe collaborated with a partner (other firms, education institutions or government institutions) for their innovation activities. Large firms are significantly more likely to collaborate than SMEs (although countries differ in this respect). Following the increase in economic globalisation and the corresponding internationalisation of R&D/innovation, firms increasingly co-operate with foreign partners (OECD, 2009e). There are many examples in which FDI has brought about innovation through design and engineering centres. However, the lack of local capacities to engage in innovation with these centres and the lack of spin-offs from FDI companies, slash potential spillover effects in Chihuahua.

Scanty resources for innovation and a bias towards pure scientific research might be crippling entrepreneurial potential in Chihuahua. Finance remains key to develop entrepreneurship and a number of channels are available. First, debt financing and equity financing are the two main sources of finance for entrepreneurial firms. Debt financing involves the acquisition of resources with an obligation of repayment; the investor does not receive an equity stake. It includes a wide variety of financing schemes: loans from individuals, banks or other financial institutions; selling bonds, notes or other debt instruments; and other forms of credit such as leasing or credit cards. Second, venture capital is an important source of funding for entrepreneurial firms, especially young, technology-based firms with high growth potential. Third, business angels provide equity capital and are investors that fall somewhere between formal venture capital funds and informal FFF (founders, friends and family) investors. Recent evidence has shown that business angels play an important role especially in the early-stage financing of entrepreneurial firms (OECD, 2009d). The National Council for Science and Technology (CONACYT) approved through *Fondos Mixtos* (joint funds) 135 projects with MXN 64 million (around USD 4.2 million) during the 2001-07 period (CONACYT, 2008); that is at an average annual rate of around USD 0.6 million. However, not only is finance too small to produce any kind of spillovers, but 94 out of 135 (almost 70% of total projects) were scientific research with no direct links with firms nor new-to-market innovations. Seven projects were to promote scientific research, five for R&D infrastructure in universities, and only 17 (12.6% of total projects) went to technological development that can be related or potentially related to firms and innovation in the market.

Notes

1 . A US temporary migrant programme put in place in 1942 due to labour shortages due to the US involvement in WWII and which was cancelled in 1964.

2. The period under analysis stops before the economic crisis of 2008 as the results would be biased by that atypical period.

3 . Gross value of production refers to adding intermediate inputs and taxes net of subsidies to gross value-added.

4 . Inactivity rates as defined by the residual of subtracting participation rates from 100% considered in the working-age population are lower in OECD countries than in Mexico. Although there is a wide variance on these rates, the OECD average stands at 30%, but many countries are even lower, e.g. 19% for Switzerland, 24% for the UK and 29% for Germany.

5 . The financial sector has developed relatively accessible mortgage schemes. As a result, the demand for land that is to be developed for housing, has also increased.

6 . For instance, Renault and Nissan merged in March 1999 and soon after they announced projects for Aguascalientes and Morelos (Dussel Peters, 2000).

7 . The state of Chihuahua, and in particular its major cities, have suffered from an upsurge in levels of criminality in recent decades. Chapter 2 presents some sobering statistics and description of this problem. Crime is mostly drug-related, but extortion and kidnapping have also become more common. The increased feeling of insecurity faced with this development could deter both foreign and domestic investment, encourages law-abiding citizens to move elsewhere, and imposes substantial deadweight losses on the local economy. If crime continues at high levels, the state's economic development could be compromised. Although some progress has been made recently in combating crime and breaking up the drug gangs, more and better resources need to be devoted to policing, investigating and prosecuting.

8 . The capacity to introduce new products, processes, services, business models and organisational methods in firms.

9 . The *Sistema Nacional de Investigadores* (SNI/National Researchers' System), is the nation's network of researchers that have fulfilled high-quality research criteria established by the National Council for Science and Technology (CONACYT).

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Chapter 2

Policies and Institutions to Enhance Economic Growth

This chapter examines federal, regional and local policies and institutions for regional development in Chihuahua. It starts by discussing the institutional framework – the international context being a border region, as well as the federal, state and municipal levels of government – in Chihuahua. The chapter continues with an analysis of the policies in place and points at the need for reforms to enhance economic growth. In particular, the chapter looks at policies for private-sector development: i) those that aim at fostering private investment, ii) those for upgrading the regulatory framework, and iii) cluster policies to link value chains. One of the central policy discussions in this chapter is the policy options that the state has, in order to strike a balance between attracting foreign direct investment and supporting local entrepreneurship. The chapter also looks at policies to develop and attract skills and talent, as well as innovation policies such as science and technology parks, the financing of innovation and the institutions for innovation. In light of Chihuahua's vulnerability to external shocks, one of the policy options that are explored is the diversification of the economy in sectors with growth potential. The chapter ends with a discussion on the potential role of a regional development agency in Chihuahua that would allow a quadruple-helix approach to regional development with the implied involvement of the private sector, academia and civil society.

2.1. Institutional framework in Chihuahua

The International Context

The intense commercial and interpersonal relations between border communities along the Chihuahuan part of the US-Mexican border requires special attention as it has economic, social and environmental implications. Chihuahua is one of Mexico's states with the greatest interaction with the US in a border that is among the busiest in the world. Along the more than 3 000 kms that divide Mexico and the US, almost one-third lies in Chihuahua. The state is the only Mexican state that shares a border with two US states: New Mexico and Texas. With ten border-crossings – the largest infrastructure in the country – around one-fifth of all truck crossings occur in Chihuahua. Almost 16 million annual passenger vehicles and more than 9 million pedestrians cross through one of Chihuahua's international border-crossings. The successful model of inward attraction investment programme called *maquiladora* has most of that employment, which in turns dominates Mexican manufacturing, in Chihuahua. Primary sector activities (mining, some of the perennial crops and cattle-raising) are also largely focusing on the US market. International water agreements such as the 1944 International Water Agreement that establishes a specific water volume delivery from Mexico to the US through the rivers that converge in the Rio Grande (that serves as international border) in return for the volume that the US delivers through the Colorado River also have provided political disagreements among regional governors on both sides. Environmental concerns related to nuclear disposal sites, as well as air pollution have also been a source of interaction.

US cities on the border of Chihuahua are closely interconnected to economic and transport flows with Mexico. El Paso, for instance, has a large transportation and distribution sector serving international traffic and a retail sector that is inflated by serving two cities. The strength of border retail sales in El Paso results from Mexican shoppers who prefer the US side for many items. The result is exportable retail sales that equal approximately 6% of total sales in El Paso (Phillips and Manzanares, 2001; cited in Gilmer and J.C. Cañas, 2005).). Understanding Chihuahua's development path requires an understanding of its cross-border relationships (See Annex B for a discussion).

The Federal Level

Mexico is moving from a highly centralised system of government – in which the federal government maintained an unquestioned power over other levels of government – towards a much more decentralised and federalist arrangement. Nowadays, an increasing number of political actors, both at the national and sub-national levels, have a greater say in public affairs and regional governments have started to play a more active role in deciding their own future. Many of the competencies by Constitution assigned to local governments have now for the first time acquired real validity as a result of the transformations of the Mexican political system.

Mexico is a Federal Republic with a representative and democratic system of government. Public power is divided across the national territory in three levels: the central (federal) government; 32 federal entities (31 States and 1 Federal District), and close to 2 500 municipalities. During most of its modern history Mexico was characterised by having a highly centralised political system. Formal and legal provisions, as well as most of the political authorities at the federal, state and local levels were subject to the commands and control of the Presidency. As a consequence, the capacity of

lower orders of government to perform their functions autonomously and particularly to respond more directly to the population's wishes was curtailed.

As a result of the democratic transition that has taken place and the ensuing enhanced political competition, there has been a substantial redistribution of decision-making across the three levels of government. Although a new governance system amongst the different levels and branches of government is starting to appear in several areas of policymaking, improvements are necessary particularly regarding the conditions of federal transfers and the capacity of sub-national governments to make real policy decisions.

Although the Constitution divides public power among the aforementioned three levels of government and establishes separate functions for the executive, legislative and judiciary powers, in reality the federal and executive, namely the Presidency concentrated the decision-making process. The President is both the Head of State and Chief of Government and is elected by popular vote for six-year terms. In contrast, the Mexican bicameral Congress, as well as the judicial branch traditionally exerted far smaller powers than the Executive. Nevertheless, with the recent emergence of a multiparty democracy Congress is increasingly playing a more active role. This legislative body is divided between the Senate aiming at representing states, and the Chamber of Deputies who are elected to represent electoral districts usually part of cities or smaller communities.

The President also had considerable influence over the judiciary power. Upon approval from the Senate, the President appoints the 11 judges that integrate the Supreme Court of Justice. In addition, there are 23 federal judicial circuits with a total of 346 courts and 560 judges. Being appointed by the President, the judiciary and especially the Supreme Court enjoyed very little autonomy. As a result of recent actions to insulate judges from political pressure, the Supreme Court is now playing a more active role in such areas such as intergovernmental disputes (constitutional controversies), and even ruling against the position of the President.

Sectoral ministries were strong and the previous scheme centred on the President implied weak mechanisms to co-ordinate them. Such mechanisms weaken in turn, the co-ordination of sectoral programmes, particularly on territorial development where sectoral policies interplay. Cross-ministerial co-ordination is thus of key importance for the implementation of programmes at the territorial level. Federal countries have chosen different approaches for inter-ministerial co-ordination. Austria has long-developed an informal approach which places greater emphasis on consensus-building among different ministries. Switzerland has chosen a more formal approach where ministries dealing with territorial development issues have to convene regularly in an inter-ministerial body whereas in the US, the Cabinet of the President carries out policy co-ordination. Notwithstanding the specific model chosen it is important that formal or informal mechanisms for policy co-ordination are used and that co-ordination does not increase, but reduce transaction costs between decisions of the President and their implementation. In the case of Mexico a greater institutionalisation of co-ordination mechanisms for public policy seems to be desirable.

The State Level

The strong centralism can also be found at the state and municipal levels. State governors were highly dependent on the wishes of the Presidency, and in contrast to municipalities, lacked the formal autonomy granted to them by the Constitution. Likewise, state governor's replicated the model at the regional level. Mexican state

governors remain the only executive officers to be elected state-wide and do not have to contend with other potentially powerful elected officials such as a Deputy Governor or a Treasurer as in the US (Ward and Rodríguez, 1999).

As in the federal level, the state Congress had long been confined to a role of simply responding to the executive's initiatives. The role of the state Congress is manifold. First, it oversights the state executive actions by examining and given the case approving the state's public accounts and the state budget, as well as determining taxes Second, it supervises municipal governments by examining and given the case approving the municipal councils' income law, as well as by controlling their public accounts; resolving conflicts between municipalities and if necessary, suspending the municipal council or removing members and can create new municipalities. Third, it legislates in areas related to state government by introducing regulatory decrees and by-laws or by directly reforming the state Constitution. Fourth, it validates major changes in administration such as the nomination of magistrates to the local Superior Court or the elections for state governor.

The Municipal Level

Despite it is recognised in the Mexican Constitution, municipal autonomy has been very limited rendering it the weakest tier of the Mexican government. However, the 1983 Constitutional changes in addition to greater political competition have served to strengthen municipalities. A new redistribution of the decision-making process in social, economic and cultural areas, have led to greater municipal autonomy allowing municipal problems to be solved using their own resources coupled by a decentralisation programme and training of local servants (OECD, 1997). Legally municipalities have no legislative function and can only make regulations within the framework of state and federal laws. They are responsible for the provision of many public services such as drinking water and sewage, retail and wholesale markets, and public security. Tax rates have to be approved by the state legislature and municipal accounts are audited by the state controller who then reports to the legislature, but they are heavily dependent on federal and state transfers. As a result of the 1983 reform, their legal authority was reinforced, which conferred to them some regulatory powers without prior agreement from the state Congress. It also fixed minimum fiscal responsibilities and granted exclusive authority for property taxes as well as the right to partake of public revenue.

2.2. Policies to enhance endogenous growth

Structural reforms in Mexico should be accompanied by spatial policies that maximise their benefits while addressing the unintended spatial consequences. Changes to the product market regulation (PMR) have become a corner-stone of economic growth policies. For Mexico, PMR represents a golden opportunity to boost growth rates in the medium and a long-run shifting development levels. Fostering competition in key sectors for Mexico as energy and network sectors (telecom most notably) is paramount to unleash growth in the country. While freeing competition in retail trade is also important (OECD, 2011a), all of these key policy areas lie outside the competencies of state and municipal governments. The OECD strongly supports undertaking the pending "structural reforms" on product market regulation that concern energy and network sectors as well as a labour legislation reform that would allow Mexico to speed up growth. However, such reforms if undertaken will not be spatially blind and will likely favour some regions and not others and therefore the need to accompany such reforms with spatial policies. This review

focuses precisely on those policies, those that state and municipal governments can carry out to foster growth. Those policies can be divided into three main groups: private sector development, human capital development, and innovation.

Private sector development

If markets worked perfectly and were able to allocate resources efficiently there would be no need for private sector development (PSD) policies. The role of the state would therefore be confined to providing a stable macroeconomic environment and providing public goods such as defence, education and infrastructure (OECD, 2007a). Only when market failures (i.e. imperfect competition, market power, public goods, negative externalities or imperfect information) are present that intervention has economic grounding. However, intervention in itself does not necessarily correct failures as government can bring about its own failures. Government failure arises when its intervention lead to distortions in the markets and either: *i*) ineffective policies and waste of resources or *ii*) a worsening of the original situation due to unintended consequences rooted amongst other things on political self-interest, policy myopia or regulatory capture. Effective implementation requires autonomy, skills and capacities, as well as impartiality (Lall, 2000). However, the real world is plagued of cases in which there is a need for effective intervention.

PSD policies in Chihuahua should aim at increasing productivity and value added through SMEs support, as well as the integration of local companies in MNEs' value chains. Increases in productivity stem from efficiencies gained through the more use of capital (the deepening effect), the use of technology (the technical progress effect), the better mix of factors (the organisational effect) and the benefits of proximity to other firms (the external economies' effect). This section deals with policies that lead to private investment (i.e. capital deepening) as the technical progress effect will be address in the innovation policy section and the external economies effect will be addressed in chapter 4; the organisational effect is considered to be an internal decision of firms for which intervention is not available.

Fostering private investment

Policymakers have two main sets of tools to foster investment from the private sector: improving access to finance and upgrading the regulatory framework. Access to finance is crucial in all OECD countries and in particular in Mexico. Access to finance is intimately related to firm size. When firm size for manufacturing and services (86 four-digit industries and 12 two-digit services) in Mexico and the US are compared in Buera, Kaboski and Shin (2011), the result is a significantly smaller size in Mexico. However, industries with large average firm size such as automotive, IT or steel are larger in Mexico than in the US. Conversely, industries with smaller average firm size such as food, retail or dairy are even smaller in Mexico. These results are consistent with the international division of labour between the two countries: a relatively labour-intensive country like Mexico will host manufacturing firms with more employees than the relatively more capital-intensive economy in the US. Most of the value of production in manufacturing in Mexico is now carried out by MNEs through FDI. As a result, Chihuahua's manufacturing sector heavily relying on *maquiladoras* will likely have a larger size. These companies are hardly constrained by finance. However, finance becomes much more a constraint for local, usually smaller manufacturing firms in the state. Relatively larger firm size in manufacturing is a reflection of high fixed costs in the

industry which leads to greater financial needs. The implication for Mexico is that finance frictions derived of a less developed financial sector by distorting the allocation of capital and entrepreneurial talent lead to lower productivity levels (Buera, Kaboski and Shin, 2011).

Mexican SMEs experience severe weaknesses that render them unable to compete globally. Among the main factors are insufficient know-how, low technological level, limited access to financing (OECD, 2007b). The country's SMEs almost exclusively produce for local markets generally with outmoded design, outdated tools of production, low quality and inadequate marketing. Micro firms do not participate in 'association networks' and suffer from low levels of human capital, inadequate use of technology and limited access to finance (OECD, 2007b). There are sharp asymmetries in financing. Larger companies in tradable sectors have access to bank credits, while SMEs rely mainly on costly suppliers' credit with adverse effects on investment and innovation activities. In 2005, suppliers' credit accounted for two thirds of finance for small enterprises (OECD, 2007b). In addition, SMEs are in need of seeing their environment improving. Currently Mexican SMEs operate in the context of inadequate infrastructure and skills coupled with low public spending levels.

Commercial banks have faced several obstacles to increase finance for firm development. Among the factors constraining credit supply are the problems lending institutions face in enforcing contracts that involve collateral. Therefore, providing more certainty in guarantees to creditors would help debtors by increasing opportunities for contracting credit at competitive prices and reducing the scope of informal credit at exorbitant prices.

State policies should mainly aim at correcting market failures. Many OECD countries have taken measures to improve SME access to venture capital and other types of private financing. In order to address asymmetric information, some OECD countries use "business angels", networks that bring together SMEs and investors. Some OECD governments play a more direct role in helping SMEs, by guaranteeing or providing venture capital. Chihuahua could benefit from developing a business angels' network as well as by further developing state funds to not only use grants and credit but also to provide venture capital schemes. Chihuahua could also involve commercial banking by providing guarantees.

By far the most widely used Federal Programme to develop SMEs in Chihuahua is *Fondo PYME* (SMEs Fund). In Mexico, after the Law for SMEs entered into effect in 2002, the lion's share of Federal resources for SMEs has been channelled through *Fondo PYME* and via sub-national governments. In 2007, 95% of the total budget (MXN 2.9 billion or USD 263 million) for the Under-Secretariat for SMEs was allocated to *Fondo PYME*. Unfortunately access to finance has not been the most important driver for *Fondo PYME*. In 2006, only 51 out of 944 approved projects (5.4%) by *Fondo PYME* were for access to finance (Canales Salas et al., n.d.). At the state level, between 2004 and 2009, MXN 272 million (around USD 21 million) were given to 74 projects in the state (CODECH, 2010). The State Government of Chihuahua contributed with 30.5% of those resources while 33.3% was a Federal contribution. It is noteworthy to mention that the private sector contributed with almost as much as the State Government (short by around USD 28 000). Although with the available information is not possible to assess the impact of *Fondo PYME* in terms of employment or other indicators, it seems to be an ideal mechanism to bring to the table different actors involved in the process of, and to co-

ordinate actions in favour of SME development. However, it has the downside of being a federal programme with rules set up at central-government level, which means that there is little room for policy innovation at the state level.

Chihuahua has also put in place state-level programmes to improve the regulatory environment, to attract FDI, and support SMEs. Chihuahua like other Mexican states has been addressing the easiness with which businesses can start-up in the region. The Quick Business Start-Up Business System (SARE) facilitates procedures and the One-Stop Shop Programme has also helped the task. Chihuahua is also one of Mexico's FDI champions and the state has programmes to provide fiscal and non-fiscal incentives to attract overseas investment. The State's Secretariat of Economy has put in place six different programmes to support SMEs in manufacturing. On the commercialisation front, the state has supported three manufacturing firms in 2011 to attend an international event that arguably will boost promotion for their products and increase their capacities, through the International Events Programme (Table 2.1). Commercial capacity is also expected to increase through 40 manufacturing projects in 2011 with the Industrial Image and Property Improvement Programme that supports micro-firms to meet the rule NOM 051 on labelling and improving image (bar codes, nutrition information, label design and printing) to venture in new markets. The state has also set up two programmes to address dwindling productivity. The *Programa ABC* (Low-Cost Automatisation Programme) helps firms lower their scraping costs and thereby increase productivity. With around USD 27 000 they are expecting to benefit 8 firms in 2011. The state also has created Entrepreneurial Development Centres (CEDEMs) in different regions of the state to reduce the information gap on what the government can do and bring its programmes closer to entrepreneurs. CEDEM is the Secretariat's highest impact programme for manufacturing in terms of the number of users: 3 600 in 2011. In terms of SME financing, the *Fideicomiso Estatal para el Fomento de las Actividades en el Estado de Chihuahua* (FIDEAPECH/State's Trusteeship to Foster Activities in the State of Chihuahua) is the main source of funding. In 2010, FIDEAPECH granted 335 loans for MXN 86.04 million (around USD 6.88 million) with almost half of the resources going to manufacturing projects, almost one-quarter to services, 22% to commercial and 5% for agri-businesses. Further resources are needed for FIDEAPECH to support SMEs. In addition to manufacturing projects in partnership with CEDEP (see below), agro-businesses currently a small part of the funding from FIDEAPECH seems to be a clear opportunity (see Chapter 4).

The State government places an overwhelming emphasis on FDI attraction, but the strategy can be improved by striking a balance between inward investment and local firm development. FDI has provided many benefits to Chihuahua, including job creation, but at the same time has been based on fiscal, financial and regulatory incentives, as well as on the benefits provided by cheaper labour and reduced transport costs by being close to the border. The lion's share of the budget, that is 95.5% of the budget, goes to attract FDI (Figure 2.1). However, local firms have, in general, been less able to access MNEs' value chains and limited technological spillovers have arguably taken place. An independent study carried out by the Inter-American Development Bank (IDB), found out similar conclusions to this review in terms of the focus on FDI and the under-emphasis of local firm development (see Pietrobelli and Prats, 2011; Box 2.1). Many regions, such as those in Scotland, the North of England, and Ireland have shifted away from subsidies and job-creating FDI attraction, towards more endogenous growth. In particular, Ireland was very successful in bringing FDI through subsidies to MNEs but the strategy has more recently incorporated the integration of local firms in global value chains (Box 2.X). Like in

Chihuahua and Mexico at large, the value added of local firms was very low with limited spillovers (Box 2.2). The government decided to shift away from a model based on large incentives for FDI attraction – that had become largely contested and ineffective – towards endogenous-growth-based regional policies, with strong innovation components (OECD, 2008a). In addition, an over-emphasis on FDI can lead to dependence on such flows rendering the region vulnerable to external shocks. OECD experience shows that regions with undiversified activities, thin markets and high dependence on few sectors as in some Swedish regions can be vulnerable to crises (Box 2.3).

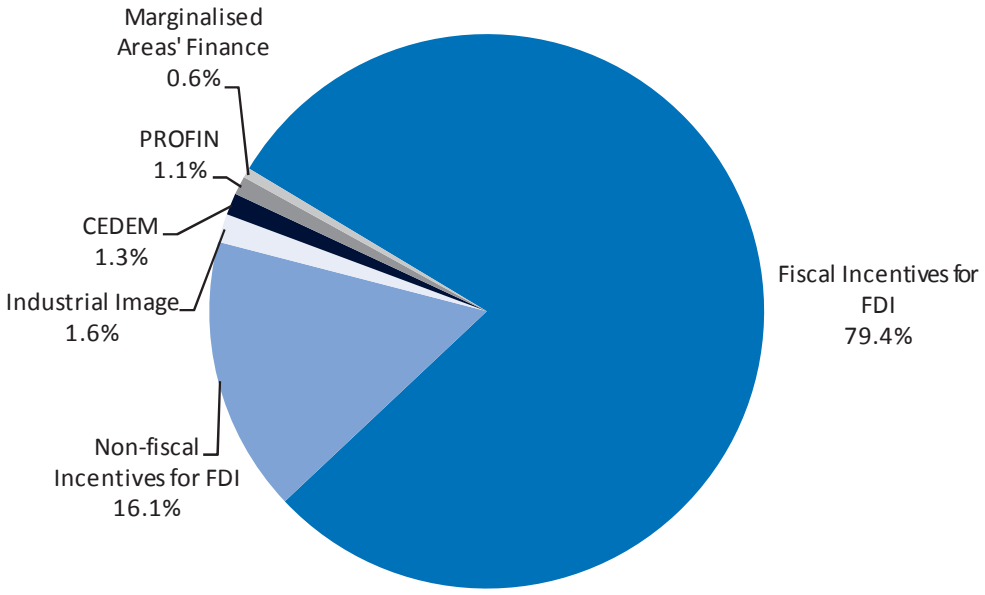
Table 2.1. **Economic and manufacturing development programmes implemented by the state of Chihuahua**

Type of programme	Name	Description	Budget	Budget Source	Achievements in 2011
Regulatory-related	One-stop shop	Facilitate start-ups	Annual budget	State level 100%	115 firms supported
	Quick Start-up Business System (SARE)	Facilitate low environmental-impact start-ups	Annual budget	Federal, State and Municipal	9 500 users
FDI-related	Fiscal Incentives for FDI	Main strategy to promote industrialisation and clustering and retain jobs in the state	MXN 50 million (USD 3.8 million)	State level 100%	n/a
	Non-Fiscal Incentives for FDI	Main strategy to promote industrialisation and clustering and retain jobs in the state	MXN 10 million (USD 769 000)	State level 100%	n/a
Support for SMEs	International Events Programme	Participate in international events and support SMEs with export capacity through training and promotion	Annual budget	State level 100%	3 firms supported during 2011
	Entrepreneurial Development Centres (CEDEM)	Bring the Secretariat of Economy's services closer to firms by going directly to communities	MXN 800 000 (USD 61 000)	State level 100%	3 600 users
	Industrial Image and Property Improvement Programme	Support micro-firms to complying with the NOM 051 on labelling and improving image (bar codes, nutrition information, label design and printing) to venture in new markets	MXN 1.03 million (USD 79 000)	State level 100%	40 projects
	Small Manufacturing Finance Programme (PROFIN)	Support micro and small manufacturing firms' development in the state that contribute to jobs creation	MXN 680 000 (USD 52 000)	State level 100%	14 projects
	Micro-firm Financial Support in Marginalised Areas	Provide financial support to productive activities in marginalised areas	Pending	State level 100%	20 projects
	Low-Cost Automatisation Programme (Programa ABC)	Increase productivity by lowering scraping costs, raising quality and save space	MXN 350 000 (USD 27 000)	State level 100%	Goal for 2011 to benefit eight firms

Source: Adapted on the basis of information provided by Chihuahua State's Secretariat of the Economy on 30 March 2011.

Figure 2.1. **Funding for manufacturing development programmes**

2011 budgeted funds for the state's Secretariat of Economy on manufacturing



Source: Author's calculations on the basis of information provided by the Secretariat of the Economy on 30 March 2011.

Box 2.1. **Analysing competitiveness programmes in the state of Chihuahua: the IDB methodology and results**

The Inter-American Development Bank (IDB) developed a unique dataset of all the private sector development (PSD) programmes in the State Chihuahua conducted by the Secretaries of Economy, of Rural Development and, only in the case of innovation programmes, Education. The dataset was built through budgetary analysis and interviews with officials in order to gather the most robust and updated available data. The dataset is organised by type of programme (FDI attraction, business development and innovation), size of firm attended (large, SME, and micro), sector (industrial, service, agribusiness, tourism or cross-cutting), and mechanism through which the programme support is provided (grants or fiscal incentives, credit, training or technical assistance).

In order to complement the analysis, institutional and programmes management practices were analysed through a standardised survey carried out in Chihuahua between June and August 2011. The effort was to assess institutions and programmes' performance, efficiency and effectiveness through intermediate conceptual categories like the capacity to co-ordinate with other programmes and actors, to execute, monitor and evaluate the impact of their actions, and to set and implement strategic plans. The same survey has been applied in other Latin American countries and allows drawing useful comparisons and more robust and reliable conclusions.

Some of the main conclusions are related to fragmentation of programmes, lack of SME-development funding and a focus on FDI attraction:

- *There is a high level of programme fragmentation and small-scale operations*. Eighty percent of the budget is allocated by 20% of the programmes. This fragmentation raises the costs of co-ordination and the risks of unnecessary duplications and, at the same time, limits organisational synergies and the scope of PSD policies. The average support for firms is very below MXN 20 000 (around USD 1 300) per beneficiary and only five programmes provide large amounts to their beneficiaries (larger than MXN 1 million). This fragmentation also raises the costs of information gathering for firms, adding confusion and uncertainty. The small size of most programmes further hampers any impact evaluation (Pietrobelli and Prats, 2011). Fragmentation is more prevalent in business development programmes than in FDI attraction or innovation programmes. As business development programmes mainly involve technical assistance, fragmentation is also higher in support provided through technical assistance. Even if it is somehow frequent to observe a high degree of fragmentation in business development programmes as compared to fiscal, land incentive or training programmes, the degree of fragmentation appears excessively high.
- *There is a generalised lack of programmes directed to SMEs*. Programmes are mostly directed to either large or micro firms, but hardly to SMEs. This also produces the result that most of the programmes directed to large firms are also directed to manufacturing, while most of the agricultural programmes are cross-cutting. In sum, the emphasis on manufacturing, on FDI attraction and on large firms together bring about a productive development policy that mainly targets job creation.
- *There is a high concentration in programmes directed to Foreign Direct Investment (FDI) Attraction*. Cash grants and fiscal and land incentives are used as their major instruments. Programmes directed to improve business development through technical assistance are not only less important in economic terms but, as mentioned, they are also very fragmented. This means that policies, such as for example cluster policies, value chain integration or entrepreneurship, are clearly being under-emphasised by the government.

Source: Based on Pietrobelli and Prats (2011), "The Quest for Productivity in the State of Chihuahua: Analysis and Roadmap", Technical Note, Inter-American Development Bank, Washington DC.

Box 2.2. **Shifting to endogenous growth: the cases of the United Kingdom and Ireland**

The United Kingdom. UK regional policy has, as other OECD countries shifted away from redistribution and subsidies to more endogenous ways of driving growth. During the 1980s and early 1990s, many OECD governments attempted to attract FDI into target regions, with the primary objective being the creation of employment. There was also an assumption that spillovers would benefit local enterprises, principally increasing their technological and organisational capacity. The experience of Scotland's so-called Silicon Glen is an example that has been debated intensively in the UK. By 1990, electronics manufacturing led by industry leaders such as IBM, Hewlett Packard, Motorola, NEC and Compaq accounted for 20% of all manufacturing and 42% of exports. This policy was supported through large-scale incentives with electronics manufacturers in Scotland receiving half of the available regional selective assistance grants over the period 1995-1999. However, locally sourced inputs were only a very small proportion of total inputs and tended to be mainly at the low-tech end such as packaging, plastics, rubber and metal components. Although the balance was by no means all negative, policy thinking swung sharply away from this model during the early 1990s.

The first set of Regional Economic Strategies (RES) promoted incentive-based attraction of FDI. At the time, Regional Development Agencies (RDAs), were new organisations and had a steep learning curve to climb. The first batch of RES, which were supposed to give a new orientation through a more bottom-up diagnosis of challenges and opportunities, tended to resemble one another across most English regions and emphasised inward investment and infrastructure. Regional assets were defined more in terms of the absence of congestion, affordability of housing and availability of relatively cheap labour rather than on skills, entrepreneurship or technological know-how. The strategies emphasised the building of supply chains and local supplier networks around key firms in prestige developments.

However, as the FDI-led approach has become more contested and less effective, UK policymakers have adapted their strategies with an emphasis on building the knowledge economy and thus innovation-led growth. This change mirrors a trend across the OECD, where endogenous-growth-based regional policies, with strong innovation components, have been introduced. Regional policy in the UK, as elsewhere, has also moved away from an infrastructure focus. The Northern Way is working to establish the case for North-South and East-West high-speed rail capacity, but with Government hesitant to support significant investment at this stage. Similarly, there are no "growth pole" type initiatives that show Government's spatial development priorities, with the notable exception of the considerable investment taking place around London in support of the Crossrail project, 2012 Olympics, the Thames Gateway and the Heathrow expansion. As a result, regional policy is largely focused on improving economic structures.

More recently, RDAs and RESs have been abolished and replaced by 38 local enterprise partnerships – joint local authority-business led partnerships to drive economic growth and jobs. But the policy objective remains: much of their focus is on endogenous growth-led strategies. The UK no longer has a regional policy as such; but there is an increasing emphasis on functional economic areas rather than regions. Many local enterprise partnerships reflect a functional economic geography.

Ireland. A number of countries that cultivated successful clusters, like Ireland, did so without a national cluster programme. Rather, the framework conditions and indirect financing did actively support successful clusters. In Ireland, the very active FDI attraction strategy played a major role in the development of the ICT cluster. The policy served to bring in computer assembly plants of multinational computer companies. From that public-supported start, the ICT cluster grew to include spin-offs and software makers. The most recent strategy is now much more focused on strengthening these locally grown businesses and downplays the inward investment dimension, partly because the cluster now seems to be established and is somewhat less dependent on MNEs.

Source: Partly based on OECD (2008) *OECD Reviews of Regional Innovation: North of England, UK*, OECD Publishing, Paris; and OECD (2007) *Competitive Regional Clusters*, OECD Publishing, Paris.

Box 2.3. **FDI and vulnerability to crisis: the Swedish case**

Sweden's small export-oriented economy is very dependent on global markets and foreign direct investment (FDI). As a result, Sweden has suffered from the effects of the financial and economic crisis, in particular the drop in global demand. In absolute numbers, the worst affected regions in Sweden are those exposed to international markets, with a large element of manufacturing industry and services, mainly Västra Götaland, Stockholm and Skåne. Nonetheless, the economic base in these regions is more diversified and they are more likely to bounce back quicker once the overall level of demand recovers. In proportional terms, the impact of the crisis is larger in undiversified regions with thin markets and high dependence on few sectors.

Although in absolute terms the effects of the crisis are larger Sweden's main metro-regions, the proportionate impact is larger in more vulnerable regions adjacent to metro-regions and in sparsely populated coastal regions in the south with thinner markets. In absolute terms, the largest increases in unemployment – from the third quarter of 2008 to the third quarter of 2009 – occurred in the metro-regions of Västra Götaland (33 034 unemployed), Stockholm (23 662) and Skåne (20 602). The proportional impact however, was larger in Stockholm's, Skåne's and Västra Götaland's adjacent regions Södermanland, Blekinge and Värmland. The coastal regions of Västmanland and Gävleborg and the southern region Jönköping with thinner and less diversified economies suffered the largest proportional increases. Amongst the three metro-regions, Stockholm suffered the smallest proportion increase and Västra Götaland the largest.

Source: OECD (2010) *OECD Territorial Reviews: Sweden*, OECD Publishing, Paris.

There is an ongoing debate on whether incentives for FDI are decisive to influence firm location decisions. On the one hand, at the national level, when regions from the same country compete for FDI, there is a risk that competition ends in a zero-sum game for the nation; for the regions, the competition can turn out to be a sub-optimal outcome. In this view, the use of financial incentives for FDI is not a recommendable strategy. First, because of governments' foregone revenue can be allocated to tackling other pressing issues such as education, infrastructure or social cohesion; however, the cost in foregone revenue can vary mainly as a result of grace periods as the contrasting experiences of Croatia and Hungary suggest. The latter has experienced a much larger revenue loss as a result of very generous grace periods compared to the former (OECD, 2007e). New models to understand firm location decision and agglomeration such as the New Economic Geography would support the view of regions being attractive for a number of factors that act as centripetal forces and are based on the presence of firms, workers and their linkages and so taxation at some point does not compromise attractiveness (Fujita, Krugman and Venables, 1999; Box 2.4). Second, the benefits from FDI in terms of human capital development and technological spillovers do not follow automatically: spillovers are only realised if local firms have the ability and motivation to invest in absorbing foreign technologies and skills (Blomström and Kokko, 2003). Instead, incentives should focus on those activities that create the strongest potential for spillovers, including linkages between MNEs and local firms, education, training and R&D (Blomström and Kokko, 2003). Thus, in 2002, the OECD Group on Co-operation with Non-Members, which is part of the Committee on International Investment and Multinational Enterprises, concluded that fiscal and non-fiscal incentives are not critical in choosing firm location (OECD, 2002). Having said that, the same report, recognises that because MNEs are not indifferent to incentives when choosing between two similar locations, incentives may make the difference (OECD, 2002). It follows that "uncommon

though they are, situations of competitive bidding must be avoided, however; they are indeed beneficial to the investor, but at taxpayers' expense, since the firm would have made its investment even without the incentive" (OECD, 2002). Indeed, top management during OECD site visits to MNEs located in Chihuahua, confirmed that the decision of setting up operations in the state would have been the same than without incentives (see Box 2.5 for a comparison of approaches to incentives for FDI). On the other hand, for specific regions, incentives to lure investment have become a key policy tool. Some local policymakers and part of the business community would regard state-level financial and non-financial incentives as an essential tool to gear location decisions in favour of Chihuahua. While it has been shown that firms are being increasingly responsive to fiscal incentives particularly from developing countries (Moran, Graham and Blomström, 2005), tax policies for FDI in Mexico are determined at a Federal level. In that sense, the *Maquiladora* Programme constitutes the cornerstone of FDI attractiveness in Mexico.

In addition to incentives to attract FDI, strategies should be based on strengthening Chihuahua's first and second nature advantages such as reducing transport costs to seize proximity (first nature) and focusing on human capital, firm development and R&D (second nature) (see Krugman, 1993). Evidence around the world shows that competing for FDI on the basis of financial incentives can lead to sub-optimal outcomes in which the greatest bidder among states will get the project. Some projects are finally decided on financial subsidies offered by particular Mexican states. Some others are decided at an international scale where regions compete with similar regions not only among Mexican states. A large body of evidence shows that investors are primarily attracted by the enabling environment such as the regulatory framework and the cost of doing business. For example, the United Nations Conference on Trade and Development categorised location factors into three groups: economic determinants, the FDI policy framework and business facilitation (UNCTAD, 1998). While the last two refer to regulations that enable investment, the first is related to the motive to invest abroad. Firms invest in other countries seeking to seize host-country markets, resources or assets or to improve efficiency. Chihuahua's strong FDI performance is determined by firms' resource-seeking and efficiency-seeking behaviours. In the former, firms are interested in Chihuahua as they can get access to relatively cheaper semi-skilled labour, as well as the availability of skilled workers, and land availability. The latter means for Chihuahua that firms seek to reduce transport costs by being close to the US border. These are all powerful magnets for investment in themselves. Chihuahua could also strengthen their innovation and education capacity so that firms also seek to invest because of local assets such as R&D centres, educational capabilities in HEIs and entrepreneurial environment. Asset-seeking FDI has become more important, and as a result, MNEs' traditional (market and resource-seeking) locational needs have shifted to access to knowledge-intensive assets and learning experiences (Dunning, 2009). Location itself is one of Chihuahua's main advantages and one that cannot be underlined enough. Reducing transport costs and thereby seizing proximity through the introduction of more and better infrastructure, is a factor that has in particular, held back Mexico from increasing FDI in the context of labour-costs competitive markets (Amaro and Miles, 2006). Also, a policy supporting local suppliers would be complementary to an FDI strategy. One of the reasons that companies seek other locations is to reduce transport costs not only to final markets but within the value chain (Dunning, 2003). However, the state can decide how much to rely on incentives to attract FDI by using the OECD checklist (Box 2.6), but striking a balance with local firms' development and 'second nature' factors is highly recommended.

Box 2.4. **The effects of taxes on FDI attractiveness**

In setting the tax burden on inbound investment, policymakers are encouraged to assess whether their host country offers attractive risk/return opportunities, taking into account framework conditions (e.g. political/monetary/fiscal stability; legal protection; public governance), market characteristics (market size, availability/cost of labour, energy, state of infrastructure) and the prevalence of location-specific profits. Host-country framework conditions and market characteristics depend in part on past and current levels of public expenditures on programmes in areas of critical importance to investors (e.g. education, infrastructure development). This link establishes the critical importance of collecting tax where possible on economic profit in order to finance public expenditures that strengthen host country fundamentals and attract FDI.

Perhaps the framework most widely used by public finance economists to analyse tax effects on domestic and cross-border direct investment is the neo-classical investment framework. A main attraction is its incorporation of main statutory tax parameters influencing capital costs and establishing the statutory tax burden on investment returns. In particular, parameter-based marginal and average effective tax rates (METRs/AETRs) derived from the neo-classical investment model may be analysed to determine the percentage change to these tax burden measures resulting from a single or package of corporate tax policy adjustments. When combined with empirical estimates of the sensitivity of FDI to these effective tax rates, the framework lends itself to estimating the long-run effects of corporate tax reform on FDI.

At the same time, such summary tax measures must be used with care as they ignore a number of factors influencing the actual tax burden on FDI (e.g. tax-planning, administrative discretion in deciding tax liabilities, other taxes not captured by the model). Some would also question, at least in certain cases, the central assumption of declining marginal productivity of capital. In particular, business concentrations may give rise to increased rates of return (increasing returns to scale at the industry level), with possibly very different policy implications.

Central predictions of the neo-classical theory of investment as regards tax effects on investment have been challenged in recent years by the new economic geography framework, emphasising the role of self-reinforcing business concentration (agglomeration) economies. Under the core-periphery (CP) model, market access effects may dominate and create incentives for firms to locate production in large markets, to reduce transportation costs, and to export to small markets. With firms profiting from concentration economies, a degree of inertia is predicted in the location choice of firms, implying a degree of fixity of economic profits that can be taxed up to some point without discouraging investment.

Having said that, evidence shows that while taxation does not discourage FDI, investors are becoming increasingly responsive. A META-analysis of results finds that the share of FDI that comprises real investment in physical capital is more responsive to taxes than other components of FDI. Evidence is not found showing that FDI from dividend exemption countries is more tax responsive than FDI from dividend credit countries, suggesting that tax-planning renders distinctions between these systems of little importance in terms of impacts on FDI. Furthermore, empirical results do not find intra-EU capital flows to be more responsive to host country tax differences (contrary to expectations that the elimination of barriers to the free flow of capital within the EU would make tax a more influential factor). Studies for intra-EU capital flows yield smaller semi-elasticities than studies based on US data. Lastly, studies using more recent data are found to produce larger semi-elasticities, indicating that FDI is becoming more responsive to taxation over time.

Source: OECD (2007), *Tax Effects on Foreign Direct Investment: Recent Evidence and Policy Analysis*, OECD Publishing, Paris.

Box 2.5. **Regional government's competition for FDI**

Incentives-based competition for FDI is a global phenomenon: governments at all levels (national and sub-national) in both OECD and non-OECD countries engage in it worldwide. Evidence of the effects of incentives on corporations' real investment-location decisions, particularly for major new investment projects, is consistent with the view that the decision is normally a two-stage (or multi-stage) process. First, investors make a short list of acceptable sites on the basis of the economic and political "fundamentals" of alternative sites, largely irrespective of the availability of fiscal and financial incentives from potential host governments. Then later, after the short list is drawn up on the basis of the investment "fundamentals", do investors consider – and often seek out – investment incentives, sometimes playing one government off another at this stage of their location decision. Incentives and other discretionary government policies to attract FDI can thus be decisive in investors' location decisions, despite the much greater overall importance investors attach to the "fundamentals". Even in the absence of global bidding wars for FDI, the *distortionary* effects of incentives — which tend to discriminate against smaller firms, against local firms (*de facto*, though rarely on a *de jure* basis) and against firms in sectors or types of activity that are not targeted – can be significant.

Incentives tend more to compete with, than to augment, the use of public resources to increase local productivity-enhancing human-capital formation and the supply of modern infrastructure. But focusing on the latter can contribute to better target FDI: introducing policies to enhance local supplies of human capital and modern infrastructure, if successful, can be a powerful means to attract FDI – as well as to promote economic development – if the other "fundamentals" are sound.

While governments often "justify" providing investment incentives with the argument that they are needed to steer corporate investment to poorer areas within their economy, in practice incentives are often of limited effectiveness in this regard (though there are exceptions) and they sometimes actually reinforce inequalities instead. However, experiences around the world offer interesting policy lessons.

Brazil. With very few exceptions, Brazil has a low level of FDI restrictions. The OECD FDI restrictiveness index shows a considerable improvement between 2006 and 2010, bringing Brazil's outcome slightly ahead of the United States and better than the OECD average (OECD, 2011d). Sectors with relatively high levels of restrictions include fishing and the transport sector. In addition, Congress has recently passed laws to strengthen state control in the development of the offshore oil reserves via the state-owned oil company Petrobras and to limit private (including foreign) equity stakes in production-sharing contracts to 70%. Despite the progress, the recent increase in the IOF rate (Imposto sobre operações financeiras) targeting financial flows with short maturities, which are typically not those used to finance long-term investment, there is a risk of collateral damage, However, there is so far, no evidence of FDI inflows having suffered from the IOF.

Brazil has long been the largest host to FDI in Latin America. Brazil was in fact the largest developing-country recipient of FDI from the 1950s until the second half of the 1980s when the debt crisis and deteriorating macroeconomic situation caused investment to stagnate –including FDI. It was in this context of macroeconomic deterioration that there emerged in Brazil a process of decentralisation of fiscal powers, and resources, favouring the states and to a lesser extent, municipal governments. As a consequence, sub-national governments increased their spending towards the end of the 1980s. Policy competition to attract investment was "activated" in Brazil by the dramatic success of the 1994 "Real Plan" in cutting inflation and bringing macroeconomic stability to the country. Also important have been the consolidation of the "Mercosur" regional-integration process after December 1994 with average tariffs rapidly falling. Particularly important as a stimulus to both these effects has also been the federal government's Auto Regime, launched in the wake of the 1995 Mexican crisis and Brazil's

Box 2.5. **Regional government's competition for FDI** *(cont.)*

growing auto trade deficit, the latter caused by the explosion of domestic demand for cars due to reduced import tariffs and the currency appreciation that both followed the Plan. All these reforms have thus helped stimulate competition among Brazilian states to attract FDI. The federal government is additionally responsible for incentives-based competition in Brazil today in the sense that it has avoided any attempt to limit such competition among the states and municipalities. This is true, first, because the federal government has consistently failed to apply existing legislation (notably a 1975 law) which authorises it to impose limits. The negative effects of incentives-based competition in Brazil today cannot be ignored. One is, of course, the fiscal impact. Though difficult to quantify, the long-term nature of the tax incentives widely provided by sub-national governments, means that the impact on those governments' fiscal balances will be both large and long-lasting. Perhaps even more worrisome are the effects likely to stem from the strongly discriminatory nature of the auto regime. The dependence relationship, both economic and political, which the auto regime establishes between governments and industry —typical of those prevailing under import-substitution industrialisation— can be expected to stimulate both protectionist demands and rent-seeking behaviour in the industry. Significant overcapacity, a bias against small firms, and an anti-export bias are further likely consequences of the market distortions the auto regime introduces.

China. China has moved quickly from its status as a country long closed to FDI, in 1979, to become, since 1993, the largest developing-country host to FDI. It was in 1979 that China turned to the "reform and open door" policy which emphasises the role of the external sector in national economic development. Despite that more than three-quarters of FDI flows that China received in 2010 were wholly foreign-owned enterprises, many industries are either limited to joint ventures with state-owned enterprises or simply discouraged or prohibited by the *Catalogue Guiding Foreign Investment in Industry*.[1] Licence requirements are often a barrier that excludes many companies in many sectors (e.g. agriculture, automotive, chemicals, energy, express delivery, and notably on financial services and telecoms) from setting up operations. Other restrictions to FDI include forced technology transfers in which foreign companies are obliged to transfer technology to a China-nased company that is often a joint venture; however this type of restrictions are less generalised than sectoral restrictions

Based on the relatively successful experience of the coastal areas in making the most of FDI, in the early 1990s the central government began giving inland provinces the authority to pursue similar FDI-attraction policies. The central government has taken a pro-active approach to attracting FDI: it has only a negative list of industries where FDI is restricted or prohibited ("strategic" and information-technology-related industries) and it provides incentives for export-oriented and technologically advanced FDI projects. In addition to fiscal incentives, local governments can provide land and physical infrastructure incentives in the development zones.[2] Fiscal incentives involve five types of taxes: profits tax, turnover tax, value-added tax, import duties and local tax. Turnover and value-added taxes are determined by the central government, but the local tax (3%) is levied at the discretion of local governments, and is often reduced or eliminated as a means to compete with other local governments for FDI. Up until the end of 2006 and before the introduction of the 2007 Enterprise Income Law, the standard tax on corporate profits was 25% for domestic enterprises, and was reduced to 15% to foreign investors. There are no longer discriminatory tax treatments between domestic and foreign investments, except for sectors the government wishes to promote, such as environmental protection and renewable energy (e.g. 15% for State-encouraged high-tech enterprises). Duty exemptions are also granted to imports in the case of export-oriented industries. Tax rebates for exports vary and have been used as a policy alternative to varying the exchange rate for the purpose of encouraging exports. Local governments can thus use fiscal incentives as a policy tool in competing with one another, but their ability to do so, operates within important constraints set by the central government. Land is the most important cost determinant of FDI in China on which sub-national governments compete. Local governments are generally given the

Box 2.5. **Regional government's competition for FDI** *(cont.)*

authority to make land grants (a lease period of up to 50 or 70 years) and to determine land-use fees. In joint ventures between local and foreign investors, the local partner's contribution to equity is often land. The cost of land and the conditions of land grants have thus become a pivotal tool in policy competition for FDI among local governments. (Interestingly, there is co-operation as well as competition among local governments). Many local governments focus as well on the need to improve their physical infrastructure to attract FDI. A growing number also seek to attract FDI in infrastructure, including via "BOT" (Build, Operate, Transfer) agreements with foreign companies. In sum, while incentives-based competition is widespread among sub-national governments in China, it does not appear to have produced uncontrolled bidding wars to any significant degree. More worrisome is the extent to which the decentralisation of control over FDI approvals has been accompanied by the growth of regional disparities, on the one hand, and of rent-seeking on the other.

European Union. The legal bases for EU policy to control the supply of subsidies – referred to in the jargon of the Treaty as "State aids" – are two articles in the Treaty which provide for a general ban on fiscal and financial subsidies to industry as a whole, on the one hand, and give the Commission wide-ranging discretionary powers to grant exceptions to that ban, on the other. There are no rules that relate to the use of subsidies specifically to attract investment, or that relate to the nationality of potential recipients (i.e. neither subsidies to foreign investors nor subsidies to investment as a whole are specifically targeted), but the rules clearly reflect a recognition by the authors of the Treaty that uncontrolled subsidies could undermine theobjective of achieving a Common Market. There are three basic types of EU rules on government subsidies: rules that limit subsidies for specific sectors which governments have perceived as "strategic" and thus sought to develop locally (e.g. synthetic fibers, automobiles) but which suffer from overcapacity; so-called "horizontal rules" on subsidies for small and medium-sizes enterprises (SME) and for certain types of activity, such as R&D and protection of the environment, which have important "public good" characteristics of a cross-sectoral nature; and rules on member states' assistance for poorer regions. The only general exceptions the Commission allows with respect to the overall ban are for subsidies ("State aids") to favour smaller firms (SME), on the one hand, and to favour poorer regions, on the other. The result has been virtually to exclude the possibility for EU governments to provide investment incentives to large investment projects, whether domestic or foreign-owned, except for projects located in regions or areas designated by the Commission as "least-favoured" regions and/or "development" areas. Least-favoured regions are regions where per capita GDP is no more than 75% of EU-wide per capita GDP. Yet, the EU represents over 40% of the world's FDI stock. Competition among regions has nevertheless, been increasing. One of the signs of such increasing competition is the promotional activity of local governments, whose role, though still limited compared to that of national and regional governments, has grown rapidly, especially in the provision of workers' training and subsidised property and site preparation for major investment projects. Despite the fact that some lagging regions in Ireland, Greece, Portugal and Spain have the potential to attract FDI on the basis of the EU "State aid" approach and offer greater incentives, there is little evidence of that being a determinant whereas the UK and France have clearly gained.

USA. The US government's success at rules-based competition to attract FDI, is so complete that the government has no need to engage in incentives-based competition. Such competition does, indeed, remain "all but unheard-of" at the Federal level. Yet, the US, as a single country, is the one that has the largest FDI stock in the world. There are forces flowing from the Federal structure that work to increase the country's attraction of FDI. First, while the Federal government rarely engages consciously in rules-based competition, many of the rules that matter most to investors are set not by the federal government, but by the states, and to a lesser degree by cities and community governments. These rules frequently are designed to attract investment.

Box 2.5. **Regional government's competition for FDI** *(cont.)*

Second, the incentives-based competition that is so unheard-of at the national level is a mainstay of state governments' activity. While state governments are competing to attract corporate investment as a whole, and not specifically *foreign* corporate investment, there nevertheless has been a close parallel between the intensification of inter-state competition and the accelerated growth of inward FDI in the United States. Although one of the strongest arguments for the use of incentives by US states is that they can be used to steer jobs to areas that need them, there is no evidence that the price that states are paying to attract investment and jobs is serving the cause of creating jobs in the desired regions. US states have four policy options: (i) opt-out of competition, (ii) to compete, but only with incentives which clearly generate important spillover benefits, (iii) forge inter-state alliances seeking more collective strengths for state governments *vis-à-vis* investors through unity, (iv) to impose federal limits on competition. Indeed, the prisoner's dilemma nature of the problem suggests that federal limits might be the only serious option.

1. The definition of such industries is subject to the interpretation of local governments, to a considerable degree, so that those governments have some flexibility in their choice of projects for approval and for the granting of fiscal incentives — which creates opportunities both for competition among those governments.

2. The export requirement (75% in most Special Economic Zones) is also subject to local modifications, and, with the growing recognition of the need to attract FDI in services and in technologically more advanced industries, since 1996 the central government has begun progressively to implement a policy of "national treatment" whereby FDI-enterprises are allowed access to the domestic market in sectors where that access was previously denied or restricted.

Source: OECD (2000) Policy Competition for Foreign Direct Investment: A Study of Competition among Governments to Attract FDI, OECD Publishing, Paris.

State-level SME-related programmes for manufacturing are underfunded, do not particularly target access to finance, and are disconnected from an FDI strategy. There are only two programmes that address SMEs in manufacturing most urgent need: finance. PROFIN (the Financing Programme for Small Manufacturing Enterprises) and the Micro-firm Financial Support in Marginalised Areas, have both been designed to financially contribute to jobs creation through micro and small firms (see also Box 2.1). The former has benefited 14 projects with around USD 52 000 while the latter concentrated in 2011 on 20 projects that are in marginalised areas with approximately USD 27 000. These programmes that target SMEs financing amount to only 1.7% of the Secretariat of Economy's budget for programmes (Figure 2.1). Financing for SMEs is not only small relative to overall economic development budget in the state, but is small when compared to neighbouring US states. Bartik (2002) estimated that US states and local governments spend between USD 20 and 30 billion and USD 6 billion from Federal programmes. The State's Secretariat of Economy spends roughly the same on bar codes and labelling of products than it does on financing micro and small firms. Underfunding for SMEs is also evident in the fact that the State spends more on the channels to get to entrepreneurs (CEDEM) than it does on actual financing of either of the two programmes for financing SMEs. What is more, the efforts on SMEs whether it is to finance operations, streamline costs or bring services closer to users are not connected to FDI attraction. That is, the State is not developing certain capacities required in certain activities that can be linked to global value chains. Although micro-finance can definitely play a role in boosting credit for those that only rely on informal credit or simply do not have access to any, investment in micro-firms will not have an impact in better integrating the local economy to global value chains.

Box 2.6. **Principles to design an FDI policy**

Although the OECD Checklist for Foreign Direct Investment Policies (2003) should not be taken as an endorsement of the use of FDI incentives, it is a highly recommended exercise in designing FDI policies. Experience shows that some of the most important factors considered by investors as they decide on investment location are: *i*) a predictable and non-discriminatory regulatory environment and an absence of undue administrative impediments to business more generally; *ii*) a stable macroeconomic environment, including access to engaging in international trade; *iii*) sufficient and accessible resources, including the presence of relevant infrastructure and human capital.

Internationally mobile investors may be more rapidly responsive to changes in business conditions. The most effective action by host country authorities to meet investors' expectations is: *i*) safeguarding public sector transparency, including an impartial system of courts and law enforcement; *ii*) ensuring that rules and their implementation rest on the principle of non-discrimination between foreign and domestic enterprises and are in accordance with international law; *iii*) providing the right of free transfers related to an investment and protecting against arbitrary expropriation; *iv*) putting in place adequate frameworks for a healthy competitive environment in the domestic business sector; *v*) removing obstacles to international trade; *vi*) redress those aspects of the tax system that constitute barriers to FDI; *vii*) ensuring that public spending is adequate and relevant.

The use of tax incentives, financial subsidies and regulatory exemptions directed at attracting foreign investors is no substitute for pursuing the appropriate general policy measures (focusing on the broader objective of encouraging investment regardless of source). In some circumstances, incentives may serve either as a supplement to an already attractive enabling environment for investment or as a compensation for proven market imperfections that cannot be otherwise addressed. Some forms of FDI competition among states may lead to sub-optimal results for all states, including waste of economic resources and social costs. Countries adhering to the OECD Declaration on International Investment and Multinational Enterprises have undertaken commitments in this respect. The presence (and magnitude) of such spillovers is of crucial importance if FDI incentives are to be economically justified. If spillovers were thought to be negligible, host country authorities would, in the absence of financing constraints, be better advised to pursue generic investment promotion policies.

Regions should be careful that FDI policies are not wasteful. In particular, it is important to assess the ineffectiveness of policies by checking that the benefits to the economy are larger than the costs. At the same time is important that inefficiencies are avoided by maximising the benefits of FDI and minimising the costs. Thus, focusing on spillovers and questioning the real need for incentives is key, particularly to avoid dead-weight losses –when investment projects would have been attracted without the need for incentives. The region should consider the opportunity cost of giving incentives as opposed to other measures and weigh each alternative's benefits.

A well-designed FDI policy should consider six broad categories:

1. *The desirability and appropriateness of offering FDI incentives*. Considering whether FDI incentives are appropriate and the links with an enabling environment.
2. *Frameworks for policy design and implementation*. Clearly state what are the objectives and criteria for offering FDI incentives and bear in mind that sub-national incentives could cancel each other out leading to a zero-sum gain.
3. *The appropriateness of the choice of strategies and policy tools*. Clarify the links between FDI policy and other policy objectives and assess the cost of pursuing an FDI policy as opposed to other alternatives.

Box 2.6. **Principles to design an FDI policy** *(cont.)*

4. *The design and management of individual programmes*. The success of an FDI policy also depends on having a top-level expertise managing the programme, establishing realistic maximum duration for incentives and evaluating the results.
5. *Transparency of procedures (i.e. evaluation, monitoring and follow-up)*. Establish cost-benefit analysis principles not to particular projects but to the whole FDI-attraction effort and open the process to public scrutiny.
6. *Assessing the extra-jurisdictional consequences of FDI incentive strategies*. Ensuring that the measures are consistent with international commitments and that the likely impact on peers (regions) is taken into account.

Source: Based on OECD (2003), OECD Checklist for Foreign Direct Investment Policies, OECD Publishing, Paris.

SME-development programmes in Chihuahua suffer duplicity due to a recent restructuring. In the two previous administrations, having a Secretariat for Industrial Development and another one for Commercial and Tourism Development led to the creation of similar programmes for two different sectors which duplicated programmes and administrative costs with an unclear impact on the economy. The current set up of programmes shows this duplicity. The Direction for Commerce (previously a separate Secretariat) offers two different programmes to attend events. The combined budget for those programmes under commerce in 2011 was MXN 2.34 million (around USD 179 000) while a much smaller programme is still active in the Industry Direction, both in the same Secretariat (Table 2.2). Similarly, duplicity can also be seen in the functions carried out by the Regional Development Network (part of the Direction of Commerce) and those attempted by the Council for the Economic Development of the State of Chihuahua (*Consejo para el Desarrollo Económico del Estado de Chihuahua – CODECH*). They both take the very useful regional approach to development through the identification of strengths and weaknesses. Since CODECH is partly co-ordinated by the Secretary of Economy with the participation of other State Secretariats and levels of government, academia and the private sector, it makes more sense for other efforts on regional development to be integrated into CODECH.

Administrative costs in many cases are cumbersome and much greater than the actual support to SMEs. The State Government has developed the Export Promotion Centre (*PYMEXPORTA*) with a total budget for 2011 that amounts to MXN 1.5 million (around USD 115 000), but 90.45% of those resources end up paying bureaucracy and other administrative costs and only slightly over MXN 143 000 (around USD 11 000) will be benefiting firms. With 39 firms supported in 2011, each firm received on average USD 280 from *PYMEXPORTA*. Although the programme is a very useful idea and might have an impact by inserting local companies in international markets, underfunding is seriously limiting not only SMEs development but one of the channels to connect local firms to global markets. Similarly, the Regional Development Network's (*Red de Desarrollo Regional*) 2011 budget amounting to over MXN 1.47 million (around USD 113 000) is mostly devoted to paying administrative costs: only MXN 300 000 (just over USD 23 000) or 20% represent resources for development projects.

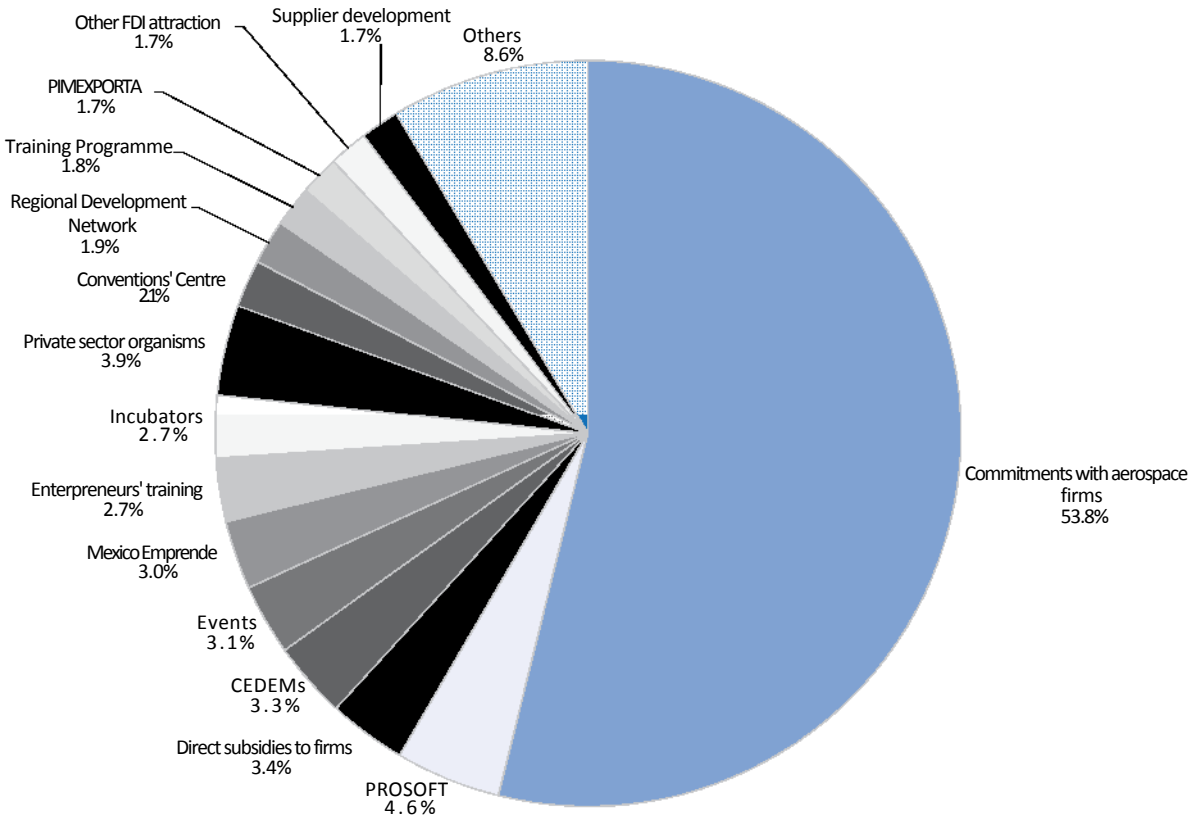
Table 2.2. **Programmes in the Secretariat of Economy for the commercial sector**

Type of programme	Name	Description	Budget	Budget source	Achievements in 2011
Regional Development	Regional Development Network	Carries out studies and analysis to foster regional development by identifying strengths and weaknesses	MXN 1.47 million (USD 113 000)	State level 100%	45 projects
Support for SMEs	Promotion Programme for National Events	Support to promote local goods in domestic markets	MXN 2.1 million (USD 161 000)	State level 100%	300 firms supported
	Promotion Programme for International Events	Support to promote local goods in international markets	MXN 237 000 (USD 18 000)	State level 100%	7 firms supported
	Export Promotion Centre (*PYMEXPORTA*)	Develop export capacity in SMEs through specialised consultancy and niche market identification	MXN 1.5 million (USD 115 000)	Federal and State	39 firms supported
	Support Programme for SMEs in Commerce	Support the adaptation of products to domestic market needs	MXN 848 000 (USD 65 000)	State level 100%	57 firms supported

Source: Adapted on the basis of information provided by the Secretariat of the Economy on March 30th 2011.

There is a clear need to align programmes to enhance the FDI strategy and at the same time remove market failures to access to credit by SMEs. In addition to underfunding and duplicity of programmes, SME policy main challenge is perhaps lacking relevance as an objective reflected in the budget. In 2011, almost 54% of the entire Secretariat of Economy's budget was allocated to commitments acquired through the attraction of two foreign firms. Although FDI and in particular, in high value-added sectors such as aerospace is important, a very small share of the budget is allocated to fostering endogenous growth through local firms. The funds available to develop suppliers – a key component in reaping the benefits of FDI – amounts to only 1.7% of the Secretariat's budget for 2011 (Figure 2.2). Also, in spite the fact that a number of programmes address export capacity, training and technological progress, SMEs financing is still limited in the state. In addition to discretional grants to firms (3.4%) only the Federal programme *México Emprende* shows a small relevance in the budget (3%).

Figure 2.2. **Allocation of budget in the Secretariat of Economy, 2011**



Note: Others include: operational costs, EPEX Programme, PIADET, studies and events.

Source: Adapted from Soto-Villalobos, A. (2011), *State Budget Analysis*, MRK Consulting on the basis of information provided by the Secretariat of the Economy, Chihuahua, Chih. Mexico.

Upgrading the regulatory framework

Regulatory reform has become a key component of the competitiveness agenda in Mexico and other OECD countries. The *Comisión Federal de Mejora Regulatoria* (COFEMER/Federal Commission for Regulatory Reform) is the sole Federal entity that oversees regulatory reform in Mexico. However, COFEMER is only in charge of central government regulation and cannot oversee legislative nor sub-national regulation. Nowadays, 17 in 32 Mexican states have a law for regulatory reform, 12 states have set up a decentralised commission to make recommendations and 20 states have bodies within their Secretariats of Economic Development to deal with the challenge (García Villarreal, 2010).

Efforts carried out by COFEMER have led to an improvement in Mexico's ranking in the World Bank's Doing Business. In 2011, Mexico was 35 among 183 countries, which represents an improvement with respect to the 41st place in 2010 (World Bank, 2011a). Mexico has managed to achieve better scores than OECD countries in time to start-up a firm and the amount of minimum capital required, it is around the OECD average on the number of procedures, but it still lagging in terms of costs. Even though, the cost of

starting up in Mexico is one-third of the Latin American average, it is still more than double than OECD levels. As most of the procedures occur in Mexico at no cost, the vast majority of the financial burden lies in notary fees. In addition to starting up costs and time, firms also have to deal with other operational burdens. Mexico's score is particularly low in paying taxes (rank 107 of 183 countries) and registering property (rank 105). Profit taxes and labour taxes and contributions are still higher than OECD countries and businesses in Mexico can expect to spend twice as much time making tax payments than firms in other OECD countries. Registering property in Mexico is still slightly more costly than in the OECD, but at more than twice the number of days needed to finalise the procedure, Mexico's problem on that front lies in expediting the registry (World Bank, 2011a). Enforcing contracts (rank 83) is also an area that Mexico needs to improve. While time to enforce a contract is lower in Mexico than in the OECD, procedures are 22% more numerous than the OECD and cost is almost twice as high as that of OECD countries.

Competitiveness in Chihuahua's main urban centres is being challenged by deficiencies in regulatory reform in particular for start-ups. Juárez is the only city in the state of Chihuahua that is compared through the Doing Business in Mexico. The city is ranked 11th among 32 (World Bank, 2011b) with a strong position on registering property and enforcing contracts (4th on both) which contrasts with Mexico's areas for improvement. Starting a business (19th) and dealing with construction permits (22nd) are areas with much more room for improvement. These two factors can be improved through policies since both are fully or partially competencies of local and state governments. Chihuahua should strengthen the role being played by the SAREs in different municipalities and continue couple their efforts with those provided on advice and guidance by CEDEMs. Integrating services related to fiscal, labour and environmental obligations would be key to speeding and easing the way in which start-ups take place in the region. As SAREs are municipal efforts guided by the Federal government (COFEMER) and with the support of the State government, municipal involvement is essential. One way of achieving this is by creating the right local incentives. CEDEMs can continue to house SAREs, but should also look at ways to further integrate services, such as providing a physical space for municipalities' local economic development directions as well as the local Councils for Economic Development that stem from CODECH. As a result, entrepreneurs would have in place most of the services and support needed to start-up and operate and have different bodies interacting with the local Councils that can provide a strategy.

Competitiveness is also hampered by insecurity and inadequate rule of law is a key component that all government levels in Chihuahua need to continue to address. IMCO (2010) had a more pessimistic view on Juárez than World Bank (2011b). The city was ranked at a medium-high competitiveness level among 86 Mexican cities. Juárez's violence and crime has meant that the city was ranked with similar competitiveness to the likes of Campeche, Durango, Nuevo Laredo, Saltillo, Tijuana and Tuxtla Gutiérrez (IMCO, 2010); most of these with lower GDP per capita. In contrast, Chihuahua City achieved the second highest level of competitiveness with an "adequate" level shared with high performing cities such as Aguascalientes, Colima, Querétaro and Guanajuato. Delicias, the third Chihuahuan city in the ranking got a medium-low ranking. However, these competitiveness levels mean that Chihuahua's competitiveness lied between Malaysia and Costa Rica, Juárez's between Panama and Brazil, while Delicias had similar competitiveness levels than Colombia or Turkey. Rule of law is according to IMCO (2010) the most important challenge for Juárez and Chihuahua with low and

medium-low rankings whereas Delicias appears with a medium-high. Addressing rule of law is therefore key for competitiveness and development (see Chapter 3 for full discussion).

Chihuahua must consider moving into the institutionalisation of regulatory reforms. In addition to resolve pending issues concerning insecurity (see Chapter 3) and improving regulatory reform in certain areas,[1] a challenge in Chihuahua is to embed regulatory reform and best practices in the regional governance system. The institutionalisation of regulatory reform requires clear political leadership that puts the regulatory and competitiveness factors as interdependent and as a priority of regional governments (García Villarreal, 2010). Chihuahua's Congress could consider creating a law for regulatory reform or alternatively, make reforms to the existing Law for Economic Development to include this aspect as the State Development Plan suggests (Chihuahua State Government, 2011a). In addition to what the Legislative power could do, the Executive could consider creating a decentralised entity that can push the regulatory reform. Such independent organism could be newly created expressly to do so, such as Jalisco did (Box 2.7) or alternatively, one of the councils already set up for economic development such as the Council for Economic Development of the State of Chihuahua (CODECH) could play that role as many of the actors needed for such an independent body are already part of the Council. It is important that institutionalisation of regulatory reform is accompanied by a citizen participation mechanism that allows regulatory reform to be constantly improving according to citizens' needs. This is another reason why taking one of the existing bodies such as CODECH that includes civil society and the private sector and has a local component can also work to institutionalise regulatory reform.

Box 2.7. **Jalisco's regulatory reform institutionalisation experience: the COMERJAL experience**

In Jalisco there are institutionalised mechanisms at both, state and municipal level. COMERJAL is the main instrument at the state level. Indeed, there have been numerous important regulatory discussions in its meetings, such as those related to the State Law on Administrative Procedure and the Announcements By-law. The participation of business and citizen groups in COMERJAL is not limited to identifying opportunity areas for regulatory reform, but it is extended to the design of laws and regulations. In fact, COMERJAL works through committees that are headed by business and citizen groups (table below). At the municipal level, there is a Regulatory Improvement Municipal Council (COMEREG) in Guadalajara. This council facilitates co-ordination with other levels of government and civil society, by involving representatives from the business community and the three levels of government.

Committee	Presided by
Improvement of Laws and Regulations	Chamber of Commerce (CANACO)
Environment and Energy	Mexico's Business Confederation (COPARMEX)
Water	Neighbours' Federation
Urban Development and Housing	Construction Industry Chamber (CMIC)
Administrative Modernisation and Innovation	COPARMEX
Intellectual Property	Mexican Institute of Intellectual Property (IMPI)

Members of COMERJAL:

- From the State of Jalisco Government:
  - the State Governor.
  - SEPROE and five other ministries (Finance, Urban Development, Transportation, Health, and Environment).
  - Urban Development Bureau.
  - Inter-municipal Water System (SIAPA).
- Municipalities.
- Business and citizen groups:
  - nine Business Groups: COPARMEX, Industrial Chambers Council of Jalisco (CCIJ), CANACO Guadalajara, CMIC, Mexico's Business Council for Foreign Trade (COMCE), Restaurant and Processed Foods Industry National Chamber (CANIRAC), Banking Centre of Guadalajara, Housing Business Association of Jalisco, and Regional Farming Union of Jalisco.
  - Small Rural Property Owners Federation of Jalisco.
  - Workers and Peasants Confederation.
  - Mexico's Workers Confederation (CTM).
  - Peasants National Confederation.
  - Professionals Federation of Jalisco.
  - Neighbours Federation.

Source: García Villarreal, J. P. (2010), "Successful Practices and Policies to Promote Regulatory Reform and Entrepreneurship at the Sub-national Level", OECD Working Papers on Public Governance, No. 18, OECD Publishing.

Cluster policies that link value-chains

Spatial clustering is not enough to create real clusters and institutions play a key role. Clusters have been in vogue ever since Porter (1990) described his diamond model. Other forms of clusters such as the industrial districts have been around for centuries in England and Italy with idiosyncratic features to each place. Becattini (2004) argues that industrial change should shift from a sectoral development to a community-based approach. Interdependency for a flexible specialisation model of industrialisation was first discussed by Piore and Sable (1984), but it was Saxenian (1996) that argued that successful industrial systems such as those in Silicon Valley or Route 128 are based on regional networks. Proximity allows that repeated interactions among trusting agents lead to sustained recombination of technology and skills (Saxenian, 1996). But, spatial clustering alone does not create mutually beneficial interdependencies. Network systems like any other form of productive organisation are fragile constructs that need to be constantly renewed and redefined (Saxenian, 1996). Regional interdependencies require institutions and policy instruments that foster them.[2]

The state has applied cluster policies with some success on spatial agglomeration. Chihuahua has for years followed a cluster-development policy that started with the programme *Chihuahua Siglo XXI* (Chihuahua 21st Century) that aimed at developing the state through clusters and FDI attraction through the mechanism Chihuahua Now that brought private and public agents together (Box 2.8). *Chihuahua Siglo XXI* was abandoned but the cluster-development principles remained albeit with a government-led FDI attraction programme called Chihuahua Mexico Industrial. The current state's cluster development strategy focuses on seven clusters: agri-businesses and foodstuffs, textiles and clothing, lumber, construction materials, automotive, electronics and aerospace (Box 2.9).

Box 2.8. **Public-private partnership for development in Chihuahua**

After winning the state elections in 1992, the first opposition governor, Francisco Barrio (1992-98), promoted state growth through a public-private co-operation scheme. The economic transformation was designed at the private non-for profit organisation *Desarrollo Económico del Estado de Chihuahua A.C.* with the aim at fostering growth through the promotion of clusters. The strategy identified the automotive, electronics and textile industries as having potential for growth. To that effect, supplier-development councils were created in Chihuahua City and Ciudad Juárez. Under such state-development strategy known as *Chihuahua Siglo XXI*, R&D centres were created in the state, dedicated to particular topics or to tackling industry-specific needs. Similarly, natural-resource exploitation was geared towards agriculture and cattle-raising, forestry and furniture production and some other materials. In services, transport, business services and tourism were supported (Ruiz Durán, 2000).

FDI in Chihuahua was promoted by 'Chihuahua Now', designed jointly by the organisations in charge of fostering economic development both in Ciudad Juárez and in the state. Although considerable progress has been made in employment, investment and growth in the region, few non-*maquiladoras* have progressed in the state; moreover, a large proportion of those that have thrived have been supplying inputs or services to *maquiladoras* (Vázquez Ruíz, 1997). Although regional growth has been affected by trade liberalisation, state and local governments have gained more autonomy and have been playing a more active role in promoting growth and employment often seeking a public-private partnership approach.

Source: Adapted from Sanchez-Reaza (2009), *Trade, Proximity and Growth: The Impact of Economic Integration on Mexico's Regional Disparities*, VDM, Berlin.

Box 2.9. **Chihuahua's cluster development strategy**

The Secretariat of Economy has defined seven clusters to promote economic activity: agribusinesses and foodstuffs, textiles and clothing, lumber, construction materials, automotive, electronics and aerospace.

Agribusiness and foodstuffs. Chihuahua produces and exports a number of crops, but their processing remains a key opportunity for development. Employment has increased by 14% between 2004 and 2007, reaching nearly 23 000 workers. Among the main areas of development are beverages (4 700 employees), the dairy industry (4 000 employees), cereals (3 500 employees) and meat packing and products (3 500 employees). Among the leading companies in the area are Alpura, Bafar, Bimbo, Grupo Zaragoza, and some soft drink bottlers and other SMEs engaged in cheese production that are largely located in Chihuahua, Delicias and Cuauhtémoc.

Textiles and clothing. The industry has faced a severe crisis nationwide, due to tougher competition from China and Central America. As a result, its importance in the state economy has significantly declined albeit a recent and short-lived job recovery. The industry still employs 34 800 workers.

Lumber. Chihuahua has remarkable specialisation in lumber and wood processing, which reflects the importance of the furniture industry in the state. In recent years, the national lumber industry has faced competition from imports of furniture from China and Southeast Asian countries. As a result, employment in the industry declined in Chihuahua since 2006. Currently, the furniture industry is working with the national Ministry of Economy with the objective of imposing a safeguard or antidumping duties on furniture imports from Asian countries due to dumping. It is important to mention that businesses in this sector are chiefly based on domestic capital.

Construction materials. Specialisation levels for this industry have increased significantly, which reflects the production of cement and tile floors growing importance in the state's industrial development. Largely, the dynamism of the sector is based on the success of local companies such as *Grupo Cementos de Chihuahua* and *Interceramic*, in addition to the recent opening of a domestic company (*Vitromex*). Job creation in the industry grew by 11% in recent years, employing more than 5 000 workers in 2007.

Electronics. This is the most dynamic cluster in Chihuahua driving recent industrial growth as the largest manufacturing employer in the state. The industry has generated 22 000 new jobs in the last three years totalling 124 000 jobs in the industry (which includes also telecommunications equipment.

Automotive. Although the automotive industry is the second largest manufacturing employer in the state, the cluster has remained rather stagnant in terms of growth and employment. In 2007, the industry employed 75 000 people, which represented a slight decrease of 2% with respect to 2004. Among the companies in this industry are Ford (with its engine plant in Chihuahua) and Delphi. Chihuahua has established itself as a national leader in the automotive industry in terms of value added.

Aerospace. This is a relatively new industry in Chihuahua. Although the state already was producing harnesses for airplanes, growth experienced in recent years has incorporated other parts of aircrafts thanks to the establishment of companies such as Hawker Beechcraft, Labinal and Textron.

Source: Based on information in CODECH (2011), *Background Report for the Territorial Review of Chihuahua*, Consejo para el Desarrollo Económico del Estado de Chihuahua (CODECH), internal document prepared by CODECH for the OECD.

However, the state's cluster policy has had much less of an impact on generating the network system that can make clusters evolve. In terms of FDI attraction, clustering and job creation both had successful outcomes, even in spite of external shocks. Nevertheless, to date no single cluster in Chihuahua can be said to be mature. Chihuahua's clusters range in their maturity. Some clusters have a few companies that are often rivals and do not co-operate, but because they have some support from one of the local actors they can be said to be emerging clusters by some standards (see Andersson, 2004) or a classical model of pure agglomeration (Gordon and McCann, 2005). This is perhaps the case of the construction materials cluster featuring a few large companies that compete in markets, but some of them supported by R&D stemming from the Chihuahua City-based Advanced Materials Research Centre (CIMAV). Some other clusters present in Chihuahua can be said to be developing as the number of firms and supply interactions multiply, actors supporting collaboration emerge such as the *maquiladora* associations (AMAC and AMEAC in Juárez and Chihuahua City respectively), multi-actor entities like CODECH, and as strategies that aim at making the region's name known internationally appear such as *Chihuahua Siglo XXI*, Chihuahua Now and Chihuahua Mexico Industrial (following the industrial-complex model according to Gordon and McCann, 2005). These are the cases of the electric, electronic and automotive clusters. More recently two contrasting experiences have sprung up. First, the aerospace cluster, supported by an aggressive government-led strategy to attract FDI on that sector and government-provided training through the *Centro de Entrenamiento en Alta Tecnología* (CENALTEC/Centre for Training on High-Tech) that seems to be an emerging cluster as different actors from the government, private sector and academia (for instance with the support of the *Instituto Tecnológico y de Estudios Superiores Campus Chihuahua* or ITESM Campus Chihuahua) start to collaborate; however, collaboration among the few firms in the sector is yet to appear. Second, the wine cluster, which is a local initiative that congregates over 30 grape producers in the state, aims at achieving the re-launching of the wine industry in the state. The wine cluster has not only strong personal ties among producers and a well-organised supply chain, but producers have also co-operated to supply the network with plants to start the crop and to undertake research on micro-climates and grape-variety adaptability. Although the cluster is yet to prove that is there to stay, the elements of the cluster point at maturity in the near future. The cluster also has the added value of being entirely local which means that endogenous benefits are likely to be achieved.

Cluster policies are a powerful tool to move-up the value chain. SMEs that are able to participate in global value chains gain in stability and output, but they face serious challenges in financing both, R&D and the delayed payments of MNEs, training, as well as quality control (OECD, 2007f). However, clusters in Chihuahua have a general tendency of being poorly connected among firms. This is reflected in a low – even though above national average for the industry – degree of integration. The private sector has recently shown commitment in trying to develop local suppliers for the aerospace industry. Although recent and incipient, the *Pacto Industrial Chihuahua* (Industrial Pact of Chihuahua) aims at developing local industry in Chihuahua and has started with the goal of developing two local suppliers for the aerospace industry (Box 2.10). Institutionally, this task is the mission of the *Centro para el Desarrollo de Proveedores* (CEDEP). CEDEP has been working on making those inter-firm pecuniary links and although Chihuahua remains above the national average in the value of production that can be accounted for with domestic inputs (the so called degree of integration), the challenge remains as it has been for the past 40 years: inserting local firms in global value chains. The CEDEP has been basing its strategy on developing local and domestic

suppliers to increase direct inputs integration on the *maquiladora* industry (CEDEP's mission, see CEDEP, 2011). Its key mechanism to target integration is matchmaking. CEDEP carries out passive matchmaking as it expects suppliers and buyers to ask for support, but it also carries out some active roles such as facilitating connections through firm representation in international events. However, CEDEP has not been entrusted with more active roles. Inter-firm networking could be supported by CEDEP by:

- *Fostering cross-agency cluster working groups*. CEDEP can join AMAC and AMEAC along with CANACINTRA (the National Chamber of Manufacturing) and other actors to create teams that foster the creation of cluster-specific teams to address particular issues such as the aerospace cluster has been working with ITESM Campus Chihuahua, DESEC (Desarrollo Económico del Estado de Chihuahua, A. C. /Economic Development of the State of Chihuahua NPO) and the State Government to attract and develop the cluster. Cluster-specific working groups can then decide on a number of issues such as the benefits of *branding and marketing* the cluster. Again, seizing the fact that CODECH is already in operation could also be a potential partner for CEDEP or alternatively let the Council lead the *working groups* with the participation of CEDEP.
- *Support export networks*. CEDEP can also join forces with *PYMEXPORTA* to identify and help develop export-potential firms.
- Promote the establishment of technology standards among potential suppliers.
- *Help establish and co-ordinate public procurement for groups of firms*. Clusters and SMEs can also be strengthened by public procurement policies such as providing financial resources to enable SMEs to participate in public procurement as long as this is done in consortia. Chihuahua could be interested in studying the Polish Agency for Enterprise Development which provides financial assistance to consortia of SMEs to get engaged in public procurement or Brazil's State of Ceará (Box 2.11).
- *Promote spin-offs through designing incentives*. This is a key component of developing suppliers. The 40-year-long manufacturing experience boosted by the *Maquiladora* programme should have been a crucial asset for spin-offs from FDI-based companies to be generated. Instead very few cases of spin-offs have been identified in 40 years that *maquiladoras* have been installing operations in the state.[3] Incentives that ease start-ups (see above), facilitate access to finance (see above), and grant similar benefits as those for FDI should be a few of the examples that should be explored. Infrastructure for spin-offs is also crucial as the experience from the UK Cambridge and Oxford clusters, as well as in Finland and Norway show (Box 2.12). Training and guidance of entrepreneurs is also key for spin-offs as in the cases of Georgia in the US, Japan and Korea (Box 2.12).
- *Liaising with firm-development funds to support the creation of pre-seed venture capital funds*. CEDEP could liaise with FIDEAPECH or *Fondo PYME* and generate innovative mechanisms to offer pre-seed venture capital for firms that have the potential of becoming suppliers.
- *Seek the integration of innovative firms or R&D actors in the cluster*. Innovativeness is another key ingredient in cluster development and thus supplier development programmes such as CEDEP should seek liaising with the State Science and Technology Council (COECYTECH) and research centres to foster the innovation content of local clusters.

- *Seek local firms' productivity growth through training and quality control by MNEs*. Two mechanisms that MNEs in other countries have undertaken leading to increases in productivity levels by local firms is on the one hand, training of engineers and other technical workers in the MNEs often at their headquarters; and on the other hand, visits to local firms to suggest ways in which efficiency can be increased and the desired quality be achieved (Lesher and Miroodot, 2008).

Box 2.10. **The Industrial Pact of Chihuahua**

On July 7th 2011 an Industrial Pact of Chihuahua was agreed among the government and key private sector actors in Chihuahua. The aim of such pact is to develop local firms in Chihuahua and set a goal for 2012 to invest in two start-ups as joint ventures in order to supply already installed aerospace firms. The pact brings together the most important private sector actors in Chihuahua City and the State Government. It is also a mechanism that links two key entities: *Desarrollo Económico del Estado de Chihuahua, A. C.* (DESEC/Economic Development of the State of Chihuahua NPO) and the *Consejo para el Desarrollo Regional de Chihuahua Centro* (CODER Chihuahua Centre/ Regional Development Council for the Chihuahua Central Region).

The Pact stems from a "local tour" that the adherents undertook to get to know the processes in already installed MNEs in the aerospace industry. The opportunities to develop suppliers were evident and an action plan followed. Among the agreed proposals are: *i*) develop the aerospace industry's strategic route map in co-ordination with federal authorities responsible for FDI attraction (ProMexico); *ii*) perform similar tours for the mining, automotive and electronic sectors; and *iii*) establish a strategy to identify technicians and/or executive officials that can become pillars for spin-offs.

Source: Author's interpretation of information provided by Chihuahua's leading entrepreneurs.

Box 2.11. **The role of public procurement in SME-cluster development**

A public purchasing scheme in the Brazilian State of Ceará highlights the potential for a demand-driven approach led by the public sector and coupled with both technical support and the promotion of collective action. The state government needed to create jobs and thus promoted labour-intensive production of items for public works such as wooden wheelbarrows, wooden furniture for schools and metal grain silos. The programme was shaped by the Industry and Commerce Department of the State government and the Brazilian SME assistance agency and was created to be customer-driven. Although there was skepticism on the part of some government departments since they expected poor quality and high transactions costs, the small producers had to win the confidence of customers by completing small orders at a lower price and better quality than existing large-firm suppliers. A paper published by the United Nations Industrial Development Organisation (UNIDO), argued pressure would not have produced competitiveness without a collective approach to SMEs (Humphrey and Schmitz, 1995). One of the key aspects of success in the programme was the fact that contracts were granted to associations of firms, which were responsible for quality and had to co-ordinate small producers. Orders would be made out to individual producers, but payment would only be made once the whole order had been completed. The one element of subsidy in the plan was that half of the payment was advanced with the order. This generated working capital for the small enterprises. If one of the enterprises defaulted, the Association had to repay the advance.

Source: Humphrey, J. and H. Schmitz (1995)," Principles for promoting clusters & networks of SMEs", UNIDO's Small and Medium Enterprises Branch, United Nations Industrial Development Organization, Vienna.

Box 2.12. **Enabling spin-offs**

The effectiveness of these R&D investments is based not only on the university or research institution in isolation, but also its embeddedness in a regional milieu with strong firm linkages. Research excellence can cultivate strong links with business, including spin-offs from university research and the appearance of innovative start-ups in areas adjacent to the university (often on business park premises managed by the university). The effectiveness of the R&D investment is therefore contingent on clustering processes. The United Kingdom's selection process has clearly accounted for research/industry relationships in its fund allocation process, with the success of Cambridge and Oxford in generating innovative new firms around their respective campuses being rewarded with higher allocations. For example, Cambridge University's research block grant from the central government is larger than that destined for any of the metropolitan areas outside London, such as Manchester or Birmingham, even though in most cases these cities have four or five major universities.

Similarly, both the Finnish and Norwegian Centres of Expertise are actively linked with the science park and incubator programmes in their respective countries. In fact, the Finnish programme even includes in its evaluation of success the number of new companies created. The Georgia Research Alliance supports projects with university partners, including the commercialisation of research via the creation of new spin-off firms with counselling services and management advice. Japan's Industrial Cluster programme has a strong SME creation focus and seeks to establish facilities to provide training to entrepreneurs. The Korean Innovative Cluster Cities often include an incubator component.

Source: OECD (2007), *Competitive Regional Clusters*, OECD Publishing, Paris.

Policies to develop and attract skills and talent

Formal schooling

Mexico spends as much as Korea on education, public funds for education have been growing as fast as in Finland, and Mexican kids spend as much time in school as the French, yet its performance lies at the bottom of OECD ranking. Lagging productivity in Mexico is partly due to low human capital development. There are many dimensions to low skills in the country that can be grouped on quantity, quality, efficiency and equity challenges. On the quantity, Mexico faces low educational attainment rates and still high drop-out rates. On average, Mexicans spend less time in formal schooling than the average for the OECD. In addition, Mexico's drop-out rates for secondary schooling remain high despite recent progress (Guichard, 2005). Only 21.3% of population 55 to 64 years old had finished secondary education compared to 61.3% for the average of the OECD; although the rate goes up to 41.9% for those 25 to 34 it still almost half of the OECD average at 81.5% (OECD, 2011b). Quality of education is a crucial problem that leaves Mexico at the bottom of the table despite spending similar levels (as a proportion of GDP) than high performing countries such as Korea. Repetition rates, dropout rates and students' achievements show that the average quality of education services is poor and although repetition and drop-out rates have decreased in recent years there has not been any improvement in international literacy surveys such as PISA (Guichard, 2005). Efficiency issues are related not only to low performance given spending levels, but also to time spent in formal instruction. Mexico's poor educational attainment and PISA scores are not in line with the amount of schooling in public institutions for those 7 to 14

years old. Mexican kids spend almost as much as the French and more than the English in school, but the outcome in attainment and scores are not comparable. Mexico also spends around 6.8% of GDP on education which compares to Sweden (6.7%), Norway (6.6%) and New Zealand (6.8%) and not too far from Korea (7.5%). Moreover, spending growth has been comparable to what the top OECD performer (Finland), is adding to current spending (OECD, 2009a). However, Finland and Mexico stand at the two extremes of the performance ranking. Access to schooling among regions and between urban and rural, are also part of the problem (equity issues on education will be addressed in Chapter 3).

The new government's efforts in education are paying off in terms of coverage, but there is still room for improvement by focusing on increasing terminal efficiency. Currently the focus is on access to education by building 12 new universities which is as much as the state has built in the last 40 years. The new administration has also built three technical colleges and will build five more in 2012, as well as ten new upper high schools (*Colegios de Bachilleres*). In addition, the government is opening full-time primary and secondary schools that make children stay more time in school rather than on the street. The new administration has already managed to bring secondary education coverage to 68% in 2011, up from 64% in 2009 and increase university coverage from 29% to 38% during the same period. These will all be very beneficial actions. However, for these to have a positive impact on productivity and growth, the government should also pay attention to terminal efficiency (the proportion of students graduating).

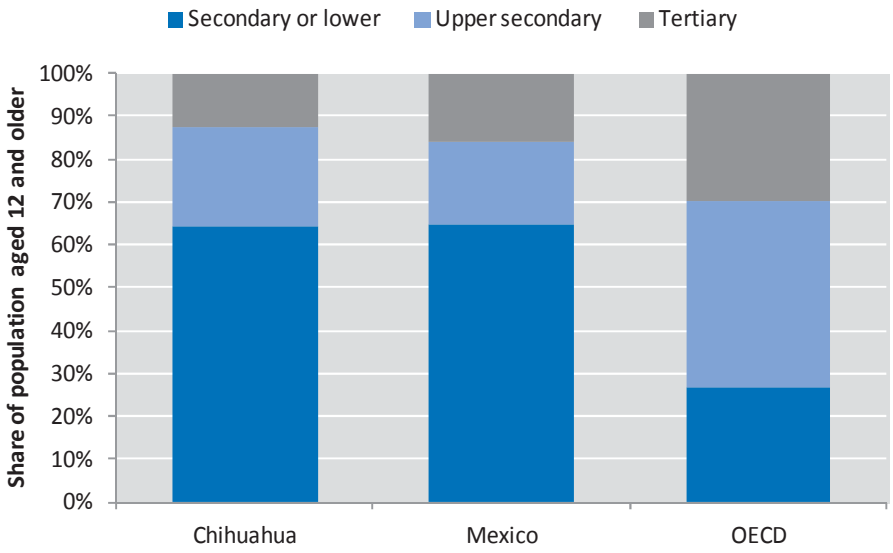
Improving educational outcomes in Mexico requires a systemic approach that touches upon most elements in the system (OECD, 2005a). The key problem is not a lack of resources: Chihuahua spent 52% of the 2011 budget on education; but rather inefficiencies and misallocation of spending, together with weak incentives for education professionals to perform well (Guichard, 2005). Moreover, there is only a weak connection between spending and student performance (Hanushek, 1996). For education policy to have an impact on better regional economic performance, the Chihuahua State Government should focus on a limited number of measureable, ambitious and plausible educational goals and commit to achieve them. These goals should be easy to understand to the public and resonate with professional educators. Commitment should be reflected in publicly announcing these goals (OECD, 2005a). There are a number of goals that can be set:

1. *Raising educational attainment*:
    - *Raising secondary education attainment levels*. Although 28.3% of population aged 12 and older had some secondary instruction those that had the degree stood at 19.9% of population 12 years and older in 2005 (INEGI, 2006) (Figure 2.3). A number of measures can be introduced. For instance, it has been estimated that secondary attainment levels can be improved by introducing the Quality Schools Programme (*Programa de Escuelas de Calidad*) (Skoufias and Shapiro, 2006). It is also likely that the Full-Time Schools Programme that the State Government started in 2011 with 200 schools will have a positive impact on raising secondary attainment levels (Chihuahua State Government, 2011b).
    - *Raising upper secondary educational attainment levels*. Almost one-quarter of those aged 12 and older had some upper secondary schooling in Chihuahua which is above the 19% at national level but far from the 44% for the OECD average (Figure 2.3). However, only 10.3% of total population aged 12 or older had an upper secondary degree. In 2011, Chihuahua was the first

Mexican state to offer upper schooling opportunities to every student wishing to study. While this in itself is a great achievement, ensuring those new students finish school should be one of the main policy focuses in order to seize such newly acquired asset and turn it into educational attainment that can have an impact in the labour market and productivity.

Figure 2.3. **Distribution of population according to educational level**

Shares of population aged 12 years and older



1. Secondary and lower educational levels refer to people with no schooling, pre-school, primary and secondary education.

2. Upper secondary refers to population with finished or unfinished upper secondary education.

3. Tertiary education refers to population with university degree.

Source: Author's calculations based on OECD (2011), *Regional Database*, accessed online at OECD.Stat on June 22nd 2011; and INEGI (2006) *Conteo Nacional de Población 2005*, Instituto Nacional de Estadística, Geografía e Informática, Aguascalientes, Mexico.

- *Raising tertiary education attainment* (14.2% in 2006 lower than the national average at 14.7% and lower than the OECD average for TL2 regions at 24.3%). This remains key if Chihuahua wishes to compete nationally and internationally as the proportion of people with a university degree is lower than the national average and is less than half of what OECD countries have (Figure 1.17).

2. *Increasing the coverage of early education* (currently at 70% of total population aged between three and five). This will not only have an impact on student performance at later stages of education, but also will increase female participation rates as women are able to engage in productive activities. While improving coverage at pre-school age will have definite impact, those aged three show a particular lower coverage at 46% which contrasts with the 86% for the age 4 group and the 78% for those aged 5 (figures based on SEP, 2011, for the 2011/12 academic year).

3. *Increasing quality of education*:
   - *Raising test scores at ENLACE and PISA tests*. Chihuahua has already taken strides in improving the PISA score and ranking third just after Mexico City and Nuevo León, but further improvement is plausible.
   - *Reduce repetition rates*. During the 2010/11 academic year, upper-secondary repetition rates stood at 37.4% (SEP, 2011). Repetition rates can be improved by introducing the Quality Schools Programme (Skoufias and Shapiro, 2006).
4. *Broadening educational goals to include an integral approach to human development and incorporate arts, humanities and civics*.
5. *Emphasise the role of developing educators*. Recruiting, educating, training, developing and supporting educators is paramount in a human capital development strategy (OECD, 2005a). The quality of teachers is the single most important school-level predictor of student learning (OECD, 2005b).
6. *Place strong financial and professional incentives to attract young and highly skilled people to become educators*. Smaller classrooms (lower pupil-teacher ratios) and better teacher wages that are linked to performance are associated with higher returns to schooling in the labour market (McHenry, 2010). Such smaller classrooms and better teacher wages should public finances permitting, be pursued by the State Government of Chihuahua.
7. *Place a similar emphasis in life-long training for educators to continuously improve the quality of teaching*.
8. *Strike a right balance between encouraging innovativeness and autonomy at school level and exercising monitoring mechanisms that promote accountability*. Schools with greater autonomy tend to have better student performance, but only if autonomy is aligned with accountability measures (OECD, 2005a). Chihuahua can explore the Austrian Leadership Academy (ALA) experience as an example of encouraging autonomy. The ALA consists of four two-to-three-day forums within a two-year period on partnerships, coaching teams, regional networks and virtual networks. The ALA has been a powerful mechanism to move the system from a school-management approach (bureaucratic) to an instructional leadership aiming at school improvement (OECD, 2005a).

Technical degrees, training and learning by doing

Chihuahua has been doing an effective work in addressing skills mismatch in the labour market. The Council for Academic-Productive Linkages (*Consejo de Vinculación Académico-Productivo*/COVAP) has been an effective mechanism to make the process of building new human capital in universities and other educational institutions, a more flexible one. The COVAP has the objective of proposing and promoting an effective liaison with the participation of academia, the private sector and the government (the Triple Helix approach). This approach allows labour-market matching at the upper-secondary and tertiary education levels. COVAP has adopted a three pillar strategy to become effective: *i*) forecast future labour-market needs, *ii*) design and develop strategic programmes to liaise, *iii*) monitor linking processes. In particular, the council has been active in establishing sectoral working groups to discuss curricula and training needs for metal-mechanics and aerospace in Chihuahua City, plastics and electric-electronics in Juárez and agri-businesses in *Nuevo Casas Grandes*. These working groups have enabled

curricula redesign, productive reconversion programmes, design of new diplomas, creation of visiting professorships and the creation of a glossary of technical terms in English.

Chihuahua should continue to concentrate on removing market failures such as asymmetric information as COVAP has done, but should avoid investing in training areas that firms are willing to regardless of government involvement. One of COVAP's most successful programmes is ENLACE that provides funding for firms particularly in aerospace that want to send their workers to training in their headquarters or in another plant. While these type of knowledge spillovers are highly important and one of the main benefits of FDI, COVAP should concentrate on market failures. Firms in the aerospace industry recognised that they would be willing to undertake such training in the same fashion regardless of government funding. The lack of need for funding is equivalent to wasting money that can be used in training programmes that firms find hard to finance themselves or to focus these on potential local suppliers or SMEs.

Opportunities for high-tech training can be pursued with improved co-ordination among existing bodies within the Secretariat of Economy. In 2003, the State Government created the *Instituto de Apoyo al Desarrollo Tecnológico* (INADET) to promote technical training in high-tech activities. The INADET co-ordinates two training centres. In Juárez, the Centre for High-Tech Training (CENALTEC/*Centro de Entrenamiento de Alta Tecnología*) and in Chihuahua City the Training Institute of the State of Chihuahua (ICATECH/*Instituto de Capacitación para el Trabajo del Estado de Chihuahua*). While both training centres are very positive institutions in the state that most likely have been an attractiveness factor for the state, these centres are not providing training on high-tech. Both are chiefly focusing on machines and tools for the automotive and aerospace industries, on activities that are not high-tech such as riveting. Perhaps the state, in addition to continue to provide training on these activities could also explore real high-tech training. One way of doing this is by exploring these opportunities in the context of COVAP's activities.

Chihuahua should continue to foster technical degrees that are highly connected with labour market requirements. Social and human capital and not just physical and financial are key sources of regional dynamics. Human and social capital influence location advantages. Universities are the traditional human capital development centres and NGOs and other non-profit organisations participate to social capital formation and as such, location advantage can be created or influenced by conscious private and public decision-making (Karlsson, Johannson and Stough, 2005). In addition to high-quality graduates from the Autonomous University of Chihuahua (*Universidad Autónoma de Chihuahua*/UACH), the Autonomous University of Juárez (*Universidad Autónoma de Ciudad Juárez*/UACJ), the Technological Institute of Chihuahua (*Instituto Tecnológico de Chihuahua*/ITCH) and the Technological Institute of Juárez (*Instituto Tecnológico de Ciudad Juárez*/ITCJ), Chihuahua should further invest in technical universities such as the Technical University of Chihuahua (*Universidad Tecnológica de Chihuahua*/UTCH). By allowing secondary graduates to enter technical degrees, UTCH are not only making degrees previously not available accessible, but producing ready-to-work graduates. Graduates from UTCH have the characteristic of being trained with machinery and tools that local firms need and curricula is highly adaptable to firms' needs. UTCH-type of education is a good vehicle to train workforce and reduce inequality in access to education. It would be advisable that UTCH look into transferring programmes to the four big public institutions for students wanting to take their studies to tertiary education

as the Technical Metropolitan University of Mérida, Yucatán has done (OECD, 2008b). Scholarships are essential for technical degrees as that is often the main barrier to undertake upper-secondary/technical studies and beyond (OECD, 2008b).

Innovation policy

Innovation has been clearly associated to higher productivity levels. More than 86% of OECD countries show a correlation between patenting activity and higher productivity levels (OECD, 2007g). Governments should intervene in supporting R&D when societal benefits are greater than private benefits (Baily and Friedman, 1994). Chihuahua has recently managed to increase Federal resources for innovation-related projects from MXN 35 million in 2009 to MXN 50 million in 2011 and the number of researchers that are recognised and supported by the National Researchers System (SNI) has increased from 184 to 241 during the same period. Notwithstanding such progress, Chihuahua's intervention in innovation activities should be guided by the institutionalisation of S&T policy through planning, redefining the sectoral co-ordination of innovation policy within the government, generating State-level programmes that can complement Federal funding, linking the regional innovation system agents and creating cluster networks, as well as focusing on market-oriented innovation.

Taking stock of the innovation capacity

Chihuahua can take advantage of high-tech clusters and local R&D capacities to provide market oriented innovation. In particular:

- *Chihuahua should consider establishing mechanisms to link HEIs and R&D centre's innovative capacities to firms' needs*. HEIs and R&D centres are key to developing a regional innovation system. HEIs already have played a crucial role in producing a qualified and specialised labour force for Chihuahuan local markets. However they can also be the source of market-oriented R&D by providing firms with innovation inputs, through consulting contracts, joint projects or help generate new innovative SMEs through incubators. In the case of Chihuahua there are few examples of firms' innovation through support stemming from HEIs or R&D centres. Despite some attempts from the Secretariat of Industrial Development in previous administrations in co-operation with one of the state's most important business associations DESEC (*Desarrollo Económico del Estado de Chihuahua A. C.* /Economic Development of the State of Chihuahua NPO) to link CIMAV's (*Centro de Investigación en Materiales Avanzados*/Advanced Materials Research Centre) patents and research to potential investors in DESEC, virtually no benefits have been derived locally. In contrast, businesses in Monterrey in the State of Nuevo León have been very active in asking for practical solutions for their plant-level problems to CIMAV working from Chihuahua. There are also few examples of the four biggest public HEIs in Chihuahua helping firms innovate.
- *Chihuahua should consider developing innovation networks around developing high-tech clusters*. Non-HEI research could be an alternative that complements academic R&D. For example, the Jalisco Institute for Information Technologies supports initiatives in the IT sector (OECD, 2009b). Guanajuato created a state innovation observatory as well as innovation networks linked to the state's strategic sector priorities. Querétaro trains firms in innovation processes, partly funding

innovation seminars and grants financial resources for firms seeking to attend innovation-related events (OECD, 2009b).

- *Chihuahua could find complementarities in aligning its FDI strategy with an innovation policy*. Inward R&D-intensive FDI is a powerful mechanism for technology transfer. Receiving regions as a result can develop specialised clusters and integrate local firms in global value chains (Audretsch, 2000; Carlsson, 2006; Guimón, 2008). Chihuahua is already successful in attracting FDI and some innovation capacity is already in place. In fact, some design and engineering centres in the automotive sector already have a base in one of the two largest cities in the state. By partly focusing the FDI-attraction effort towards R&D-intensive activities, Chihuahua can generate technological spillovers through international technology transfer. However, R&D-intensive FDI alone won't necessarily bring about the expected benefits if the links between local HEIs and R&D-intensive FDI are not made. The relatively recent case of Visteon being located physically contiguous to the ITESM Campus Chihuahua is an ideal model to follow.
- There are clear opportunities in encouraging co-operation in R&D both locally and internationally (particularly in neighbouring US states).Knowledge spillovers can be fostered by encouraging co-patenting and other forms of co-operation in R&D locally. In addition, being a border state, Chihuahua can seize international knowledge and benefit from spillovers which can act as local externalities.
- Chihuahua should actively seek to make technology and innovation more accessible to farmers. The potential in primary activities of Chihuahua is significant (see Chapter 4), but its future growth and competitiveness in global markets will depend on introducing technology, branding its products and the effective use of water (see Chapter 4). In particular, making technology available and correctly branding local products for global markets can be key strategies as Chile shows with the success in wine, fish, copper and other primary products.

Science and technology parks

Across OECD regions, there has been a long history of the development of technology and science parks. Unlike traditional industrial parks, which have more of a spatial planning and infrastructure focus, these other types of parks imply the presence of research facilities (including specialised research centres and HEIs) or other service providers that could be accessed by firms. In many cases, science parks are co-located with a university. The results of these projects, which often involve significant infrastructure investments (buildings, IT and other technology-related investments) are mixed across OECD regions. For example, it took the now successful Sophia Antipolis technology park in southern France many years to be fully operational as a technology park. In its early stages, it was merely a location for several multinational firm offices (OECD, 2009c). In Toronto, the MaRS Discovery District is a centre that incubates and accelerates firms; it is a place contiguous to the University of Toronto that brings together government, non-for-profit organisations, researchers, entrepreneurs, business consultants, funding, education, and market intelligence (Box 2.13).

Box 2.13. **MaRS discovery district in Toronto**

The Medical and Related Sciences Centre (MaRS) is a non-profit innovation centre connecting science, technology and social entrepreneurs with business skills, networks and capital to stimulate innovation and accelerate the creation and growth of enterprises. This collaboration happens physically through location of research labs, companies of all sizes, business advisors, investors and professional services within the MaRS Centre and more broadly through advisory services, entrepreneurial programming, networks and an electronic community.

Located in Toronto's Discovery District, two square kilometres that have been designated as the city's centre of innovation, the MaRS Centre is the gateway to Canada's largest concentration of scientific research, anchored by major teaching hospitals, the University of Toronto and more than two dozen affiliated research institutes. The centre is also close to the Bay Street financial district, provincial legislature, key government organisations, arts and cultural attractions.

The MaRS Centre, both as a physical complex and as the hub for an extended virtual community, is designed to accelerate the commercialisation of Canadian innovation by uniting the disparate worlds of science and technology with industry and capital. The MaRS Centre includes research facilities for some of the area's top scientists and incubation facilities for young companies. It has grown into a cluster of professional services firms and investors, technology transfer offices, research and community networking organisations and mid-sized and established global companies, benefiting from a state-of-the-art conference and multimedia facility, as well as the programming required to animate the shared spaces and maximise the impact of cluster development.

The MaRS Advisory Services unit helps Ontario-based companies to commercialise early-stage innovations, in information and communications technology, nanotechnology and clean tech, life sciences, medical technology and beyond. Services that are provided include:

- Advice, including business strategy, investor readiness and mentorship
- Education, through a range of MaRS -produced events, including peer-to-peer offerings and the Entrepreneurship101 programme.
- Market Research, with access to a range of proprietary databases and skilled market analysts.
- Finance, through funding from the Ministry of Research and Innovation for business projects and investments of up to CAD 500 000 in seed capital and preparation for and providing contacts to angel networks and other venture capitalists.

Business Project Funding enables entrepreneurs to access specialised advisory services. Projects might include consultation from niche market experts, intellectual property strategy, third-party validation or testing or primary market research. Recommended companies can apply to receive up to CAD 10 000 in a given year.

Source: OECD (2009), *OECD Territorial Reviews: Toronto, Canada*, OECD Publishing, Paris.

Chihuahua should upgrade the government's role in fostering incubators by taking stock of HEIs and R&D centres, as well as by setting up clear strategies and objectives. The Federal government has established a number of programmes such as PROSOFT,[4] the Business Incubators and Business Accelerators Programmes to develop the technological and science park concept in Mexico. Many of these parks house business accelerators and incubators that can support high-growth SMEs and start-ups. ITESM, the private university, has played an active role in the development of the concept in Mexico, while participating in great number of these projects through their campuses in different

states. One of the most prominent examples is the PIIT in Nuevo Leon that is part of the City of Knowledge initiative. Many other states are now trying to replicate the concept. One of the challenges in ensuring the success of these massive investments to support regional innovation systems is the potential lack of focus and specialisation of the park (OECD, 2009b). Private HEIs such as the *Instituto Tecnológico y de Estudios Superiores de Monterrey Campus Chihuahua* (ITESM/Monterrey's Technological Institute-Chihuahua Campus) as well as the UACH have both set up incubators with very successful examples of SMEs working on high-tech sectors particularly in software and renewable energy. Further progress can only be achieved if incubators' programme in the state establishes a strategy that is aligned to an overall S&T plan with measurable objectives not only in terms of firms but actually on firms' success in innovating and in the market. The role of physical space and the difference a centre such as MaRS in Toronto can make for Chihuahua should not be overlooked (Box 2.13).

Funding innovation

Chihuahua should seize Federal funding aligning resources to local needs and cluster development objectives, further involving the private sector and based on an innovation plan that creates State-level programmes. National S&T funds from CONACYT are restricted to agents registered with RENIECYT (National Registry of Science and Technology Firms). This restriction has been noted as a major barrier for SMEs. The most active states are those with a strong and highly developed industrial base such as Nuevo León or Jalisco. Between 2005 and 2008, Chihuahua was fourth in the country in terms of the number of projects applied to *Fondos Mixtos* (FOMIX/ Mixed Funds) (CODECH, 2010). However, the amount of resources that the state has managed to attract has been much lower. Partly, low levels of funding attracted by the state could be related to low involvement from firms and the private sector. At national level, project sizes vary considerably based on the purpose and industrial branch, ranging from USD 10 000 to USD 2 million with a maximum 50% co-financed by CONACYT. States' capacity to attract resources is conditioned on a number of factors such as having a higher number of research centres and HEIs registered with RENIECYT. Such capacity is according to OECD (2009b), also correlated to policy innovativeness. Those states with higher number of HEIs, R&D centres and better able to attract Federal resources, are also those that create new State-level programmes to foster innovation. State programmes include exchange visits and scholarships to visit foreign firms or study in foreign universities, support for intellectual property registration, technology transfer and innovation network support and even technology parks. Chihuahua has put underway some of these programmes but not others and it's important for Chihuahua to start proposing FOMIX resources on the basis of firms' needs and strategic cluster development objectives.

Institutions for innovation

Chihuahua's Council for Science and Technology should develop a clear plan with measurable objectives that have an impact on firms. Like many Mexican states, Chihuahua has a Council for Science and Technology, as well as a law, but no plan for innovation. The benefit of a general text in an S&T law is that this leaves greater flexibility for policy initiatives, however that flexibility means that the long-term goals may not be supported with a government change (OECD, 2009c). Even if a law exists with very specific goals, it may not be respected. For example, similarly to what happens at the national level, a state law may determine that there should be a certain percentage of expenditure relative to the size of the total economy (such as 1% of its GDP) in science

and technology. Whether the goal is reached or not is unimportant as there are no enforcement or accountability mechanisms.

In order to have an impact on market-oriented innovation, Chihuahua could consider having the State's Council for Science and Technology being co-ordinated by the Secretariat of Economy which is in a better position to link up with the private sector. There are a number of challenges for Mexican S&T councils from an operational standpoint. They tend to be very small in terms of staffing, often just a handful of individuals (OECD, 2009c). The ministry or entity to which the S&T councils report (where they are "sectorised") can play a role in its perception within the state and the focus of the policies it will implement. While there are some associated with an education secretariat, there is a greater likelihood that those councils are more oriented to basic research and academic activities. Several other S&T councils report to an economic development secretariat. In general, those councils tend to be more oriented towards an industry linkage approach. Colima's S&T council is new but the approach within the state is interesting. The Governor asks all state-level ministries to submit their S&T needs and an accompanying budget such that the council has a list of priorities for projects in service of the state across different secretariats (OECD, 2009c). Linking the Council to the productive sector will be a way to foster innovation networks and spur productivity through innovation in firms.

Economic diversification and sectors with potential

Vulnerability to external shocks is one of Chihuahua's most important challenges (see Chapter 1) and in the context of sluggish world economic growth, the state could benefit from diversifying sectoral investments and target markets. This means that to the FDI-based strategy to develop manufacturing for the NAFTA market, the region can add new markets in emerging economies and the further development of primary activities such as mining, forestry and farming, as well as tourism. Already, farming and mining activities were found to be rapidly growing sectors, but they are still a fraction of the state's total assets.

In addition to farming activities (for a full discussion of farming potential see Chapter 4), there are clear opportunities in diversifying the economy, in particular by supporting mining, forestry and tourism activities. These are all, activities with a strong rural context; mining and forestry take place in rural areas, and the eco-tourism character of Chihuahua's mountains and desserts are clear examples. However, all these activities can be potentially harmful to the environment. Although off a small base, mining activities' impressive growth has recently led to a fivefold increase in its share of state's GDP. Mining's strong performance is being chiefly fuelled by FDI in the sector. However, the State Government could aim at linking local miners to global value chains. Mining can become an enclave in the economy, producing few jobs – as the mining process has become capital-intensive – almost no backward and forward linkages to local firms and few fiscal benefits as a result of it. One way to avoid the enclave economy and maximise the potential of mining activities is that the public sector partners with the private sector on the initiatives to develop local mining suppliers in metal-mechanics. In addition, environmental regulation should reflect the potential harm to the environment of gold, silver, lead, zinc and copper mining and enforcement of it should take a central role.

Chihuahua holds one-third of Mexican forests in a surface that is equivalent to that of Portugal. But in order to develop the industry in sustainable way, forestry requires not only strong regulation, but most importantly its enforcement. Chihuahua's Ecology Direction is promoting sustainable behaviour and actively seeking to enact regulation, but lack of resources impinges on enforcement. Institutionalising the environmental payment services approach already in place an extending it to forest sustainability can yield not only economic and environmental benefits, but also social since marginal groups (e.g. ethnic minorities) can get a remuneration by conserving them. It is important that the state government ensures forestry firms that regulation that seeks sustainability is a way of protecting the environment, but also gives them long-term security on their own activities. Diversifying the economy without enforcing environmental regulation can result in unsustainable development. Tourism development can perhaps look into ways to attract FDI in the sector that can serve as a catalyst for private-sector-led promotion. For instance, global tourism service providers can be effective promoters of the region and attracting a global player to the region can boost the sector. Finally, Chihuahua's sunlight exposure throughout the year, makes it a candidate to develop the renewable energy sector (see Box 2.14).

Box 2.14. **Fostering Renewable Energy**

Many OECD governments see the renewable energy supply chain as a promising sector for the creation of valuable and stable jobs. This is particularly important in rural areas, since exploitation of the major renewable energy sources is space-intensive and thus likely to develop primarily in rural areas. Worldwide investment in renewables increased more than tenfold between 2002 and 2010, reaching USD 240 billion (Ernst and Young, 2011). This surge in global investment is strongly supported by public policies aimed at stimulating the development of renewable energy sources. These policies reflect three major concerns: climate change; energy security; and job creation. The first of these is a well-established driver of policy change, while the second has grown in salience over the last decade, owing to the upward trend in oil and gas prices and geopolitical instability in many hydrocarbon rich areas of the world. The emphasis on job creation has become ever more important as a result of the economic crisis and is seen in particular as a way to revive some lagging rural economies – in particular, since renewables, being space-intensive activities, are in some respects fundamentally rural undertakings.

The deployment of renewable energy is thus increasingly seen as a key development opportunity for rural regions and also a way for governments to give substance to "green growth" rhetoric. However, economic and workforce development opportunities are often constrained in rural areas by limited infrastructure and/or limited availability of the necessary competences to deal with new sectors or new technology. To reverse this trend and tap rural regions' endowment of renewable sources of energy will require improved learning capacity and the accumulation of competencies in rural areas. If successful, regional specialisation in the production of renewable energy is likely to percolate to other sectors, like construction, manufacturing, and services, thereby multiplying job opportunities along the supply chain localised in the region. Regional governments are well positioned to magnify the impact of this regional specialisation. In many OECD countries, they have a key role in the design and/or implementation of national energy strategies. Regional governments are also well placed to develop innovative policy solutions that can be scaled up into supra-regional or national programmes, or to provide laboratories for national pilot programmes

Source: OECD (2011) *Regional Outlook 2011: Building Resilient Regions for Stronger Economies*, OECD Publishing.

2.3. Multi-level governance to facilitate co-ordination

Central – local relations and multi-level governance

Because economic issues and challenges everywhere are multi-dimensional, are driven by forces and actors on the world, national, state and local stages, and are likely to demand solutions beyond simple economic policies and instruments, more than one level of government or their agencies needs to be active in a regional economic strategy. Effective delivery demands that each of these partners are involved throughout the process of constructing the strategy, rather than being employed just to deliver the plans, policies and actions handed down from above. As in the discourses around the quadruple helix and regional innovation systems, there is recognition that vertical partnerships are necessary to ensure efficient and economic outcomes. Complementing the horizontal co-operative working within the State of Chihuahua discussed above, this approach builds economic development capacity at all levels and so enhances the prospects for knowledge transfer, exchange and sharing between officials and practitioners across the nation, state, regional and localities. As above, such co-operative and constructive working usually needs frameworks to be constructed and facilitated. While agreements and regulations may be important underpinnings for such co-operation and partnership working, there is still a need for facilitation and co-ordination at the heart of the economic development landscape – a specific institution is often required to undertake these roles and in many contexts a Regional Development Agency (RDA) or equivalent body at arm's length from all other organisations with power is required. The Council for Economic Development of the State of Chihuahua (CODECH), can be considered as potentially filling this and other roles here: as a critical player in its own right within a triple or quadruple helix, both in bringing expertise and experience and in representing particular interests to ensure inclusive and accountable participation on the one hand, and as a source of intelligence and voice for the State of Chihuahua as it faces the rest of the national and global environment and their players (public and private).

Subsidiarity

The concept of subsidiarity has been embedded into European policy frameworks and programmes so that higher levels must take account of the correct level at which policy should be formed, developed and delivered. The presumption is that the lowest level of governance should be preferred for each of these stages. In the EU regulations, it states[5]:

> [U]nder the principle of subsidiarity, in areas which do not fall within its exclusive competence, the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level

Here the Mexican national state is the equivalent of the [European] 'Union' and the state of Chihuahua the 'Member State'. Crucially in this context are the origins of the principle of subsidiarity, which was initially promoted by the regions – in particular the German federal states (Länder) – to use subsidiarity as a way to protect their regional autonomy recognised at the national level.

It continues that:

> […]
> a Declaration attached to the Treaty of Amsterdam which states that 'for the German, Austrian and Belgian governments it remains understood that the actions of the European Community on the basis of the principle of subsidiarity concern not only the Member States, but also their bodies, to the extent that these bodies possess their own legislative powers, conferred on them by national constitutional law.

Applying this principle in the State of Chihuahua would see a somewhat different economic development landscape than presently. The allied concepts of 'institutional thickness' and 'institutional capacity' are important here as, without an appropriate set of bodies and agencies able and empowered to be involved in the whole process of the formation and delivery of policy, there can be gaps and inefficiencies in the economic development framework. Although some countries are federalist and have constitutional frameworks and regulations to guide such processes, others have struggled to determine the most appropriate approach. Within the European Union context, the distribution of Structural Funds to certain regions has been delayed by the lack or incompleteness of particular administrative layers of governance (Kafkalas and Thoidou, 2000).

Institutional thickness and capacity

Measures to address this lack of capacity and in particular the need for the training of staff, knowledge exchange of good practices, hold lessons for elsewhere, as do the experiences in federal states such as the US and Canada. In the case of Greece, with a poorly developed governance structure, Kafkalas and Thoidou (2000), basing their work on the case of Central Macedonia, assessed the emergence of specific RDAs. By analysing the significance of the competitiveness of SMEs and of the gradual establishment of RDAs in the promotion of regional intelligence, they place institutional thickness and capacity at the heart of the economic development process. In that case and across much of Central and Eastern Europe, there was a specific programme of establishing a *cadre* of officials skilled in the development and implementation of policies consistent with mainstream approaches across the European Union and, complementing this, a strategy to establish suitable and appropriate local and regional economic development institutions.

Following the enhanced roles given to the regional levels in the EU and the traditional levels of autonomy and responsibility in other federal states, the partnership model has been critical not only in establishing regional networks of agencies and authorities, but also in creating the conditions and environment for quasi-regional governance structures. The State of Chihuahua has many of these powers already but is helpful to restate the benefits of applying devolution and subsidiarity. Although there are economic strategies for the state it is important to recognise the characteristics of multi-jurisdictional planning frameworks in which the principal issue is the optimal assignment of functions (Armstrong, 1997). Good practice confirms the need for flexibility in regional economic planning and development to allow for the different interests at the sub-state level to be involved as well as state institutions. As elsewhere, this level often remains a relatively isolated area for debate and inclusion, exacerbated in the context of the State of Chihuahua by the distances involved between major settlements and the fairly empty landscapes in between. For nations such as Mexico, the nature of federalism and the network approach to national regional policy have been viewed as a means of facilitating the co-operation and/or competition between different national and regional institutions.

Experience from Italy and more broadly (Capellin, 1997) argues for a new approach to within a federal arrangement based on public-private partnership (rather than on public authority). The aim of the partnership approach is to create flexible mechanisms of governance of those public-private relationships in order to establish a strategic agenda for change. This can be achieved through the establishing of networks that stress the transactions between institutions and partners rather than the older prescriptive or centralised "top down" system. Constructing such networks and partnerships and facilitating their operations requires active participation and application to implementing the strategic economic development agenda if success is to be pursued. Elsewhere either a formalised partnership or forum must be established, with its own secretariat and resources, or an RDA or equivalent entity empowered to progress this approach. CODECH would appear to have the essential elements and embryonic characteristics necessary to fulfil this role at present. It appears to have the respect of the other economic and social actors in the State of Chihuahua to be able to justify holding this key co-ordinating responsibility, and so to have the capacity and status necessary to pull together the partners from the different levels of governance in the State. Not too powerful and without responsibility to implement and deliver all functions and programmes at all levels, CODECH could assume the position at the centre of a partnership while building trust and co-operation across the players.

Multi-level models

Some studies show that there are connections between the different areas of governance and methods of analysis. The micro-, meso and macro-levels obviously interact in ways that make it difficult to separate the varying forces and forms of influence. Others acknowledge that policymakers and practitioners within the federal systems of government in, for example, Germany, Canada and the United States and so Mexico, are dealing with regional jurisdictions in a constant process of dynamic realignment. As the regional dimension is neither often recognised, nor appropriate arrangements flow out of federal institutions, this suggests there is no off-the-shelf model but again flexibility is required to ensure that capacity is built and gaps addressed in the regional economic development infrastructure. Networks of cities within federal states can secure a strategic perspective on meeting the needs of economic development in localities where economic spillovers exist. With different and potentially complementary plans for completing supply chains for the *maquiladora* and industries based on indigenous enterprises and strengths, this suggests better co-ordination between the cities and major towns of the State of Chihuahua could be appropriate for the delivery of the economic strategy. As agglomeration economies are stressed increasingly in the location decisions and analyses of successful and competitive economies at all levels, so the need for co-ordinated and seamless support for mobile capital investment is required. With significant distances between its settlements, restricted labour market catchment areas and problematic transportation systems, it is critical for the state as a whole and for individual cities and regions within it that the disadvantages of such a vast territory and limited population distribution are not obstacles in attracting FDI. In parallel, the comparative advantages of the geography and industry of Chihuahua will be realised more readily if the resources and production factors across the state are available to be applied to optimising opportunities for economic development. Competitor locations in Mexico and beyond, offer co-ordinated packages of support for mobile inward investors so that ease of opening and staying in production have become important selling points that Chihuahua has to recognise and match. The size of many cities in the state is too small in terms of labour force, supply chains and markets to compete with the opposition

locations, therefore, and co-operation within Chihuahua is necessary if all are not to lose in self-destructive attempts to attract business. Complementing each city's resources and attractions within an overall state strategy offers the best path to addressing such competitive forces from outside.

Networked RDAs

Below is discussed the particular form of institution at the centre of delivering most regional economic development strategies: the regional development agency (RDA). Before embarking on that, a confirmation of where the consensus lies on the nature of the economic development landscape should provide the basics for that assessment. Although there are stronger versions of the partnership model in certain federal countries, to summarise the typical good practice form:

Social partners include representatives from the government, trade unions and employer's organisations (triple helix). However, representatives from 'civic' society can also be involved (quadruple helix).

Social partners can be involved in partnership working at national, regional, sub-regional and local level. They can be included in discussion and debate on policymaking; however it is more likely that they are involved in practical development of strategy and implementation.

There are strengths and weaknesses of any particular model, but generally:

1. Debate and negotiation with social partnerships can bring about a certain degree of consensus in society with regard to strategies undertaken by government.
2. Final policy decisions are more likely to be welcomed and implemented more effectively. Nevertheless, the process of negotiation can be lengthy.
3. Further issues with regard to social partnership include the need to:
   - Develop best practice and appropriate membership
   - Incorporate evaluation mechanisms into frameworks
   - Communicate effectively as a 'partnership' and between partners
   - Develop data systems where appropriate
   - Be forward looking as a partnership.

Within this environment, most economic development agencies have adopted networking and partnership working as integral to their mode of operation. Building consensus and pooling resources to ensure co-ordinated efforts and efficient implementation in most cases will entail very real advantages, and may well be an important part of the real reasoning behind the growth of the networked development agency. But partnership arrangements are rooted in the specific historical circumstances of the last decade or so. In the particular situation of the State of Chihuahua, the limited and apparent decline of central government and state regional funds which fuelled the growth of policies and of bottom-up initiatives into an uneven web of regional and local development initiatives – many of which seem to have very restricted resources and little activity – imply that working in partnerships offers advantages over the continuation of an unco-ordinated strategy. Presentations from a range of economic partners (state, municipalities and agencies) and in the Background Papers (e.g. CODECH, 2010) offer a mixed picture in this respect. The PYME fund (aimed at providing financing to small and

medium sized enterprises) showed growing levels of investment in companies from 2004 until 2007 but then decline as the global recession had an impact on entrepreneurs' plans. Science and technology projects supported through a mix of funds under the State Government and the National Council of Science and Technology (CONACYT) and PIADET (the Programme of Support to Applied Research and Technological Development) showed similar profiles over these years. By contrast PROSOFT (the Support Fund for the Development of Software Industry and Related Services) showed growth from 2006 through 2008. In each case, although the public sector were key funders of each initiative, usually providing over half of the total investment over several years, the private sector was key to the periods where growth was especially strong.

A key challenge in many jurisdictions has been the need to present a one-stop shop or window for SMEs, internationally mobile investors and university spin-outs. A web of initiatives may appear attractive to policymakers and planners, apparently learning from best practice elsewhere, but can often become self-defeating as confusion and obfuscation deter enterprises and entrepreneurs from progressing location decisions. Simplification and certainty alongside a co-ordinated and coherent approach to supporting enterprises and projects are recommended, therefore, in many contexts. Having a co-ordinating agency at the heart of this web, able to recognise and represent the demands and needs of SMEs, industries and other cluster partners, is usually seen as essential in such an environment. In recent years, a regional development agency has come to play the dual role of both forum and catalyst/facilitator/enabler in addressing such challenges.

These new forms of co-operative governance, such as partnerships and networking - may challenge traditional perceptions of the advantages for both RDAs, leading to the possibility of significant problems for these institutions, and their political sponsors (Cameron and Danson, 2000). Analysis of experiences in the Austrian region of Styria demonstrate the importance, in the process of consensus building and strategy development, of the communication dimensions of regional development activities; echoing the organisational learning literature and confirming the linkages with governance and strategy in regional economic development. Within this crowded landscape, the RDA's role is typically now as a facilitator, enabler or catalyst in the regional economy (Danson et al, 2005; Morgan 1998), rather than the multifunctional all embracing organisation of the last few decades. In the context of Chihuahua, there are questions over whether the existing institutions can fulfil the role of the traditional RDA, are strong enough to act in partnership and can offer leadership in a networked relationship. CODECH and the other possible embryonic contenders for this role of RDA are somewhat different entities to the traditional large body which became the model agency of the 1990s and early 2000s. Far from having a broad range of functions, significant resources and staff, and a degree of power at arm's length from government and their sponsoring authorities, CODECH appears to have a limited budget and only a few personnel working to deliver its services. This suggests that CODECH has the makings of a secretariat at the centre of a network or partnership of economic development organisations. However, whilst this legitimate role for such an institution and can operate well in this role of catalyst or facilitator, it requires that the skills, expertise and experience are embedded into the RDA if it is to be successful in co-ordinating a co-operative response to demands of the economic development agenda. To be able to command the respect of the other players, to convince them of the need to compromise and follow the common and agreed plan requires that these functions and characteristics are apparent and accepted across the board. CODECH, therefore, must be able to demonstrate to all other partners – public, private and civic – that it has the

requisite human capital resources and qualities to be able to command attention and have their leadership accepted and trusted. Commitment by all to this approach must also be in place if CODECH is to drive this agenda forward.

In looking abroad for good practice models, in many countries the city-region scale increasingly has become important in regional economic development terms. This suggests that (sub-) regions, city networks, some other administrative area, or aggregation of areas are the level at which interventions and evaluations progressively are focused (Herrschel, 2012). Learning from partners within these areas rather than from other RDAs may be fruitful. With the large distances between the major economic cities in the State of Chihuahua, examples from fairly autonomous city-states within federal states may prove to be the most appropriate benchmark to consult. This is consistent with learning from those cities where co-ordination and strategic planning are favoured at this level rather than at higher or even lower jurisdictions in the spatial hierarchy. Again this in keeping with economic and structure planning arrangements in many parts of Europe and reflects that many of the more transferable initiatives and practices within countries tend to be based on sub-national programmes. Regardless of the institutional configuration in an area, intervention involves a range of functions, programmes and activities. Again, whether these are incorporated mainly into a single agency or across organisations, there is need to carefully assess the potential models which could be appropriate for Chihuahua and then to determine what particular form would be optimal at the particular time for the state and its regions, cities and rural communities.

The role RDAs in fostering public-private co-operation

The consensus across practitioners and the policy community and amongst academics is that partnership working between the key players is essential for the successful delivery of economic development strategies (Danson, Halkier and Cameron, 2000; OECD, 2009d). Formally, this can be seen in the concept of a triple helix of government-enterprises-universities working in unison in pursuit of the full benefits of innovation and cluster developments. Beyond having the right policies and support for inward investment projects, indigenous firms and new enterprises, this approach to economic development for the State of Chihuahua requires other factors to promote success. In particular, it is necessary to have the institutions, trust and co-operation between all the actors involved in delivering development. Key to this is having dedicated agents for change, and in many contexts the leadership and expertise to make this happen are embodied in a regional development agency. In the case of Chihuahua, CODECH could potentially be considered as being best placed to take on the role and responsibility for co-ordinating the implementation of the State's economic development strategy.

The main actors in the State of Chihuahua are aware of good practices in economic development, have the policies and people aiming at delivering them, and face similar constraints to most other national and regional economies. This knowledge and understanding has to be complemented, however, by stronger partnership working and co-operation across all the agencies active in the state. For the particular circumstances of Chihuahua, this suggests the key issues to be addressed to achieve a better economic development environment, and so to realise higher levels of sustainable growth and development are:

- improved co-operative and partnership working across the public and private sectors;

- clarity and agreement over the roles and responsibilities of different agencies and especially local, state and national governments and their agencies; and,
- ensuring that the institutional infrastructure and capacity to deliver support are appropriate.

CODECH and the local councils: the bottom-up approach

Across the OECD, inclusive partnerships between the public and the private sectors are at the core of economic development strategies. Almost all strategies for sustainable growth and development recognise that a full complement of local economic actors have a role to play in achieving success. Across the world, evidence on how regional policy programmes are most efficiently and effectively delivered stresses the importance of an inclusive partnership approach. Whether the strategies concern any of a diverse range drawn from clusters, regional innovation systems, inward investment attraction, or community and neighbourhood renewal, the participation of public and private organisations is essential. Within the European Union, regional policies are based on partnership working at all levels. In Scotland, so often the laboratory for innovative strategies for delivering economic development policies, a fundamental principle is the inclusion of businesses or their representative organisations in the development, formation, and delivery of programmes and initiatives. Other parts of Europe similarly have adopted close involvement of businesses in these processes. In the transition economies of Central and Eastern Europe, and of some of the southern member states of the EU, progress in such partnership working has been slower to become accepted with the private and public sectors working independently to pursue their own interests. There are examples of such partnership working in Chihuahua with the private sector active in such schemes as the *Fondo PYME* and the PROSOFT Programme, though their participation varies greatly between years.

Cohesion and partnership

CODECH seems to be particularly well placed to assume a co-ordination role to foster economic development through cohesion and partnership across economic agents. Reliance on market solutions alone to overcome uneven economic and social development has tended to be less than successful and progressively discredited as unable to reverse divergence in economic performance. Without a reasonable balance of growth and prosperity across a territory, there is a threat to overall stability and efficiency across the whole economy. For most of the last hundred years, it has been accepted that the State needs to intervene in the market economy to ensure that the overall system offers an environment that allows private enterprises to thrive. In more recent times, public-sector bodies with limited resources have looked to enhance their capacity to promote development and so have worked in partnership with other agencies, including the private sector. From the 1980s, the experience of the 'Third Italy' and similar consensual networking ways of working became popular and so partnerships at all levels were seen as the way forward. There were different motives for a development agency to link up with other public and private bodies including both push and pull factors: on the one hand the search for functional advantages, on the other hand a constant quest for additional resources from other public and private actors. Given the circumstances of the State of Chihuahua at the present time, there is the potential for CODECH to assume this role in co-ordinating the partnership approach advocated by the literature and good practice in Europe.

Knowledge and Clusters

Chihuahua must consider developing a document that brings the academic, private, public and social actors together on a shared vision for competitiveness and development. The vision, can serve as a basis to develop an inclusive agenda for competitiveness and development that takes into account recommendations in this review and beyond and set responsible actors to carry them out on different time horizons (short, medium and long). The promotion of an economic strategy with a strong commitment to identifying and building clusters, completing and taking full opportunity of supply chains, and maximising the benefits from innovation and R&D, all depend on an inherent and high degree of trust and shared vision that fosters co-operation across economic players. The critical role that knowledge production and information plays in a cluster goes beyond a simple set of relations in the market, and should not be underestimated. Knowledge production creates spillovers and much of the knowledge produced in the innovative milieu is tacit so that joint critical development within a partnership will enhance chances of success. These related elements suggest that proximity – both spatial and cultural – is crucial to achieving a competitive advantage through the establishment of a "learning economy" within the globalised economy. Many regions have adopted the classic cluster, as envisaged by Porter, as a way of organising their economic development efforts. This follows from the understanding that knowledge production increasingly has been stressed and prioritised in European and national perspectives as critical for competitiveness of regions and nations. Information, knowledge and ideas created and developed through clustering are reliant on strong partnerships and, if synergies are to be maximised, the whole process of the knowledge-based economy is dependent upon "working to build trust and a shared vision" (Scottish Enterprise, 1998). The strong partnerships at the heart of such clusters ideally consist of customers, suppliers, competitors, universities, colleges, research bodies and utilities: essentially a private-public sector mix.

Removing barriers to innovation is key to developing competitive clusters. Market failure in R&D activities in the early phases of the innovation process is a common challenge that leads to underinvestment in those activities. Such underinvestment is usually generated by the large element of fixed costs associated with the innovation stages of new products or processes. At the commercialisation stages the innovator may have restricted capacity to reap the benefits of the innovation, and throughout the development and launch process, risk and uncertainty will act as constraints on successful completion from laboratory to market.

Cross-border co-operation could become a key asset to boost university-industry links and innovation, but it would require stepping up resources over a long period in which trust and partnership are nurtured. Few examples of close university-industry links and of policy interventions to support these are present in Chihuahua (see section on "taking stock of the innovation capacity" earlier this chapter) with incubators matching good practices elsewhere. Increasingly such facilitated linkages can transcend state, regional or even national boundaries. In the culturally close communities of the Nordic countries, which host a series of well-regarded national incubator programmes, as well as having developed university-industry based regional innovation systems (most notably exemplified by the Oulu Phenomenon in Finland); there are cases of collaborations across borders. Such transnational partnerships may well operate at a regional level with conglomerations in virtual regions across borders; Orseund is the best recent and researched example of such co-operation. However, even in these companion locations, there are actually limited instances of successful large-scale operations which would act as models for Chihuahua. Not too much should be expected of the attempts to reap any

innovation and technology-based agglomeration economies potentially offered in the North by the geographical proximity of El Paso (Texas) and Ciudad Juárez. There is a high degree of knowledge and intelligence in the state of Chihuahua around these issues,[6] and there is evidence of how well informed the different stakeholders are on good practice across the world. Indeed, this extensive base of understanding and the academic and professional literature underpinning it suggests, caution in anticipating how successful the collective efforts of the main economic agents could be in generating economic growth and development (see Annex B for a discussion on the obstacles for cross-border co-operation). El Paso's Regional Economic Corporation (REDCO), in particular, can be a valuable mechanism to foster collaboration with *Desarrollo Económico de Ciudad Juárez* (DECJ/Ciudad Juarez's Economic Development NPO). However, a long period of time and significant resources are needed to take collaboration to a higher level. The recent report on the Paso del Norte region (OECD, 2010b) confirms this need for realism on both sides of the border. As highlighted in the evidence from this region, it takes time to build co-operative working practices, to build trust between partners and to attract a spiral of supporting infrastructure. The recent steps to agree memoranda of understanding and agreements across the border between the major players represent important indicators of a developing relationship within this community. However, the difficulties SMEs encounter in entering the value-added chain and the low-skill-low-wage cycle inherent to many – albeit not all – plants located in the region, signal the limitations on developing a diversifying economy quickly. The still few number of incubators on the Chihuahua side of the border and difficulties in raising investment capital stifles the capacity of spin-out companies and other new start-ups to generate this process. Experience across Europe and North America point up the importance of having means and time to address such market failures, and the tentative moves in the area to identify and close such gaps need time to come to fruition.

The further development of clusters in Chihuahua also depends on striking a balance between FDI and local assets, moving up the value-added chain and on the role of knowledge production linked to a healthy services sector. Although there is a need to further take advantage of local endogenous growth factors, the need for intervention to influence and bend the location decisions of private enterprises should not be dismissed. On the US side of the border, the significant number of clusters identified (OECD, 2010c) appear to offer low wage/low skill employment despite a strong higher education infrastructure behind several of the industries. Similarly in the State of Chihuahua, although there are major concentrations of manufacturing plants – the highest in North America – value added is low as cost competition dominates the attraction and location decisions of transnational enterprises (OECD, 2010b). On both sides of the border, therefore, it has been recommended that efforts are made to move up their respective value added chains to improve the competitiveness and sustainability of selected sectors (OECD, 2010b). Complementing this strategic change, it has also been proposed that services are recognised more strongly in the overall landscape as necessary and integral elements of a vibrant economy. The key role of higher education institutions is stressed in the academic and policy literature in these contexts, and in Chihuahua this is reflected in the strategies and programmes of the governmental and agencies for regional development such as CODECH.

Triple helix and migration

The concept of a triple helix of government-university-enterprise is quoted in Chihuahua, therefore, but there are few examples of either cross-border projects involving

bodies in the US or of successful collaborations within the state of between higher education institutions and industry. Significant participation in higher education across the state suggests there is a pool of graduate skills available for movement up the value-added chain, critical if the advantages of a learning economy are to be realised. As elsewhere, the high propensity of graduates and post-graduates on each side of the border to be mobile, and then open to migration, raises questions over the appropriate education strategy for the State of Chihuahua. Both, relatively low and falling wages and the security situation, provide strong disincentives for local people with tertiary education qualifications to consider migrating northwards into the growth areas of the US for a better life. Although the ability of Mexican migrants to secure positions legally or as 'undocumented workers' progressively is being curtailed, for many, the attraction is still strong. Economic development policies to encourage the use and reward of graduate skills within the supply chain of technologically advanced production enterprises present an opportunity to meet the challenges of competing in a globalised economy and of retaining the human capital investments embodied in these graduates (OECD, 2010b).

It was clear in the discussions with economic development actors, academics and government agencies and departments that there were issues with labour market information at all levels but especially with data on graduates across the state. Across many economies there are similar problems, exacerbated where there are highly mobile, skilled and motivated young people educated to university-degree level and beyond. Better labour market intelligence on the aspirations, behaviours and requirements of school-leavers and graduates is essential in these circumstances as well as improved understanding and knowledge on the demands and plans of employers. In the UK and in Europe more broadly, regional observatories have been established to address these gaps and to better inform policymakers and practitioners. The awareness of such issues within the State of Chihuahua and its agencies bodes well for the identification of solutions, and the promotion of leadership is strengthened in such a context of potential success.

Quadruple helix?

Any such strategic approach requires a consolidated, coherent and inclusive partnership involving each of the triple helix actors. In some modern interpretations the community is added to construct a quadruple helix (The Quadruple Helix refers to the interaction of four pillars in innovation ecosystems: knowledge institutions, enterprise, government and civil society. This represents an important change in how regional, industrial and innovation policies are conceived, developed and delivered. In the words of the CLIQ report,

> [A]n era of linear, top-down, expert driven development, production and services is giving way to different forms and levels of co-production with consumers, customers and citizens.
>
> Public authorities can develop environments which both support and utilise citizen-centred innovation activities. Moving towards Quadruple Helix models does, however, have ramifications for all stakeholders in both the private and public sectors. It requires a significant culture change, adaptation of processes, acquisition of new skills and a re-distribution of power. If public authorities are able to rise to the challenge of changing the way services are designed and delivered it means allowing citizens to take a turn 'in the driving seat' (Arnkil et al, 2010).

The key issue of security represents a severe constraint on the participation of civil society in such a partnership framework, although there is the potential for limited but

evolving initiatives to be undertaken in the interim. This suggests that attention should turn to the mainstream economy and the form and operation of public-private partnership working involving the *maquiladora*, Chambers of Commerce, and other representatives of small, medium and large enterprises. Leadership is necessary even though partnerships and networks are promoted, however, and this may be best located within an arm's length institution where there is a need for the public, private and community sectors to be included in decision making and delivery mechanisms.

Public-private partnerships

In similar contexts, such as the European transition economies, mutual suspicions between entrepreneurs and privatised enterprises, state agencies and other institutions have gradually been overcome so that they have been adopting the European Union model approach to regional economic development, with its strategic partnerships of central and local government, regional development agencies (RDAs), non-departmental governmental organisations, and other players in the public, private and voluntary sectors (Danson et al., 1997). These partnerships have been established over the last three or four decades, initially in West Central Scotland, through the progressive development of multi-agency, multi-annual, multifunctional initiatives, task forces and area agreements (Moore and Booth, 1986). While there have been criticisms of individual partnerships, their durability and transnational acceptance have been testament to the perceived effectiveness and success of these forms of comprehensive intervention in the regeneration and redevelopment of communities.

Local and regional governments have worked closely to a common agenda with the market-oriented regional development agencies (Danson et al., 1989), and the private corporation-based Enterprise Trust movement. Their work, which has involved a series of partnerships at the local and sub-regional levels, suggests the building of trust through co-operation and experience. This has been critical in producing a model of intervention which is now adopted across the European Union and embedded into many regional development strategies across the continent.

Supply-chain construction

In other regions of the developed world where branch plants of multinational enterprises have been located and the possibility exists for local involvement in supply chain activities, the advantages of such partnership working have been replicated and have evolved toward a cluster approach to regional economic development. For many regions and States, partnerships are not only a legitimate and effective way of co-ordinating and focusing the resources of a number of agencies onto a problem, but also the favoured approach. Further education colleges, housing agencies, health boards and others have joined mainstream economic development bodies in formal partnerships with each other to meet economic and social challenges. In most regions, this approach often as a formal cluster strategy stresses the objective of moving to the high value end of the market, with enterprises active in the cluster operating within "a local economic environment geared to innovation, investment and upgrading" (Scottish Enterprise, 1998). Flexible partnerships and clusters in different regions have devised action plans around which all economic players cluster to promote an integrated development policy so that the region can "capitalise better on [its] scientific and technological expertise; ... help companies build up their research, design and development capacities; ... stimulate entrepreneurship; ... encourage companies' international ambitions and ... build a high-performance transport infrastructure" (Scottish Enterprise, 1998).

The aspirations of the State of Chihuahua and its agencies relate well to these generalisable objectives. Advancing up the value-added chain by pursuing these and related objectives offers the opportunity for sustainable economic development, retaining graduate workers and embedding local companies as essential components of the supply chain of the *maquiladora* whilst promoting longer term indigenous development. However, experiences in some of the regions where cluster strategies have been implemented based on such models of supplying multinational enterprises results have been mixed.

Although there often appear to be opportunities for much higher levels of local sourcing by *maquiladora* or their equivalents, the relationship with regional suppliers can be described as corresponding to a "dependency model" rather than to a "self-sustaining economic development scenario." Linkages are seen as weak or based on dependency; therefore the industry is not embedded into the regional economy. With few high technology linkages between indigenous supplier and the *maquiladora*, there are no effective clusters because connections are founded on market strengths, not trust and co-operation. Unlike experiences of the electronics, software and aerospace sectors in California or Nokia in Finland, there are few recorded instances of transfers of staff or technologies. Classically, the branch plant scenario means the retention of higher order functions (R&D, marketing, strategic management, financing) elsewhere, effectively limiting the ability of the regional economy to establish business services externally to the multinational enterprises themselves, and to furnish spin-offs, transfers, and the other components of a successful milieu.

Nevertheless, the *maquiladora* and other examples of inward investors worldwide demonstrate they may offer higher wages than local producers themselves, diversify industrial structures, introduce new labour processes, skills and knowledge into the economy. Co-operation with the *maquiladora* may be considered as an essential and necessary stage in transforming the Chihuahua economy, but cannot be a sufficient step on its own. Complementary public-private partnerships focused on the local economy, its comparative advantages, strengths and needs are equally important in the long term development of the economy, therefore. The examples of programmes which are dedicated to the traditional and primary sectors of Chihuahua, which put the State's graduates and demands at the core offer at least as much promise for the future, according to evidence gathered from other peripheral regional economies.

Power and representation in the cluster

A cluster strategy can be an effective instrument in the development of a regional economy by providing a forum to generate synergies between actors and mechanisms for resolving conflicts However, the lessons from this approach need to be incorporated fully into these strategies if they are to successful. Trust and co-operation are essential if the advantages of innovation and networking are to be realised by all of the players in a sector, and if clusters are to be effective. In successful partnerships in Italy, Denmark and in certain other selected regions, the long development of working relationships between organisations and between individuals has been critical to formulating a successful approach to regional economic development. By contrast, networks dominated by multinational enterprises/*maquiladora* or their structures and where *modi operandi* have been imposed from above, have seen significant problems in the perception and appreciation of the benefits of the new clusters. A sense of ownership over their cluster and network is crucial if small and medium enterprises, which may have the most to gain

from the promotion of partnerships or industrial districts, are to be attracted and included into these partnership activities.

How power is distributed within the cluster can be critical, therefore, to its acceptance and success. In a highly globalised economy, where Mexican States are competing with localities around the world for mobile plants, it is very difficult for Chihuahuan players – public and private – to ensure that all are committed to the local cluster. For example, in the context of research, development and innovation, the local partners have no guarantee that a multinational corporation, which is not necessarily tied into a specific locality because of the relative mobility of capital, is going to share advances in knowledge acquired through the network. As much of the output of knowledge is information, and given the public good aspect of information, these concerns may be resolvable; Morgan (1997) suggests that this is the case. However, there is a need to create a structure for clusters that meets the desires of regional SMEs, and that allows indigenous companies to regain control over future development and to have a stake in the growth and evolution of the industry.

Co-operation and compromise

Constructing and transferring an economic development strategy that appears to be successful in the US or European environment requires attention to such details therefore. Examples from Finland (Helsinki, Oulu), Singapore, Massachusetts and California demonstrate the advantages of and resilience to the negative effects of change where there are coherent and inclusive linkages between public and private agencies. More is required where the major industries are branches of multinational companies controlled and headquartered elsewhere. A strategy based on supplying the factors of production competitively and readily in this environment may not be sufficient to achieve sustainable development, although short term advantages may accrue. Experiments in co-locating such economic activity and dedicated suppliers within business parks, economic and enterprise zones have tended to reveal apparent successes; while these are often established to offer tax reliefs and allowances, many of the real benefits have been identified as the co-ordinated and coherent approach to offering a package of support and facilities. A one-stop shop or window through which all the public and private suppliers and players come together to attract inward or mobile investors is claimed to be the real advantage a state can provide. Cases of industrial estates and developments in Chihuahua city, for example, seemed to be private initiatives where a range of support services were arranged for inward investors, but planning, training, external security, taxes amongst other factors necessary for operating a plant effectively and efficiently are supplied through the open market, by different agencies or governments, or are lacking. The private initiatives being taken here suggest the need for a co-ordinated approach to development, reducing the costs for mobile capital but through a managed and socially optimal strategy.

Pooling resources and power across the elements of the triple helix can strengthen the position of each, releasing synergies and realising economies of scale and scope. In many parts of Europe, and partly as a condition for accessing particular European Structural Funds for the development of local and regional economies, localities and sub-national governments co-operate across traditional boundaries to achieve such benefits. National and European programmes encourage universities to collaborate with each other and with industry through various initiatives and knowledge transfer partnerships which make explicit and transparent the rights and responsibilities within such agreements. It must be recognised and accepted that any form of co-operation requires compromise and sharing

of these conditions and outcomes, and this in turn is best nurtured and developed within a culture of trust and co-operation. Where this is reciprocated across the partnership, cluster or pooling relationship, then further advantages are believed to flow in each subsequent turn.

The benefits and operating conditions for successful public-private partnerships and other forms of co-operation do depend on the particular and peculiar context within which they are established. The security situation in the State of Chihuahua militates against building trust and co-operation in this environment at all levels. Experiences in not dissimilar circumstances in Northern Ireland, South Africa, Latin America and parts of Europe demonstrate that change and improvement are possible but that time and resources are essential factors in promoting this. Realistic timetables, objectives and targets are critical in this process if frustration of aims and players are not to undermine the long term goals and rewards. Although some programmes and policies are wholly confined within single, usually state, institutions (CODECH, 2010), there are a number of instances of different bodies – public and private – coming together to deliver support for new, multinational and local enterprises. A number of the schemes to support high tech and innovative activities (e.g. PYME, PROSOFT, PROATEC, etc.) demonstrate the inclusion of different partners, with varying degrees of participation by the state, municipal, academic and private sectors over time and programme.

However, other programmes and initiatives are developed and delivered exclusively by particular government departments and ministries. For example, for all of the programmes of the Industry Directorate of the State of Chihuahua such as the One-stop Shop (VUG); Enterprise Development Centres (CEDEM); Quick Start-up Business System (SARE); Image Improvement and Industrial Property Programme (IMAGEN); Financing Programme for Small Manufacturing Enterprises (PROFIN); and Self-Employment Promotion Programme (*Fomento al Empleo*); Low-Cost Automatisation; Tax Incentives; and Non-tax Incentives, all funding and participation is derived only from the State itself. However, the programme CEDEM is a 'collaboration agreement between the private sector, academia, the Secretariat of Economy and the Secretariat of Finance and Administration, and SARE is a 'collaboration agreement between the Federal Commission of Regulatory Improvement, Chihuahua State Government and participant municipalities. The other initiatives are either agreements between departments of the state or limited to the particular directorate. In other countries and contexts, there would be recognition of the need to avoid overlap and duplication between different support schemes and agencies, and to ensure that there was a seamless and co-ordinated package of support for entrepreneurs and enterprises.

Therefore, co-operation across and within government boundaries, between public and private agencies and organisations, and a willingness to compromise, enter into dialogue and to share power are all essential in achieving common aims. The evidence from Chihuahua is that there are good examples of such partnership working, evidenced by the co-operation over the OECD visit itself. The activities and position of CODECH as the lynchpin in this environment and processes can be seen as critical. Without an independent organisation at the core - such as an RDA, it can be difficult for the different partners to commit to participation and to perceive and seek to realise collectively a common cause.

The prudent arms-length from government

Regions, States in the Mexican nation, are the most appropriate level or jurisdiction for the delivery of certain macroeconomic policies, justifying the need for institutions to be designed and for specific organisations to operate at a sub-national scale (Armstrong, 1997; DG Regio, 2010; OECD, 2009d). Addressing the allocation and growth functions of government to optimise the opportunities offered by backwash and spread effects in the economy, economies of scale can be secured in policy implementation and a bottom-up institutional approach ensured. This institutional framework demands appropriate regional organisations to manage these territorial spaces (Morgan, 2007) and a greater integrated policy focus to secure institutional and network gains in public administration and more effective joint working with the private sector (Lloyd, 2008). Across most developed and many developing countries of the world, the institutional form that satisfies these needs is the regional development agency (RDA).

Model RDAs

A model regional development agency has been defined (Halkier and Danson, 1997; Danson et al., 2005; Danson and Lloyd, 2012) as a body that, first, is in a semi-autonomous position vis-à-vis its sponsoring political authority; second, supports mainly indigenous firms by means of "soft" policy instruments; and third, is a multifunctional and integrated agency, the level of which may be determined by the range of policy instruments it uses. A regional development agency can be defined as a specific organisational form: "a regionally based, publicly financed institution outside the mainstream of central and local government administration designed to promote economic development." They have become associated with promoting "bottom-up" development and realising endogenous potential (Stöhr, 1989). In effect, an RDA represents the relatively more local scale of a broader macro-economic policy framework. They may include a spatial dimension – the provision of regional incentives or disincentives – and the RDAs provide a complementarity with, and reciprocity within, the national institutional framework for regional development. Because RDAs work "outside the mainstream government" they may be able to facilitate the pursuit of public policies without direct government intervention making the development agency approach to regional economic development relatively more acceptable to the full range of social partners, without necessarily undermining accountability and legitimacy.

Principles

The first principles and critical criteria against which the RDA mode of delivery of economic development policies should be measured focuses on accountability, sustainability, subsidiarity, integration and inclusion. These have entered already into the discussion above in terms of the recommended ways of working for the State of Chihuahua within the constraining contexts of the security situation and corruption. Building trust and co-operation are essential underpinnings to these principles, criteria and the successful implementation of the economic strategy.

Accountability

The need to be *accountable*, especially to local rather than national or multinational stakeholders, has exercised authorities across Europe over the years and is key to achieving the long term sustainable and broadly based economic development aspirations of the state. Transferring the power over the local delivery arms of the central RDA to

local governments – especially with regard to support for new firm formation and start-ups, SMEs, training for local markets and lower level jobs, the co-ordination of property, finance and marketing, advice and guidance – should raise the degree of accountability and sense of local ownership over the RDA's activities. Experiences with the leading RDAs suggested that control over their strategic long-term objectives and priorities set by the state government is necessary, but crucially there should not be day-to-day interference in delivery mechanisms and projects: rather, these should be assessed through appropriate techniques and forms such as annual reports, monitoring frameworks, targets, and performance criteria. Examples from Europe can be offered to support these different approaches and the challenges and problems of such interference. In the case of Chihuahua, evidence was offered of changing national and state agendas and budgets, of varying priorities and objectives between ministries and sector bodies, all of which can be considered as interfering with the ability of CODECH and others to pursue a coherent strategic approach to economic development. Direct interference in the decision processes of local planners and developers was offered anecdotally in Chihuahua, though many were circumspect in making more public statements. The myriad of schemes, policies and programmes, often with limited lives, can more readily be considered as evidence of interference, especially where these are of limited duration and closely processed and monitored by ministries. If similar resources were available to an RDA with greater degrees of freedom over the identification of priority programmes, timelines, targets and performance indicators then a more optimal strategic approach and set of outcomes could be anticipated. Opening many incubators, spreading investment across many clusters and sectors are other dimensions to interference where the counterfactual would suggest alternative economic development decisions might be expected.

Sustainability

Sustainable development requires the involvement of the whole community and being accepted across all the social partners – including Trade Unions, small and medium enterprises, community and voluntary sectors. Tensions can often be generated through the attraction of the *maquiladora* inward investment to create a branch plant economy where this is perceived as being at the expense of long-term indigenous development. To address the conflicts between these different forms of enterprise and to maintain the stability of the overall economic strategy, attention has often been paid to the promotion of supply chains and of clustering and networking. In the State of Chihuahua, policies to support traditional sectors and products and to rural areas should further complement these efforts to pursue sustainable economic and social development. Social enterprises, and the community and voluntary economic sector have an important role to play in this regard also, especially as they have key advantages in generating activity in the poorest areas and for women.

Subsidiarity

Subsidiarity has become a significant element of many policies and structures in regional economic development and has been instrumental in driving changes to the levels at which policies and programmes are delivered. Seeking a balance between efficient outcomes and local delivery can be testing for the boards of the development agencies and the committees of their governing bodies. The large distance between settlements in the state, different labour and SME demands, and varying economic, industrial and geographical contexts suggest that the RDA should not be seeking to be the agency delivering policies and activities everywhere. Co-operation with the lower level

authorities, devolved departments of national and state agencies, and other partners should be planned strategically to ensure this balance is pursued within the overall agreed strategy. In the specific context of CODECH, the strength of this agency is in its core expertise and experience of the operations and strategic roles of an RDA. A strategic role, co-ordinating and facilitating co-operation across the main economic development players appears to be a more appropriate role for the foreseeable future. It is not advisable for CODECH itself, for the State of Chihuahua and its people, and for the different economic concerns for this agency to be burdened with a strategic role of implementation when driving forward the economic development plan, and acting as a catalyst and facilitator are critical functions that a central and trusted organisation needs to be focused on.

Integration and inclusion

Finally, *integration and inclusion* are important themes and sources of tensions for policies and partners. As elsewhere, Chihuahua aims at maximising the value added in the state economy and to capture the benefits of the *maquiladora* by paying greater attention to the linkages between plants, offices and services if all are to be included in the benefits of sustainable growth and development. The inclusion of SMEs in the development and the administration of economic policies has been a perennial problem in some countries, notably, but not only the UK. The strength of the Chamber of Commerce system and of other employer associations can be crucial in ensuring that SMEs and indigenous enterprises are involved in strategic policy formation and development. In a dual economy of large multinational company *maquiladora* and local SMEs that excludes most indigenous entrepreneurs from decision-making within trade and employer associations, there is a real need to ensure that the interests of the mass of locally owned concerns are heard in the regional development agencies and industry networks. Without a strong indigenous presence among the commanding heights of the economy and in the leading sectors especially, plans for improved networking and clustering would fail to deliver the anticipated outcomes (Danson and Whittam, 2001).

Notes

1. The COFEMER-CIDE (2002) guide to municipal-level regulatory reform argues that one of the benefits of better regulatory frameworks is an improvement in the rule of law as it reduces asymmetry of information, limits corruption and enhances the application of rules.

2. However, a small stream of literature has focused on the empirical and theoretical grounds for cluster policies. Duranton (forthcoming) in particular, argues that while clusters do exist they do because of pervasive market failures and due to its complexities it is unclear what the aim and the vehicles for cluster policies should be.

3. Some Juarez's local suppliers that design and produce precision pieces are arguably a form of spin-offs; owners of such firms previously worked in the *maquiladora* firms (Dutrent and Vera-Cruz, 2003). Spin-offs are a form of knowledge spillovers. Knowledge and skills acquired while working for FDI firms are applied at local supplier firms (Jordaan, 2008).

4. PROSOFT is the Federal programme (Fund for the Development of the Software Industry and Related Services) whose goal is to promote the software industry. In Chihuahua, the programme is co-ordinated by the Secretariat of Economy. Between 2004 and 2008, MXN 218 million (around USD 18 million) were allocated to 8 companies and 3 universities. Firms got support from PROSOFT to acquire technological certificates and to get assistance to formulate their business plans. PROSOFT also supported the construction of the Center for Information Technologies Training by the UACH and the UACJ. ITESM Campus Chihuahua also got funding to set up integral services for firms in the sector on high-value added processes. ITEMS Campus Juárez City also began the construction with the support of PROSOFT, of a Center for Productive Integration and Open-Standard Technology and in collaboration with UACH, for the construction of a technological park (CODECH, 2010).

5. *Subsidiarity*, Eurofound, CEC, November 2010, *http://www.eurofound.europa.eu/areas/industrialrelations/dictionary/definitions/subsidiarity.htm.*

6. See CODECH (2010), *Background Report for the Territorial Review of Chihuahua*, Consejo para el Desarrollo Económico del Estado de Chihuahua (CODECH), internal document prepared by CODECH for the OECD, for a comprehensive discussion of this.

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Chapter 3

Tackling Inequality to Foster Growth

This chapter examines the interrelationship between economic and social challenges and the need to address both with regional policies that expressly look for policy complementarities between them. The chapter presents the reader with several dimensions of inequality in Chihuahua: interpersonal, regional, wage, gender and inter-ethnicity. The chapter continues with a section on insecurity trends in Chihuahua and the challenge it represents; the review argues in this chapter that insecurity is one of the systemic challenges of the region and failure to curve down crime will impinge on any economic development strategy. The chapter revises policies at the federal and state levels to reduce inter-personal, regional, ethnic and gender inequality and while recognising the progress made thus far, it argues for an integrated approach to regional policy in which synergies between economic and social policies should be sought. The chapter ends with a discussion on fiscal challenges focusing on tax autonomy, the nature of federal transfers and the need to address recent indebtedness to avoid another systemic challenge.

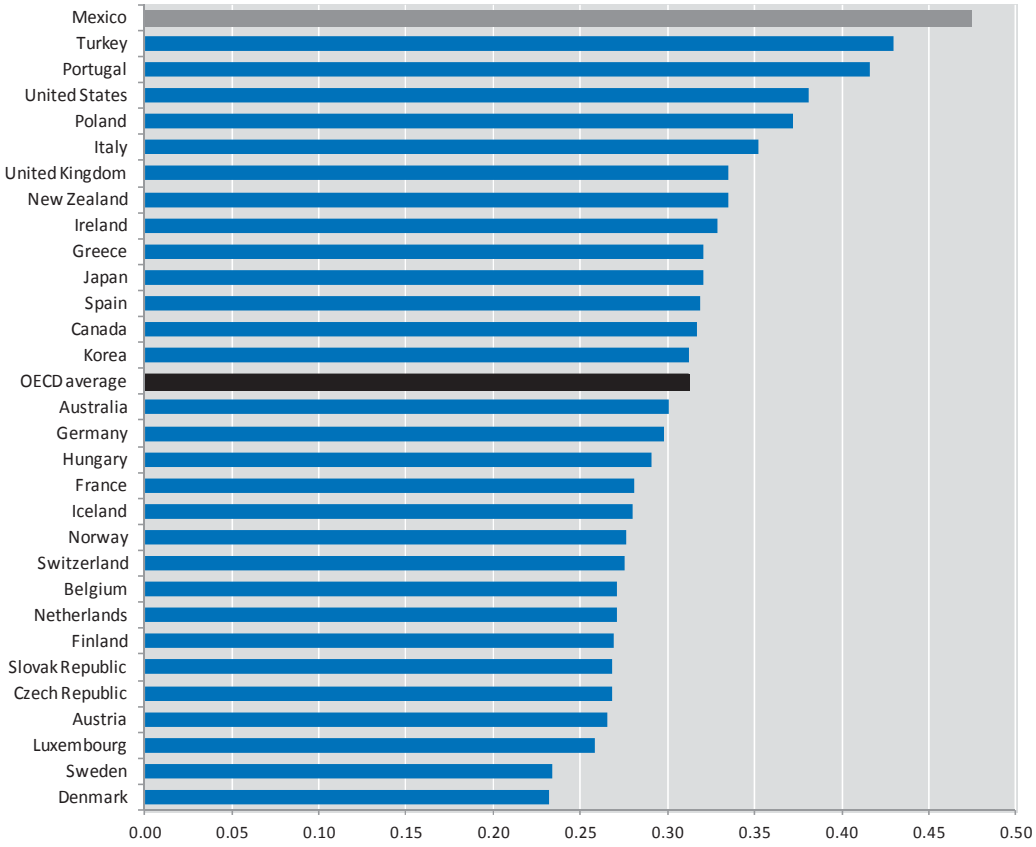
3.1. The many expressions of inequality

Interpersonal, regional and gender inequality

One of the most important challenges that Mexico faces is large inequality levels. Mexico is the OECD country with the largest income inequality (Figure 3.1). Mexico is also the OECD country with the lowest median income (OECD, 2009a). Mexico's top decile also fares poorly with the third lowest average income for that income bracket. At just over 18%, poverty rates in Mexico are the largest in the OECD, almost doubling the average for the Organisation. However, Mexico is also the country that has made the most progress in reducing poverty rates since 1990.

Figure 3.1. **Income inequality in Mexico**

Gini coefficient (2010)



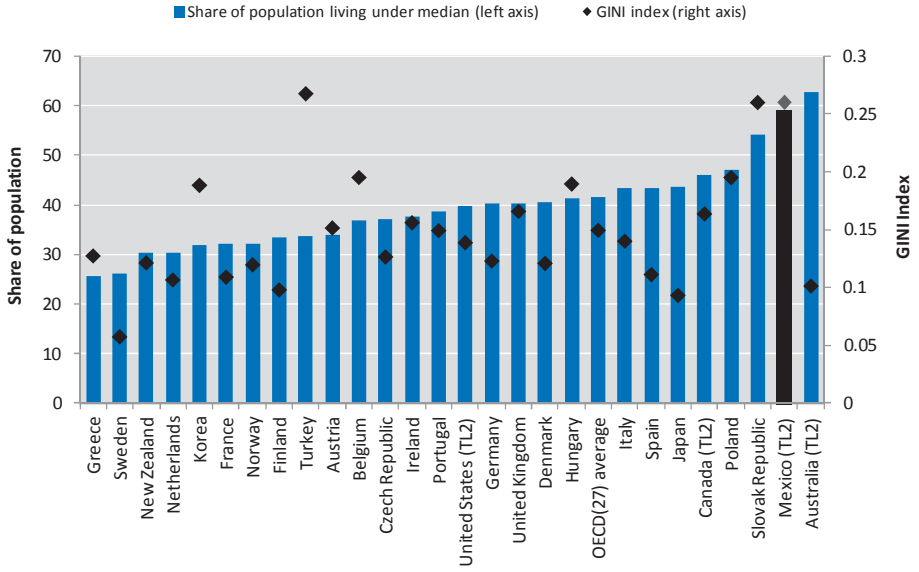
Note: The Gini coefficient is based on the comparison of cumulative proportions of the population against cumulative proportions of income they receive, and it ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality.

Source: OECD (2010), *OECD Factbook: Economic, Environmental and Social Statistics*, OECD Publishing, Paris.

Mexico's regional disparities are among the top in the OECD. In terms of GDP per capita differences across regions, Mexico comes second in the OECD after Turkey (Figure 3.2). Mexico is also second in terms of the size of population living in lagging areas is considered. Over 59% of the country's population lived in Mexican states that had GDP per capita below the median.

Figure 3.2. **Regional disparities in the OECD and Mexico**

Gini index and share of population living under median (2006)



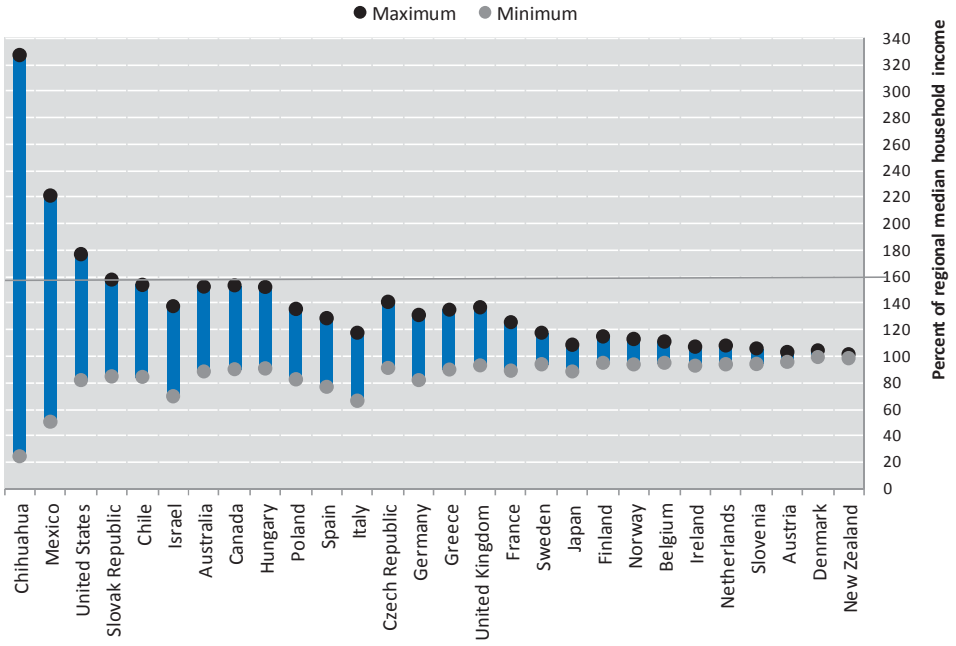
Notes: Available years for Mexico 1995-2004; New Zealand 2000-03; Poland 2000-05; Turkey 1995-2001 and United States. Low GDP per capita refers to GDP per capita below the national median value.

Source: Author's calculations based on OECD (2009), *Regions at a Glance*, OECD Publishing, Paris.

Chihuahua's regional disparities are larger than what any other OECD country – including Mexico – experiences. Regional convergence analysis based on the coefficient of variation or the conditional convergence was not possible given the absence of a data series based on GDP per capita. However, taking into account average household income, and comparing Chihuahua with Mexico and the rest of OECD countries for which data was available, reveals staggering inequalities. If Chihuahua was a country, it would be the place where the greatest regional disparities would be found. Although Mexico is the OECD country with the largest regional average household income inequalities (for which data is available), Chihuahua's range of income is wider than the one that can be observed among Mexican states (Figure 3.3). The maximum value for a municipality in Chihuahua was MXN 10 962 monthly for Gómez Farías which represents 327% of the median household income for municipalities in Chihuahua (MXN 3 350), which compares with the state of Baja California at the top of the Mexican states' distribution but that represents 221 % of median household income for Mexican states. Other Chihuahuan municipalities at the top of the household income distribution are Julimes (MXN 10 864), Juárez (MXN 10 172) and Chihuahua City (MXN 8 616). It is surprising that the two main cities, while at the top, are not the first and second places in the ranking which might signal intra-urban inequality as well. Low values for Chihuahua are observed in Rosario (MXN 822 roughly USD 63 per month) which is only 24.5% of median average municipal household income in the state. Mexico's lowest value can be observed in Oaxaca with (MXN 2 315) which is 50.5% of states' average household income. That is, the poorest municipality in the second richest state in Mexico (Chihuauhua in terms of household income) is poorer than the poorest state in the country (Oaxaca).

Figure 3.3. **Regional disparities in Chihuahua and the OECD**

Range of average household income with respect to regional median household income



1. Maximum and minimum values show each region/country's extreme values on regional average household income as a proportion of regional median income.

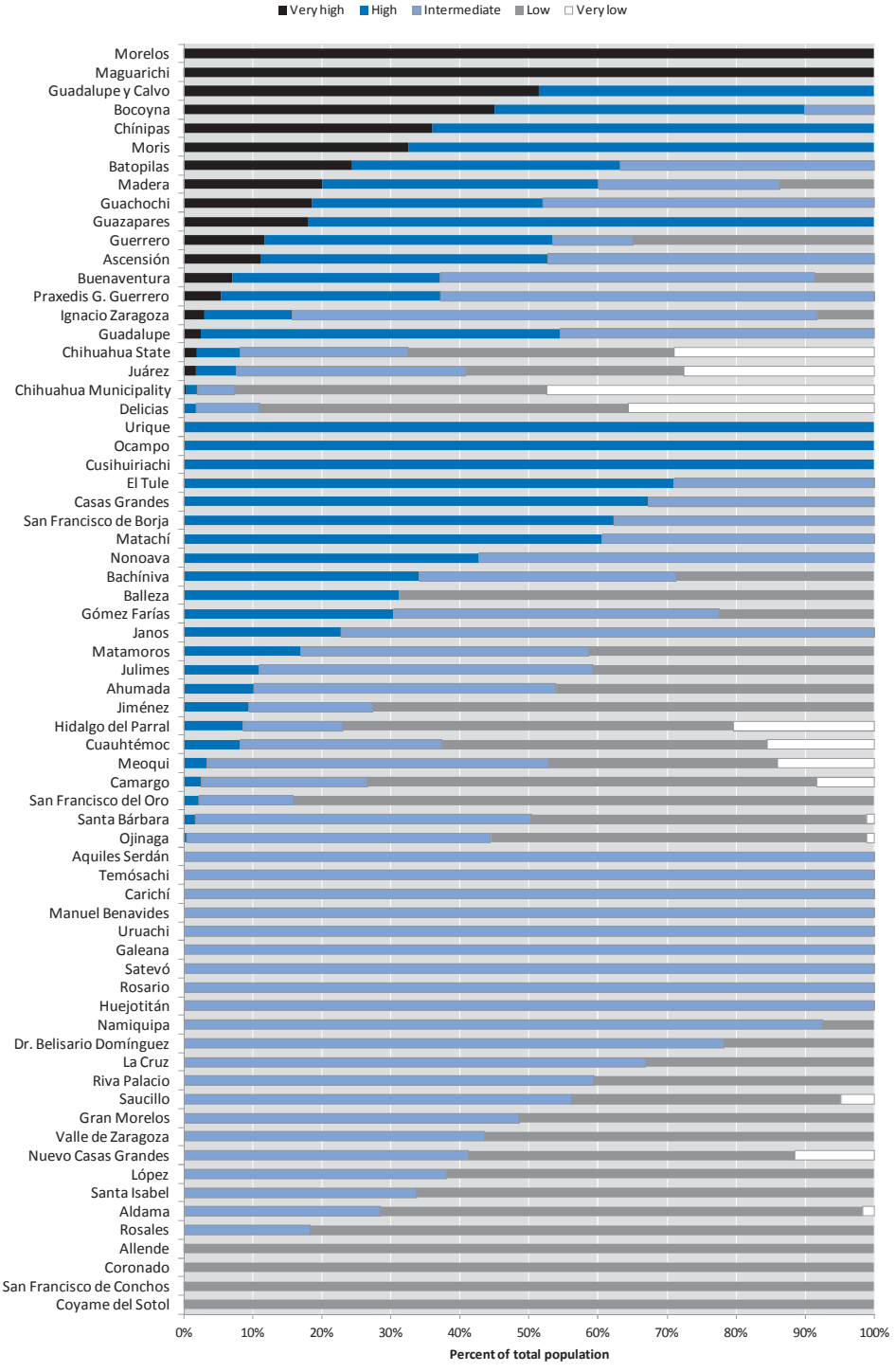
2. Data for all OECD countries refers to 2007 except for Mexico and the Mexican state of Chihuahua that refer to 2010.

Source: Author's calculations based on INEGI (2011) *Censo General de Población y* Vivienda, Instituto Nacional de Estadística, geografía e Informática (INEGI), Aguascalientes; and OECD (2011) *Regions at a Glance 2011*, OECD Publishing, Paris.

Marginalised neighbourhoods are present in some rural communities, but they concentrate in urban areas. Some rural municipalities show high and very high degrees of urban marginalisation. In 2005, municipalities such as Morelos, Maguarichi, Guadalupe y Calvo, Bocoyna and Chínipas to name a few show that whatever urban population they might have, they all lived in marginalised neighbourhoods (Figure 3.4). In contrast, people living in urban neighbourhoods within predominantly rural municipalities such as Coyame del Sotol, San Francisco de Conchos, Coronado and Allende show low levels of marginalisation. Less than 8% in the most urbanised municipalities, namely Juárez and Chihuahua, live with marginalisation. However, in absolute numbers, both account for the most part of the inhabitants living with marginalisation. Over half of all marginalised inhabitants lived in one of these two municipalities. Juárez is a particularly problematic area with almost 100 000 people living marginalised (Figure 3.5). Another 40 000 marginalised inhabitants can be found in Chihuahua City (15 000) and the medium-sized cities of the state: Cuauhtémoc (8 782), Parral (8 608), Jiménez (3 163), Casas Grandes (2 546) and Delicias (2 051). Six out of ten marginalised inhabitants in the state are urban dwellers of one of these cities.

Figure 3.4. **Urban marginalisation by municipality in Chihuahua**

Percent of municipality's population by degree of urban marginalisation

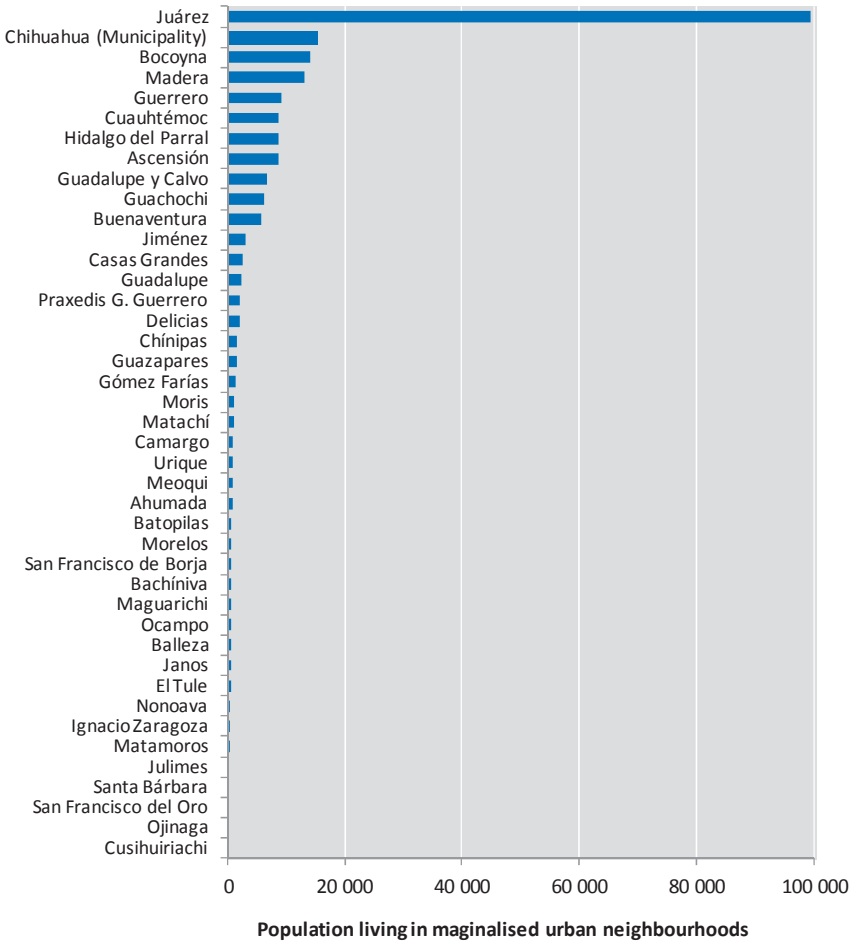


Note: Urban population was taken into account using the basic urban geographical units in Mexico (AGEBs)

Source: Author's calculations on the basis of data in CODECH (2010), *Background Report for the Territorial Review of Chihuahua*, Consejo para el Desarrollo Económico del Estado de Chihuahua (CODECH), internal document prepared by CODECH for the OECD.

Figure 3.5. **Magnitude of urban marginalisation by municipality**

Population living in urban neighbourhoods considered
to have high to very high levels of marginalisation



Note: Urban population was taken into account using the basic urban geographical units in Mexico (AGEBs)

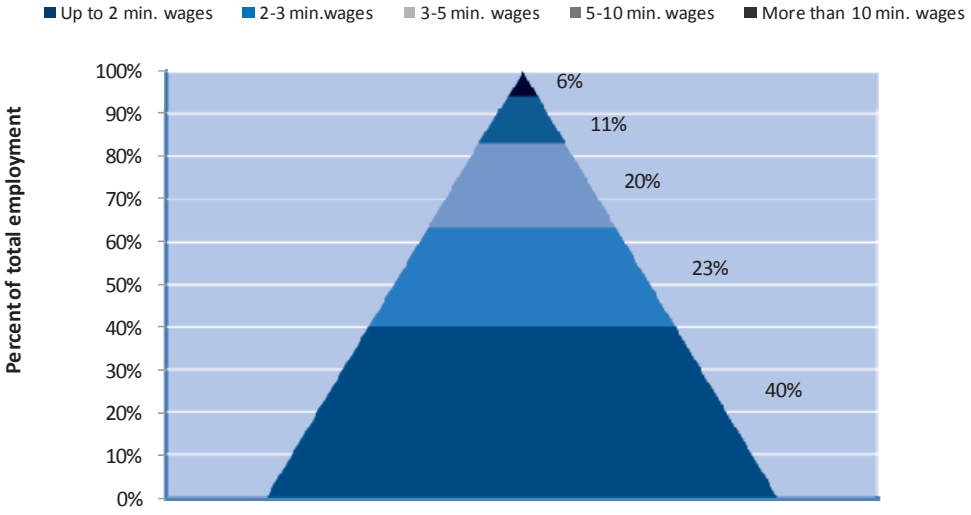
Source: Author's calculations on the basis of data in CODECH (2010), *Background Report for the Territorial Review of Chihuahua*, Consejo para el Desarrollo Económico del Estado de Chihuahua (CODECH), internal document prepared by CODECH for the OECD.

The income gap is wide in Chihuahua with most people living with lower income levels on the basis of their occupation. Four in every ten employees in Chihuahua are performing unpaid work or earn less than twice the minimum wage (roughly USD 8.80 per day); the proportion expands to two-thirds of total employment for those earning less than three minimum wages (USD 13.20) per day (Figure 3.6). One-fifth of all employees earn around USD 110 per month and 11% of total employment has earnings between USD 111 and USD 220 monthly. Only 6% of total employment earns more than USD 220 per month. Although data does not allow to cross this information with that of occupations, it does suggest certain hypothesis. In 2010, nearly half of all top management employees had earnings that fell within the two top income categories (Figure 3.7). Other professionals and technicians followed a similar trend only falling within the third and second top income categories. In contrast, 44% of all industrial workers earned less than three times the minimum wage (USD 8.80 per day) and the proportion expands to 71% with less than three times the minimum wage (USD 13.20)

per day. The situation worsens for agricultural workers. Almost 40% of employees in farming go unpaid for diverse reasons that could include family ties. An additional 36% of those working in agricultural activities earn less than three times the minimum wage.

Figure 3.6. **Wage inequality in Chihuahua**

Percent of total employment according to wage levels

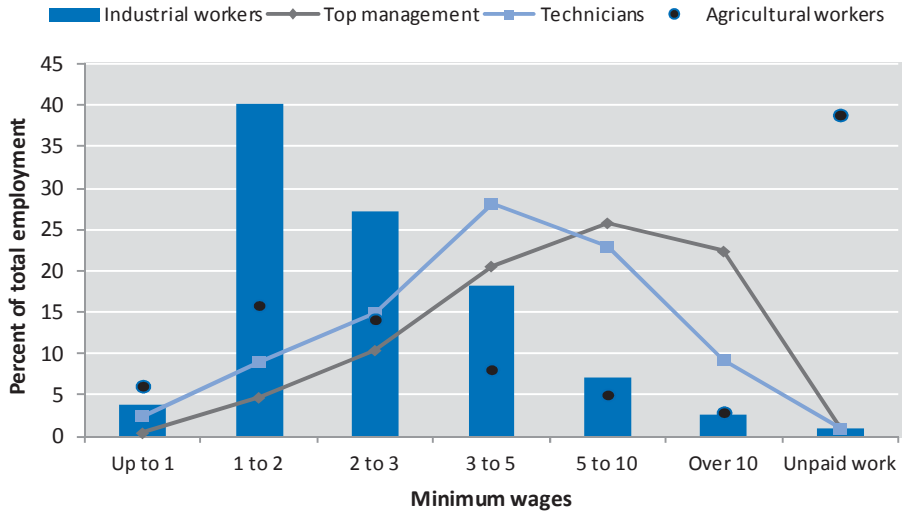


Note: Wage intervals were constructed on the basis of minimum wages. The interval "up to 2 min. wages" includes employees that earn up to 2 minimum wages as well as those with unpaid work.

Source: Author's calculations based on INEGI (2010) *Censos Económicos 2009*, Instituto Nacional de Estadística, Geografía e Informática, Mexico.

Figure 3.7. **Wage inequality by occupation in Chihuahua**

Percent of total employment by occupation and wages (2010)



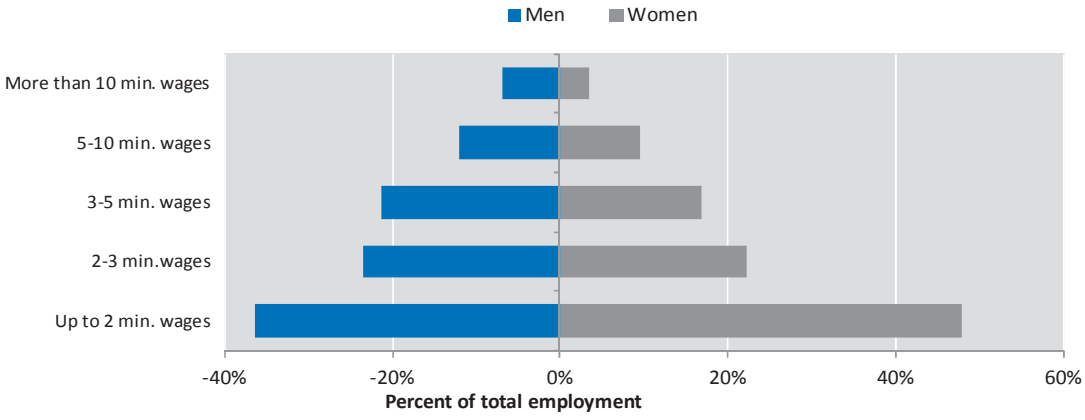
Note: Wage intervals were constructed on the basis of minimum wages.

Source: Author's calculations based on INEGI (2010) *Censos Económicos 2009*, Instituto Nacional de Estadística, Geografía e Informática, Mexico.

Chihuahua also experiences gender inequality. There are many expressions of gender inequality in the state. Some have sociological consequences such as the violence against women and some have economic implications.[1] On the latter, like in many other regions, women are paid less than men. While 36% of men earn less than twice the minimum wage, the proportion reaches 48% for women (Figure 3.8). In fact, almost eight out of ten women earn up to three times the minimum wage compared to seven out of ten men. Top earners with more than ten minimum wages are more than twice as large for men than for women: only 3% of female workers earned USD 1 144 per month. On the former, out of the 635 000 Chihuahuan females with over 15 years old that had a partner living with them in 2003, over 46% experienced some sort of violence: 39% with emotional violence,[2] 28% with economic violence, 8% with physical violence and 8% with sexual violence. It is noteworthy that the shares go slightly up to 49% for women who are economically active (INEGI, 2004).

Figure 3.8. **Gender inequality in Chihuahua**

Percent of total employment by range of income and by gender



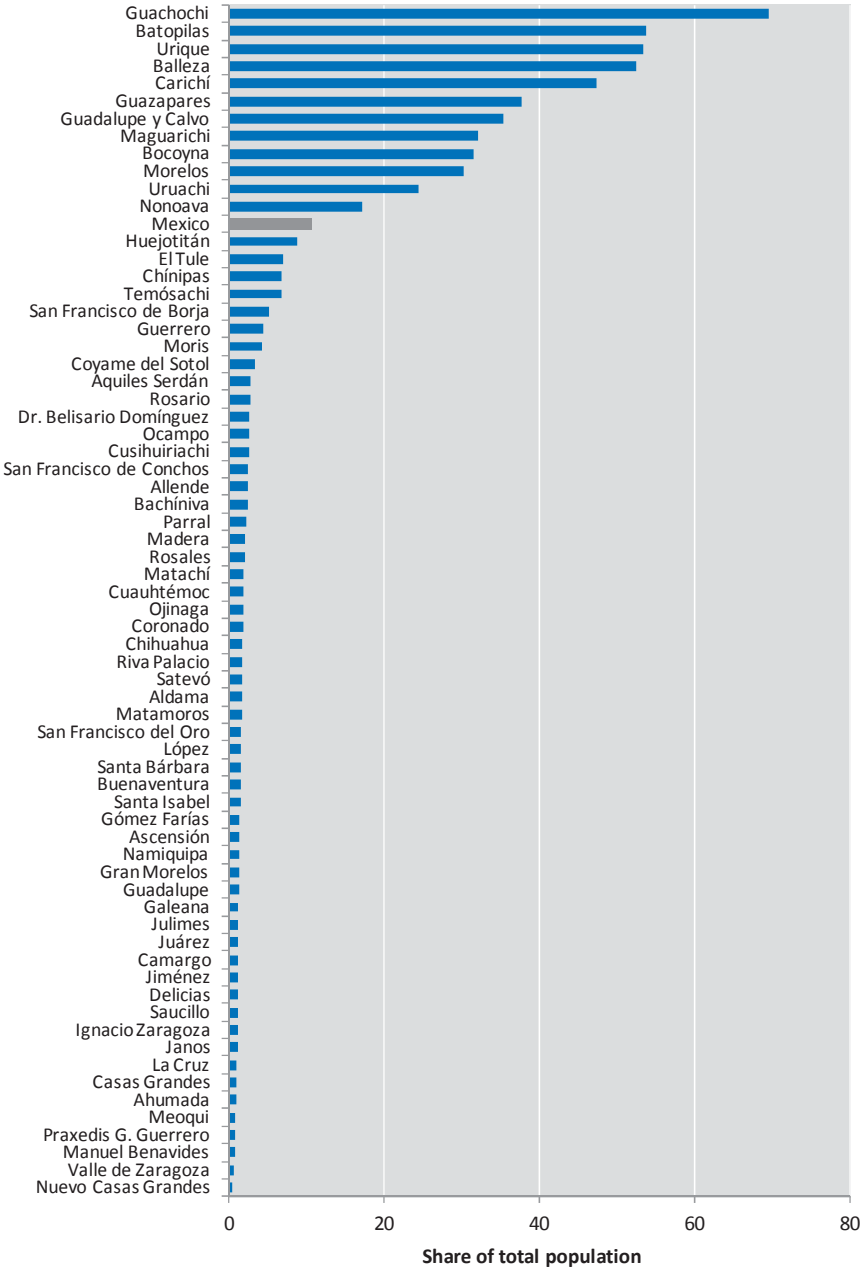
Note: Wage intervals were constructed on the basis of minimum wages. The interval for up to 2 minimum wages includes employees that earn up to 2 minimum wages as well as those with unpaid work.

Source: Author's calculations based on INEGI (2010) *Censos Económicos 2009*, Instituto Nacional de Estadística, Geografía e Informática, Mexico.

Chihuahua is the Mexican state with the largest inter-ethnic inequality. The human development index (HDI) levels for Chihuahua's non-indigenous population stood in 2006 at 26% more than the levels for indigenous groups (CDI-PNUD, 2006a). Chihuahua is also one of the Mexican states with the largest presence of indigenous groups, which are highly concentrated in the mountains to the southwest of the state. The region has a difficult topography and population tend to be dispersed in communities of less than 100 people with high to very high marginalisation (CDI-PNUD, 2006b). The state had in 2006 over 136 000 indigenous inhabitants mainly of the four different local ethnic groups: Tarahumara (88.3%), Tepehuanes (10.2%), Guarijíos (1.2%) and Pimas (0.3%). Twelve municipalities precisely in the mountainous region show indigenous population rates above the national average (10.5%): Guachochi (69.5%), Batopilas (53.7%), Urique (53.5%), Balleza (52.5%), Carichí (47.4%), Guazapares (37.7%), Guadalupe y Calvo (35.5%), Maguarichi (32.1%), Bocoyna (31.6%), Morelos (30.3%), Uruachi (24.6%) and Nonoava (17.2%).

Figure 3.9. **Indigenous population in Chihuahua, 2006**

Indigenous population as a share of total by municipality



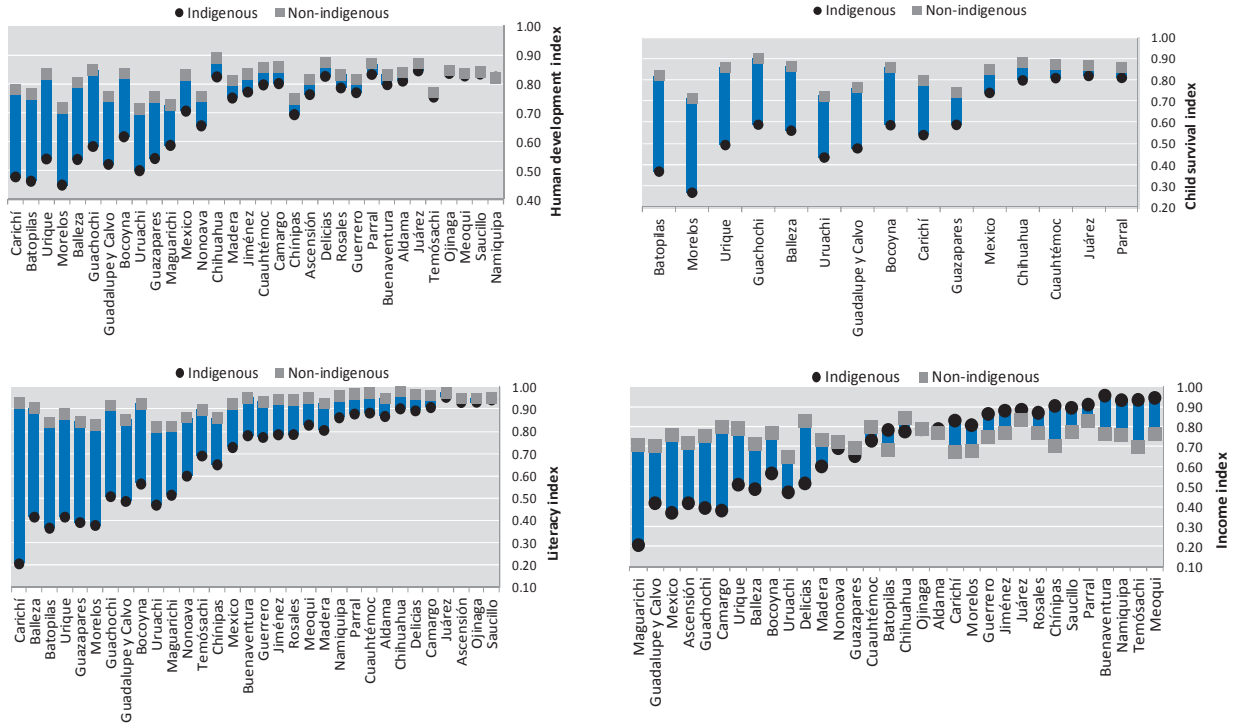
Source: CDI-PNUD (2006), *Informe sobre Desarrollo Humano de los Pueblos Indígenas de México 2006*, Consejo Nacional para el Desarrollo de los Pueblos Indígenas and United Nations' Development Programme, Mexico.

Inequality is particularly acute in municipalities of difficult geographical access. Indigenous people in eleven municipalities in Chihuahua experience a lower Human Development Index (HDI) than non-indigenous people living in the same municipality. Among other factors, lower levels of HDI among indigenous population can be partly attributed to a lower literacy and child survival scores. These eleven municipalities show larger HDI gaps between indigenous and non-indigenous population than the national

average (Figure 3.9). Carichí, Batopilas and Urique had HDI gaps of around 30% with respect to their non-indigenous neighbours. Morelos, Balleza and Guachochi experienced HDI gaps of over 26% while Guadalupe y Calvo, Bocoyna, Uruachi and Guazapares lived with the implications of gaps over 20%. Maguarichi also experienced higher than national average HDI gaps of nearly 15% (Figure 3.10). These municipalities with the exception of Maguarichi showed also child survival indices that were much lower than their non-indigenous neighbours. Indigenous groups in Batopilas and Morelos had in 2006 a lower child survival score than the non-indigenous population by around 45%; Urique, Guachochi and Balleza with gaps of over 30% and Carichi, Bocoyna and Guadalupe y Calvo with more than 25%. The eleven municipalities with higher than national average HDI gaps, also experienced a literacy gap. Carichí's literacy index for indigenous people showed a gap of 72% lower than their non-indigenous neighbours. The rest of the municipalities showed gaps that range between 31% in Maguarichi to 49% in Balleza. However, only two municipalities, namely Maguarichi and Guadalupe y Calvo showed wider income index gaps than the national average. It is possible that lower HDI among the indigenous in Chihuahua is the product of hampered access to education and health. It is also possible that social programmes aimed at giving employment to indigenous people have rendered these groups less vulnerable to income. In fact, indigenous groups in more urban settings such as Juárez, Meoqui and Parral show higher income scores than non-indigenous groups signalling social-spending transfers. But most likely outmigration from these communities led to income progress through remittances.

Figure 3.10. **Human development index gaps in Chihuahua**

Differences in scores between indigenous and non-indigenous population by municipality in 2006 for the human development index and some components



Source: CDI-PNUD (2006), *Informe sobre Desarrollo Humano de los Pueblos Indígenas de México 2006*, Consejo Nacional para el Desarrollo de los Pueblos Indígenas and United Nations' Development Programme, Mexico.

3.2. Insecurity, social issues and citizen participation

This review aims at providing analysis and advice on policies and institutional arrangements to boost Chihuahua's competitiveness and economic development. However, the advice that will follow is subject to removing the obstacles on two systemic limitations not only for economic development but also for making life possible in the region. First, insecurity levels in the state have recently gone to unprecedented levels and could be an obstacle to further attract FDI, but also make life difficult in the region to the extent that people are already fleeing to other states in Mexico or to the US. Second, water scarcity due to inadequate management have led to resource depletion in many areas of the state leaving not only rural activities unable to flourish, but also rendering urban areas in danger of severe scarcity levels that make urban competitiveness difficult (see Chapter 4). Although, the review briefly presents the main trends and shows the main limitations, precise policy advice on security in particular is beyond the scope of this review.

Insecurity trends and current changes

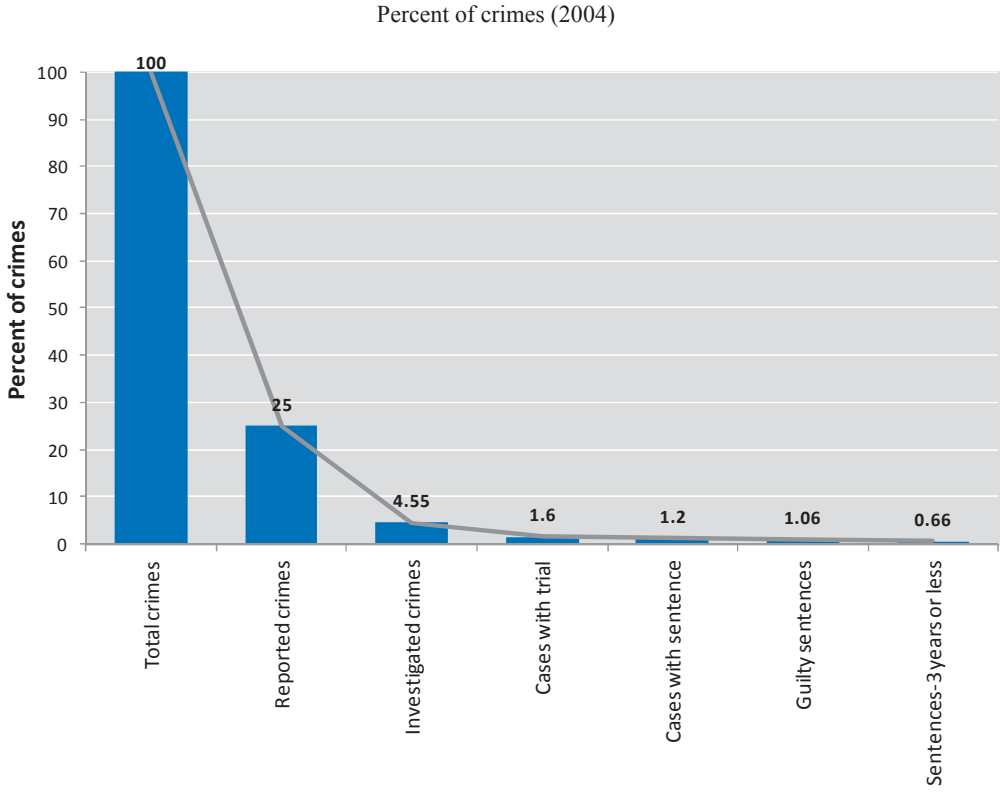
Mexico has had insecurity problems for a number of years now, partly due to inadequate justice procurement institutions. In fact, most of the differences in insecurity approaches between Mexico and the US are largely the result of different priorities. For the former, the priority before 2006 was to build professional and efficient judicial and justice-prosecution institutions to attend multiple criminality problems and fight corruption. For the latter, the priority has been to address insecurity stemming from drug consumption and gun-related violence (Chabat and Bailey, 2001).

However, progress towards better justice prosecution system has been slow and challenges are mounting. Between 1991 and 2004, district attorney offices saw an 85% increase in reported crimes (Arellano Trejo, 2004). Violent crime is also growing fast. Arellano Trejo (2004) argues that in the 1970s, Mexico experienced ten violent crimes per 100 000 inhabitants which increased to 12 in the 1980s. Although the rate has gone down to 11.1 in 2004, this figure is among the top ten in the world. Only recently have some states – among which Chihuahua – made reforms that will allow them to have better judiciary systems featuring oral and public trials. However, transition in these states has been slow and ineffective. First, there are unresolved co-ordination issues due to different systems operating in different states and the federal level. Second, there are clear opportunities to upgrade skills needed for the new system to run properly. Third, investment in infrastructure to allow live, video-recorded court proceedings is needed. Fourth, monitoring systems to assess performance needs also to be designed and put in place (Shirk, 2011). These challenges are quite understandable given the fact that Mexico is trying to change hundreds of years of legal tradition in a relatively short time.

Mexico had severe insecurity problems linked to impunity even before the Mexican government implemented a strategy to address organised crime in 2006. There are a number of worrying statistics in Mexico's judicial process. First, there is an extremely low level of reported crimes due to lack of citizens' trust in authorities. According to the UN International Crime and Victimisation Survey (ICVS, 2005), between 1999 and 2004, three of every four crimes went unreported. According to Concha Cantú et al. (2004), eight out of ten citizens thought the police was corrupt, and half of the population believed judges were not independent. Second, there is a lack of prosecution as investigation in the vast majority of cases is not concluded. Prosecutors finish

investigations in only 4.5% of crimes (Figure 3.12) which represents 18.2% of reported crimes. Mexico's Citizen Institute for Studies on Insecurity (ICESI, 2002), finds a similar figure: only 17% of reported crime was prosecuted. In Arellano Trejo's opinion such a lack of prosecution can be translated into 83% of impunity. Third, lack of trials might signal lack of transparency. Only 1.6% of cases have a trial and a judge. According to the United Nations Office on Drugs and Crime (2010), Mexico's judiciary system prosecuted only 30.7 persons per 100 000 inhabitants, which compares very low to those for Chile with a rate eight times higher (257 for 2008), Canada 43 times (1 313 for 2008), Portugal almost 55 times (1 686) or Finland with more than 150 times (4 561). Fourth, although the system seems very effective once a trial is reached, arguably many individuals charged with crimes are deprived of due process, spend long periods in jail without formal sentence, obtain inadequate legal defence and suffer human rights abuses (Cornelius and Shirk, 2007). Three-quarters of trials end up with a sentence and such a sentence is guilty in almost 90% of the cases. Finally, in some cases, two-thirds of those sentenced to spend less than three years in prison.

Figure 3.11. **Impunity and judicial process in Mexico**



Source: Author's calculations based on data reported in Zepeda Lecuona, G. (2004) *Crimen sin castigo: Procuración de Justicia Penal y Ministerio Público en México*, Fondo de Cultura Económica-CIDAC, México.

Recent insecurity

In 2006, Mexico launched an aggressive strategy to tackle organised crime. In the National Development Plan (2006-12), President Calderón established objective 8 within Axis 1 (Rule of Law and Security) and more precisely axis 1.4 (Organised Crime) as "recover the strength of the State and security in social interactions through head-on and effective combating drug-trafficking and other criminal groups". Such an objective has been pursued through four strategic actions: *i*) provide technological aid to armed forces to deploy them in the territory and recover areas controlled by drug-lords, *ii*) implement a multi-level co-ordination policy that will orchestrate actions to tackle street-level drug-dealing, distribution centres and labs, *iii*) reach international standards to abate money laundering, *iv*) break-up value chains in drug-trafficking (Presidencia de la República, 2007). According to the Fourth President's Address to the Nation, in 2009 the General Attorney's Office had published the names of the 37 most wanted drug-lords in Mexico, by the time of the address in September 2010, the Mexican strategy against organised crime had captured 19 (51%) and 1 773 people connected to the drug cartels had been apprehended; by September 2011 the number of most wanted criminals that were captured increased to 21. The Fifth Presidential Address to the Nation (*Informe de Gobierno*) published that in the current administration 6 560 kidnappers were caught, 5 725 victims were freed and 902 gangs were destroyed. Unofficial death-toll estimates related to the battle against organised crime – and as a consequence of the latter on civil population – stand at around 40 000 people. In Juárez, the Mexican Institute for Competitiveness (IMCO) a private-sector think-tank, estimated that 30% of businesses closed down due to insecurity and the homicide rate per 100 000 inhabitants grew by 575% since 2006 (IMCO, 2010).

Crime in Mexico is perceived to be running rampant despite spending and actions on that sense, and no other place in Mexico is perceived to be as insecure as Juárez. Almost 90% of population in the state believed they were unsafe in Chihuahua, which is the highest proportion in the country (INEGI, 2011b). According to the 7th Survey on Insecurity carried out by the Mexican Citizen's Institute of Studies on Insecurity – the most reliable source of data on the issue – the perception of insecurity has increased in Juárez much more than anywhere in the country: 93% of the population thinks the city is unsafe against 65% for the country. Such perception is held due in turn to population's perception on government's actions and investments such as the lack of policing (51% of population) and public lighting (37%), but also for unemployment (36%). Such perception contrasts with the percent of inhabitants that became a victim of crime. In 2009, 12.1% of population were victimised in Chihuahua, which is above the national average rate at 10.1%, but almost half of that in DF (Mexico City) at 21%, and lower than other states such as Aguascalientes at 14.3%, Sonora 13.2%, the Estado de México at 13.1% and Baja California Sur at 12.6% (INEGI, 2011b).

But Mexico and the Mexican states are spending a large and growing share of their budgets on security, yet with rising costs for the economy. In 2009, Mexico spent more than 19% of its budget on security. Spending at state level represented an even larger share: 50.6% of state's budget was dedicated to security. All in all, according to the *Instituto Ciudadano de Estudios sobre la Inseguridad AC* (ICESI/Citizens' Institute for Studies on Insecurity NPO), insecurity in Mexico has meant a loss of almost 7.4% of GDP in 2007 (ICESI, 2010). Such economic losses are 20% larger than they used to be in 2007, which means that every Mexican lost almost MXN 10 000 in 2009 to insecurity, which represents almost half of yearly earnings for someone on minimum wage. IMCO

(2009) arrives at similar conclusions in terms of the cost per inhabitant (USD 770) arguing that 39% of such cost is related to crime and corruption as families take security measures and the cost of corruption is factored in; 56% of costs are economic losses for firms and 5% is related to health. With more than one-third of budget spent on insecurity, Chihuahua's budget on that item is among the top 5 in the country. However, in per capita terms, Chihuahua's budget allocation for security fell 1% with respect to 2008. Such a decline in budget allocations is even more acute at municipal level. Chihuahua's municipalities allocated 62% less resources in 2010 than the previous year. According to Villalobos (2008) from 1997 to 2007, Mexico spent almost USD 100 billion to tackle insecurity which is roughly 3.5 times what the country has invested in infrastructure in the same period through the National Infrastructure Fund.

Despite mounting costs, Chihuahua seems to be on the brink of changing the trend, but Juárez unfortunately is still in trouble. Chihuahua state's crime rates have recently been falling. In 2010, 12% of the population aged 18 or more have been victims of a crime, down from 14% in 2009. In Ciudad Juárez the situation has not changed with rates standing at 15% in both years, which has led to outmigration and vacant housing by the thousands. The situation worsens when homes instead of people are taken into account. In 2010, 21% of homes in Juárez have experienced crime, up from 15% in 2009, which can be explained by increasing crime towards minors. Indeed, homes in Juárez experienced an increase in crime rates against minors from 3% in 2009 to 8% in 2010. Chihuahua is also the state in Mexico with the 3rd largest burglary rate in the country (51%), and Juárez and Chihuahua City are respectively second and third place among urban areas in the country. At 45.7 per thousand homes, Chihuahua state's motor vehicle theft rate was the highest in the country. Although mugging in Juárez stands at one-third of Mexico City's figures, figures in Juárez are two-thirds of Mexico City's when it comes to extortion.

The new administration is making great strides in tackling crime and is doing so with the help of civil society. More recently, the State Governor César Duarte during the launching of his State Development Plan in Chihuahua City on 27 June 2011 declared that executions related to the organised crime had fallen 60% compared to the previous year. In addition to policing efforts, the State Government established the State Security Council, integrated by actors from civil society and the private sector. The Council has been mandated to foster civil auditing and observatories, advice on social policies to complement the fight against organised crime. At the same time, the Council has been active in proposing a unified and professional police and an intelligence centre, as well as in developing strategies to fight crime in particular extortion, kidnapping and motor vehicle theft. Chihuahua must continue to reduce crime and bring back the safe environment it once used to enjoy in order for any development strategy to work.

Also federal social policy has been helpful in partly addressing the roots of the problem. The *Oportunidades* Programme increased scholarships by 30% for people in the most segregated parts of Juárez. More than 5 000 rooms were built for families living in overcrowded homes. The Ministry of Social Development (SEDESOL) also has implemented a temporary job programme in the city and has supported the development of Community Development Centres to promote sports, training, schooling and even provide medical consultation. SEDESOL has also supported the Public Spaces Recovery Programme, as well as the overarching programme *Todos Somos Juárez* (a federal programme with state and municipal participation as well as civil society) that has put forward a strategy based on 160 commitments in six axes (security, economy, jobs, health, education and social development). *Todos Somos Juárez* has built schools,

extended school times so that kids are secure at school while parents are at work, as well as built health centres.

In the particular environment of the State of Chihuahua, with its severe security and safety problems, the need to co-operate across agency and organisational boundaries is even more evident. Apart from the straightforward aspects of the standard support for inward investors, indigenous companies and new enterprises, the peculiar circumstances of the state – and this affects both the *maquiladora* and local businesses alike – means that protection of people and property is a fundamental and critical factor for all. This situation imposes costs on both the private and public sectors, as well as negative effects on firms' competitiveness and the economy as a whole. While there is evidence of some of these costs and impacts, as well as of the need to enhance security protection, there is far less certainty on the market effects of labour being deterred from migrating to, or deciding to move away from, the employment opportunities in Chihuahua. According to unofficial sources in local and national press, Ciudad Juárez has lost 80 000 people that have left the city due to insecurity.[3] Normally this would be expected to raise wage costs with premia being required to attract and retain workers, but that doesn't seem to happen yet. Beyond these costs to enterprises and state budgets alike, there will be hidden payments and other financial and non-pecuniary penalties to conducting business in this context. This environment confirms the advantages of public-private partnership working to meet common economic and enterprise aims and objectives (see chapter 2 section on multi-level governance.

Progress tackling insecurity

One year after taking office in October 2010, the new administration is addressing crime prevention and mitigation, as well as social rehabilitation. The government's strategy to prevent crime is based on education as part of a larger social development programme that in addition seeks complementarities with economic development through *Chihuahua Vive,* the new government's flagship programme (see below section 3.3). In addition, more than 1 600 new police officers became active, and another 1 200 are being trained within a framework that requires systematic evaluations. The new government is also fighting crime with tangible results. The State Congress approved a piece of legislation mandated life imprisonment for kidnappers, police officer homicides and for extortion. As a result, the judiciary system has sentenced 28 people to life imprisonment, has detained 195 kidnappers, 151 abductions have been resolved and 52 gangs have been dismantled. Federal-state co-ordination with the army has allowed 126 tactical operations in the most important prisons and allowed seizure of over 140 firearms, large amounts of ammunition, homemade weapons, almost 500 mobile phones and drugs. Such effective vertical co-ordination to fight crime is best portrayed with tactical operations CONAGO 1 and CONAGO 2 where Chihuahua got the best results among participating states. For instance, in CONAGO 1, Chihuahua recovered almost 3 000 stolen vehicles, detained 60 kidnappers and made over 6 500 arrests. As a result, annual homicide figures have been reduced by 40% since the new administration took office, vehicle hijacking numbers have contracted by 27% and more than 11 000 vehicles have been recovered. The new administration is also investing in helping the victims of crime – mainly women and children – recover psychologically and offering legal and social work advise (Fiscalía General del Estado, 2011).

3.3. Policies to tackle social challenges

The Federal Government is providing useful help to address inequality, particularly for women and children development. The Ministry of Social Development's (SEDESOL/*Secretaría de Desarrollo Social*) Child Nurseries Programme (*Estancias Infantiles*) for instance provides subsidies that range between MXN 35 000 and MXN 50 000 to make physical improvements to nurseries. In addition, SEDESOL also provides subsidies to cover for the cost of nurseries. The *Oportunidades* Programme has been instrumental in reducing inequality and has become a model for successful poverty-abatement policy design. Nevertheless, the need to better co-ordinate social and educational policy to increase the impact of the programme has been identified as a major challenge. While cash grants – conditional or not – can be criticised, the *Oportunidades* and the *Estancias Infantiles* programmes are valuable to develop children capacities at an early age which can be determinant of future academic achievements as has been proven not only in Mexico, but also by the progress made in Brazil thorough their Bolsa Familia (Box 3.1). It is also valuable because it increases mothers' capability to engage economically in the labour force. For the state, a larger female participation rate although already higher than the national average, would result in greater income and increased attractiveness for firms as the pooled labour market increases. It is in fact, a good example of a social policy with economic implications which should be sought. One of the main objectives of social policy is to break the cycle of disadvantage across generations and prevent the development of a self-replicating underclass. The evidence OECD (2008) suggests that interventions targeted at improving childhood outcomes are desirable. Such interventions have become a much more important feature of social policies in most OECD countries in recent years. Reducing the stress and anxiety of children, from whatever source, and providing them with greater educational opportunities will have a pay-off in the incomes they subsequently command and the longer-term contribution that they make to society as adults. Tapping their full potential is key to promoting both economic growth and equality.

Chihuahua has strong and useful social development programmes housed in the Secretariat of Social Development (SFS/*Secretaría de Fomento Social*) in particular those aimed at children, women and handicapped population. A good example of social policy is the efforts that the Community Centres (*Centros Comunitarios*) are doing. Through empowered leadership, a still underfunded programme is building centres in Chihuahua's most marginalised urban neighbourhoods and providing support for children and women. Children can get school support to do homework through the *Rincón de las Tareas* and reading at a young age is also encouraged through storytelling like many European local libraries do. In addition to resources to expand their geographical presence, Community Centres can look at the UK experience. In particular, the Scottish Storytelling Centre is providing training to foster storytelling capabilities. Canada's London (Ontario) public libraries have also developed their READ (Reading Enjoyment and Development) programme, which is designed to help children who are experiencing difficulties with reading by motivating them to read and use libraries, creating a positive relationship with a volunteer reading partner, encouraging families to read together and introducing children to a variety of reading materials. These programmes have a long-lasting effect as early reading habits have been shown to reflect in better academic performance later in life. Once again, Community Centres can also play a long-term economic role. Similarly, women are empowered to learn a craft that can enable them to get into the labour market, so that centres play also that medium-term role in economic performance.

Box 3.1. **Conditional and unconditional grants for social development: evidence from Brazil and South Africa**

Brazil. *Bolsa Familia* is a large-scale cash-transfers programme that has had a major impact on female participation rates. Those benefiting from *Bolsa Familia* have shown 16% greater than for women in similar non-participating households. The programme has also reduced the probability of employed women leaving their jobs by 8%. By linking to services such as pre-schools and day-care, encouraging girls to continue their education and otherwise easing the time burdens placed on women, it offers women more opportunity to seek and continue employment (OECD, 2009c). *Bolsa Familia* has arguably been increasingly responsible for the decrease in income inequality, especially after 2000. Influenced by the expansion of the *Bolsa Familia* conditional cash transfer programme to poor households, income from social programmes increased between 2003 and 2008 at a rapid rate. This was followed by pension income, which is linked to the minimum wage. Even if income from work explains 70% of the reduction in inequality in Brazil between 2001 and 2008, social programmes are the second factor, followed by old-age pensions (accounting for 17% and 15.7%, respectively). The remaining incomes explain only 1% of the inequality reduction (Arnal and Förster, 2010).

A comparison between Brazil's *Bolsa Familia* and Mexico's *Oportunidades* carried out by a UNDP study (see Veras Soares et al., 2007) yields contrasting outcomes and demonstrates that cash transfer programmes face a trade-off between extending coverage and improving efficiency in targeting. The programme in Mexico has more efficient targeting than that in Brazil but at the price of having fewer poor households covered by the programme. Indeed, it is very difficult to expand a targeted programme while keeping the leakage rate from rising. The number of poor that are not beneficiaries (with respect to the total poor) is 70% in *Oportunidades* but 59% in *Bolsa Família*. In contrast, *Bolsa Família* has a higher inclusion error: 49% of all beneficiaries in *Bolsa Familia* are non-poor, which contrasts with only 36% for *Oportunidades*.

South Africa. The unconditional Child Support Grant in South Africa is also associated with an increase in the labour force participation of mothers (OECD, 2009c). In South Africa the importance of public transfers as a share of total income has increased (from 5.4% in 1993 to 7.9% in 2008), compensating the loss in remittances observed mainly since 2000. However, transfers do not seem that they have had a major impact on inequality. Evidence shows that South African state transfers make up less than 1% of the overall Gini coefficient of per capita household income (Arnal and Förster, 2010).

Source: OECD (2009), *Promoting Pro-Poor Growth: Social Protection*, OECD Publishing, Paris; and Arnal, E. and M., Förster (2010) "Growth, Employment and Inequality in Brazil, China, India and South Africa: An Overview" in OECD (ed.) *Tackling Inequalities in Brazil, China, India and South Africa: The Role of Labour Market and Social Policies*, OECD Publishing, Paris.

Through the *Coordinación Estatal de la Tarahumara*, the SFS also aims at providing aid to ethnic groups precisely in marginalised areas. Although there are serious doubts that any progress has been made in relieving poverty and exclusion from ethnicities, the new state government has recently decided to relocate the organism to the mountains to get their services and help closer to social groups in need. While such a decision is unquestionably positive, there is also a need to include economic aspects to their programmes perhaps by better linking it to the Secretariat of Economy and in particular its Programme for Employment in Marginalised Areas. However, in terms of housing, Chihuahua's new Self-Built Rural Housing Programme can become a best practice in Mexico. Through this programme, the state government in collaboration with federal authorities, pays a wage and provides methods and materials to ethnic minorities in rural and remote areas to build their own homes based on methods developed by the state that are suitable to the local environment.

The false dichotomy: policy complementarities between social and economic instruments.

For some, inequality is part of the process of economic development and can be reduced through urbanisation and industrialisation. Inequality is associated with lower income societies as savings can only be realised at the very peak of the income distribution (Kuznets, 1955). A key aspect of such observation of inequality is that development implies moving from a rural society with a dominant agricultural sector to urbanisation and industrialisation. If this approach to inequality was correct, convergence in income would depend on the distance from the steady-state a particular country or region is (Barro and Sala-i-Martin, 1995). Some argue that what matters for convergence is that the catch-up process by lower income regions is determined by their ability to absorb knowledge from the technology frontier (Rodrik, 2011). In this view, what matters are active policies that foster structural change from low-productivity activities such as traditional agriculture towards higher productivity activities in tradables (Rodrik, 2011). The basic idea in such a view goes back to Kuznets (1955): fostering urbanisation and industrialisation will eventually deliver convergence.

For some others, inequality limits and even harms economic growth. Income distribution in a country is negatively correlated with subsequent growth (Alesina and Rodrik, 1994). Such relationship is explained in the literature as the product of distributional conflict. Societal pressure to redistribute income in countries experiencing severe inequality leads to taxation; fiscal measures in turn, result in lower investment and growth (Persson and Tabellini, 1994).

Another aspect related to the political economy of growth is the degree of rent-seeking in the economy. As the rewards to rent-seeking are endogenous, an economy can be trapped in a cycle that favours rent-seeking behaviour, reduces in turn marginal productivity of investment and the rewards to entrepreneurship (Acemoglu, 1995). Some others, explain countries' differences in per capita GDP as the result of progress in human capital development (Lucas, 1993).

Social policies can be complementary to those that seek efficiency just as economic growth can reduce inequality. The equity-efficiency dichotomy is a false one. Access to education is an example, addressing urban and rural poverty environments, as well as extreme poverty can have a real impact on a place's economic dynamism. Addressing gender inequality in professional opportunities and providing the right mechanisms so that women are paid in equal circumstances than their male counterparts are also important to increase women's participation in the labour force and influence overall income levels (see chapter 1 on decomposition analysis of GDP). Similarly, ensuring that children do not desert education through measures such as scholarships is a way in which social exclusion and economic growth can be complementary. Other examples can be found in investing in network technologies and health (Box 3.2). Ensuring that Chihuahua continues – and actually increases – to be an attractive destination for FDI and domestic investments is key to formal employment that can lead to economic growth while tackling inequality in health access.

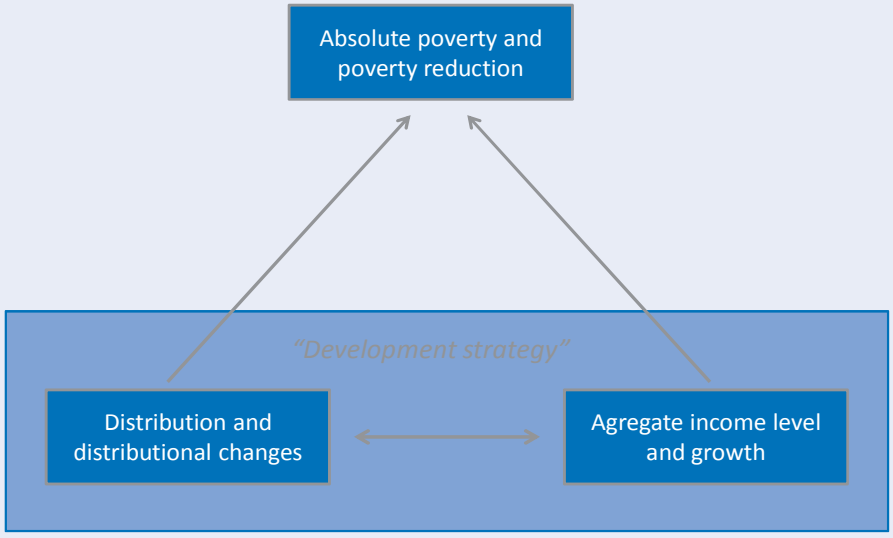
Inequality in health hampers economic growth not only in low, but also in middle-income countries like Mexico. Although Acemoglu and Johnson (2006) argue that there is no evidence that the increase in life expectancy over the last 60 years led to faster growth of income per capita or output per worker, evidence casts doubt on the view that health has a first-order impact on economic growth. Lowering inequality in the access to health services may lead to an increase in aggregate productivity. A conservative estimate

by Grimm (2011) found that among 62 low and middle-income countries, a reduction in health inequality measured as a reduction in child mortality in low-education groups by 4.25 per 1 000 children per year (i.e. by 5%) leads to an almost 8% increase in GDP per capita after a period of ten years. Grimm (2011) also finds a positive effect of life expectancy on economic growth that is – in terms of its magnitude – in line with other estimates in the literature.

Box 3.2. **The equity-efficiency false dichotomy**

Although governments often consider there is a trade-off between addressing inequality/poverty and growth, this is not necessarily the case. Growth at the national level, for instance, has been shown to reduce poverty. Dollar and Kraay (2004) have found that every percentage point increase in mean income due to growth is associated with an exactly corresponding increase in income in the lowest quintile. Similarly, Bourguignon (2004) argues that the dilemma of policy focus on growth, poverty, and/or inequality is a false one. Addressing poverty and inequality in general is a meaningful development goal for equity reasons. But in addition, to achieve the goal of rapidly reducing absolute poverty requires strong, country-specific combinations of growth and distribution policies (Bourguignon, 2004). Poverty reduction would be according to Bourguignon (2004) the outcome of two effects. The growth, effect would reduce poverty by increasing income across the distribution of income but won't necessarily reducing inequality. The distribution effect would reduce poverty and inequality by improving income in the lowest quintile (see figure below). The OECD (2009d) has argued that all show increasing returns on adoption of policies that increase investment in those areas so that efficiency raises with greater equity in such areas.

The Poverty-Growth-Inequality Triangle



Equity approaches aim to reduce financial disparities between people and places (where sub-national authorities are responsible for basic public services).

Efficiency approaches aim to foster growth in places that may already be relatively wealthy. They are based on the increasing acknowledgement of agglomeration effects.

Box 3.2. **The equity-efficiency false dichotomy** *(cont.)*

In practice, equity and efficiency policies can be complementary:

- "Increasing returns to adoption" (positive externalities associated with a growing number of users) is a characteristic of knowledge economics. This is obvious in the case of network technologies, but it also applies to education, since the acquisition of diplomas, whether within a country or abroad, increases national innovation capacity. Similarly, increasing the number of people receiving health treatment benefits the whole population. Thus, equity in public spending can increase efficiency.
- "Decreasing returns on investment", or an excessive concentration in the allocation of public spending, will constrain its capacity to produce additional results. For example, in France, a small number of students of the *Grandes Ecoles* receive disproportionately more public funds than university students, with lacklustre results overall. Again, more equity in public spending can raise efficiency.
- "Dynamic perspective" investment in wealthy regions with favourable growth potential can result in extra wealth, which can then be redistributed. Similarly, efficiency in public spending (either by limiting the cost of public policy for the same results, or by improving its outcomes) can increase the resources available for the equity objective.

Note: This is not necessarily the case at sub-national level. In Indonesia, growth has benefited the poor in some regions but not others, depending on market access. In fact, urban areas experience a slight increase in poverty, while poverty is reduced in most rural areas (Friedman, 2005).

Sources : OECD (2011), *Urban Policy Reviews: Poland, OECD Publishing, Paris;* Bourguignon, F. (2004), "The Poverty-Growth-Inequality Triangle", paper presented at the Indian Council for Research on International Economic Relations, 4 February 2004, New Delhi.

However, for complementarities to be effective, a long-term vision and strategy is needed. One-shot redistributions cannot have long-lasting effects. Short-term aid does not affect the unique invariant distribution of income. A long-term strategy is required since "permanent redistribution policies must be set up in order to durably improve the efficiency of the economy in steady state" (Aghion and Bolton, 1997). The State of Chihuahua can evaluate how a long-term strategy can have a durable effect on income and growth can be set up. Perhaps current programmes in different secretariats can be redesigned to include economic and social aspects. For example, the Secretariat of Social Development and the Secretariat of Economy can constitute a task force to look at employment, poverty and health aspects of their programmes so that they are linked and mutually reinforce. Under such a scenario, the *Chihuahua Vive* programme seems like a suitable mechanism to make actors and programmes converge and provide a vision not only for social but for overall wellbeing. Chihuahua has already in place a Programme for Employment in Marginalised Areas that needs to further seize funds from the federal government (as they are currently underexploited), which can be used to test other social aspects that can be incorporated or mechanisms in which the programme is linked to other social requirements.

3.4. Fiscal challenges

Mexican fiscal federalism is characterised by a significant fiscal gap that clearly sets the country apart from other OECD countries. Mexican sub-national finances reveal a sharp discrepancy between transfers from the central government and state's own-resources stemming from local taxation. Among OECD countries with federal

institutional arrangements, Mexico's sub-national governments are not only the regions of the OECD with the least resources as a proportion of GDP, but they heavily rely on transfers. The lion's share of public finances in Mexican states are either earmarked or non-conditional transfers from the federal government and local taxes make only for a negligible part of their resources (Figure 3.13). Furthermore, sub-national governments in federal countries in the OECD such as Canada, Belgium, Germany or Australia derive much of their resources from local taxation. As a result, regions in these countries are highly autonomous. When transfers are used, many federal countries notably Canada, Spain and Italy rely on non-conditional as opposed to earmarked transfers, and even when countries use more earmarked funding than non-conditional transfers, as in the cases of Austria or Switzerland, they all have an important part of their resources stemming from their own taxation. In contrast, Mexico is the OECD federal country with the lowest local taxation rate and the highest proportion of resources conditionally transferred to regions, a combination that curtails autonomy and decision-making.

Tax autonomy and revenue

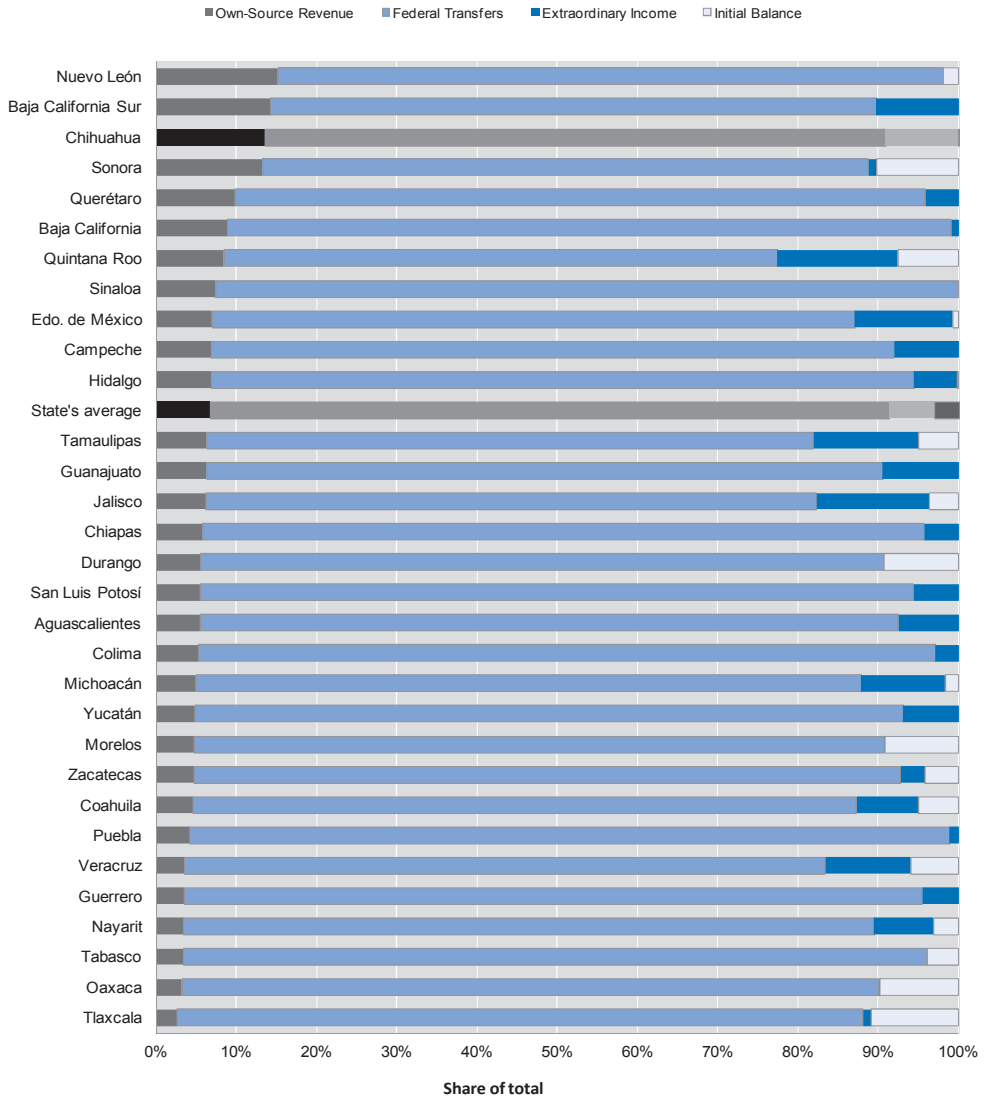
Mexican states are not only the regions with the lowest tax autonomy among OECD federal countries, but tax autonomy has barely made any progress over the years. Mexican states' taxation represents just over 2% of total revenue in the country the OECD average for regions in federal countries is ten times greater. Canadian, German, Spanish or Swiss regions account for over 20% of total national taxation. After Mexico, Austrian regions show the lowest tax autonomy among federal countries; but even in that case, autonomy is 4 times greater than Mexico. Most countries have exhibited meagre to none tax autonomy growth rates between 1995 and 2007. But nonetheless we can distinguish three models of tax autonomy evolution among federal countries in the OECD. First, high but stagnated autonomy countries, such as in the cases of Canada, Switzerland and the US. Almost 60% of Canadian and over 53% of total state-level revenue in Swiss and US regions were accounted for by regional taxes. Second, intermediate to high autonomy countries that have grown in terms of state-level tax autonomy, such as in the cases of Belgium and Spain. Belgian regions obtain more than 16% of their revenue from own taxes, but the figure has doubled since 1995. Spain exhibits the strongest growth among federal countries. More than 54% of regional revenue in Spain's *Comunidades Autónomas* is obtained through their own taxation, and the figure reflects a 38.4 percentage points increase in 2007 with respect to 1995 levels. Third, intermediate to high autonomy countries that have seen an increase in autonomy mostly at the local level –as opposed to the state. Austrian regions saw their own taxation revenue shares decrease by almost four percentage points, but local areas saw an increase of more than 11 percentage points since 1995. Germany's *länders* already collect through taxes more than 72% of their revenues and, 2007 figures reflect an increase of 3.3 percentage points from 1995 levels. However, local areas saw an increase of 10.3 percentage points in autonomy. In dire contrast, Mexico's tax autonomy stands at 5% of total revenue and from 1995 to 2007, Mexican states have only gained 0.23 percentage points in tax autonomy (OECD, 2011c).

Chihuahua stands out as the state in Mexico with the second highest tax revenue as a share of total income, only behind the Federal District.[4] In 2009, taking into account total own-source revenue (not only taxes, but user fees, asset-based revenue and others), Chihuahua ranked third among Mexican states (excluding DF), only behind Nuevo León and Baja California Sur (Figure 3.12). By 2011, own-source revenues represented 15% of the state government´s total revenue in 2011, up from 13.6% in 2009. Among the main own-sources revenue are taxes and user-fees. Tax revenue stood in 2011 at only 4.3% of

total revenues. In 2011, Chihuahua's main tax was the payroll tax, which accounted for 68.7% of total tax revenue, but only 2.95% of total state revenue. The lions' share of user-fees revenues came from toll roads which accounted for almost 58% of such revenues. Although Chihuahua is the Mexican state with the third largest own-source revenue (Figure 3.13), those stemming from user fees are larger; the state benefits more from toll roads than the largest regional tax.

Figure 3.12. **Structure of revenues by state, 2009**

Revenues by major source as a proportion of total



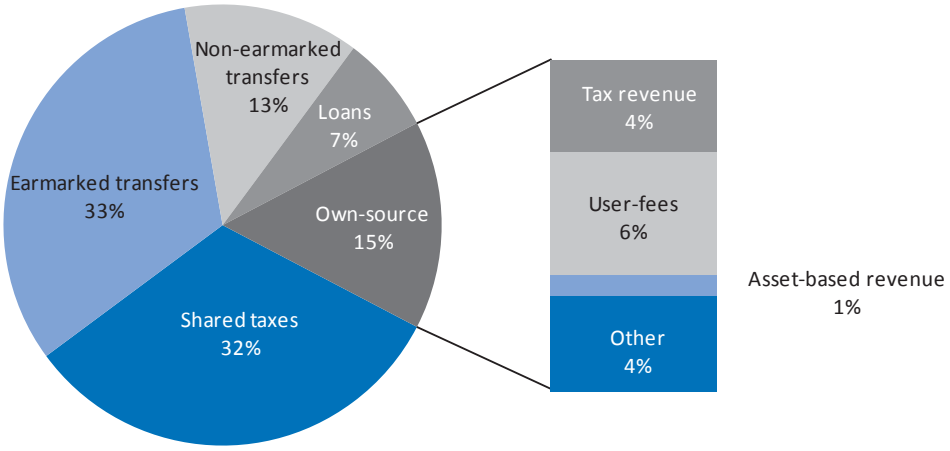
1. Own-source revenue includes taxes, user fees, asset-based revenue and other. In turn, user-fees revenue includes public property and civil registrars, transit permits, toll roads, and other. Asset-based revenue includes revenue from renting or selling real estate, as well as financial revenue. Other own-source revenue includes fines, as well as grants for public works, road maintenance, housing and other.

2. Federal transfers include shared taxes, earmarked and non-earmarked transfers. Shared taxes are state's participation on federal taxes. Earmarked transfers include resources through the Federal Transfer Funds.

Source: Author's calculations based on INEGI (2011) *Sistema Estatal y Municipal de Datos*, *http://sc.inegi.org.mx/sistemas/cobdem/*, accessed 30 September 2011.

Figure 3.13. **Revenue structure in Chihuahua, 2011**

Revenues by broad source in the 2011 Revenue Law



1. User-fees revenue includes public property and civil registrars, transit permits, toll roads, and other.

2. Asset-based revenue includes revenue from renting or selling real estate, as well as financial revenue.

3. Other includes fines, as well as grants for public works, road maintenance, housing and other.

4. Shared taxes are state's participation on federal taxes.

5. Earmarked transfers include resources through the Federal Transfer Funds for: education (*Fondo de Aportaciones para la Educación Básica y Normal*), health (*Fondo de Aportaciones para los Servicios de Salud*), social infrastructure (*Fondo de Aportaciones para la Infraestructura Social*), municipal strengthening (*Fondo de Aportaciones para el Fortalecimiento de los Municipios*), other social issues (*Fondo de Aportaciones Múltiples*), public security (*Fondo de Aportaciones para la Seguridad Pública*), adult and technological education (*Fondo de Aportaciones para la Educación Tecnológica y de Adultos*), and states' strengthening (*Fondo de Aportaciones para el Fortalecimiento de las Entidades Federativas*).

Source: Author's calculations based on Chihuahua State Congress (2010) *Ley de Ingresos del Estado de Chihuahua para el Ejercicio Fiscal del Año 2011*, H. Congreso del Estado de Chihuahua, Chihuahua, Chih. Mexico.

Despite increasing autonomy, like every other Mexican state, Chihuahua depends heavily on federal transfers. If shared taxes are included, transfers account for almost 85% of state revenue. In 2009, transfers in strict sense (earmarked and non-earmarked transfers) represented more than 46% of total revenue. On average, Mexican states receive unconditional grants (branch or *Ramo 28*) that accounted for nearly 35% of their revenue and a set of earmarked grants (*Ramo* 33) that accounted for more than half of sub-national revenues. Earmarked transfers (*aportaciones*) accounted for one-third of total revenue but over 70% of all transfers. These include federal contributions to provide services on education, health, social infrastructure and other social issues, municipal strengthening, public security, adult and technological education and states' strengthening. The remaining 28.5% of federal transfers are so-called *participaciones* that the state can dispose of according to its own priorities. Nevertheless, in practice, the state has little flexibility in how it uses the *participaciones* it receives from the federal government, as it has already committed most of its budget to specific expenditure items.

In Mexico, 70% of all expenditures on education and 55% in health are decentralised (Scott, 2004). Earmarked transfers are channelled to Chihuahua through eight funds (*Ramo 33*) that address social, educational and insecurity issues. Some of these funds are tightly linked to payments to the education system, particularly salaries of teachers.

Almost two-thirds of *Ramo 33* resources are allocated to education through three of the eight funds, namely the Basic Education (*Fondo de Aportaciones para la Educación Básica y Normal*), the Adults and Technological Education (*Fondo de Aportaciones para la Educación Tecnológica y de Adultos*) and the Multiple Transfer Funds (*Fondo de Aportaciones Múltiples*). Funds oriented towards addressing social and health issues such as the Health Services Fund (*Fondo de Aportaciones para los Servicios de Salud*) and the Social Infrastructure Fund (*Fondo de Aportaciones para la Infraestructura Social*) represented in 2011, almost 18% of earmarked grants. Together these five funds represent nearly 80% of all conditional grants tackling social and educational issues. A further 18% is allocated to institutional capacity building at both state and municipal levels through the Municipal Strengthening and State Strengthening Funds (*Fondo de Aportaciones para el Fortalecimiento Municipal* and the *Fondo de Aportaciones para el Fortalecimiento de las Entidades Federativas*, respectively). The Public Security Fund (*Fondo de Aportaciones para la Seguridad Pública*), with MXN 245.8 million represented less than 2% of all earmarked transfers in 2011.

Autonomy in municipalities is less compromised than at the state level but they are still meagre. The main source of municipal revenue is the property tax, a prerogative that the Constitution grants to such level of government.[5] Chihuahuan municipalities compare favourably with local governments elsewhere in terms of tax revenue collection. In aggregate terms, the state ranks second in the country in property tax collection as a share of municipal income, only behind the state of Quintana Roo, a prime tourist destination which includes Cancún and the Mayan Riviera and that, hence, benefits from property tax revenue collected from hotels.[6] The two biggest municipalities in the state, Juárez and Chihuahua, rank 4th and 11th among all municipalities in the country in the share that the property tax represents in total municipal income. These two municipalities represent 82% of total property tax collection in the state – significantly more than their share of the state´s population (63%). There is thus, a need to strengthen the ability of municipal governments to collect revenues from this base. On average, property tax as a share of total municipal revenue in Chihuahuan municipalities is 0.9 percentage points higher than in the rest of the country, even after controlling for the share of the urban population in the municipality, its degree of marginalisation, and average income per capita.[7] If the 300 most representative municipalities in Mexico are taken into account, around two-thirds of revenues stem from state or federal transfers, whereas own-source revenues such as taxes make up for about one-quarter of all municipal income. In contrast, own-source revenue at the state level is on average around 7% of total income. Richer and more populated municipalities such as Monterrey, Querétaro or Chihuahua have larger autonomy levels. Transfers represent as low as one-third of total revenue in the case of Querétaro and own-source revenues can amount for half of municipal income in Culiacán (Figure 3.13). In the case of the municipalities of Chihuahua and Juárez, own-source revenues stood at 34% and 36% of their respective total revenues.

The most evident problem of Mexican fiscal federalism is that taxes are highly centralised. The standard assignment of tax types across levels of government generally suggests that taxes on less mobile resources and benefit taxes, principally in the form of user fees can be assigned to lower level governments. The best taxes for state governments are usually thought to be sales taxes and non-progressive taxes on labour, while land or property taxes are thought to be the best revenue source for local governments. While all levels of government can employ user fees, they are particularly useful for local governments. Current taxation in Mexico does not allow for sub-national government's use of income taxes, a practice that is widespread in OECD countries.

Congress approved in 2002, a tax reform package aiming at increasing taxing power of the states. On the business side, new incentives for investment include immediate expensing of investments outside of Mexico City, Guadalajara or Monterrey as well as immediate expensing of investments within these areas for labour-intensive firms that use eco-friendly technology. New taxes on goods and services have been added. States also received new taxation options. In particular, they are now allowed to add an additional rate of up to 5% to the personal income tax and an additional rate of up to 2% on individuals with commercial activities. States can also now charge a retail sales tax of up to 3% (except on goods that are now exempt under the current value-added tax). Combined, the new taxing powers appear modest, particularly if compared to the initial government reform proposal that, inter alia, provided a shift of three percentage points of the value-added tax to the states. Moreover, states appear to be reluctant to make use of the new taxing prerogatives.

Box 3.3. **Recent decentralisation trends in Mexico**

A number of responsibilities and expenditure rights were devolved to states and municipalities in the last decade. Today, the central government is exclusively responsible for defence, foreign affairs, monetary policy, mail and telecommunications, and labour policies. Housing is primarily the responsibility of the central government, though some states have housing agencies. Central and state governments share industrial policy and tourism. States sometimes have separate tourism programmes. Education is quite centralised although central, state, and local governments all have some spending responsibility. The central government sets the curriculum, provides funding, and trains teachers and sets wages. Some states have developed a complimentary system of state financed schools at the high-school and university level and are responsible for administering the federal schools. Municipal governments have a limited role but are responsible for school maintenance and some construction concurrent with the state (Cabrero and Martíņez-Vázquez, 2000).

Health, transportation and social policies are also quite centralised albeit states have some responsibilities. The central government sets health policy, determines wages, and invests in infrastructure. States administer programmes and are responsible for primary care for both the rural and urban poor. Road construction and maintenance are split between the three levels with each having responsibility for their road system. Parks and public transportation are split with all levels of government providing services that correspond to their geographic area. Water supply and sewage are joint state-municipal functions while garbage collection is done at the local level. Social assistance programmes are funded by the central government through *Ramo 28* and *Ramo 33*, but are implemented by state and local governments with the former co-ordinating with SEDESOL (the central level Ministry of Social Development) for that effect. Two particular branches of expenditure, namely *Ramo 28* and *33* channel most of conditional and unconditional transfers to municipalities. On the one hand, the *Ramo 28* transfers to *municipios* comprise mainly the *Fondo General de Participaciones* (General Participation Fund*)* that on average, account for 63% of all *Ramo 28* contributions and 34% of state and federal transfers to municipalities. States are required to transfer 20% of the *Fondo General de Participaciones* to municipalities; consequently, a large proportion of the latter's revenue stems from this fund. On the other hand, *Ramo 33* transfers to *municipios* are divided into two funds,2 the social infrastructure (FAIS) and the municipal strengthening (FAFM) funds. Together, the Ramo 28 and 33 grants accounted for 77% of all state and federal transfers to municipalities in 2004.

Mexican state and local governments do not fully seize the gains of decentralisation. First, the heavy reliance on transfers blurs responsibilities for spending decisions. Although some discretion in how to spend public funds is allowed for unconditional grants, state and local

Box 3.3. **Recent decentralisation trends in Mexico** *(cont.)*

governments receive most funds from conditional transfers. Their use is tightly prescribed, and there is little incentive to spend money efficiently. Transfers allow state or local officials to escape responsibility for bad projects, the blame for which can always be placed on higher levels of government. Moreover, excessive reliance on transfers may result in a mismatch of funds and demands for public services. Unless transfers exactly match possibly diverse demands for public services, some states will end up consuming non-optimal quantities of public services. Moreover, it is both costly and difficult for the central government to acquire knowledge of each state's demands, which may change over time. Second, the restrictions related to re-election further decrease the accountability of public officials. Mexican election laws limit most terms to three years and ban immediate re-election, being allowed only after at least one term out of public office. The electorate has no way to punish or reward a politician that does not face re-election, and although party loyalty plays a part, the public official has fewer incentives to always act in the general interest or to use public funds efficiently. Even if taxes and other resources were raised locally, the Mexican election system prevents a long-term commitment towards more accountability in policy-making and public spending. The citizenry sees constrained its capacity to punish bad decisions of local officials and reward good ones through the ballot box. The re-election laws thus affect efficacy and efficiency of the public sector.

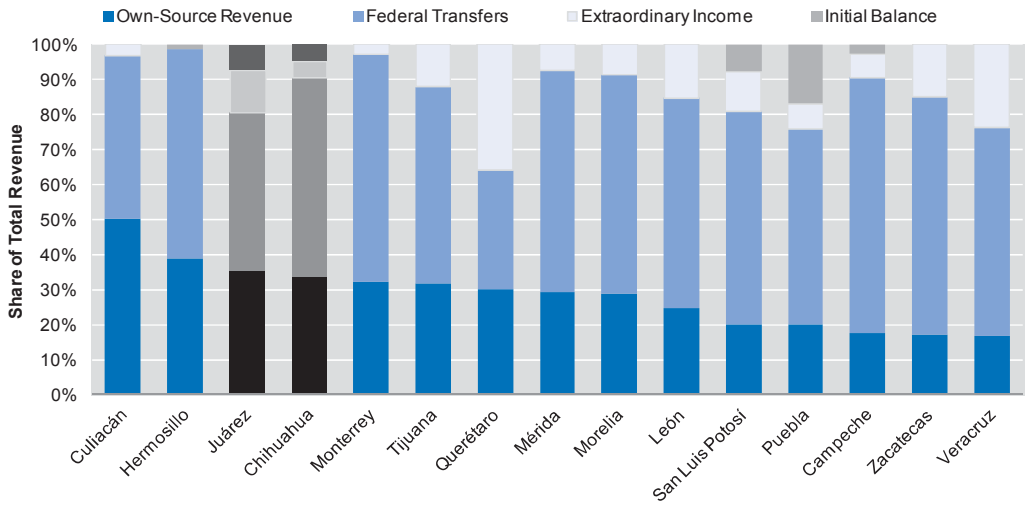
Source: OECD (2007), *OECD Territorial Reviews: Yucatán, Mexico*, OECD Publishing, Paris.

Although taxes can be levied locally, capacities and skills in municipal governments have impinged on the amount of own-source revenue. Municipalities can suggest property tax rates to the State Congress, where the rate and base is established. Collection of the tax is left in the hands of the municipalities, although many municipalities lack people with the necessary administrative skills. Some states, such as Nuevo León or Chihuahua, have incorporated special grants to municipalities that are distributed partly on the basis of tax effort in collection of property taxes. As a result, both Chihuahua and Juárez can compare favourably against other municipalities in the country in terms of own-source revenue (Figure 3.14).

A feature of current Mexican transfers is that they seem to be slowly incorporating efficiency – and not only equity – as the basis for redistribution. Traditional approaches to regional policy follow an *equity* logic: compensating lagging regions with transfers that aim at reducing disparities. New approaches to regional policy focus on *efficiency* issues as well: strengthening and supporting bottom-up place-based strategies that aim at making the most of their assets. Mexican transfers are designed with *equity* more than *efficiency* considerations in mind. The criteria behind the allocation of earmarked grants such as *Ramo 33* lies essentially in the amount spent previously in a given category. In contrast, the formula for unconditional transfers through *Ramo 28* although can be improved to further its objectives follows specific allocation criteria (Box 3.4). Transfers to Mexican municipalities from federal and state levels of government are almost equally divided between earmarked and unconditional transfers. On average around 54% of all transfers to municipalities are done on an unconditional basis and 44% through earmarked funds. Non-earmarked resources are divided into purely unconditional transfers, a municipal fund, as well as concessions on taxation. Purely unconditional transfers chiefly through the General Transfers Fund (*Fondo General de Participaciones*), account for as much as the totality of non-earmarked transfers in the case of the southern and lagging state of Guerrero or as little as 55% in the case of Zacatecas. On average, Mexican states receive around three-quarters of non-earmarked resources in the form of pure unconditional transfers.

Figure 3.14. **Municipal revenue sources**

by broad source of revenue



Source: Author's calculations based on INEGI (2011), *Sistema Estatal y Municipal de Bases de Datos (SIMBAD)*, Instituto Nacional de Estadística, Geografía e Informática, *http://sc.inegi.org.mx/sistemas/cobdem/*, accessed 15 June 2011.

The recent global financial crises had an adverse impact on the state government's income via two channels. First, formal employment in the state fell by almost 11% in 2009 – due to the state's close links to the US economy (see chapter 1)—which resulted in a drastic reduction in payroll tax revenue (12.3%) in that year. Second, federal transfers in the form of *participaciones*, which depend on an explicit formula that takes into account federal government revenues and the price of oil, declined by 16% in 2009.

Earmarked resources to municipalities are allocated without taking into account policy objectives. On the one hand, FAIS resources are aimed at improving social infrastructure to address gaps in municipal urbanisation, basic health, basic education, housing, rural roads or rural productive infrastructure, as well as in the provision of water, sewage or rural electrification. Although FAIS resources are channelled through the states, in their majority (87.8%) are passed on to municipalities through the Municipal Infrastructure Fund (FISM) and only the remaining 12% (through FISE) stays at the state level. While it is highly desirable that the provision of municipal public goods and services is administered where the needs are, that is, at the local level, many of those public goods have regional externalities that are more suitably managed at the state level. Therefore, a system of transfers should take into account expected externality effects both at the local and regional level, in order to allocate resources more efficiently. In any case, current allocation of resources is far from addressing policy objectives as many states with lagging in terms of infrastructure such as Chiapas, Tlaxcala or Nayarit receive meagre resources through this fund.

Box 3.4. **An overview of transfers**

The reasoning behind fiscal federalism starts by arguing that each level of government should collect its own taxes and examine in what situations this might not be efficient or equitable. Own-tax collection may result in inefficiency when externalities are present in the provision of public goods. Some governments are bound to provide some goods with external benefits or to levy some taxes that have external costs. Transfers can be used to try to correct for these externalities. A second reason for transfers is to equalise tax bases between jurisdictions. This can be justified on efficiency grounds (since equal tax bases remove any pecuniary incentives for migration) and might also be justified on the grounds that certain merit goods such as education should be provided to all. A third reason for transfers is administrative efficiency. This arises if local officials are poorly educated and do not have the necessary skills in tax collection; however, lack of skills can be tackled through training and further education (Oates. 1972; Inman, 1999).

It is important for transfers to be designed in a reasonable way. For instance, matching grants usually are used to correct for externalities since they alter the prices faced by regional governments encouraging expenditures on goods with external benefits. Similarly, matching grants can also be used to offset tax competition that often results in under-provision of public goods. However, the use of grants to correct for externalities presumes that state governments have access to their own revenue sources and are therefore able to change spending decisions in response to a change in relative prices. Since Mexican states have limited ability in this regard, the current Mexican transfer system cannot correct for externalities very effectively.

A second important design feature of a good transfer system is to try to ensure that grant formulas use sensible variables that are relatively exogenous and somewhat isolated from short-term political considerations. For instance, a formula to distribute funds for health might take into account the number of elderly people in a state. This makes economic sense since the elderly normally use health services in a more intensive way, and the state government is likely to view the number of elderly as something that is outside of its control.

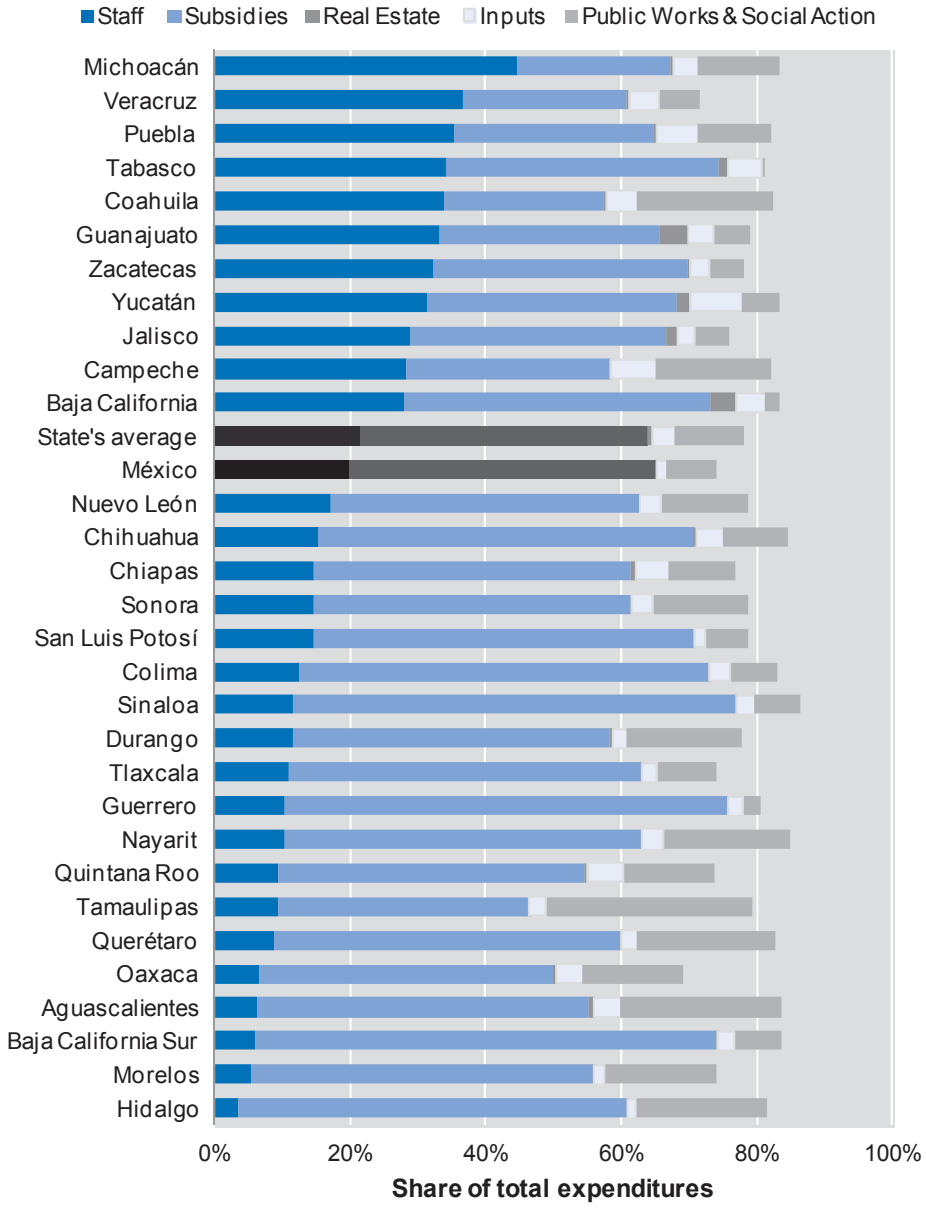
Source: OECD (2003), *OECD Territorial Reviews: Mexico*, OECD Publishing, Paris.

Public Expenditures

Mexico is the OECD country with the lowest level of expenditure and what is spent lacks coherence with policy objectives. Mexico's total expenditure represents just over 20% of GDP and contrasts with Canada or Sweden's at nearly twice and three times that proportion respectively (OECD, 2007). Public expenditure in Mexican states is heavily concentrated in paying for staff bureaucracy and providing subsidies. Payments to staff widely vary across states in Mexico from small proportions ranging from around 5% in states like Hidalgo or Morelos to states that spend around 40% of their resources in bureaucracy such as Michoacán (Figure 3.15). In contrast, the vast majority of states spend an important share of their earnings in subsidies that can exceed two-thirds of total state revenue as in the cases of Guerrero or Sinaloa. Chihuahua's spending was in 2009, heavily geared towards subsidies: 55% of total expenditures. However, in the case of infrastructure (public works and social action) states allocate resources in a more moderate way. These allocations can be as small as in Tabasco (0.3%) or as large as 30% in the case of Tamaulipas. Indeed, half of all states, including Chihuahua (9.6%) invest less than the national average 10.3% of their total revenue in public works (Figure 3.16). The state's expenditure in 2009 contrasts with more balanced budgets at municipal level in Juárez and Chihuahua although in both cases infrastructure seems to take a back seat at 12% and 6% of their respective total expenditure (Figure 3.16)

Figure 3.15. **State expenditures**

by broad categories in 2009



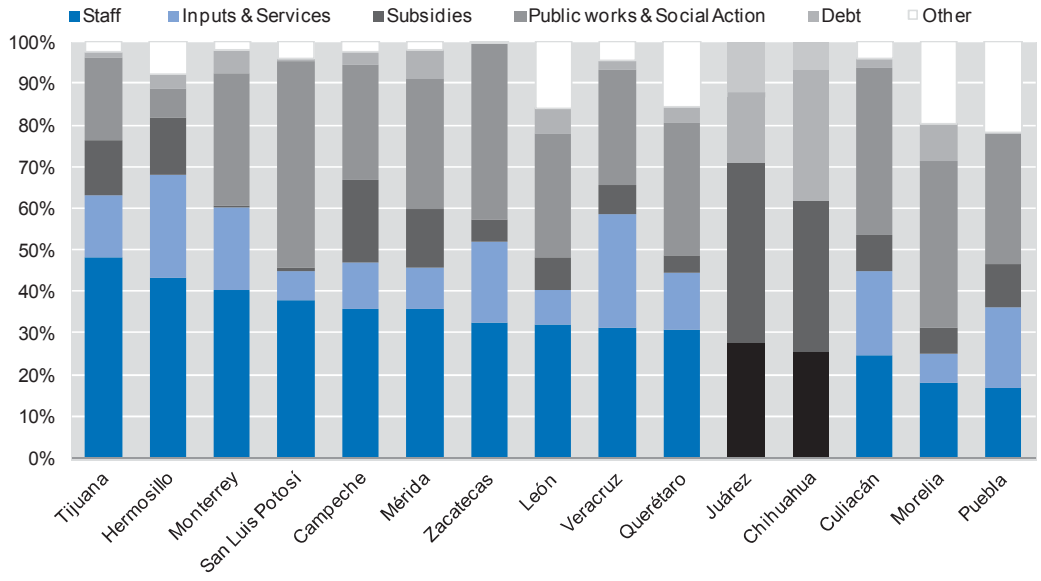
Source: Author's calculations based on INEGI (2011), *Sistema Estatal y Municipal de Bases de Datos (SIMBAD)*, Instituto Nacional de Estadística, Geografía e Informática, *http://sc.inegi.org.mx/sistemas/cobdem/,* accessed 15 June 2011.

Expenditure at the municipal level seems to replicate trends at the state level. Although expenditure in staff widely varies across municipalities according to size, the proportion of resources allocated to bureaucracy is similar to the levels in many states in Mexico. The 300 most representative municipalities according to INEGI (2011c), show that large municipalities in Mexico use between one-quarter (Puebla) and one-third

(Monterrey) of total resources in salaries of staff. Medium-sized municipalities spend between 25.6% (Chihuahua) to nearly half (Tijuana) of their resources on staff, whereas smaller municipalities spend less than one-fifth.

Figure 3.16. **Municipal expenditure, 2009**

Selected municipalities



Source: Author's calculations based on INEGI (2011), *Sistema Estatal y Municipal de Bases de Datos (SIMBAD)*, Instituto Nacional de Estadística, Geografía e Informática, accessed 15 June 2011 at *http://sc.inegi.org.mx/sistemas/cobdem/*,.

Accountability

Chihuahua is making significant progress in terms of transparency and efficiency of spending. Fiscal decentralisation in Mexico has deepened alongside the political changes that the country has undergone over the past decade and a half. Since then, an increasing proportion of public spending is carried out at the state level. With it, discussions about the importance of transparency and efficient spending have come to the fore. Chihuahua has made inroads in both fronts. Regarding transparency, the Mexican Institute for Competitiveness (IMCO), a private-sector think-tank, has developed a methodology to assess the availability of budgetary information across state governments and the Federal District. In 2011, its State Index of Budgetary Transparency (*Índice Estatal de Transparencia Presupuestaria*) ranked Chihuahua in sixth place in the country (IMCO, 2011). Mexico has adopted legislation mandating that all levels of government adopt a results-based budgeting framework.[8] While recent assessments put Chihuahua below the median relative to other states, to the extent to which the state has adopted such framework, the 2011 budget contemplates a substantial increase in resources under the framework, from 38.7% of the state´s budget in 2010 to 52.5% in 2011.

Financing Development in the State

The combination of rising spending and the challenges posed on the revenue side by the recent crisis have left the state´s government with little resources to finance public investment. Indeed, the government estimates that in 2011 there will not be any fiscal space left for that purpose. As a result, the government has relied on debt financing to sustain its investment programme. The State of Chihuahua stands out relative to other Mexican states in terms of how its local public finances are managed. Local revenue collections are relatively higher than in any other state and public spending is fairly open to public scrutiny. Despite such strengths, the decline in public revenues associated with the recent economic recessions, combined with structural factors that put pressure on public spending and limit investment outlays, has resulted in an increasing reliance on debt financing to carry out investment projects. While, at present, the risk that the state might not be able to uphold its debt obligations is not a concern, it could become an issue in the medium term if actions to increase local revenues and to rationalise public spending are not put in place.

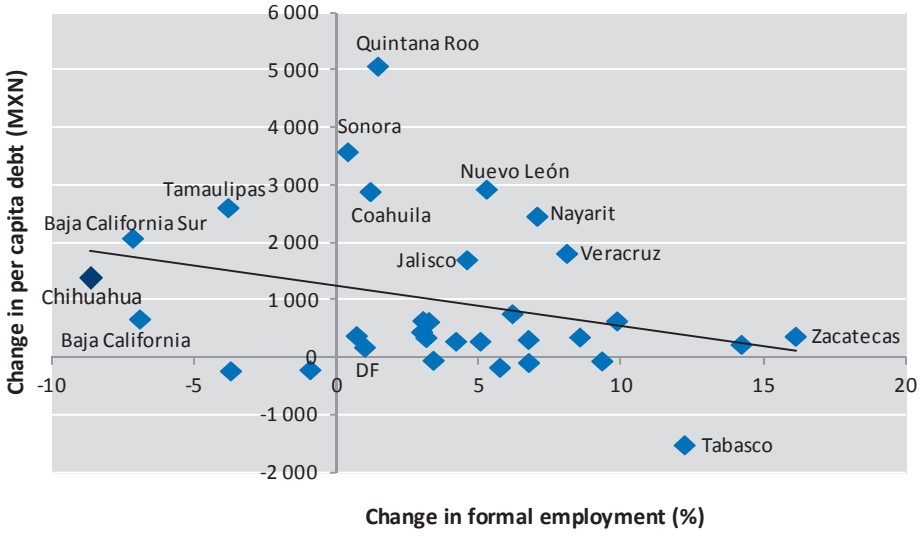
Chihuahua's financial obligations are guaranteed through balancing assets already in place and forthcoming revenue. Financial obligations increased from MXN 5.5 billion in 2005, to MXN 12.3 billion in 2010 –a 79% increase in real terms—rising from 1.9% to 3% of state GDP. Although debt increased substantially, more than half (54% of total debt by the end of 2010) was backed by securities (*certificados bursátiles*) linked to a very successful toll road system, rated AAA in the Mexican scale of rating agencies; the remainder is guaranteed by shared taxes (*participaciones*). This constitutes an advantage for Chihuahua compared to other states, as in most cases, local debt is entirely guaranteed by shared taxes.

Despite accomplishments in financing expenditure through own-source revenue, lower cost financing and overall more balanced budgets at municipal level, the state faces important challenges due to insecurity that are constraining its capacity to invest in infrastructure and on further upgrading human capital. While total expenditures have been growing fast, public resources devoted to investment projects have grown more slowly. From 2005 to 2010, total spending by the state government increased by 29% in real terms, but investment expenditures grew only by 11%. Rapid increase in total spending is partly explained by the rising cost of addressing insecurity (see section 3.2). Although spending on education represents a significant fraction of total expenditures, the lion's share of spending in education is due to only maintaining the current stock of teachers.

Chihuahua shows greater fiscal autonomy than most states, but rising spending has meant that public debt has been on the rise. Following the relatively new possibility of Mexican states to rate the quality of their debt; many Mexican states have seized the opportunity to finance development through public debt. In particular motorway projects have been partially funded by independent bond issuing such as in the cases of Chihuahua and Nuevo León. Indebtedness by state governments has been the subject of intense debate in Mexico throughout 2011. While aggregate debt held by state governments is modest, at only 2.4% of GDP, much smaller than what is observed in comparable countries, such as Argentina (9.2%) or Brazil (12.9%), it has increased rapidly since 2008, representing only 2% of GDP in that year. To some extent, state-level indebtedness appears to have played a countercyclical role, rising relatively more in states that saw a

greater decline in economic activity (Figure 3.17). However, it might also reflect the inability or unwillingness of state governments to adjust public spending in the face of declining revenues. While the growth of state indebtedness does not seem pose a risk to the country's macroeconomic stability, there is indeed concerns about debt sustainability in specific states. The current situation has also brought attention to the need to strengthen local public finances. In particular, local revenues are deemed to be too low, with excessive reliance on federal transfers, and resources devoted to investment projects too limited.

Figure 3.17. **Sub-national debt and employment in Mexico, 2008-10**



Source: IDB (2011), Inter-American Development Bank with data from de SHCP and IMSS.

Notes

1. Violence against women in Chihuahua are documented in Inter-American Commission on Human Rights (2003). Femicides have been a societal concern particularly in Juárez since the mid-1990s.

2. Emotional violence includes insults, denigration, property damages, and threats of leaving or killing her (sometimes with weapons) among others according to INEGI (2004a).

3. Arguably, part of this lost population represents returning migrants to their own communities in other Mexican state.

4. The Federal District, which compromises a sizable fraction of Mexico City´s metropolitan area, is not a state and has a unique administrative status and socio-demographic characteristics. In particular, it can collect property taxes, which otherwise are a prerogative of municipal governments and hence unavailable to state governments.

5. Data for 2008 is used in discussing the state´s performance in collecting property taxes.

6. In per capita terms, the state ranks third, behind Quintana Roo and Baja California Sur, also an important tourist destination.

7. The latter result stems from a regression of the property tax revenue as a percent of total income in 2008 on the following variables: the percent of the municipality´s population that lives in urban areas; an *index of marginalisation* of the municipality in 2005; an estimate of the average income per capita in 2005; and an indicator variable equal to one if a municipality is in Chihuahua. The estimated coefficient on the latter variable is 0.893 and it's significant at the 1% level; all other variables are also highly significant. The regression exhibits an R^2 of 0.4366.

8. Based on figures presented by Mexico's Ministry of Finance in its budget information website, *http://www.transparenciapresupuestaria.gob.mx/,* accessed 12 October 2011).

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Chapter 4

Going Local to Enable Complementarities

This chapter examines the role of space in allowing for policy complementarities. It argues that the best way to foster complementarities between efficiency-seeking policies (economic) and equity-seeking policies (social) is by addressing the challenges and design the policies at the local level. The chapter argues that while infrastructure is a crucial dimension of regional policy, the risk of not having an integrated approach to regional policy is that providing transport infrastructure can reduce costs, but also lead to further agglomeration and therefore a leaking-by-linking effect. The chapter continues with the urban challenges in terms of housing, sprawl, sustainability and transportation that the pattern of urbanisation has represented for Chihuahua and argues for a city-regional approach to urban planning, as well as for the use of fiscal tools to reduce vacant land, curtail sprawl and increase density. The chapter then alerts the reader to rural challenges and the way in which these have exacerbated water stress, leading to the third systemic challenge. The review looks at issues that limit rural areas' productivity and reduce water availability such as: farm size, type of crops, subsidies to electricity, lack of financing and outdated modes of land and water management. The chapter ends with a discussion on water governance and the need to allow for more local regulation among other recommendations.

4.1. The role of space and place-based policies to manage equity and efficiency objectives

Growth-enhancing and efficiency-seeking economic policies can as argued in Chapter 3, be complementary to equity-seeking social policies; but complementarities can better be exploited at the local level. Space matters for policy complementarities. The recent policy debate on regional policy in which the European Union, the World Bank and the OECD have presented somewhat different approaches to policymaking, versed in what can be said to be a false dichotomy. Countries and regions do not have an option between pursuing economic growth or equalisation. Governments most often than not pursue both. Policies can be place-based and still be people-centred. On the one hand, traditional views on regional policy related to the old paradigm saw regional policy as a compensatory mechanism to foster convergence. On the other hand, some national governments can regard investing in lagging regions as sub-optimal as cities make the best use of skills, ideas and knowledge. However, lagging regions represent unrealised potential for growth that is not in detriment to urban dynamism. Enhancing growth in lagging regions can produce a convergence trend so equity is addressed. Growth in rural areas complements urban growth as specialisations are different and comparative advantage enables exchange and efficiency. Similarly, talking underserved neighbourhoods in urban areas directly addresses inequality, but as a consequence leads to better urban mobility if transport infrastructure is provided and increased productivity, to name a few positive effects of complementarities that can better be realised at the local level.

Enhancing the impact of regional development policies can be complicated since the factors that determine the competitiveness of each region are so diverse. Nonetheless, the OECD national territorial and region-level policy reviews, suggest that despite the broad range of potential attributes that affect the competitiveness of a region, a small number of common success factors appear repeatedly. According to the OECD (2009), these can be grouped under three broad policy areas:

- *The capital stock dimension:* the level of past and present investment in a region's infrastructure. In OECD countries this has tended to mean transport infrastructure, while in less developed countries it also implies infrastructure for basic needs. More recently, ICT infrastructure has become a key target.
- *The labour market dimension:* this includes policies not only for the labour market – for example, (dis)incentives for labour mobility and participation in the labour market – but also human capital development.
- *The business environment dimension:* this covers a range of policies designed to support firms, such as cluster policies, policies to promote links between research and industry, and, in particular, promotion of innovation in regions.

The assumption of the OECD's new regional policy paradigm is that the implementation of regional development policies involves the integration of these core policy areas. The emphasis on the quality of the local environment for business leads directly to the question of the quality of locally provided services and public goods. Firms, especially SMEs, are dependent on the environment in which they are located to

provide them with different types of "local collective competition goods". This involves the participation of various categories of actors (public authorities at local, regional and central levels, private firms or non-profit organisations etc.) to ensure that the provision is appropriate, relevant and of a high quality. For example, regional innovation systems are based on relations between industry and universities, between small and large enterprises, and among sectors (e.g. training and employment). In that context, infrastructure is in the long-run, a necessary, but not sufficient condition for growth.

Infrastructure policy: linking vs. leaking

Investment in physical capital has always played a prominent role in regional policy. Many policies have tried to reduce disparities by reducing travelling times from the target region to other regions and by eliminating gaps in telecommunications networks. Recent examples of this approach include Mexico's Plan-Puebla-Panama or the EU-TEN transport corridor programme. The expectation that improvements in physical infrastructure will generate productivity gains for local businesses and increase the attractiveness of an area for investment has been a recurring theme in OECD reviews. High quality infrastructure and services are accepted as being vital to a strong economy - locally, regionally and nationally. To take the example of transport, upgrading infrastructure changes access (travel times) which, in turn affects property prices and economic rents, influences decisions of households (residential location, patterns of consumption) and firms (production location, access to markets and investment decisions) and these, in turn, should have a net positive impact on the economy, increase tax revenues, create employment and generate resources for further investment. For business, the benefits could include: *i*) access to a wider labour market pool, with more diverse skills; *ii*) faster access to suppliers and customers, reducing transaction costs; *iii*) expanded market reach, including suppliers, as well as customers; *iv*) reduction of land-use constraints.

One of Poland's main focuses of regional policy since 2004 has been road development (expressways, motorways, national roads). Major EU transport infrastructure investments have concentrated on Poland because it is crossed by four out of the ten pan-European transport corridors. One of Poland's critical priorities is to create an effective network of motorways connecting the country's major urban centres and connecting these with the Trans-European Transport Networks and to improve road bearing capacity and quality. The focus on roads has continued in the 2007-13 regional development strategy: 51.7% of total funds for the infrastructure programme (including co-financing) are allocated to road development (EUR 11.2 billion from EU funds and EUR 1.98 billion from national funds), while 21% is for rail transport and 13% for urban transport. In the regional programmes, some EUR 4.4 billion out of a total of EUR 16.6 billion (which represents 26% of the funding) goes to transport (OECD, 2008a). However, the Territorial Review of Poland (2008) also notes the efforts of the Polish national and regional authorities to adopt a balanced policy mix for regional development, focusing on transport, but also human capital and innovation and to maximise the economic multiplier from the significant infrastructure investment through integration with other policies (Box 4.1).

Box 4.1. **Integrating infrastructure investment: Eastern Poland development**

The development of Poland's eastern regions, the poorest in the European Union in terms of GDP per head until the accession of Romania and Bulgaria, is a major policy objective of Poland and the European Commission. The five eastern regions situated along Poland's eastern and northern borders are the smallest contributors to GDP (less than 3% each) and have the lowest growth rates in Poland.

A macro-regional programme targeting the development of the five eastern regions has been developed with the EU funds for 2007-13, co-financed with national funds. An additional budget of EUR 2.2 billion has been allocated by the European Commission for Poland for this purpose. This is the first macro-regional programme of this type in the European Union. Previously, several programmes had been implemented for eastern regions, but they targeted specific regions or locations rather than the macro-region as a whole. The macro-regional programme is an opportunity for eastern regions, not only in terms of additional funding, but also in terms of co-operation and connections among the five regions, to address underused potential (such as environmental assets and tourism), develop transport networks within the area, and elaborate a common strategy for cross-border co-operation. The added value of the programme lies precisely in its macro-regional dimension, as it is a way to go beyond the administrative borders of *voivodships* (regions).

The Eastern Poland operational programme is managed by the central government (Ministry of Regional Development). It aims to enhance the attractiveness of eastern regions, strengthen the metropolitan functions of cities and improve the quality of transport infrastructures. The programme has a well-balanced strategy, with six priorities (modernisation of the economy, infrastructure and information society, transport infrastructure, support to cities, tourism and technical assistance) and aims to integrate various sector policies in a regional perspective. However, there are challenges: the insufficient cross-regional common vision of the various pillars; and the limited involvement of local actors in the design of the programme.

Source : OECD (2008), *OECD Territorial Reviews: Poland*, OECD Publishing, Paris.

OECD experience suggests that the construction or upgrading of transportation infrastructure can have a positive influence on a region's economic development, but that economic growth is not automatic. Growth effects are likely to appear only when positive externalities exist in the region. Faster transport connections can exploit potential positive externalities that exist in various markets – typically unexhausted economies of scale, scope, agglomeration, density or network – and consequently improve (labour) productivity, enhance output, reduce production costs and promote more efficient use of resources. If such latent economies do not exist, however, improvements in accessibility could lead to changes in existing transport flows and spatial patterns without having long-term effects on growth. The case of the Öresund region (OECD, 2003a), underlines that the bridge between Copenhagen and Malmö is only one element in a wider strategy to build on the complementarities that have developed between the two regional economies (Box 4.2). The challenge for policymakers is to ensure that the potential in the labour market, research community and enterprise systems is realised. The review of Vienna-Bratislava provides a similar example: providing infrastructure to link the two centres will not necessarily generate sustainable growth unless policy challenges relating to economic specialisation, innovation and governance can be resolved (OECD, 2003b).

Box 4.2. **Impacts of the Öresund bridge on attractiveness and competitiveness**

Three levels of impact should be considered: the regional level, the national level and the international level. At each level, the effects are different and, more importantly, the reactions of stakeholders are quite diverse.

At the regional level (Öresund), the new infrastructure links – in addition to the bridge – have framed a new internal network of mobility and communication which has increased interactions between people, firms and institutions. Such interactions increase the "value" of internal inter-dependence as a factor of robustness of the local economy and society in terms of competitiveness and attractiveness. The main feature of this evaluation is identifiable in the strengthening of the two main poles, Copenhagen and Malmö, but that growth has also affected a many other areas within the region. Thus, on both sides of the strait, the spatial "continuity" between the cores and their hinterlands causes fewer problems today than in the past.

At the national level, he competitive role of the Öresund Region has also affected its relative position within the two countries. This is a relatively minor issue for Denmark, where Copenhagen, as national capital and already a main pole of attraction in the Öresund Region, saw its role gain in importance. However, in Sweden, the growth of the Öresund Region will inevitably have a more significant impact. Stockholm and Gothenburg in particular have felt the impact of the growth in the Öresund region and are reacting to its increased competitiveness. On the one hand, the strengthening of the position of Malmö and Skania has led to a new development area in Sweden, increasing the overall output of the country. On the other hand, the acceleration of growth in southern Sweden has upset traditional political thinking on regional policy in the country. Due to its marginality, the north had always been in a privileged position when it came to the allocation of regional subsidies, in comparison with the central part of Sweden (along the Stockholm-Gothenburg axis), which was self-sufficient, and the south, which, despite the industrial decline in Malmö, had always been considered as developed and not in need of intervention. The opportunity represented by the growth of the Öresund Region has brought about a change in this approach. The tendency to favour equality rather than supporting dynamism is slowly reversing and, as a result, greater attention is being paid to the southern part of Sweden (also because this area of the country is the link with the rest of Europe).

Source : OECD (2003), *OECD Territorial Reviews: Öresund, Denmark/Sweden*, OECD Publishing, Paris.

Chihuahua's new government administration is aiming at liking rural communities and small and medium-sized cities in the state by building or rehabilitating ten airports and airfields, and doubling motorway infrastructure. Some of the airports are located in the mountainous regions which would help better link rural communities and provide better access to ethnic minorities, whilst potentially boosting tourism in those areas. Chihuahua's road infrastructure is currently the ninth in the country in terms of absolute length, but it is the last one if the size of the state is taken into account. The 7 109 kms long road infrastructure includes the second largest four-lane motorway system in the country that connects 80% of the population in the state. The new administration aims at connecting remote rural areas with small cities through 1 000 kms of paved rural roads, the construction of secondary motorways and seven large inter-state motorways. In addition, border-crossings are being modernised.

Notwithstanding the progress made on transport infrastructure in Chihuahua, if regional policy concentrates only on providing capital in the form of infrastructure, a lagging region may end up losing economic resources (the "leaking by linking" phenomenon). By reducing inter-regional transport costs, firms continue to find it cheaper

to concentrate in the core regions, reap the benefits of agglomeration economies and thick markets and ship the goods to the periphery. In Chihuahua, poorer regions in the state have a structural problem of economically accessing relevant markets which impinges on their performance and growth. However, such market accessing is not only about infrastructure provision, but also to a business environment that leads either to the attraction for new firms or to the linking of local firms to global production chains (Sánchez-Reaza, 2009). Chihuahua's objective of doubling motorway infrastructure by 2016 should take into account that local economic development requires integral place-based policies that include human capital development and business environment. The new administration has worked on 80 different motorway axes since it took office in October 2011. An additional 400 kms are also being modernised (Duarte, 2011). Motorway links are expected to improve connectivity with neighbour states Sonora (to the West) and Sinaloa (to the southwest) in an effort to gain access to seaports and thereby access to Asian markets (Duarte, 2011). The ultimate goal is for all municipal government seats to be connected through paved motorways (Chihuahua State Government, 2011). Nine marginalised municipalities will be connected through roads by the end of the administration. In total, the ambitious programme will invest MXN 2 billion in roads. While in themselves these actions are well-intentioned since they aim at opening regions to markets and to reduce marginalisation and extreme poverty, transport infrastructure alone is unlikely to provide long-run growth. Providing infrastructure alone can lead to a leaking by linking effect. As infrastructure will reduce transport costs, these in turn will make it more profitable to concentrate production in main urban centres and ship it from there to more remote areas. Providing human capital development while very positive, would likely accelerate the outmigration tendency from remote and rural areas to urban centres and abroad. These two policies (infrastructure and human capital) require an integral strategy at local level that spurs local firm development that benefit from lower transport costs and skills in the labour market.

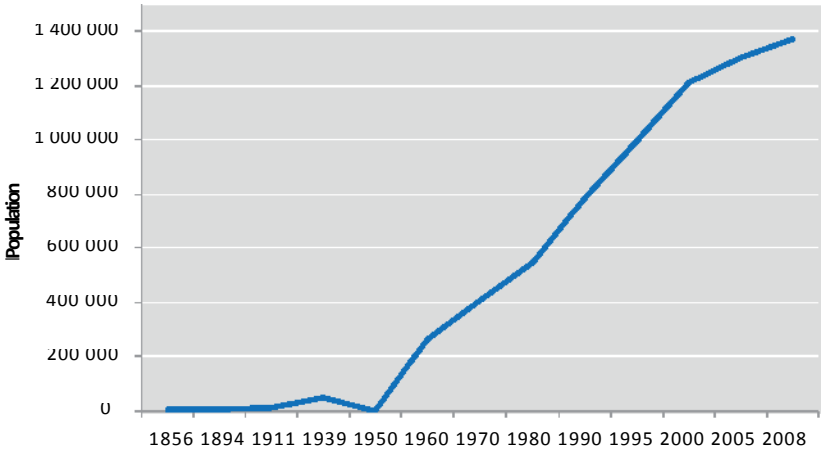
This raises the issue related to agglomeration often termed "the privatisation of benefits and the socialisation of costs". It refers to the fact that cities can continue to grow to a point at which they generate net costs for the society as a whole (e.g. pollution, congestion and crime) while they continue to generate benefits for (some) firms. Thus the process of concentration continues with society paying an increasingly high price (OECD, 2009). For urban areas to work properly and to seize the potential of rural ones, the linkages and the complementarities between these two types of areas are crucial.

4.2. Urban challenges and policies for development

The economic success of Chihuahua based on FDI has reinforced the pattern of population being concentrated in the two main cities and has led to lower density levels and urban sprawl. With almost no exception, population concentration indices for the 1970-2000 period, show that Juárez and Chihuahua City have seen an increase in population while the rest of the municipalities experienced a process of de-concentration (Currit and Easterling, 2009). Although an FDI-based development model is not the sole reason for urban sprawl, it partly explains urban form and growth in Chihuahua (Currit and Easterling, 2009). Juárez's population started to increase at an almost exponential speed in 1950 and reached almost 1.5 million by 2008 (Figure 4.1). Chihuahua and Juárez concentrated almost 64% of the population in the state in 2010 (INEGI, 2011). In spite of such concentration in the main urban centres, density in these two municipalities –albeit low by Mexican standards—are by far higher than in the rest of the state (Figure 4.2). Cities in the state of Chihuahua have some of the lowest rates of residential density in

Mexico and have struggled to contain urban growth. The growth of Ciudad Juárez is particularly emblematic of this phenomenon. In 1950, Ciudad Juárez was nearly four times as dense as today, with 152 inhabitants per hectare compared to 42 in 2008 (Figure 4.3). Decreasing density and concentration can only be explained through rapid urban sprawl that brings about environmental externalities, higher service provision costs and could lead to congestion.

Figure 4.1. **Population in Juárez, 1856-2008**



Source: Adapted from IMIP (2009), *Plan de Desarrollo Urbano*. Instituto Municipal de Investi gación y Planeación (IMIP), Ayuntamiento de Juárez.

Figure 4.2. Population density in Chihuahua

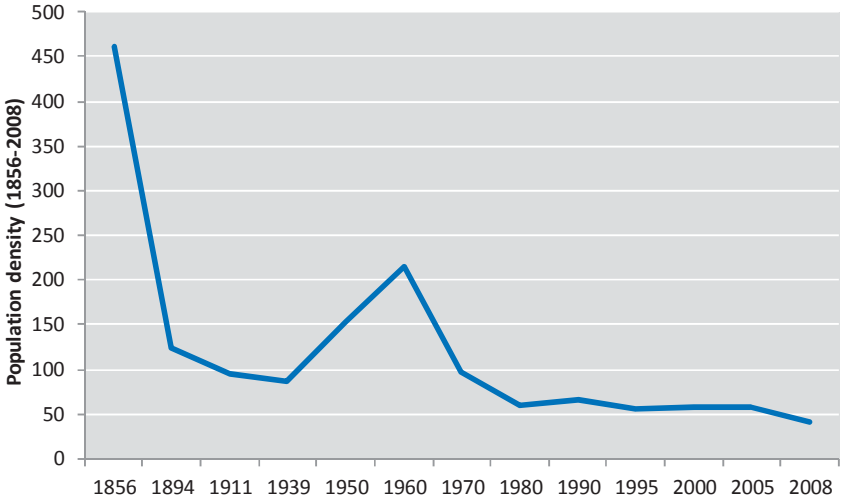
Share o **f** population to municipal surface in 2010



Note: This map is for illustrative pur**p** oses and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: OECD calculations based on INEGI (2011), *Censo General de Población y Vivienda 2010*, Aguascalientes, Instituto Nacional de Estadística, Geografía e Informática.

Figure 4.3. **Population density, 1856-2008**

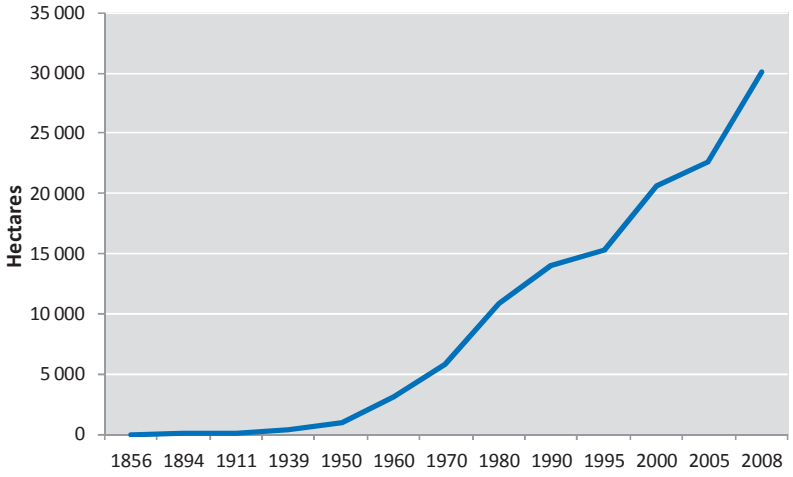


Note: Population density is calculated as the quotient of population and city size in hectares.

Source: Adapted from IMIP (2009), *Plan de Desarrollo Urbano*. Instituto Municipal de Investigación y Planeación (IMIP), Ayuntamiento de Juárez.

Juárez is experiencing sprawl at an impressive rate. The city is growing at 1 000 hectares per year which means that urban surface has grown six times more than what population has expanded. By 2008, Juárez occupied a surface of over 30 000 has (Figure 4.4). What is worrying is the fact that well-intentioned policies such as the creation of a "knowledge city" that brings a number of universities together is pushing urban development even farther away. The *Ciudad del Conocimiento* already underway is building a 134 000 square metres campus to house the Juarez Institute of Technology, the Technological University of Juarez, the Autonomous University of Chihuahua, the Autonomous University of Juarez, the *Tec Milenio*, the *Colegio de la Frontera Norte*, and Mexico's largest universities namely the National Polytechnic Institute (IPN) and the National Autonomous University of Mexico (UNAM). While having a number of institutions may nonetheless represent an opportunity to boost knowledge spillovers particularly if the project is linked to firms, urban sprawl does not seem to have been a concern when they put forward the project to build the *Ciudad del Conocimiento* more than 30 kms away from the city centre. Although this new development can be considered as a new spatial cluster within the city, a series of implications become important, such as missing transportation links, the cost of public service delivery and the spatial mismatch in housing given demand where the knowledge city will be located and the already excessive housing supply that has been experienced with outmigration since insecurity broke lose 4 years ago.

Figure 4.4. **Physical land occupied by Juárez, 1856-2008**



Source: Adapted from IMIP (2009), *Plan de Desarrollo Urbano*. Instituto Municipal de Investigación y Planeación (IMIP), Ayuntamiento de Juárez.

Economic success in Juárez has led to increased attractiveness for migrants and firms but at the same time unused tracts of land are left inside the city as it rapidly sprawls. Population growth in Ciudad Juárez has led the city to expand its physical size by 35.8% from 2001 to 2008. Most startling, is that while in 2001, only 11.3% of the city's land mass consisted of vacant lots, this had grown to 30.5% by 2008. The largest vacant lots are located in the western and southern area of the city, which are characterised by informal settlements. This has occurred in spite of the existence of large tracts in urban corridors and in areas along the periphery of industrial complexes throughout the city (IMIP, 2009).[1]

The low residential density of Chihuahua, combined with improvements in the quality of roads, low-cost automobiles, and insufficient public transportation has created an automobile-dependent urban form, similar to many cities in the United States. In the City of Chihuahua, for example, 61.3% trips made each day are done through cars. Indeed, only 16.5% of the trips are made through public transport, which is far below the Mexican national average which is between 50 and 60%. The increased use of automobiles has also been stimulated by improved road conditions (i.e. the percentage of paved areas in the City of Chihuahua grew from 50% in 2000 to 69% in 2007). Recent efforts to promote more public transportation have been challenged by the high accident rates of buses. Although accidents have decreased lately, they are still elevated in cities, such as Ciudad Juárez where the public transportation fleet causes or is the victim of an average of 3.8 accidents per day (IMIP, 2009).[2]

An explosive real estate market explains part of the rapid urban expansion in places like Ciudad Juárez. Indeed, from 2000 to 2007 while the population grew by 140 970 people, housing grew by 140 818 units, nearly a one to one ratio. This compares with the 1990-2000 period when the population grew by 420 318 inhabitants and 26 384 housing units were built, which translated into a new home for every 16 inhabitants (IMIP, 2009). Economic success leading to rural to urban migration has partly led to urban sprawl through new housing. As Juárez, Chihuahua City and other cities have grown, so have "*fraccionamentos*", middle-class residential subdivisions that are often

located outside the city centre and comply with some, but sometimes not all planning, infrastructure and zoning requirements. There are approximately 448 of these subdivisions in Chihuahua, which house 78% of the population of Chihuahua according to the Instituto de Vivienda del Estado de Chihuahua (IVI, 2011). The monofunctional nature of these housing developments and their location in outlying areas has not lent itself to a transit-supportive environment.

The recent abandonment of urban neighbourhoods due to the crisis and insecurity has created mini "ghost towns" within Ciudad Juárez. It is estimated that in the first semester of 2010, 19.2% of the homes in the State of Chihuahua were not lived in or completely abandoned (Table 4.1). Rates in the major cities were even higher in Ciudad Juárez (23.8%) (IVI, 2011). There is not a parallel for such a market in OECD metro-regions. Ironically, the meteoric rise of the housing stock in Ciudad Juárez from 2000 to 2007 was also associated with the abandonment of several houses throughout the metropolitan region. In 2009, there were more than 100 000 unoccupied housing units in Ciudad Juárez alone, where "entire informal settlements seemed to be ghost towns" (IMIP, 2009). With 74.8% of the abandoned housing stock, Ciudad Juárez is affected by the abandonment issue much more severely than elsewhere in the State of Chihuahua.

Table 4.1. **Abandoned homes in Chihuahua, 2010**

	Total Housing Stock	Occupied Housing Stock	Abandoned Housing Stock	Percentage Abandoned
Chihuahua City	279 840	234 006	43 662	15.6%
Ciudad Juárez	465 013	361 370	110 442	23.8%
Chihuahua State	1 194 835	944 681	229 210	19.2%

Source: IVI (2011), "Estudio de Evaluación y Análisis de la Vivienda Económica en el Estado de Chihuahua: Documento Síntesis del Estudio", Instituto de Vivienda del Estado de Chihuahua.

The abandonment of these homes combined with the proliferation of low density development has created new problems of public service maintenance in older neighbourhoods, vandalism directed to abandoned homes, and the financial burden of extending services lines to newer, peripheral areas in the metropolitan region. A high percentage of homes in subdivisions were vandalised: of the 341 330 housing units in Chihuahua's subdivisions, 7.2% (24 688 homes) have been vandalised. The cost to recuperate these homes is not insignificant; it was estimated at MXN 1.46 billion (USD 114.6 millions or EUR 84.05 millions) in 2011 (IVI, 2011).[3]

Urban policies and institutional change

Chihuahua has embarked on a very ambitious urban era in the policy design and implementation of urban development policy. Its municipal officials rightly conceive of urban planning as a holistic exercise that transverses themes of urban economic development, questions of adaptability to climate change, and citizen participation. The Chihuahua State Development Plan 2010-16 (*Plan Estatal de Desarrollo*) outlines six main objectives:

- To have planning instruments for sustainable regional and urban development that are clearer and easier to implement in order to achieve social cohesion, urban management and to consolidate urban corridors.
- To update the state's regulatory framework on urban development.

- To acquire new territorial reserves with housing vocation aiming at providing housing lots preferably with basic services.
- To increase efficiency in urban transport systems in large and medium-sized cities in the state.
- To tackle lack of property titles particularly for families in need.
- To advance in the regularisation of land tenure through the *Comisión Estatal para la Regularización de Asentamientos Humanos Irregulares* in co-ordination with and supporting municipal governments and if necessary with federal authorities (Chihuahua State Government, 2011).

This ambition is mirrored at the municipal level. In the *Chihuahua Visión 2040 Plan*, the authors outlined the following objectives of urban development policy:

- integrated and continuous growth of the city;
- densification and the occupation of vacant urban land;
- regeneration of the Historic Centre;
- urban renewal;
- consolidation of the city and its neighbourhoods and informal settlements;
- conservation of natural patrimony and built heritage;
- diversification and mix of uses for land;
- mitigation of risk;
- environmental sustainability;
- social development; and
- economic development and competitiveness.

Improving urban land regulation in Chihuahua

A split-rate property tax, which places proportionally higher taxes on land than on built structures, could support the City of Chihuahua's objectives to reduce vacant land. The Chihuahua 2040 report clearly reveals that the current property tax structure does not include the cost for the government to provide infrastructure and services to abandoned buildings and that "the public administration has not developed policies nor mechanisms to incentivise tax collection through property taxes to the numerous property owners who do not pay the real cost, which contributes to maintaining vacant areas" (Ayuntamiento de Chihuahua and IMPLAN, 2011). A split-rate would make it more costly to hold on to vacant or under-utilised, centrally located sites. The split-rate property tax is in sharp contrast to the conventional equal-rate system that applies the same tax rate to land and to structures built on it. Reducing the total tax burden on land-intensive development and redevelopment could facilitate revitalisation and the replacement of obsolete buildings in older central cities. The effect is to reduce the tax burden on land-intensive uses (e.g. apartments) and increase the tax burden on land-extensive uses (e.g. parking lots) (Bengston et al., 2004). This form of tax is implemented in Sydney, Hong Kong, and in Pittsburgh, Harrisburg and many other cities in the state of Pennsylvania in the United States along with cities in Denmark and Finland (Box 4.3). However, because the split-rate tax may provoke premature land conversion in outlying areas, effective regulatory

mechanisms should be designed to avoid unintended consequences. A disadvantage of the tax could be the transaction costs of valuing urban land values independently from built structures (OECD, 2010a).

Box 4.3. **Confronting vacant urban land: the case of split-rate property taxation in Pittsburgh**

This type of graded (or two-tier) tax plan was adopted by fifteen cities within Pennsylvania, the largest being Pittsburgh and Scranton. In theory, by dropping the relative tax penalty for land development, owners are less likely to view selling-price appreciation as their primary asset, and unproductive speculation is reduced. The most positive results of this approach have occurred in Harrisburg, PA, which between 1982 and 1998 reduced vacant plots by 88% (from over 4200 to under 500), and increased total real estate value more than fourfold.

Pittsburgh, the only major American city to use this taxation method, has been more extensively studied. Pittsburgh has had a graded property tax system since 1913, a system under which land was taxed at a rate twice that of the structures on the land until 1979. The City introduced a striking restructuring of the City's property tax in 1979 and 1980, raising the tax rate on land while leaving the rate on structures unchanged, thus raising the tax rate on land to about five times the rate on structures. This emphasis on the land element has been maintained or increased since the initial restructuring. Special districts, the county, and the overlying school district use a conventional property tax, so that when accounting for all jurisdictions, the complete tax rates within Pittsburgh are roughly twice as high on land as on improvements.

A study conducted by two economists (Oates and Schwab, 1995) closely examined the connection between the downtown urban renewal of the last two decades, and the graded tax plan, in comparison with other Midwestern cities.68 They found that other factors were more directly responsible for increased building; the City had instituted a generous three-year tax abatement on the additional value from new construction, for example, and secured commitments from several large corporations to headquarter in the City, before the tax revision was made. The authors argued that by its nature the land value tax does not distort economic choices and is therefore neutral. However, they concluded that this very characteristic was key in Pittsburgh's development, as the City was under heavy fiscal pressure and had to raise its revenue by some means. Had it resorted to another method of taxation, the new boom economy would have been negatively impacted. The increased rates on land provided the additional revenue for tax abatement on improvements as well as for other City programmes. According to this perspective, the tax scheme has been a success. This success, however, was on a wider economic basis rather than as a policy directed narrowly to vacant or underdeveloped land within the City.69 Because of the far-ranging consequences of tax reform, the use of tax policy as a mechanism to encourage vacant urban land redevelopment should carefully consider the possible, unintended consequences of altering relative taxation.

Sources: Goldstein et al. (2001), "Urban Vacant Land Redevelopment: Challenges and Progress", Lincoln Institute of Land Policy Working Paper, based on Eils Lotozo, "The Land Value Tax Could Be A Win-Win For The City, But Getting It Passed Won't Be Easy," Philadelphia Weekly, April 1, 1998; Robert M. Schwab and Amy Rehder Harris, "An Analysis of the Graded Property Tax," October 1997. Appendix to the District of Columbia Tax Revision Commission, Summary Report to the Mayor and Council of the District of Columbia, May 1998; Oates, W.E. and R.M. Schwab (1995) "The Impact of Urban Land Taxation: The Pittsburgh Experience" Resources for the Future Discussion Paper. Real Estate Research Corporation, Infill Development Strategies, prepared for the US Dept. of Housing and Urban Development, Office of Policy Development and Research. Published jointly by the Urban Land Institute and the American Planning Association, 1982.

Alternative densification tools beyond density thresholds could be deployed given the inability of cities to meet these established thresholds and the potential of densification to support mobility and reduce land consumption. Cities in Chihuahua have relied on traditional density thresholds that have not been as effective as imagined. The 1994 Master Plan of Ciudad de Hidalgo del Parral, for example, sought to raise density to 80.3 habitants per hectare. In 1998, the city had a density level of approximately 51 habitants per hectare and planners revised their goals, lowering their target to only 60 habitants per hectare in 2015 (Ayuntamiento de Hidalgo del Parral, 1998). There is also movement away from citywide density targets to those for particular zones, as seen in the *Plan de Desarrollo Urbano de Chihuahua*. In pursuing densification, municipal officials might look to other cities for alternative tools. For example, the City of Kalamazoo, Michigan in the United States, adopted a dynamic height control for areas surrounding its downtown core, in which the maximum height on an individual parcel corresponds to the height of the tallest building on an adjacent parcel plus one floor. Delhi makes maximum heights in some areas of the city a function of surrounding street widths – if streets are widened then maximum heights are allowed to increase automatically (Elliott, 2008).

Increasing the number of building and land inspectors, as currently done in Chihuahua City, would reduce the deviance from official land regulation. Though enforcement of planning legislation has traditionally been weak in Chihuahua, momentum is building quickly to enforce existing planning legislation. The clearest sign of this commitment is the growth of the Chihuahua City Office of Urban Development and Ecology (*Dirección de Desarrollo Urbano y Ecología*), which traditionally only had ten inspectors for the entire city. In May 2010, the City increased the number of inspectors to 32 and mainstreamed a new work scheme called, *Guardián Ecológico* (Ecological Stewards). These efforts have been complemented by the support from the local police force, which assists the inspectors identify informal settlements and illegal dump sites. If one counts the 21 additional inspectors from the police who assist the inspectors, its number has risen from 10 to 53, a notable achievement. Though it is premature to evaluate this programme completely, there are clear signs that it is contributed to better vigilance over planning norms. Until now, the city has witnessed a growth in construction licenses and a threefold growth in formal citizen complaints, such as those that identify in illegal construction materials and violations of environmental accords.

Momentum is building in Chihuahua for more rigorous land regulation, as witnessed by the recent approval of the *Ley de Desarrollo Urbano Sostenible del Estado de Chihuahua*. This law contains for stringent obligations for property developers

Leveraging mass transit improvements to improve density

The bus rapid transit programmes could help create a more dense urban form if they supported transit-oriented development (TOD) that permits higher densities along a mass transit corridor. TOD could reduce car congestion and encourage densification by facilitating increased use of public transportation. A variety of requirements and/or incentive programmes have been introduced in OECD metro-regions that could be helpful for Chihuahua. The Finger Plan of the Copenhagen Capital Region is one of the most renowned examples of policy-mix of urban containment land use regulation and transit-oriented zoning (TOZ). In the Plan, the principle of accessibility, i.e. the rule that large office workplaces will generally have to be located within 600 meters of the closest public transportation station, provides a key rule for controlling sprawl and maintaining a compact urban form. The other example of the integrated concept linking development

and transport is seen in Luxembourg where IVL (Integrated Transportation and Territorial Development) concept is promoted in its spatial planning system (OECD, 2007a).

As Chihuahua and Ciudad Juárez introduce bus rapid transit systems, particular attention could be paid to the operational phase. Particular attention on operations could be directed to Ciudad Juárez, where the bus rapid transit system has not been rolled out despite the construction of bus stations and the purchase of a new BRT fleet (Box 4.4).

Box 4.4. **Optimising the operational phase of bus rapid transit systems**

A number of actions can be taken to optimise the operation of bus papid transit systems. one of the aspects that is crucial, is to match service operations to supply and demand, using the intrinsic flexibility of buses by:

- allowing departures from the fixed route, introduce mid-way returns, and operate express services. Note that feeder-trunk operations might not be applicable to all local conditions;
- restructuring or transforming existing bus operations so that they complement rather than compete with the new system;
- taking into account the required infrastructure maintenance such as pavement, stations, and terminals;
- allowing time to adapt and implementing advanced fare-collection systems;
- using advanced transit-management systems if operations are complex, and applying them as tools to control reliability, not just as a means of acquiring operational data.
- paying attention to the system's image, through good public information provision, user surveys, and careful maintenance of fixed infrastructure and vehicles.

Source : WRI/EMBARQ (2010), Modernising *Public Transportation: Lessons Learned from Major Bus Improvements in Latin America and Asia*, *http://pdf.wri.org/*modernising_*public_transportation.pdf*.

Does planning have its intended effects in Chihuahua? Supporting ex post evaluation and monitoring

An apparent disconnect exists between the highly advanced planning concepts presented in the various framework documents and the current state of spatial planning and territorial governance on the ground in Chihuahua. Relatively few countries in particular the Nordic countries, have an evaluation culture in spatial planning. Traditionally planning systems are poor at measuring their impact on development patterns against targets and indicators. Impact analyses are considered difficult to use because they tend to be medium and long term endeavours. Criteria to evaluate the effectiveness of spatial planning are mostly sectoral, at least when it comes to short-term evaluations (e.g. concerning regional economic development, transports and communications). These evaluations are mostly process oriented, while the effectiveness can only be assessed after some years. Performance measurement is further complicated by the fact that planning systems is only one among many influences on regional development.

It is not known whether the lengthy strategic plans in Chihuahua have their intended impact. Part of this can be explained by the traditional lack of attention to monitoring and implementation. International experience suggests an overestimation of planning's actual effects. In Melbourne, for instance, it was found that the city's strategic planning had unintended effects given a "*lack of understanding of the dynamics of urban change* (especially by the professional public service) [and] a *lack of attention to forecasting, monitoring, research and review* associated with actual land-use policies" (McLoughlin, 1992). For this reason, the United Nations Human Settlements Programme is encouraging stricter evaluations of urban planning (Box 4.5).

Box 4.5. **Guidelines on evaluations of urban planning**

Urban planning systems should integrate monitoring and evaluation as permanent features. This should include clear indicators that are aligned with plan goals, objectives and policies. Urban plans should also explicitly explain their monitoring and evaluation philosophies, strategies and procedures. Use of too many indicators should be avoided and focus should be on those indicators for which information is easy to collect.

Traditional evaluation tools – such as cost–benefit analysis, cost-effectiveness analysis and fiscal impact assessment – are still relevant, given the realities of local government resource constraints. Recent interest in performance measurement, return on investment and results-based management principles means that the use of these quantitative tools in urban planning practice should be encouraged.

All evaluations should involve extensive consultation with, and contributions by, all plan stakeholders. This can be achieved through, for example, participatory urban appraisal methods. Experience has shown that this can enhance plan quality and effectiveness through insights and perspectives that might otherwise not have been captured by the formal plan-making process.

Most routine monitoring and evaluation should focus on the implementation of site, subdivision and neighbourhood plans. The outcomes and impacts of many large-scale plans are difficult to evaluate because of the myriad of influences and factors that are at play in communities over time. It therefore makes more sense for monitoring and evaluation to focus on plans at lower spatial levels, i.e. site, subdivision and neighbourhood plans.

Source : United Nations Human Settlements Programme (2009), *Planning Sustainable Cities: Global Report on Human Settlements 2009*, Earthscan Publications, London.

To improve compliance to Chihuahua's municipal urban plans, the Chihuahua State government could provide technical assistance in measuring plan implementation and compliance. To date, there has not been a serious evaluation of the extent to which these regulations have been implemented and/or followed despite the enormous planning initiatives underway. Planners in Chihuahua have difficulty in knowing the extent to which the plans they have created have actually been implemented. In general, "[i]f planning intends to have any credibility as a discipline or as a profession, it should be possible, through a systematic assessment, to have a real judgment of planning effectiveness…'Good' planning or 'good' plans should be distinguishable from 'bad' planning and 'bad' plans (Oliveira and Pinho, 2010). To measure the implementation of plans, methods could include conformance-based approaches, such as the application of a "planning monitor" to measure the extent to which the goals and the objectives of the plan are met (Calkins, 1979). Performance-based methods could also be considered to

better understand in what conditions land use and housing plans were consulted for subsequent decisions (Box 4.6). More sophisticated analysis using Geographic Information Systems (G.I.S.) could also be employed to map permits and compare to regulation, as done in the Brody et al. (2006) study on compliance to environmental protection regulations in Florida.

Box 4.6. **Methods to monitor the effectiveness of planning**

At the end of the 1970s, Calkins (1979) presented the planning monitor, a mechanism to measure the achievement of plan objectives and to explain eventual differences between planning and urban development. There are two separate components of the planning monitor: *i*) a set of rational planning procedures; and *ii*) a supporting information system. A planning monitor would provide information that is needed for modification of a plan and for the evaluation of planning as an effective means of controlling development. When fully operational a planning monitor would introduce accountability into the planning process through the evaluation of plan implementation actions. The planning monitor is a system where I is a vector of inventory attributes; subscript $t+n$ is the final-state inventory and subscript t is the inventory at the beginning of the planning period; superscripts g and a are used to differentiate between planed inventory vectors and actual inventory vectors, respectively; P is a vector of the rate of the change that is expected as a result of public policies; and R is a vector of the rate of forecasted change, or change that is expected as a result of exogenous factors.

$$I_{t+n}^{g} = I_{t}^{a} + \sum_{n=1}^{n} (P_{t+n} + P_{t+n})$$

The Plan Implementation Evaluation (PIE) Methodology developed by Laurian et al. (2004) offers another evaluation framework. It conceptualises implementation as the extent to which a plan achieves its policies through adoption of the relevant management techniques in development permits. For PIE, the permitting process provides the locus of observation of the linkages between policies and their implementation. This link most strongly reflects implementation as decision makers operationalise the plan objectives (and related policies) through permits on a regular basis. Thus, permits are intended to manage land development and thereby implement the plan. A well-implemented plan is defined as one in which a high proportion of policies for achieving an objective in the plan are implemented by the development permits. The evaluation method focuses on the strength of the linkages between policies and permits, measured through the adoption of relevant management techniques. For each permit, implementation is measured as the proportion of plan polices that are implemented by the permit (as a proportion of all relevant policies). Within the plan, a policy is considered implemented if the permit includes at least one appropriate management technique that implements. PIE has been applied to six New Zealand plans and to almost four hundred land development permits and has focused on storm water and urban amenity management.

Source: Calkins, H.W. (1979), "The planning monitor: An accountability theory of plan evaluation", Environment and Planning A 11 (7): 745-58; Laurian, L. et al. (2004), "What Drives Plan Implementation? Plans, Planning Agencies and Developers", *Journal of Environmental Planning and Management* 47: 4.

Conducting a systematic land assessment

Given Chihuahua's government's key role in land-use policies and strategic planning, it could evaluate the effects of municipal planning on meeting national land demands. Land market assessments can determine how much land and infrastructure are currently available and project how much additional land and infrastructure need to be developed to accommodate urban growth. A wide variety of techniques have been utilised in OECD

countries to conduct a land market assessment and monitor land supply. Effective land analysis has allowed policymakers to identify areas that are growing the fastest and given them accurate projections to inform infrastructure development. Similarly, monitoring land prices can give policy-makers the information of where land prices are the highest and where land prices are increasing the fastest, which are both critical to local property tax streams.

Though cities in Chihuahua and the State itself produce helpful housing statistics, government can go beyond such diagnostics to analyse the effects of land policies through systematic assessments thereby helping understand land policies' effects such as:

- increases in the permitted density of existing residential land and in intensity of existing commercial and industrial lands in a zoning ordinance;
- financial incentives for higher density housing;
- reduction of on-site parking requirements in a zoning ordinance;
- reduction of space requirements in a zoning ordinance;
- provisions permitting additional density in the particular zoning district(s) in exchange for amenities and features provided by the developer;
- minimum density or intensity requirements in a zoning ordinance;
- redevelopment, infill, or brownfields strategies;
- authorisation of housing types or site planning techniques in a zoning ordinance that were not previously allowed by the local comprehensive plan or zoning ordinance
- authorising changes in zoning-use classification, including mixed-use zones;
- changes in standards for public and community facilities or services, including transportation, that require the use of less land.

An analysis of the effects of municipal land policies, could inform the Chihuahua government of the effects of their various municipal and state plans. This merits attention given importance that land has to support Chihuahua's economic activity, as well as to safeguard environmental resources. A system could also be established to monitor the transportation improvements in the pipeline to ensure that they provide accessible and reliable services and benefit from intelligent transportation systems (ITS) technology that has been implemented throughout Latin America (Table 4.2).

Table 4.2. **A comparison of bus rapid transit systems in Latin America**

	Date for the first line	Main lines (kms.)	Overhead lane in stations	No. of buses in main lines	Passengers per day (thousands)	IPK (main line services)	Fares (USD)
Curitiba	1974	65	no	189	532		1.25
Bogotá	2000	85	> 90%	1 192	1 650	5	0.87
Pereira	2006	18	no	45	104	9	0.76
Barranquilla	2010	13	67%	57		14	0.76
Bucaramanga	2010	9	no	115	187		0.76
Quito -Trole	1995	18	no	113	250	14	0.25
Guayaquil	2006	38	no	115	280	6	0.25
Cd de México	2005	48	no	214	500	8	0.39
León	2003	26	no	52	90	10	0.42
C. Guatemala	2007	11	algunos	62	155	6	0.13
Lima	2010	27	> 80%	308	854	6	0.54

Source: Menckhoff, G. et al. (2010), "El metropolitano de Lima: implementación y primeros resultados de un nuevo sistema BRT", mimeo.

Adapting a city-region approach that acknowledges inter-municipal relationships in Chihuahua

In light of its rapid growth, the City of Chihuahua should be acknowledged for its promising efforts to go beyond the Urban Development Plan (PDU) and engage in metropolitan planning. Momentum has been building for a more metropolitan approach to governance, beginning with the Consejo Nacional de Población's definition of the Chihuahua Metropolitan Zone, which includes the municipalities of Chihuahua, Aldama and Aquiles Serdán. The PDU recognises the interconnections between the three municipalities and how sprawling land patterns have enlarged the metropolitan region. The PDU outlines policy instruments that could be used to help build metropolitan-wide agreements. Currently, IMPLAN is co-ordinating with *Secretaría de Desarrollo Urbano y Ecología* (SDUE) and participating municipalities in the design of a Metropolitan Plan of Chihuahua, which is projected to be completed in the end of 2012.

The experience of OECD metro-regions offers several important lessons for intermunicipal agreements that could be applied to capture economies of scale between cities throughout the State of Chihuahua. Although approximately 25% of municipal governments in Mexico have formalised agreements with neighbouring municipalities for co-ordination and collaboration in the supply of public services – water and sewage, public security and public transport – the annual nature of programme funding and short-planning periods associated with 3-year municipal election cycle limit co-operation (OECD, 2010a).

Cities in Chihuahua could expand their co-operation to encompass joint service provision. A successful example is the area-wide management of services through inter-municipal collaboration, leading to the creation in 2007 of the first area public multi-service company in Italy's Veneto region.[4] Replacing four local companies, it offers integrated water and waste collection and disposal services at the metropolitan scale to 25 municipalities; sells and distributes energy through sister companies: and offers integrated management of urban services and industrial services, including wholesale markets and the environmental clean-up of polluted sites (OECD, 2010b). Considerable co-ordination costs are sometimes incurred, due to the involvement of many different actors, but some of the transaction costs usually associated with mergers can be avoided. As local utilities have in many OECD countries been de-politicised or privatised, such mergers tend to arouse less political resistance, and reform efforts thus entail fewer transaction costs. Future reform efforts in Chihuahua deserve reflection, and further co-operation, including mergers, should be assessed, based on estimations of potential gains in efficiency. Moreover, any international practice would need to take into account the rich institutional history of intermunicipal co-operation in metro-regions like Mexico City (OECD, 2004).

In addition, municipalities also require more time in office to plan and implement long-run growth. Many infrastructure projects require many years from design, agreement with stakeholders and implementation. Despite that Mexican legislation prevents re-election, state-level legislation can accommodate slightly longer administration periods that while preserving the national legislation, would allow local governments to have greater impact on development. Chihuahua's State Congress could consider, within the legal limits of the Constitution, expanding municipal periods to allow for longer local administrations that would have a positive impact on policy planning and implementation, as well as on local-capacity building.

The various experiments with voluntary inter-municipal co-operation agreements governance in OECD countries show clearly that the central state has played a dominant role in the process, often through the use of fiscal or legal instruments (OECD, 2010a). One such example is Canada, where much of the federal infrastructure programming requires that contiguous municipalities in a functional region, either urban or rural, to partner on joint infrastructure projects where appropriate. Each municipality, rather than ask for its own funding, pools its efforts with others to maximise investment efficiency in the functional region (for waste management or transit, for instance).[5]

Adopting a city-region perspective

Chihuahua could benefit from adopting a city-region policy framework given the interconnectivity of municipalities in the state and the promise of city-region arrangements to deliver services at a larger scale. City-regional arrangements have recently emerged in England to deliver services such as transport and training, across groups of municipalities within a single, economically integrated urban area. The city-region concept has gained traction there because a number of the underlying factors that shape the urban economy have changed. The ongoing effects of globalisation, increases in long-distance commuting, and expansion of the service and knowledge-based economy have widened the scale at which urban economies function. Local authorities can no longer tackle housing, transport and training issues within their own boundaries and instead collaborate much more with their neighbouring authorities. Ultimately this allows city-regions to pool devolved funding with local resources to deliver transport, training and urban regeneration (Larkin and Marshall, 2008).

Given the proliferation of small, tightly connected municipalities in Chihuahua, a "micropolitan" scale would be helpful for organising inter-municipal partnerships. The concept of a micropolitan area was created by the United States Census and features a smaller nucleus the metropolitan statistical area. A Micropolitan Statistical Area is a Core Based Statistical Area associated with at least one urban cluster that has a population of at least 10 000, but less than 50 000. The Micropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county or counties as measured through commuting.[6]

A contract covering an entire metro-region would allow policymakers in Chihuahua to increase policy coherence across the city-region area. There are a number of cases where partnerships and contracts have been concluded with recently created metropolitan authorities, though largely as *ad hoc* sectoral partnerships. Some countries have begun to introduce or contemplate the introduction of contractual procedures at metropolitan level based on a more multi-sectoral approach. France created the agglomeration contracts that involve the central state, the region and the inter-municipal body of either the Agglomeration Communities or the Urban Communities focussing on human capital improvement and economic development initiatives (Box 4.7). The introduction of Metropolitan contracts in 2007 was a major step towards recognising functional economic areas by fostering collaboration among municipalities around a commonly defined project for economic development, without creating a formal metropolitan body. The Swiss Confederation has also introduced an agglomeration policy which would better integrate large city problems in sectoral policies in particular by encouraging project implementation through policy incentives entitled the Model Projects (OECD, 2006a).

Box 4.7. **Contractual tools made at the metropolitan functional level in France**

The agglomeration contract in France is a bottom-up method based on 'one territory–one project–one contract', which is proving increasingly successful and contributing to agglomeration-based governance, bringing together the central government, the region and the Agglomeration Community or the Urban Community. The county council (*conseil general of the département*) can be associated with the signature of the contract, in particular for questions related to social policies. This procedure involves four main stages. *i*) The agglomeration project which is the basic document that contains a diagnosis of the functioning of the agglomeration. It identifies the issues, provides development policy options and an indication of the support areas for these choices as well as the policies and measures to implement these choices, with a phased timetable and identification of priorities. The project must focus on regional development (economic, social and human development) rather than infrastructure development and improvement. The project must be based on dialogue with the municipalities and the main actors in the area by mobilising non-public actors for implementation. *ii*) The development board: that represents a variety of economic, social, cultural and association groups which must be consulted during the preparation of the project and on final delivery of the project prior to signature of the contract. They can also be associated with the drafting of the contract. *iii*) The agglomeration contract that is the financial and programme document on the implementation of the project which identifies the partners, projects, pluri-annual financing and contractors. *iv*) The regional coherence plan (SCOT) which is a spatial projection document of the agglomeration project that translates the project decisions into urban planning law (included in the State-Region Contract procedure).

The metropolitan contracts in France focus on actions which nurture and expand the development of the metropolitan areas: economic development, access to infrastructure, research, higher education, cultural development, etc. Particular attention is paid to poles of competitiveness, especially on actions which allow the development of synergies between the private sector, research and universities. Metropolitan contract is supposed to unfold in three phases: (i) a government call for proposals for engineering stronger metropolitan co-operation; (ii) a metropolitan plan, prepared by governments; (iii) introduction of a metropolitan contract, based on very specific activities.

Source: OECD (2006), *Competitive Cities in the Global Economy*, OECD Publishing, Paris.

A comprehensive review of the enormous breadth of urban planning efforts in Chihuahua is beyond the scope of this Review, which will instead offer targeted recommendations on three vital areas: *i*) improving urban land regulation, *ii*) linking an evaluation of deviance from official plans to better enforcement of approved land policies, *iii*) adopting a city-region perspective that supports intermunicipal partnerships and co-ordination, and *iv*) make planning a citizens, experts and metropolitan issue. Additional urban policy tools, if administered correctly, can be employed to construct a co-ordinated urban policy and confront the aforementioned challenges. The four pillars of an urban policy strategy could consist of the following:

- *Improving urban land regulation in Chihuahua*: A split-rate property tax, which places proportionally higher taxes on land than on built structures, could support the City of Chihuahua's objectives to reduce vacant land. This could also be useful in Juárez whose density and sprawl is even more acute. Alternative densification tools beyond density thresholds could also be deployed, such as dynamic height control for areas surrounding its downtown core. Increasing the number of building and land

inspectors, as currently done in Ciudad de Chihuahua, would reduce the deviance from official land regulation. The bus rapid transit programmes could help create a more dense urban form if they supported transit-oriented development (TOD) that permits higher densities along a mass transit corridor.

- *Supporting ex post evaluation and monitoring*: It is not known whether strategic urban and regional plans in Chihuahua have their intended impact. Mexican urban planning has traditionally lacked attention to monitoring and implementation, e.g. there are often few explicit statements about timing and sequencing of development and public facility provisions. *The Chihuahua State government and local municipalities could consider integrating monitoring and evaluation as permanent features of their urban plans. The central government could also provide technical assistance and capacity building for local officials to* measure plan implementation and compliance. Monitoring land policy merits specific attention given the proliferation of informal settlements, the evidence of illegal land sales, and the role of urban planning for supporting economic activity and safeguarding environmental resources.

- *Facilitate city-region networking to improve service delivery*: Co-operation among local governments in functional areas remains limited in Chihuahua. Voluntary modes of co-operation among adjacent municipalities could be encouraged and policy frameworks could explicitly acknowledge city networks and develop delivery agreements at the metropolitan or micropolitan levels. Additional projects and funding would be needed to integrate sister city agreements into the region's long-term common strategic goals and to build a stronger policy framework to support an interconnected urban system.

- *Make planning institutes more inclusive, expert-based and metropolitan*. There is a need to increase planning institutes' effectiveness, encourage co-operation and overcome political obstacles and politicisation of these bodies. Urban experts from academia can join council boards and planning institutes should incorporate their views. In order to increase inclusion and strengthen the potential benefits of having experts' views, citizens and civil society representatives should join these councils and should be decision makers in cities' plans. Moreover, these plans should go beyond administrative boundaries and incorporate the functional area where applicable. This will not only increase the relevance and effectiveness of plans, but will balance power within the institutes.

Given the large distances between medium and large cities in the state (some of them are apart by hundreds of kilometres), interaction among them are not as intense as in other smaller and better connected regions. In this context putting in place the right mechanisms for the regional urban system to foster complementarities among cities, can be key in strengthening regional comparative advantages and can render the region more competitive. Mechanisms such as participatory bodies that look at regional development through a functional regional approach are advisable. Chihuahua is already making progress in this respect. CODECH has been very active in the past years empowering local leaders in different regions in the state to constitute their own regional economic development councils (*Consejos Regionales para el Desarrollo Regional/CODERS*). CODERs are part of CODECH, but they focus on regional development on a functional basis. Most of their activities are geared towards strategic planning, local government advice and spurring regulatory reform units at local level through the support of public, private, social and academic actors. In terms of urban development however, interaction

between regional development strategies produced by CODERs and urban planning institutes is required to avoid a disconnection between economic and spatial planning. Better co-ordination in economic and social planning can be achieved by including CODERs members to be part of urban planning institutes.

4.3. Rural challenges in Chihuahua

Expanding the Rural Economy

In OECD countries, economic development has always involved a process where the agricultural sector releases labour for more productive employment in urban areas. This results in both farming accounting for a smaller share of employment and a growing urban share of the national population. Mexico has moved steadily along this path and Chihuahua is further along it than most Mexican states. However, as agriculture releases labour it also increases the amount of capital, allowing agricultural output to continue to increase on the same land base, which provides food and raw materials for the growing urban population. This process inevitably results in an increase in average farm size. Further, high fixed costs of investing in machinery and other technologies, such as irrigation or modern dairy barns, leads to larger shares of output coming from the biggest farms.

A central question in rural development is what happens to small farms in this modernisation process. Some small farms are abandoned when the household relocates to an urban area to take advantage of better income opportunities. In this case land is consolidated into other farms. Some small farms are able to expand and reach a large enough size to remain viable, particularly if the household can find off-farm employment in the local community. Other small farms become trapped in a semi-subsistence lifestyle. For these households, the farm is unable to provide an adequate income, but there are either too few off-farm employment opportunities in the community, or the members of the household have such limited skills that they are unable to find employment.

Rural development policy largely consists of efforts to deal with these phenomena. One strand of policy deals with the modernisation of agriculture by facilitating the adoption of new technologies and expanding markets. A second strand deals with expanding local employment opportunities for those displaced from farming and those engaged in part-time farming. Facilitating rural to urban relocation can be an important component of this policy thread. A final strand deals with providing a safety net for those unable to adapt to changing market conditions on their own. This last set of policy requires intervention to provide the means for the worst off in society to participate in the development process.

Increasing the Competitiveness of Rural Areas in Chihuahua

In OECD countries there is an increased recognition that a strong national economy requires that rural regions and citizens take on a larger role in increasing productivity. The New Rural Paradigm (NRP) adopted by the OECD (2006b) provides a framework for developing a strategy for this to happen. It recommends that an investment oriented approach be followed to rural development that is based on taking advantage of sectors where there is a local competitive advantage (Box 4.8). Identification of these sectors is best done at the local level, although senior levels of government can play an important role in helping local actors define development strategies and in supporting their actions.

Urban areas are currently play a leading role in state economy, but there is great potential for rural areas to contribute more to the economy and for levels of rural income and employment to significantly improve. In all OECD countries a key part of economic development involves a transition in the countryside where labour leaves primary agriculture at the same time that farm output increases, largely because of the adoption of new technologies and the substitution of capital for labour. In Chihuahua there is evidence that this transformation has begun, but there is also evidence of significant impediments to the process that are preventing modernisation of the rural economy.

While the rural economy encompasses more than farming, for example, tourism, renewable energy, mining, forestry and manufacturing, in Chihuahua farming is currently the backbone of the rural economy in terms of both output and employment. Thus, rural development in Chihuahua requires a transformation of agriculture as a fundamental first step to rural development. Currently there are a small number of highly efficient large commercial farms that are competitive with the best farms in North America. These farms already account for a large share of agricultural output in the state and dominate important commodities like, dairy, apples and other fruit and nuts and vegetables.

Box 4.8. **Chihuahua's Mennonite cheese**

The Mennonite colony, near Cuauhtémoc, has established a national brand in the form of Mennonite cheese. This cheese is produced at a number of small cheese plants in a part of the state that has weak road connections to major markets. In the region dairy is a major enterprise, and many small farms rely on milk sales to the cheese plants for a major share of their earned income. The existence of the cheese plant makes the dairy industry in the immediate region viable because it is the sole market for raw milk.

The combination of a large number of farms with small dairy herds, low animal productivity and a location that is far from milk markets would normally suggest that dairy is a poor enterprise for the region. However, while fresh milk cannot be exported, it is possible to transform the milk into a stable and higher value product and ship it out to distant customers. Cheese is an ideal transformation since it results in a high value product that is easily transported and has a long shelf life.

Mennonite cheese, in particular, is ideally suited to the region, since it is made using a simple process and does not have to be aged, so there is no need to have a large storage facility. Most importantly, Mennonite Cheese is clearly a local brand that reflects the local population. This makes it harder to imitate and can contribute to a price premium over similar cheese.

The clear lesson for rural development is that by introducing a cheese plant the local dairy industry was kept viable, leading to better levels of farm income. In addition, each cheese plant also creates additional local employment for about 40 people in a region where non-farm jobs are scarce. Certainly the success of the enterprise is also linked to the willingness of the Mennonite community to adopt a collective approach to the enterprise through a co-operative time organisational form. However, the larger lesson is that successful agricultural development may require linking primary production to local processing in order to make the primary production a viable economic activity.

But, farm numbers are currently dominated by a large number of small farms that have low levels of output and where farm household income is low. These farms account for a large share of the rural population and their low income is a major factor in the large gap between urban and rural income in the state. For agriculture to play a larger role in the rural economy, a large share of these farms will have to be transformed into larger

more efficient producers, or the land will have to be transferred to other farms and ceasing production for current operators.

In Chihuahua the process of land consolidation will be complicated by widely held social values that continue to see "peasant agriculture" associated with broadly held access to land as a valued outcome of the Revolution of 1910 and the Constitution of 1917, when land was distributed to peasants through the creation of *ejidos* (Moreno-Brid and Ros, 2009). The creation of a dual system of farmland ownership set in place the foundation for a dual structure of agriculture by removing the possibility of using land as collateral for loans for farmers on *ejidos*. That, and weak incentives for sound land management on *ejidos*, due to collective ownership, led to growing gap in productivity and incomes between farmers on *ejidos* and farmers on private land.

Consequently, while reducing farm numbers, increasing the average size farms and modernising farm management practices is necessary if agriculture in Chihuahua is to be competitive with farming in the US southwest this will be a difficult task due to: social beliefs in the inherent value of the *ejido* model, the dominance of the national government in issues of land tenure, weak credit markets for agriculture, and the limited scope for alternative employment for many small farmers that results in low incentives to give up semi-subsistence farming.

The geographic location of Chihuahua on the US border and far from the high population states of the south of Mexico conditions rural opportunities. The most obvious consequence is that the closest markets for Chihuahua are in the United States. This not only reflects actual distances, but the much better transport infrastructure that is available just across the border. A second consequence is that the rural areas of Chihuahua are more similar to those in the American southwest in terms of agronomic conditions than to rural areas in southern Mexico. This suggests that production in Chihuahua competes with similar production in the US, especially post-NAFTA. This in turn means that farms in Chihuahua are under far more pressure to increase productivity to the level of their US peers than are the more geographically insulated farms of southern Mexico.

Agriculture in Chihuahua

Chihuahua is largely a semi-desert environment with limited rainfall that is highly seasonal in occurrence. Due to significant variability in elevation across the state there are considerable variations in temperature and the length of growing season. In particular, higher elevations offer opportunities to produce crops, such as apples, that would normally not be expected to be found at latitudes this far South. While agriculture in the majority of the state is not limited by the length of the growing season, virtually the entire state faces limitations caused by low levels of precipitation. This makes irrigation necessary for virtually all forms of arable agriculture.

The combination of variable topography and highly seasonal and intense precipitation also leads to a high potential for erosion. If ground cover is disturbed rain can quickly cause major erosion events that wash away topsoil and create large gullies. With the erosion process, soil moisture levels are not restored, and the potential for subsequent plant growth is greatly reduced. This means that poor farm management practices can easily make a bad situation worse by reducing soil capability, making land harder to work, and reducing moisture availability (Box 4.9).

Box 4.9. **Declining soil quality**

Degraded soils have a clear impact on farm productivity by reducing yields and increasing the cost of production. As soils degrade either more land has to be brought into production or additional inputs have to be used to maintain output levels. If agriculture is to make its full contribution to the economy of Chihuahua it is crucial that current farming practices that contribute to soil degradation have to be replaced by practices that enhance soil capability. The possibility of climate change that will further stress plant and livestock growth only increases the need to improve soil capability.

Farming in much of Chihuahua is exploiting soil capability in the same way that irrigation is depleting aquifers. The problem exists both for arable land and for pastures. While the drawdown of aquifers is obvious, because water has to pumped from a greater depth each year; losses in soil fertility are less apparent, other than where intense erosion occurs. Nevertheless, lower quality soil imposes clear costs in the form of: lower yields, lower rates of soil moisture retention and the need for higher rates of fertiliser application.

Cultivation practices on both irrigated and dry land farms largely continue to follow older and now inappropriate practices. Many farmers continue to use ploughs and intensive cultivation to break up the soil, and fields are often left in a clean condition with no plant matter for extended periods before planting. In the past, this type of intensive cultivation was seen as providing a good seedbed for the crop and reducing weed competition. In addition, summer fallow on clean fields is a common practice with the objective of accumulating moisture over a year before a new crop is planted. A common practice in Chihuahua is allowing cattle to graze on harvested fields to remove remaining plant matter, which provides a form of livestock nutrition but which has adverse soils effects.

Intensive cultivation, when compared to no-till or conservation tillage systems, has significant adverse consequences (Verhulst, et al., 2010). Conventional tillage systems tend to result in subsurface soil compaction from multiple field operations, and cause high levels of soil fragmentation on the surface, which increases wind erosion. Removing plant residues, either through tillage or grazing, leads to: losses of organic matter, which reduces yields; reduced moisture holding potential; as well as, increased precipitation runoff. In addition, plant matter on the soil surface can lower soil temperature, which reduces drying and retains moisture for plants. Current assessments of benefits of summer fallow on clean fields suggest that in many cases it leads to erosion and nutrient leaching, unless a cover crop is employed.

In Chihuahua there is very little organic matter in fields, so the removal of residue has far more adverse consequences than in areas with a much higher original level. While chemical fertiliser can replace nutrient losses the presence of organic matter provides better physical characteristics and as well as micro-nutrients that can affect plant growth. While no-till and conservation till systems require the purchase of synthetic herbicides to be effective the initial cost of herbicides is offset by higher yields and improved soil quality. In addition, without summer fallow it may be necessary to introduce new crops into a field rotation in order to control pests.

Poor pasture management is endemic in Chihuahua. Overgrazing leads to the elimination of desired plants and the dominance of inedible plants or to no vegetation. Without adequate ground cover, rains then cause major erosion problems that make pastures less productive and increase the difficulty in managing cattle.

Source: Based on González-Barrios et al. (2010), "Soil Porosity Affected by Cattle Trampling in Highland Agriculture of Northern Mexico", 19th World Congress of Soil Science, Soil Solutions for a Changing World 1 – 6 August 2010, Brisbane, Australia, available at *http://www.iuss.org/19th%20WCSS/Symposium/pdf/0605.pdf.*

With increased urbanisation and the growth of the *maquiladora* programme, the role of farming in the economy of Chihuahua has declined. Although at about 6.5% of GDP in 1991, Chihuahua had the third largest contribution to GDP from agriculture among Mexican states. Average farm size in Chihuahua is larger than in all but two states, Baja California and Tamaulipas. The relatively large share of GDP coming from agriculture has not been accompanied by a high rate of growth. Between 1994 and 2004 agricultural GDP grew by about 2%, which is less than the average for the country. Employment in agriculture in Chihuahua in 2008 was under 10% of total employment compared to over 20% in 1980 and a national average of 13% (Scott, 2009). In this transition the role of unpaid family labour has declined while part-time paid workers have become more important. Full-time workers are most common on the largest farms.

Although Chihuahua's agricultural sector is among the most productive, specialisation on low value-added crops entail low output per hectare. Chihuahua is a leading Mexican state in a number of farming activities (Table 4.3). Output per farm-worker in Chihuahua is well above the national average and fourth highest of all states. But, the value of output per hectare is not particularly high when compared to other states. This may reflect the fact that Chihuahua has a relatively modern farm sector by Mexican standards so workers have relatively more capital to work with, which increases labour productivity. However, corn and cattle are the main uses of farmland and neither of these are especially high value per hectare outputs, which leads to a relatively low ranking on this measure.

Table 4.3. **Leading farming activities in Chihuahua**

Rank	Product	State Production	Share of National
	Agricultural Production in Tons, 2008		
1st	Whole Oats	105 221.50	71%
1st	Apples	354 041.09	69%
1st	Pecans	54 629.46	68%
1st	Cotton	189 556.38	52%
1st	Onions	197 306.92	15.8%
2nd	Green Peppers (Chili)	413 122.29	20%
3rd	Alfalfa	4 128 039.85	14%
4th	Peaches	19 065.56	10%
	Livestock Production, November 2009		
1st	Cattle head exports*	334 922.00	48%
1st	Cattle head exports (2007)	385 516.00	44%
4th	Milk (Millions of litres)	901 830.00	8.5%
4th	Beef (Tons)	84 793.00	5%
	Forestry Production, 2006		
2nd	Pine Production	1 466 503.00	22.6%

Note: */ Livestock Year: September 2007- August 2008.

Source: CODECH (2010), *Background Report for the Territorial Review of Chihuahua*, Consejo para el Desarrollo Económico del Estado de Chihuahua (CODECH), internal document prepared by CODECH for the OECD.

Increasing value added in agriculture remains a key issue as many crops are low value added and cattle raising has not vertically integrated to incorporate higher value-added processes that are left to US producers to reap. Major crops in Chihuahua include: bulk

commodities, such as, corn, wheat, cotton, sorghum and alfalfa, and high value crops, such as, tree fruits (apples, peaches, cherries) and vegetables (tomatoes, peppers, onions). In addition, there is a large livestock sector, primarily cow-calf enterprises located on the most marginal land, and dairy cattle, located in areas where irrigation provides high quality fodder. Beef cattle are largely sold to US feedlots for finishing and the majority of milk is processed into powder, cheese, butter or other final products because of limited local demand for fresh milk and long distances to large markets.

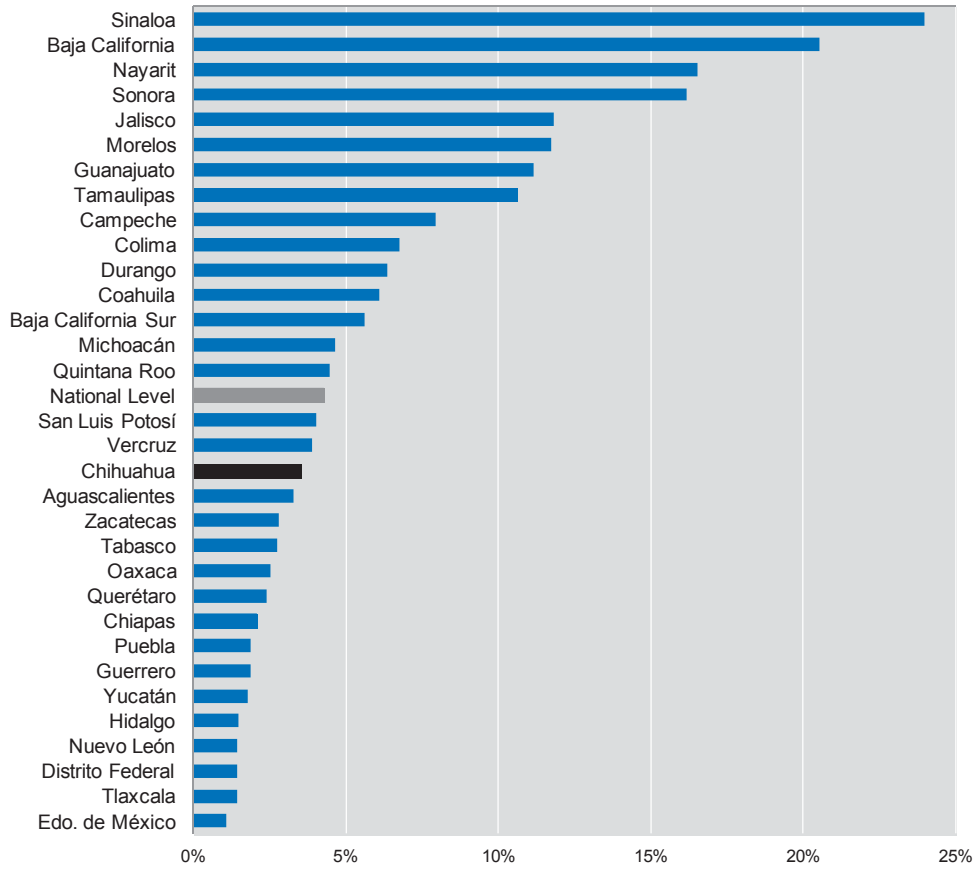
The regulatory framework for water management and the incentives that the state provides, prevent market mechanisms from correctly reflecting water scarcity and depletion. Irrigation mainly comes from groundwater, but aquifers in the state have low recharge rates. Surface water is limited in the state and in some cases withdrawals are constrained by international agreements with the US to manage stream flows on the Rio Grande basin. Most groundwater is extracted using tube wells and electric pumps. Aquifer depletion requires deeper wells and more electricity for pumping. In principle this should lead to higher costs for irrigation, but the State provides electricity subsidies that offset higher pumping costs which continue to encourage low-value water uses and water-wasting technologies. Currently there are few limits on water extraction – water meters are not compulsory and are not regularly monitored, water charges are not common, water regulations are not enforced, nor are the restrictions.

The types of crops that Chihuahua is specialising in are not only crucial to determine the lower value of output per hectare, but also determine incentives to conserve water. As might be expected in this environment there are limited incentives to conserve water and apply it to high-value crops. In many cases flood irrigation systems or inefficient sprinkler systems of irrigation are still in use. In other cases, highly efficient drip systems are in place, including those with individual head monitors. Ironically the most water wasting irrigation systems seem to be used on low value bulk commodities, while high value crops, such as tree fruits, are more likely to be irrigated with advanced technology. Two factors explain this phenomenon. The first is the difference between annual and permanent crops. With annual crops there is less incentive to worry about the long run viability of irrigation because there are low initial capital costs and no lags until production begins.

The second reason that prevents the incentives to conserve water from operating is lower financial wealth of field crop producers who may lack the money or access to credit to upgrade their irrigation system. In 2007, Chihuahua ranked 18th in access to credit among Mexican states (Figure 4.5). Only 3.5% of all economic entities in the farming sector in Chihuahua had access to credit or insurance which is lower than the average for Mexican states at 4.2% (INEGI, 2007). Among border-states only Nuevo León had a lower share than Chihuahua, while Baja California and Tamaulipas had both shares that were 6 and 3 times larger respectively.

Figure 4.5. **Access to credit in the agricultural sector**

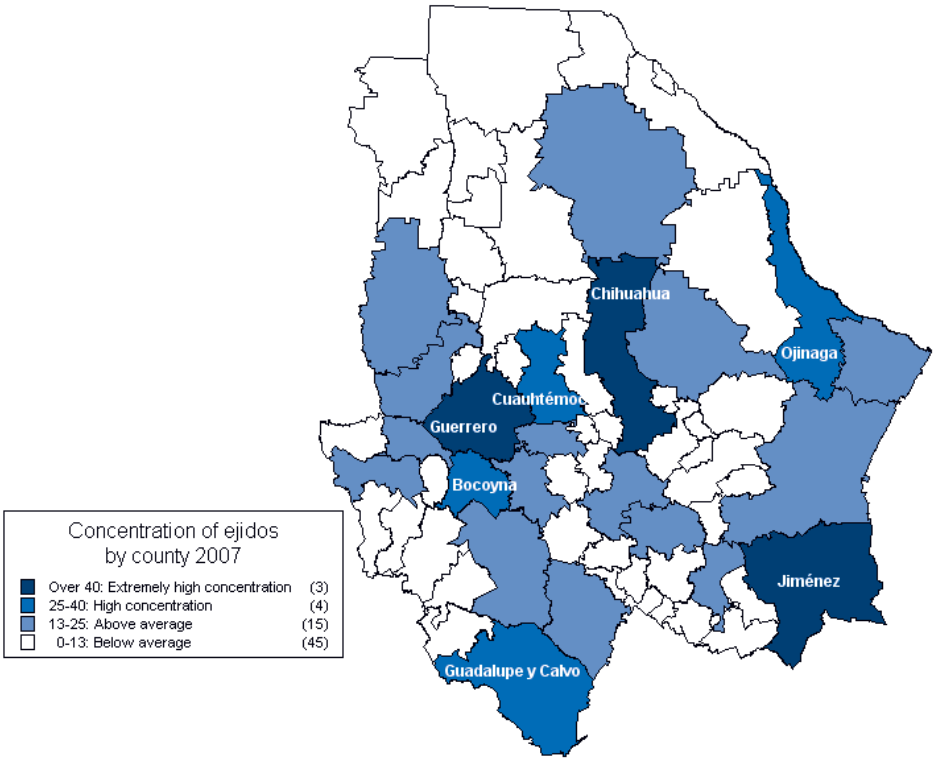
Percent of total economic units with credit or insurance (2007)



Source: INEGI (2007), Censo Agropecuario, Instituto Nacional de Estadística, geografía e Informática, Mexico.

Parallel to the problems over groundwater depletion is the problem of erosion and overgrazing primarily due to *ejidos*. Erosion is endemic in Chihuahua, especially on *ejido* land. The problem reflects a combination of, environmental forces, farming practices and weak institutions. Rough topography, intense periods of infrequent rain and limited ground cover, create an environment that is predisposed to erosion. Farming practices exacerbate the problem where farmers cultivate sloped land without proper terracing or adequate buffer strips to control water runoff. Alternatively, farmers overgraze pasture land, leaving insufficient plant matter to re-grow after periods of drought or hold the soil in place when rains come. Finally, poor institutions reduce the incentive to manage land appropriately. In particular on *ejido* land the incentives for overgrazing follow the classic model described by Hardin (Hardin, 1968). Because land is not owned by the cattle owner there is every incentive to overgraze. In addition, because *ejido* owners hold the majority of their wealth in cattle there is an even stronger incentive to overgraze (see Box 4.10). *Ejidos* are concentrated in some municipalities in Chihuahua (Figure 4.6). Extremely high concentration (over 40 ejidos) can be found in the municipalities of Chihuahua, Guerrero and Jiménez, while highly concentrated municipalities (between 25 and 40 ejidos) are Bocoyna, Cuauhtémoc, Guadalupe y Calvo and Ojinaga. Many of these municipalities are also the ones that show overdrafting and depletion of aquifers.

Figure 4.6. **Concentration of Ejidos in Chihuahua by municipality, 2007**



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: INEGI (2007), Censo Ejidal 2007, Mexico; Instituto Nacional de Estadística, Geografía e Informática.

Historically, agricultural policy in Mexico subsidised the production of staple food commodities, particularly beans and white corn, and subsidised prices for consumers, but since the late 1980s the sector has increasingly faced world prices and international competition in the domestic market (Soloaga and Lara, 2007). While agriculture exhibited high rates of productivity growth from the 1940s through the early 1960s as a consequence of, price supports, investments in irrigation and other infrastructure, and land reform, this slowed in the mid 1960s; and since then aggregate agricultural productivity at the national level has been low (Moreno-Brid and Ros, 2009).

However, the slow average growth in productivity masks a bi-modal structure of agriculture. On the one hand, a commercial sector that is export oriented has exhibited high rates of productivity growth, while other parts of farming, notably the *ejidos*, have experienced declining productivity and income (Moreno-Brid and Ros, 2009). In the latter case, the withdrawal of price supports and public sector investments left small farms, including those on private land, without the resources to modernise. Since small farms tended to specialise in the production of corn and beans the fall in prices and the growth of imports from the US of these basic commodities had a particularly negative effect (Moreno-Brid and Ros, 2009). While this phenomenon holds across all of Mexico it is particularly evident in Chihuahua because of the proximity to the US border.

Modernising agriculture requires access to credit, insurance and technology. Farmers have to borrow money to acquire long-term assets like machinery and land. They also

typically need credit to obtain annual operating inputs, such as, seed, fertiliser or feed for livestock. At present, few farms in Chihuahua have adequate access to credit. Only 3% out of the over 87 000 farms in Chihuahua had access to formal credit and only 1% had insurance. Multiple factors can explain the lack of credit.

If there are few financial institutions in rural areas, or if rural financial institutions do not lend to farmers, the low numbers may reflect a supply shortage. One factor that can limit access to credit is the absence of collateral. Small farms with few assets may not be able to borrow from conventional lenders. In particular, *ejido* farms may face problems if they do not have clear title to property. In addition, the absence of a well-functioning legal system that allows lenders to recoup losses from borrowers can also reduce the supply of credit.

In addition there may be demand side limitations. Farmers may not be willing to take on the risk associated with borrowing money if they are uncertain that they will generate sufficient revenue to repay a loan. In this situation if there is considerable production risk the absence of insurance can reduce the level of borrowing by farmers who may fear that a bad season could wipe them out.

Parallel to the problem of inadequate access to credit is the lack of technical support for farmers. Currently, farming practices in Chihuahua are mainly sub-optimal. This is leading to excessive use of water, cultivation methods that increase erosion, overstocking of pastures and a mix of crops that is not optimal. While the largest commercial farms in the state are able to obtain the most advanced technical information from the United States and Europe, there are few sources of such information within the state available to farmers, particularly small farmers who are the main source of the problems. There is a need for proactive extension programmes that help farmers do a better job of managing the current problems of natural resource depletion and suboptimal profit levels.

In Chihuahua, larger farms that specialise in the production of basic commodities, such as corn, wheat or cotton, have been able to remain profitable because they have access to low cost irrigation. Cheap water and cheap electricity for pumping produces high enough yields, that in combination with low costs, to allow these farms to compete with imports from the US. This suggests that the issue of farm viability does not rest strictly upon export oriented vis-à-vis import substituting, but is more about size and productivity.

Implications of the dual farm structure

Chihuahua is characterised by a bi-modal structure of agriculture with a small number of very large farms and large numbers of very small farms, many of which are not strongly integrated into markets and have characteristics of subsistence agriculture. Large farms are competitive with similar size producers elsewhere in North America and in many cases compete in continental markets. These farms account for the majority of agricultural exports from the state and are typically well integrated into secondary processing of their output, which creates additional value added and employment. In many cases the direct and indirect employment created by commercial agriculture, especially by large farms, provides a major source of employment in regional population centres. A dual structure of agriculture is common in farming in all OECD countries. A small percentage of farms account for roughly the inverse share of farm output – for example, 20% of farms produce 80% of output. What distinguishes Mexico from other OECD countries is: the still large share of farm families in the national and Chihuahua populations, the particularly small share of farms that are of commercial size, and the

high level of poverty associated with being a small-farm family. By contrast, in most OECD countries: farm families are less than 2% of the national population, large commercial farms are a growing share of farm numbers (over 10% in some countries), and small farms have above-average household incomes – largely because of off-farm earnings. Moreno-Brid and Ros (2009) note that the *ejido* households have attempted to offset declining farm income with off-farm earnings, often remittances from family members in the US.

Further expansion of large farms can provide both income from exports and local multiplier benefits in the form of income and employment. Agriculture in Chihuahua has relatively high local multipliers compared to say, the *maquiladora* sector, which by design minimises local linkages. For example, the dairy complex in Delicias provides a large amount of full-time direct employment on dairy farms, because milking cows is a labour and capital-intensive enterprise. But it also provides upstream employment opportunities for alfalfa farms and for feed manufacturers which are also local enterprises. In addition, the dairy processing facility adds additional income, employment and value added. Similar multiplier effects are associated with apple production, turkey processing and large-scale vegetable and nut production. As long as the region can produce high-quality agricultural products at a competitive price there will be opportunities to expand farm output and processing and employ more members of the local labour force.

These employment opportunities can be important for households in the regional trade centres where the processing firms are located and for farm families on small-holdings where there is insufficient land and capital to generate adequate family income from their own farm. This means that commercial agriculture plays a much larger role in the state economy than the value of direct farm production suggests. In particular larger population centres, other than the cities of Chihuahua and Juárez, generate a major share of their economic activity from their role as agricultural service canters for farms in their hinterland and as the main location for agricultural processing activity.

To further increase the economic development benefits associated with agricultural production and processing efforts should be made to expand seasonal processing. Currently much of the processing taking place in Chihuahua is seasonal in nature and consequently the number of full-time jobs is far lower than during the interval of the peak labour requirements. In some cases if markets can be expanded it may be possible to move from seasonal to full-time processing. An example of this is the turkey processing facility in Nueva casa Grandes, which has recently begun to operate all year. For other processors where there is a single crop the ability to expand the duration of processing can be limited by the ability to store the crop. Some crops, like apples, have a longer storage period, then others, such as peaches. If the processing interval for a specific crop cannot be significantly expanded it may be possible to introduce another crop that is harvested at a different point during the year so that the local labour force can shift between two processing activities and effectively gain something closer to full-time employment.

Small farms in Chihuahua comprise the largest share of farm numbers in the state, but account for a small fraction of agricultural output and currently provide limited opportunities for further value-added activity. Small farms in Chihuahua are characterised by: *i*) limited land base, *ii*) inadequate land-tenure rights, *iii*) locations on marginally productive land, *iv*) limited access to financial capital, *v*) weak integration into markets, *vi*) lack of access to modern farm-management techniques, and, *vii*) limited opportunities

for off-farm income. Each of these deficiencies limits the economic role of small farms in the state. And in many cases the individual deficiencies reinforce each other so the cumulative impact on farming is even larger than the individual characteristics might suggest when considered independently.

The limited land base is crucial because the majority of the enterprises that can be carried out by small farms generate relatively low net returns per hectare. As a result, although some farms with a small land base might be efficient producers on a per hectare basis, even so farm income will be small because they do not operate very many hectares. Similarly, the lack of clear title to land and difficulty in releasing land or acquiring it due to the prevalence of *ejidos*, makes it hard for many farms to expand their production, or even use their existing land base as a mechanism to fund their exit from agriculture.

Large numbers of small farms are found on marginal land that poses challenges for farming due to, irregular terrain, poor soils or inadequate amounts of water. Irregular terrain can eliminate the possibility of cropping and can make pastures less productive. In particular, steep terrain is susceptible to erosion if over-grazed. Once erosion occurs, the land becomes even more marginal as gullies break up fields, and accelerate run-off. Soils in the state are often lacking in nutrients and organic matter and this is a particular problem for small farms. Cropping practices that remove all the vegetative matter further reduce fertility by eliminating the possibility for organic matter to be retained and accumulated. Much of the land in small farms depends on natural precipitation for moisture, because the fixed costs to install irrigation are beyond the capability of small farms as they may be too small to reach the minimum scale of production required to make irrigation profitable.

Low land productivity makes it even more essential for a farm to have a large land base because per hectare revenue is limited. And once again, the common property aspects of land tenure on the *ejidos* have made it difficult for farms to expand to minimum efficient scale. More importantly multiple decades of weak property rights have contributed to reduced soil productivity, because there are few incentives for land users to invest in maintaining or improving soil productivity (Box 4.10).

Small farms in Chihuahua, like small farms in all countries, are challenged in acquiring access to financial capital. While Mexico has a comparative advantage in those activities that are labour-intensive, the nature of agricultural production has shifted to require significant amounts of machinery and higher quality livestock to be competitive. For Mexico, NAFTA resulted in major adjustment in agriculture. Mexican farms were exposed to competition from low-cost producers in the United States. Chihuahua by virtue of its geographic proximity to the US and the mix of crops and livestock was one of the states most directly affected. Farmers in Chihuahua must now have production costs close to those of their US counterparts to be commercially viable. The relative degree of capital intensity in Chihuahua will continue to be lower than in the US, but greater investments in equipment, crop varieties and livestock genetics will be needed, even with the advantage of low-cost labour. Better access to borrowed funds will be crucial for small farms if they are to increase revenues and profit margins to a level that makes them viable.

Box 4.10. **A poverty trap for rural areas**

Low income farmers without clear title to the land they operate face difficulties in accumulating wealth. The largest problem is the inability to save out of current income because virtually all they earn in a year is required for current farm operations and family living. However they also face a problem of finding a way to hold wealth. For farmers with title to land the land itself serves as a wealth holding and wealth creating vehicle. Improvements to land through farm household efforts can be captured through appreciation of land value. Farmers without land titles lack this opportunity, and also lack an incentive to make these improvements because they cannot be sure they will be able to retain the benefits from improving farm productivity in the long run. While cash savings may be a potential option for accumulating wealth, capital markets in rural Mexico are weak and difficult for savers with small amounts of money to access and earn a meaningful rate of return.

As a result, the most common form of wealth for small farms in *ejidos* is livestock, particularly cattle. Cattle are portable, self-reproducing and potentially wealth accumulating if the farmers can add to the herd over time by retaining calves. Moreover the marginal nature of most land makes extensive grazing of cattle the most common farm enterprise. Typically a large share of eth grazing land is communally held with *ejido* members having general access to this common property resource.

The combination of common property, the grazing land and wealth holding in the form of cattle creates a poverty trap with major adverse environmental consequences. Each farmer has a clear incentive to increase the number of cattle in his herd, because this is the only way to build income and wealth. But if all farmers do this the carrying capacity of the grazing land is exceeded and the cattle fail to gain weight, reproduce inefficiently and may die. While a farmer with land and cattle may be willing to suffer a short term loss and sell cattle in a low price market in order to preserve the future grazing capacity of the land, there is no such incentive for *ejido* owners. Any farmer that reduces his herd when carrying capacity is reduced suffers the short terms loss from selling during a period when cattle prices are low, but receives only a portion of the benefits from the lower stocking rate.

In practice the individual farmers has an incentive to keep cattle for as long as possible in the hope that others will cull their herds, carrying capacity will improve and prices rebound. This would lead to windfall gains. However, the consequence of this behaviour is that grazing land can be effectively destroyed and all famers lose their livelihood. In periods of long term drought, such as Chihuahua is currently experiencing, this trap becomes most obvious. Carrying capacities that are already under stress drop rapidly, but there is no reduction in stocking rates, because it is individually irrational for each *ejido* member to do so. If there is a strong collective process it might be possible to lower stocking rates, but even so individuals will resist this move because it will mean selling cattle at a time when prices are low and incurring a major loss of wealth.

Only by giving individual grazing rights to individual farms through a clear title or property right can this problem be resolved. With allocated grazing rights to particular territory the individual now has the potential for two forms of wealth accumulation cattle and land improvements. Overstocking destroys the potential for gains from land, so each farm is more likely to reduce stocking rates and cull herds when drought conditions occur.

Once again the lack of a clear title to property contributes to the financing gap facing many small farms. Without a clear title to land small farm operators have no real collateral to pledge against loans. Low margins from the current system of production also lead to a limited ability to finance debt. This combination makes it difficult to even borrow money for short-term operating expenses, such as, better seed, fertiliser or supplements for livestock feed.

In many cases small scale farms in Chihuahua are only weakly connected to the market economy. As a result much of the agriculture in the state can be characterised as being semi-subsistence in nature. Production is driven by local demand rather than by market prices. One result is low prices for producers because of a seasonal surplus when crops in a region are harvested and sold. Better storage facilities cold allow farms to hold onto their crop until prices rebound, but this would require investment in storage capacity.

Cattle production is particularly susceptible to weak market integration. Chihuahua largely has European cattle breeds that have prices set in US markets. Because cattle feedlots are not common in the state, cattle are largely exported to be fattened and processed. Producers with small herds of poorly maintained cows receive low prices from buyers in the best of times. When grazing conditions deteriorate farmers are at first reluctant to accept lower prices and hold cattle back, which soon leads to even worse grazing conditions and even lower prices. More orderly marketing of cattle and better recognition of the cyclical nature of cattle markets could allow producers to generate higher returns.

In Chihuahua the gap between farm management methods on large commercial farms and on the small farms is large. While large farms adopt the best practices and technologies in the world, small farms typically follow traditional approaches that result in: low levels of productivity, waste resources and can cause significant environmental damage. Overstocking of grazing land is common. Cultivation practices on crop land rely heavily on tillage to control weeds and establish a seed bed, which leads to: soil compaction, reduced organic matter in the soil, high fuel costs and erosion. A large share of irrigation is still flood or low-efficiency spray and centre pivot technologies, both technologies that waste a lot of water. Livestock genetics are not improving as rapidly as they could. While large farms are aware of advances in farm management that occur anywhere in the world and rapidly adopt these improvements, there appears to be no systematic effort to bring even fairly rudimentary technological improvements to small farms.

Obviously, providing small farms with new information is ineffective if they lack the incentive and the means to adopt the new approaches. Incentives come from higher long-term returns and increased productivity, but without clear title and access to credit, or even the assurance that markets can absorb higher output, there may be limited incentives for small farms to change their practices.

Agricultural policy effects

In Mexico the primary responsibility for agriculture has always rested with the national government while the states have largely played a supporting role, often in the form of delivering national policy. Agricultural policy in Mexico has had multiple objectives, some of which are contradictory (Appendini and Liverman, 1994). These include: increasing production of key staples (corn and beans), modernising the agricultural sector, supporting small farmers, providing low cost food to the urban poor, and mitigating the effects of drought and other climatic shocks. In the last two decades Mexico has shifted from a high degree of protection and a focus on self-supply to a more open economy where agricultural policy is constrained by GATT and NAFTA obligations (Scott, 2009).

Mexico now provides support in forms that are compatible with its international trade agreements. These include policies that make payments on the basis of historical production (PROCAMPO), policies designed to stimulate farm investment and

modernisation (*Programa de Apoyos a la Comercialización y Alianza para el Campo*) and policies to support the welfare of the poor and subsistence farmers (*Progresa/Oportunidades*) (Scott, 2009). Because of the longstanding concern with increasing corn production areas of the country including Chihuahua where corn has been a major crop have had relatively high levels of support. In addition, because Chihuahua and the other northern states have a relatively large share of commercial size farms, these states have disproportionately benefitted from national policies that support the modernisation of agriculture (Scott, 2009).

The historical focus on expanding corn production has resulted in corn farms receiving a very large share of subsidies, including irrigation subsidies. However, for Mexico in general, and Chihuahua in particular, the focus on corn production has major costs. Corn is a relatively low-value commodity and Mexico is a relatively high-cost producer of corn. While corn process have increased in recent years due to new demands for ethanol production, world markets can still supply Mexico with corn at lower process than the cost of production on many Mexican farms. This is particularly true if the full cost of irrigation is considered, including electricity[7] and the opportunity cost of water that could be used for higher value commodities.

Crucially, the opening up of the Mexican economy has exacerbated the difficulties in forming a single national agricultural policy. Regional differences in opportunities and competition are now more evident than when agriculture was focused on domestic markets. The northern states have developed a different agriculture than is found in the southern part of the country and they face different climatic and market conditions. In particular, the main national market in the South is less relevant for Chihuahua than closer US markets, while competition from the United States is more pressing. While national policy will continue to set broad framework conditions for agriculture it is crucial that the state government explore ways to add a set of complementary state levels policies that are focused on specific opportunities and problems in Chihuahua.

Chihuahua is currently experiencing a severe drought that extends well into the southern United States. The effects of the extreme drought in Chihuahua include water and foodstuffs shortages for more than 500 000 people in the state, as well as 250 000 head cattle dead and a five-fold increase in cattle slaughtering. Climate change is expected to increase the frequency and severity of drought in the larger region of northern Mexico and the south-western US. If it does, then the consequences for agriculture will be severe. Pressure on aquifers will increase as farms try to offset missing precipitation with increased pumping, and aquifer recharge rates will decrease. There will be major consequences for the livestock sector if forages are depleted and cattle herds have to be reduced. Competition for scarce irrigation water for crops will require new water allocation schemes if the water supply is not to be exhausted. In addition, increased variability in rainfall will lead to increased variability in incomes, which will make access to credit and insurance even more important if farms are to be viable over a longer time period.

Strengthening Market Towns through Urban-Rural Linkages

An improved rural economy in Chihuahua depends upon improved economic performance of the market towns in the state. The two dominant cities in Chihuahua now account for the majority of the population and are the focus of policies to stimulate urban growth. However, there are real opportunities to enhance the role of the other urban places in the state, but by following a different strategy. While food and agriculture is

seen as a growth opportunity for Chihuahua, it can best be achieved by a conscious and systematic effort to couple improved farm level productivity with agricultural processing (Box 4.11).

Box 4.11. **Strengthening market towns**

In the OECD countries urban policy focuses on the largest cities in the country and rural policy typically is concerned with the open countryside. This leaves a policy gap for the many smaller cities and towns that are distributed across the national territory, but are typically unaddressed by either urban or rural policy. In most cases a major, if not the most important, role of these communities is to provide services to the surrounding countryside – hence the name "market towns".

These communities are: the place where farmers bring their products to sell, the place where they buy their farm inputs and household goods, and the place where administrative or public services are provided to the people in the region. The existence of the town largely depends upon the presence of export-oriented economic activity in the surrounding rural territory, and the economic prosperity of these communities largely hinges on how well farming, forestry, fishing or other rural activities are doing.

Most importantly, many market towns can also become places where first round processing of rural outputs takes place. Food processing, timber milling and fish plants are tied to local outputs because of high raw material transport costs or perishability of the raw material. As a result, the beginnings of a supply chain are created and the region benefits from higher employment and income located from processing facilities located in the town.

This adds an additional function to the town, and it creates a source of supplemental employment for the community and its households. In regions where farm modernisation is leading to reductions in the number of people directly engaged in farming, the presence of an expanding processing sector that is initially driven by increased farm productivity can provide an opportunity for those displaced from farming to earn a higher income while remaining in the region. To the extent that outmigration to large urban centres is slowed, this reduces pressure on limited urban housing and other urban services.

Source: Freshwater, D. (2004), *Local Development and the Roles of Community*, Contract Report prepared for Agriculture and Agri-Food Canada.

Processing is important to expand foodstuffs' market and as a source of local jobs and income. Processing expands the market for farm output by expanding both, the geographic reach of farm products and longer shelf life. The geographic reach is increased because processed foodstuffs are easier to ship and have higher value. This means that farm operators and their households are encouraged to expand output and improve productivity. In addition, processing provides employment and income opportunities within the region. This reduces income risk at the household and region level because a new source of jobs is created. The possibility of local employment in processing can also provide an incentive for marginal farmers to leave farming and take up a new higher income career. Not only are they better off, but their land can be consolidated into larger and more efficient farm enterprises.

For expanded processing to take place in the market towns of Chihuahua it will be necessary for the state to make investments in improving local infrastructure. The road network that connects many smaller towns to outside markets needs improvement. Within towns, sites for processing facilities should be identified and these sites should have

guarantees of assured access to basic electricity, water and sewer services if there is private interest in developing them.

Chihuahua may also want to explore the possibility of providing matching funds to entrepreneurs who are willing to invest in processing, or other industries, in market towns. This would in a sense replicate the *maquiladora* programme, but rely on small and medium size firms that have strong supply chain links to the local community instead of multinationals.

Shifting production towards high-value commodities that have local processing potential

Chihuahua is well positioned to penetrate US markets. It has easy access to the US border and the infrastructure to accommodate exports is already in place because of the *maquiladora* programme. The high productivity farms in Chihuahua are already competitive with US and Canadian counterparts in terms of scale and productivity. While farms in Chihuahua are further away from large high income markets to the North so shipping costs are higher, they have the advantage of a different growing season and much cheaper labour.

But low-cost labour is of limited value in the production of low-value commodities. For grains and other bulk commodities, capital in the form of farm machinery and transport and storage facilities more than offsets labour as a source of productivity. Canadian and US grain producers also have a significant advantage because they largely avoid irrigation expenses due to higher precipitation levels. As water becomes more expensive in Chihuahua the competitive position of corn, wheat and other cereal producers will decline. NAFTA and proximity to the border will most likely mean that imports from the North displace domestic production.

Most importantly, a shift to higher value commodities that can be locally processed, exploits Chihuahua advantage of low-cost labour and recognises the high opportunity cost of irrigation water. Fruits and vegetables in particular, have clear advantages for Chihuahua. They are crops where labour can be effectively substituted for capital, and they are crops where high efficiency drip irrigation systems can be applied successfully. Thus employment is expanded and a major environmental problem is reduced.

It must be noted that higher value crops tend to require more water per unit of output. However, the higher prices for crops, like apples and onions, allows the use of more efficient irrigation systems and these crops are able to pay higher prices for water. Moreover, increased production of labour-intensive crops provides more direct employment prospects on farms and in associated processing industries. This increased income can allow higher imports of traditional low value crops, such as corn.

Encouraging farm transition to larger commercial farms

In Chihuahua, like all states in Mexico, there is an historical social value in small scale land ownership. Beyond this the *ejido* system of collective land ownership ensures that small farmers cannot be driven off their land. But small parcels of land also limit the ability of operators to move to more productive farming. The *ejido* system results in a semi-subsistence form of farm production, because it is hard to make land improvements, hard to obtain credit and hard to expand the enterprise.

The result is a large portion of the land base in the state that is frozen in low-value activity. More serious is the fact that a large number of rural people are also frozen in

low-income livelihoods. It appears that there is a high correlation between the share of small farms in a region of Chihuahua and the quality of the land. In particular *ejidos* seem to be located on more marginal land, in part because land management over time has led to land quality deterioration. On marginal land, it is particularly important to improve management and reduce overuse if the land is to achieve its full potential. This is more likely to happen under a land ownership structure where the farm operator has long-term incentives to improve land productivity and the resources to make the investments in land management.

Because of its location which dictates commodity types and farming systems that are agronomically possible, farmers in Chihuahua are in direct competition with farmers in the southwestern United States. Long-run viability of the farming industry in Chihuahua is only possible if farmers are competitive with US producers. While low-cost labour and cheap irrigation water has provided that competitive edge in the past, the increased depletion of groundwater reserves is weakening the competitiveness of farmers in Chihuahua. As noted above, better technology in the US and greater use of machinery along with larger farms can eliminate the advantage of cheap labour for many crops.

If Chihuahua is to be successful in creating a competitive agriculture and food sector it will have to move the structure of agriculture away from its current preponderance of small, limited resource farms to one where the majority of production comes from large, commercial farms or consortia of small producers that have adopted most of the technology found in the rest of North America. Otherwise imported agricultural commodities will place price ceilings on most of the farm outputs of the state. This will reinforce current low levels of farm income.

Develop a linked credit and technical assistance programme for farms

For economic and environmental reasons it is vital that farm management practices in Chihuahua be improved. For these improvements to occur farmers will have to make significant investments in equipment and in altering how they produce crops and livestock. This will require access to credit and access to the technical knowledge associated with better farm management practices. Both of these inputs have to be provided at the same time and in the correct proportions.

This suggests that a programme which provides credit for specific changes in farm management practices is the correct approach. Credit tied to changes in behaviour has been used in other countries since it provides an incentive to carry out practices that have benefits for the individual and for society (public goods). One model would be the original Farmers' Home Administration (FHA) in the US. FHA made loans to farmers but only if they provided and implemented an acceptable farm management plan. This plan should include economic aspects as well as land and water management strategies. If credit is extended over multiple years to allow sequenced investments it is possible to ensure that the farmer is actually implementing the plan before additional funds are released.

A combination of grants and cost-shared investments can be used to provide proper incentives. Grants can be used for initial investments or in cases where there are high public benefits, say more efficient irrigation schemes. Cost-sharing can be used where the social benefits are less evident and as a way to ensure that farmers only undertake investments that are economically rational.

Given the highly variable rainfall patterns farmers may be reluctant to borrow money and undertake investments even if credit is made available. In an environment where output risk is high due to weather events it may be useful to introduce an area-based risk insurance programme. These schemes provide payments to all participants if an extreme weather event occurs.

Put in place incentives to encourage better resource management

Current policy in Chihuahua provides few incentives to properly manage resources. For example, irrigation is overused, in part because electricity for pumps is subsidised. But depleted groundwater reserves require deeper wells, which raises pumping costs. This provides an economic incentive to reduce water use. However, this incentive is currently negated by electricity subsidies. Similarly, communal grazing land creates an incentive to overgraze because the marginal benefits from an extra cow accrue to the cow owner while the marginal costs are spread across all those using the specific parcel of grazing land.

Historically the reaction of the state and national governments to overexploitation has been to introduce regulations to ban undesirable actions. However, these regulations are either not enforced or are unenforceable in practice. For example, it is impossible to regulate overgrazing. The appropriate stocking rate on any parcel of land depends on the quality of the land and the weather. This makes it impossible to define "correct" stocking rates. Moreover given the size of Chihuahua, and the number of cattle, it is very difficult to have enough enforcement officials to deal with the issue. Similarly, regulatory approaches for groundwater management in Mexico have been tried for over 50 years with little success in reducing groundwater depletion (Scott, Dall'erba and Díaz Caravantes, 2010). Instead public policy should try to create incentives for individual farmers to do the right thing out of self-interest.

Economics shows that when individuals bear the full consequences of their behaviour they act differently. It is clear that private land in Chihuahua is better managed than *ejido* or other public land. On private land, overgrazing leads to long-term adverse consequences for the landowner, so it is less likely. If irrigation water meters are installed and water has a positive cost (including the cost of pumping it) then there are incentives to adopt water conserving irrigation methods and reduce irrigation on low-value crops.

Subsidies can be used to encourage behaviour that has positive social benefits. For example, terracing and buffer strips would slow water runoff, which would reduce erosion and improve infiltration. Given highly seasonal and irregular precipitation in Chihuahua with the probability that drought will become more common, there is a clear long-term public interest in capturing rainfall when it occurs and retaining it for later use. But individual land owners may not benefit from moisture conserving actions if the recharged aquifer is downstream from their land. In this case there is a clear need for subsidies to provide an incentive to act in a desirable manner.

Improve livestock markets

Chihuahua has the largest cattle herd of any Mexican state. Historically, Chihuahua has mainly served a cow-calf function, relying on large amounts of unimproved pasture to raise cattle and provide calves for backgrounding and feeding in other locations. The majority of calves are sold at a young age to US farms for backgrounding and then moved to US feedlots. Because Mexico is a net corn importer and Chihuahua is a high-cost corn producer, the potential for Chihuahua to vertically integrate into feeding and processing is

limited. Typically beef slaughter occurs near feedlots to minimise transport costs and cattle stress. While Chihuahua offers cheaper labour than is available in the US it is unlikely to be a sufficient inducement given the high cost of feed.

However, Chihuahua now captures very little value from its cow-calf production. While the main cattle breeds in the state are suitable for the US market they are not produced or marketed in a way that captures a price premium. Calves are typically not well cared for by farmers and are sold in small lots outside a structured market process. This leads buyers to pay low prices because they are uncertain as to the quality of the cattle and because they can exploit their market power.

Cattle feeders now face increased completion for corn and other livestock feeds from producers of renewable energy. This is leading to two important changes. The first is a shift to longer periods on grass before going to the feedlot. The second is a growing focus on better genetics and better animal health to ensure that cattle make optimal use of feed. These changes suggest that there should be price premiums for heavier calves that can be certified as being in good health and having good genetics. Conversely price discounts are likely to increase for light weight calves with uncertain records.

The implication for Chihuahua are clear. To gain better prices there will have to be improvements in both pasture and cattle management. If cattle are to be retained longer in Chihuahua then pastures will have to be managed to provide more and better forage. Similarly farmers will have to do a better job in improving genetics, taking care of cattle health and keeping records. The final step will be to improve cattle marketing by creating a system of auction markets that will allow buyers and sellers to engage in a more transparent marketing process. Recent changes in the cattle markets in Kentucky offer an example of how this might be accomplished (Box 4.12).

Box 4.12. **Improving calf prices in Kentucky**

Kentucky is the largest producer of beef calves of the states east of the Mississippi River. The majority of these calves are produced as a secondary enterprise on farms where the main source of income is another commodity, or on farms where the majority of household income comes from off-farm work. This historically meant that calves produced in Kentucky were not high quality, because the cow-calf enterprise was not the primary focus of the farmer. In addition, most farms have small beef herds so they sell only a few calves at any point in time, further reducing management incentives.

In Kentucky calves are typically sold at local public auctions, mainly to buyers who represent feedlot owners in the Midwest where corn is plentiful. At the auction the calves to be sold on any day are grouped into groups or lots of roughly uniform size and weight, and the buyers bids on each lot. This means that the buyer cannot identify the farm that produced any specific calf. Ideally, each lot of calves is just big enough to constitutes one truck load, but often there are too few calves in any group to make up a full load. Buyers are prepared to pay a premium for a truck load of uniform calves because it facilitates shipping to the feedlot and subsequent feeding.

Most importantly, calf producers in Kentucky historically received low prices for their calves from buyers. In part this reflected odd calf sizes and low number lots. But it mainly reflected a high rate of poor performing calves. Because individual producers could not be linked to specific calves in a group there was no incentive for farmers to spend money to deliver good cattle. Farmers would often bring sick calves to auction or bring calves that had not been properly weaned. These practices resulted in higher costs and lower profits for feeders and they consequently reduced the price they would pay for all Kentucky calves.

In the late 1990s the state government began efforts to expand farm income and selected the beef sector as a target for growth. Initial thoughts were to introduce feedlots in Kentucky as a way to integrate along the supply chain, but corn prices in Kentucky are high relative to nearby states and it was determined that a feeding industry was not practical. However, it was decided that it should be possible to increase the revenue from calf sales by improving the product and eliminating the discount for poor quality calves.

To do this the state provided subsidies to improve herd genetics and to build better facilities for cattle on farms. Most importantly, it instituted a voluntary programme, CPH 45 (Certified Pre-Conditioned for Health), to provide assurances to buyers that they would be purchasing high-quality calves that would perform well when on feed. Participants are required to follow recommended weaning and inoculation practices and provide records to the sales facility. At designated dates and places a number of producers agree to bring cattle to a specific sales facility where they are grouped into uniform truck-load lots and sold collectively as CPH-45 certified. Since the calves have ear tags that identify the producer any subsequent problems can be traced back to a specific farm.

The CPH 45 process does three important things. First, it allows buyers to bid on more uniform lots that contain enough calves to fill a truck. Second, it provides assurance to the buyer that the calves have been produced in a way that will lead to good performance at the feedlot. Third, it results in a price premium for calf producers who participate in the programme and incur the extra expense of raising high quality cattle. Because the individual producer has to certify each calf and problems can be traced back to the farm of origin there are few incentives to cheat, which makes the programme self-policing.

For more information see: *http://www.cph45.com/*.

Continue to diversify the rural economy

Economic development involves a shift from a rural economy that is mainly dependent on primary agriculture to one that has a more diversified economic base (OECD, 2007b). Diversification is important for two main reasons. The first is that it provides a mechanism for people to leave farming and remain productive members of society. Modernisation of agriculture pushes people out of farming as capital replaces labour, but new rural employment opportunities can create a pull that facilitates agricultural adjustment. The second reason is risk reduction at both the farm and community levels. Particularly in Chihuahua, where farm incomes are highly variable, the presence of other sources of income and employment in rural areas provides a buffer offsetting farm income shocks. Households can combine farm and off-farm income to both raise income and reduce risk (Jetté-Nantel et al., 2010). Similarly the community has less shock if, it too has multiple sources of income and employment.

Food processing adds some risk reduction benefits but it tends to be strongly coupled to primary agriculture. Crop shortfalls mean low income for farmers, but also a lack of input for processors. In many countries, rural areas have become locations for small-scale manufacturing, and this could be possible in Mexico as well. Other potential rural activities include tourism, but recent insecurity problems have greatly reduced the scope for any form of tourism in the state, even though the problem is lower in rural Chihuahua.

If the rural economy is to become more diversified it will be important to improve rural workforce skills. Educational achievement levels are lower in rural areas of Mexico, in part because there has been less demand for more educated workers and in part because more educated youth tend to move to urban areas. Employers who require more skilled workers will be reluctant to consider rural locations until workforce skills improve. But at the same time it will be hard to convince people to improve their skills if they see few returns on the investment.

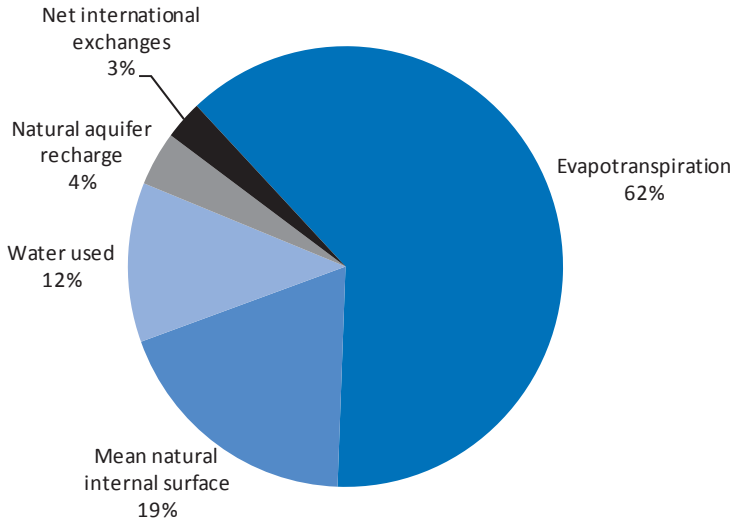
Rural development in Chihuahua depends on farming activities and these in turn are subject to water availability. Under the present scenario of water scarcity and stress and given the international commitments to deliver water to the US, Chihuahua's rural development requires tackling water management and governance.

4.4. Water governance: wider integrated planning at the state level

Water scarcity and stress

Mexico receives around 1 500 km^3 per year through rain but only keeps and uses a fraction. However (73%) evaporates, and the rest (27%) drains naturally to aquifers and rivers (Figure 4.7). Slightly over half of the available water (surface and underground) is actually used (205 km^3). Only 31 km^3 of drained water – which is 15% of all water used—is used for human consumption. Agriculture is the main use of water in Mexico. At 174 km^3 per year, water used in farming represents almost two-thirds of all drained water. Chihuahua's precipitation is one of the lowest in the country. According to Conagua (2010), almost two-thirds of the annual 459 mms rainfall occurs between July and September, but leaves Chihuahua as the fifth driest state in Mexico.

Figure 4.7. **Hydrological uses in Mexico**



Source: Author's calculations based on information in CONAGUA (2010), *Statistics on Water in Mexico 2010 Edition*, SEMARNAT, Mexico.

Mexico's water prices are partly leading the country to overexploitation and considerable water stress levels that could make development unsustainable. By 2030, almost 4 billion people (almost half of the world's population) are projected to live in areas with severe levels of water scarcity (OECD, 2008b). Although OECD countries are for the most part, not as severely affected as the rest of the world, Mexico is among the OECD countries that will be the most affected. Mexico is already one of the OECD countries with the largest per capita water consumption. At annual per capita consumption approaching 800 m^3, Mexico's consumption of water is sixth in the OECD (OECD, 2011). Mexico's water stress as measured by the proportion of abstractions to renewable resources, ranks Mexico 7th and as a medium-high stress country. Despite such water consumption and stress, Mexico is the OECD country with the lowest price on water. Mexicans pay less than half a US dollar per cubic meter, which is in sheer contrast to low-stress countries such as Denmark and Finland where water costs around ten times more (OECD, 2011). Even countries with similar water stress levels show greater cost of abstracting water: Spain and Turkey charge four times the Mexican rates.

Mexico's main use of water is agriculture, but low technology employed in the sector and low water prices have resulted in heavy consumption. In the case of Chihuahua the lion's share of irrigation is done through underwater sources. Based on the Mexican Constitution's Article 27 and the National Water Law of 1992, Mexico transferred the management of many irrigation systems to local user groups (i.e. farmers) (Garrido and Calatrava, 2009). When water is taken from aquifers as in the case of Chihuahua's farming, most or all capital is privately provided by the farmers themselves or by small-scale collective organisations. Pricing under this situation, becomes difficult. In the EU, some countries have imposed water tariffs for groundwater, including France, The Netherlands, Denmark, and England and Wales.

Already several areas in Chihuahua are experiencing water depletion through overdrafting and despite regulation, overexploitation continues, which makes development strategies unsustainable. At least ten municipalities are considered as

already overdrafted aquifers, precisely those areas where the main crops in the state (apples, chillies, onions, peaches, and pecan nuts) are located. As a result, the National Commission for Water (CONAGUA), has already designated prohibition zones in the state precisely in the areas that overexploited, but that are also the areas where large-scale farming takes place (see CONAGUA, 2010). As a result, and in light of lack of enforcement, illegal water withdrawals are common. Similarly, offstream water is heavily overused in most of the state (see CONAGUA, 2010). Under these circumstances of water scarcity and stress, regulation and enforcement become key in making development sustainable. Although this review will make the case for agricultural activities becoming an integral part of development, economic and human progress will be possible in as much as poor water management and insecurity are tackled.

Access to clean water resources in sufficient quantity is a major challenge to economic and territorial development in the State of Chihuahua and can largely hinder, in the medium term, its competitiveness. While Chihuahua faces important hydrological disparities across its territory, it also displays strong common denominators: it is mostly arid or semi-arid, rains are heavy, limited to a few months per year and there is a mismatch between population concentration and rain distribution. Overall, 73% of the territory is semi-dry, with an average precipitation level of 459 mm/year (as opposed to 760 mm/year at national level). Therefore, the ten most important cities of the region, which concentrate 82% of the total population, mainly rely on the 14 (overexploited) aquifers to extract water resources rather superficial waters. On average 90% of total water consumption (and more than 96% of groundwater) is devoted to agriculture creating related significant challenges for the sustainability of the agri-food industry. Water scarcity is even more exacerbated by the bilateral water transboundary agreement signed between Mexico and the United States; the State of Chihuahua has been the main net contributor providing 431 million m^3 to the US, without benefitting from the 1 800 million m^3 given by the US to other Mexican states.

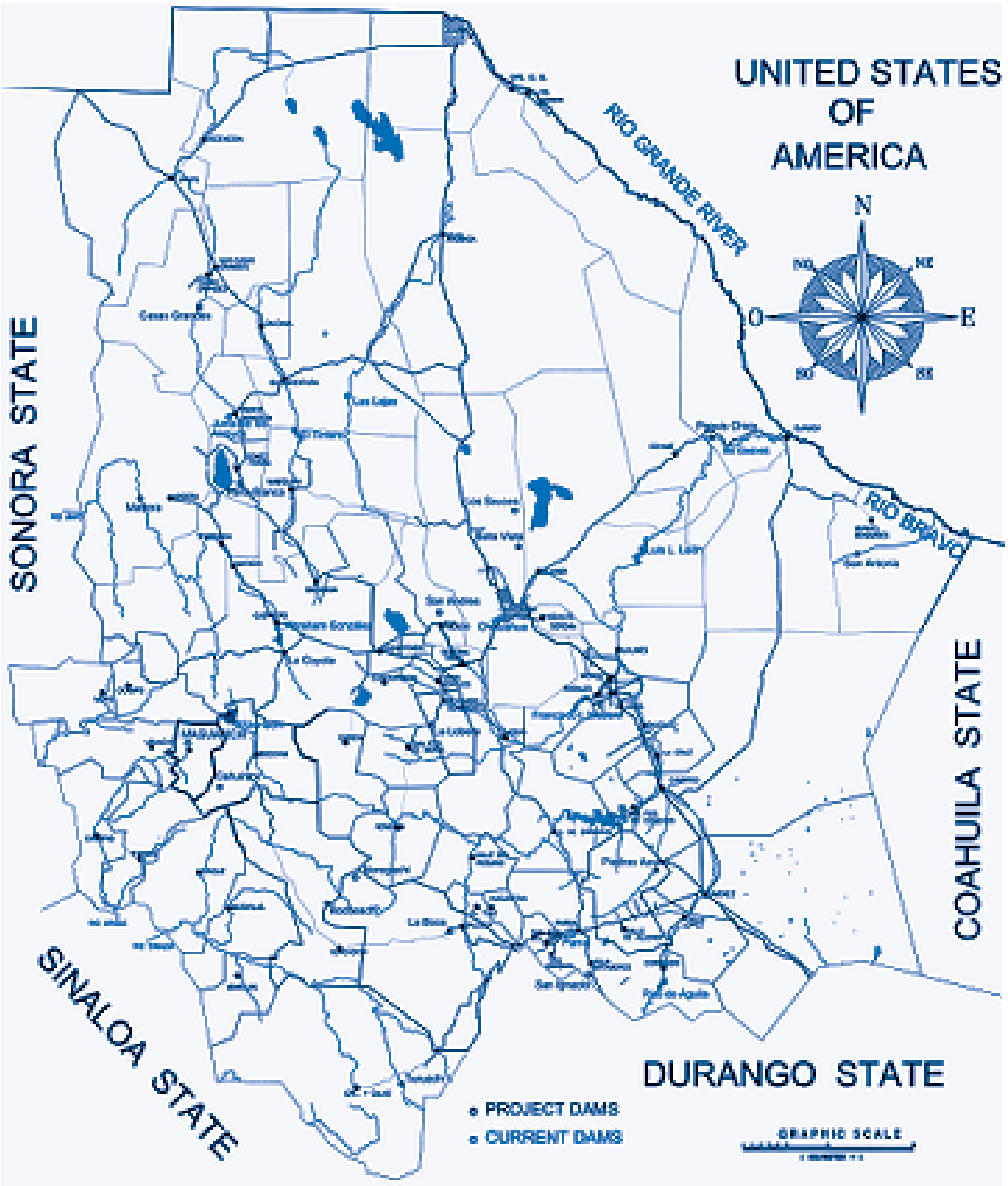
In addition to water shortage, the level and quality of wastewater treatment remain low and efficiency of service provision stays outside of what can be considered as good practice in OECD countries (technical efficiency stands today at 60%). Overall, at national level, the authorities estimate that reaching the level of treatment which meets discharge standards will require levels of investment of some MXN 114 billion (USD 9.5 billion).

In the State of Chihuahua, current water-related challenges in both, rural and urban areas, are mainly linked to water demand and supply management, planning, and financing. They include *inter alia*, the need to: *i*) reach universal coverage of water services (presently 93.5% for drinking water and 80% for sanitation); *ii*) invest significantly in the renewal, operation and maintenance of infrastructure (including for recycling water use); *iii*) increase social awareness and resort to economic instruments (e.g. pricing) to foster rational water consumption and reduce environmental impacts of water sources depletion; *iv*) manage natural disasters (i.e. droughts, floods) and their consequences on territorial development; *v*) set-up medium and long-term strategic planning, and *vi*) enhance better economic and environmental *local* regulation, taking into account territorial disparities (in terms of access and quality).

Significant efforts have been made by the State Government of Chihuahua, in co-operation with the Federal Government, to respond to the chronic water shortage. In particular, the State Government is planning on building 16 new dams throughout the state (see Figure 4.8), which will help better retain hydrologic resources since the region

only uses less than 17% annual surface flows (Secretaría de Comunicaciones y Obras Públicas, 2011). In addition, the municipalities of Chihuahua and Juárez have been active in recycling water for green areas' irrigation and industrial use.

Figure 4.8. Existing and planned dams in the State of Chihuahua



Note: This map is for illustrative purposes and is without prejudice to the status of or sovereignty over any territory covered by this map.

Source: Provided by the State Government of Chihuahua on the basis of Secretaría de Comunicaciones y Obras Públicas (2011), "Propuesta de Infraestructura Hidráulica Estratégica para el Aprovechamiento del Agua Superficial en el Estado de Chihuahua, 2010-2016", Gobierno del Estado de Chihuahua, mimeo.

Often, the required investments to put in place recycled irrigation were addressed by resorting to private-sector participation. For instance, several BOT (Build, Operate, Transfer) contracts were signed between the Municipality of Juárez, the Mexican Consortium *Atlatec* and *Degrémont* (Construction Company of *Suez Environnement*). The Federal Government – via the *National Water Commission* (CONAGUA), a deconcentrated body of the Ministry of Environment (SEMARNAT) has also invested significantly via different financing schemes (see below) to build infrastructure jointly with the State Government of Chihuahua in order to bridge the "funding gap" generated by the large sunk costs of the water sector. In particular, achieving universal access to water services at national level – i.e. connecting some 36.7 million inhabitants to drinking water and some 40.5 million to sanitation by 2030 – will require investments in network extension, wells development and rainwater harvesting of some MXN 215 billion (USD 17.8 billion).

In Chihuahua, the policy objectives of the *State Water Programme* target both water demand and water supply. It seeks *inter alia* to: *i*) improve efficiency of water service provision by 8% through support of municipalities above 50 000 inhabitants; (*ii*) reach universal coverage (100%, including in rural areas) by 2020; (*iii*) adopt systematic monitoring practices to reduce leakages in water networks (from 30% to 20%); (*iv*) adopt pricing policies towards full cost recovery; (*v*) strengthen the social subsidies' scheme across users, seek alternative sources of superficial and groundwater; (*vi*) build two wastewater treatment plants in the municipalities of Delicias and Parral, which are both lagging behind Chihuahua's sanitation coverage.

A fragmented institutional and policy framework across levels of government

In Mexico, managing and securing access to water is not only a question of money, but equally a matter of good governance. As in any other county, water is essentially a *local* issue; it involves a plethora of stakeholders at basin, municipal, state, national and international levels and poses tremendous challenges to manage interdependencies across policy areas and levels of government. In the absence of effective public governance, policymakers inevitably face obstacles to design and implement water reforms. These often proceed from the hyper-fragmentation of roles and responsibilities, low financial and technical capacity, asymmetry of information, poor regulatory, as well as institutional and integrity frameworks. Better governance is therefore crucial to efficiently manage the more and more limited water resources in Chihuahua, determining the affordability of investment plans, securing the sustainability and quality of service provision and encouraging the appropriate participation of all stakeholders – including the private sector and local communities.

Mexico's progress towards an authentic federalism still requires substantial actions to promote accountability, institution building and intergovernmental co-ordination (OECD, 2003c). Looking at the different tiers of government, "States are free and sovereign", which is made possible in effect by the fact that "Mexican state governors are the only executive officers to be elected state-wide" (OECD, 2003c). However, the autonomy of municipal government has been severely limited, rendering it the weakest tier of the Mexican government. The following paragraphs diagnose the main "gaps" generated by the fragmented institutional and regulatory frameworks in Mexico – and Chihuahua – water policymaking.

In Mexico, responsibilities across levels of governance are fragmented, leading to capacity and co-ordination challenges, which combine with an incomplete

decentralisation process to generate important heterogeneity across states. The water sector is emblematic of this fragmentation. By Constitution, the sector is managed at three levels (federal, state and municipal) and involves a number of agencies and consultative bodies in addition to the three levels of government. According to Article 27, the federal government is the owner of water resources, with a right to transfer the titles to other parties. Article 115 grants the responsibility for providing WSS to municipalities. In most cases, municipalities are therefore responsible for public service delivery, but have no legislative functions and heavily depend on federal and state transfers (tax rates that have to be approved by State Legislature), and the hyper-fragmented water sector. The Constitution also gives them the possibility to subcontract this responsibility to autonomous service provider under their supervision. In a few instances, municipalities have relinquished their prerogatives to the State and water is managed by a "*Water Commission*". This is for example the case in Cancun, Chihuahua and Monterey. In addition, states have the responsibility for planning, regulating, developing water infrastructure projects and for economic regulation of water services (tariff setting) – either through State Congresses or Water Commissions. But despite these greater responsibilities, sub-national actors (e.g. the State of Chihuahua) do not always have the authority over the financial allocation required to meet these needs, or the capacity to generate local public revenues. Meanwhile, the central government may not find it easy to promote and assess water resources and service strategies without obtaining information from sub-national governments and building, developing and reinforcing capacity at local level. Water governance is inextricably linked with territorial considerations, and increasing environmental constraints on water policy, and linkages and impacts of water on other policy areas (e.g. agriculture, energy, spatial planning) have made it increasingly difficult to execute comprehensive water policies.

Chihuahua's main actors in water service delivery and resources management include: the State's Water Utilities (*Junta Central de Agua y Saneamiento*/JCAS), the Municipal Water Utilities (*Junta Municipal de Agua y Saneamiento*/JMAS), and a set of Rural Areas' Water Utilities (*Juntas Rurales de Agua y Saneamiento*). JCAS and JMAS are funded through the collection of water revenues (on average 5% of invoices) and a percentage (three to five) of federal programmes transferring funds across levels of government. Thus, diverse situations can be found on the ground in terms of service provision, such as decentralised municipal bodies, deconcentrated bodies and state-level bodies. Often, municipalities were given important responsibilities but not the human and financial resources to carry them out. Capacity of municipalities – coupled with the short term mandate of mayors (three years) – remain important bottlenecks to the development of a long-term sustainable vision for water policy. For instance, inadequate capacity at municipal level has translated in the absence of proper urban development planning, the development of chaotic and often illegal settlements and is ultimately bearing on the development of proper service networks.

In addition to the institutions at state/local level, water management in Chihuahua involves several other actors at national and basin level:

i. The *National Water Commission* (CONAGUA), an administrative, normative, technical, consultative, decentralised agency of the federal government (SEMARNAT) in charge of managing water resources in the country. Its functions include the development of the national water policy; administering the rights for water use and wastewater discharge; planning, irrigation and developing drainage systems; managing emergency and natural disasters and managing investment in the water sector. CONAGUA funds the majority of

its activities with direct budgetary transfers from the Federal Government and with the payments it receives for water use and wastewater discharge duties. It disburses those funds back to states and municipalities through diverse programmes. Discussions have been underway for some time to support CONAGUA in its transition from its historic role of irrigation funding agency to the one of a regulatory body. CONAGUA has regional offices in the different states, including Chihuahua.

ii. The *National Association of water and sanitation Companies* (ANEAS) is an association of water supply and sanitation (WSS) providers with the aim to support professionalisation and autonomy of operators and efficiency gains in WSS provision.

iii. *BANOBRAS* is the Mexican Development Bank in charge of promoting and financing infrastructure projects and public services, mainly, through sub-national government lending and project finance. The Bank acts as trustee for the National Infrastructure Fund (FONADIN).

iv. Last but not least, a number of participatory mechanisms and bodies developed under the National Development Plan (which as one of their main guiding principles, organise water users' social participation): 25 *River Basin Councils*, 21 *River Basin Commissions*, 78 *Technical Groundwater Committees* (called COTAS), 31 *Clean Beach Committees* and a *Water Advisory Council.*

In addition to the multiplicity of actors involved in policymaking, the water sector in Chihuahua is characterised by a compilation of legislative frameworks that sometimes contradict each other and undermine effective water policy at territorial level. These legal frameworks include the *National Water Law* (1992) and a number of policy documents, such as the *National Development Plan* (PND), the *Sectoral Environmental and National Resources Programme* (PSMARN), the *National Water Programme* (PNH), the *National Infrastructure Programme* (PNI), the *National Hydrological Programmes* and the *River Basin Organisations Programme*. In addition to the policy documents endorsed at federal level, CONAGUA launched in March 2011 the *2030 Water Agenda*, after a series of consultations. The Agenda identifies a number of initiatives to consolidate sustainable water policy in Mexico with five main policy goals: sustainability, long-term objectives, basin-based vision, local control and subsidiarity. The Agenda intends to reach, in the next 20 years: (*i*) universal access to water services; (*ii*) balanced water demand and supply; (*iii*) effective management of floods and natural disasters, and (*iv*) clean rivers and groundwater.

In the face of the multiplicity of water programmes at different levels, some question the capacity of the country to follow up on and implement the policy directions contained in them and highlight (as did Tortajada and Contreras-Moreno, 2007) the gap between *planning* and *implementation*. In the case of the *2030 Water Agenda*, the uncertainty is compounded by the fact that the document has not been vetted by Congress (even though members of Congress were involved in the nationwide consultation process carried out throughout 2011) and change in leadership in the country and at the head of CONAGUA is expected in the summer of 2012. There have been recent efforts at the federal level to consolidate the legislative framework in the water sector, foster integrated water resources management at basin level, ensure investor security and foresee conflict resolution mechanisms. However, this effort it is not sector-specific and does not mention contractual forms. For that, more governance tools might be needed, for example, to

enhance better co-ordination across levels of government and bridge a series of governance "gaps" in terms of policymaking, information sharing, accountability, capacity building, consensus building and funding.

The lack of *local* regulation in Chihuahua threatens the sustainability of the water governance system over the long run, with tremendous externalities on other policy areas including agriculture. Chihuahua has no regulatory and legislative framework on water use at State level. Extraction permits are granted by the federal government. Actually, the *National Water Law* (1992) establishes that the use of the nation's waters will be carried out through the allocation of concession deeds by the Federal Executive Branch, through the CONAGUA, by means of the River Basin Councils, or directly by the CONAGUA when appropriate. Similarly, for wastewater discharges, it is necessary to have a discharge permit issued by the CONAGUA. The process is usually lengthy, raises significant integrity issues, and largely disregards the need to take into consideration territorial disparities in access to and quality of water supply. In practice, the decentralisation process, triggered by Article 115 of the Constitution, remains incomplete in some instances and has rather resulted in a "deconcentration" of central government powers, which raises a number of difficulties in terms of legal and policy coherence and institutional co-ordination that may lead to inefficient regulation. Incomplete, unclear, overlapping or inadequate transfer of responsibilities may also generate issues of capacity that hamper the ability of the sub-national (state and municipal) governments to carry out their tasks.

Enhancing better governance in Chihuahua's water sector

OECD previous work on water concluded that often, the needed solutions to the water crisis do exist and are well-known. The real challenge is *implementing* these solutions, tailoring them to local contexts, overcoming obstacles to reform and bringing together the main actors from different sectors to join forces and share the risks and tasks. In most countries, regardless of the level of decentralisation, water public governance is fragmented and from an economic and environmental point of view, would benefit from a stronger rationale to support efforts to co-ordinate water policy (OECD, 2011). Given the importance of local actors, stakes and specificity in the water sector, policymakers should not avoid *complexity* by favouring traditional top-down policies but instead, find ways to maintain coherence while preserving diversity, so as to reflect the heterogeneous concerns of stakeholders on the ground. A multilevel approach integrating international, national and local actors can help diagnose inherent governance challenges in water policymaking and to formulate possible policy responses.[8]

In the case of Chihuahua, the focus should be put on avoiding subsidies so that prices reflect scarcity, and on the need for further decentralisation of water policymaking and a strong *local* regulation in the water sector. On the one hand, prices should not be influenced by subsidies so that scarcity can influence both the crops being cultivated and the technologies employed. On the other hand, this also implies setting up legislative frameworks devoting regulatory powers to the State authorities, especially for extraction permits in order to better manage water supply and limit pollution (due to overextraction) of aquifers. Decentralisation also means giving more prominent role to the *Technical Groundwater Committees* (COTAS) in aquifer management, strengthening the organisation and functioning of the *River Basin Councils* and their auxiliary bodies, and consolidating the governance functions and regional organisation of the CONAGUA. Besides, future reforms should involve further civil society, associations of irrigations users and *Technical Groundwater Committees* in driving water conservation and the

technification of irrigation, formulating regulations for the distribution of surface water by catchment and by aquifer, and catalysing financial resources for modernisation and technification of irrigation infrastructure.

Chihuahua would also benefit from capacity building tools and enhanced co-ordination across levels of government – at local, state and national level to better manage multilevel governance in the water sector. There is no "one size fits all" model for enhancing public governance in the water sector and overcoming institutional obstacles to implementation but it is critical to diagnose the main governance challenges experienced across ministries and public agencies, between levels of government and across sub-national actors and review existing governance instruments. This will help clearly define roles and responsibilities of public authorities and set-up to dispute resolution mechanisms. Beyond the *what*, policymakers need to focus on the *how*, which requires the identification of possible overlaps in the allocation of roles and responsibilities, asymmetries of information, sectoral fragmentation of water-related tasks, insufficient knowledge, unstable or insufficient revenues at all levels of government, possibly conflicting objectives, as well as accountability concerns undermining the transparency of water policymaking. Similarly, several governance instruments are often needed to overcome identified obstacles. For instance, on the one hand, adopting contracts between levels of government can be a response to objective, *funding*, *capacity* and *policy gaps*. On the other hand, to resolve the *administrative gap*, a government may need, in addition to a shift towards river basin management, to enhance citizen participation and intermunicipal collaboration, collect information at basin level, and offer financial incentives to local authorities. A policy mix of several tools is often called for. OECD *Preliminary Guidelines for Integrated Governance of Water Policy* can provide advice on how to improve Chihuahua's water governance settings (OECD, 2011).

Table 4.4. **National Water Commission's multi-level co-ordination efforts**

Institution	Type of co-ordination
Ministry of Finance and Public Credit	Defining the annual budget assigned to the institutions related to the water sector and the corresponding calendar of payments, contributing to favouring a flexible and appropriate use of the assigned resources; if applicable, authorizing multi-annual investment programmes.
Congress of the Union	Agreeing on the policies and budget required for water resources, as well as evaluating and if appropriate approving the requests for modification of the National Water Law and its By-Laws.
States and municipalities	Programmes and actions to restore the country's watersheds support the supply of drinking water and sanitation services to the population, stimulate the efficient use of water in productive activities, such as irrigation and industry, and actions for the attention of meteorological events.
Ministry of Health	Support the municipalities so that their inhabitants receive water suitable for human consumption and foster among the population the habits and customs associated with hygiene that will afford them a better standard of living.
Ministry of Public Education	Actions aimed at school children to promote the efficient use and preservation of water, including specific sections in text books on the conservation of water and the environment.
Ministry of Agriculture, Livestock, Rural Development, Fishing and Food	Actions to promote a more efficient use of water in agriculture and to increase agricultural productivity, based on the country's food requirements, the type of soil and the availability of water.
Ministry of the Interior	Programmes and actions necessary for the prevention and attention of droughts and floods.
Federal Commission for Electricity	Build and operate the dams which are used to generate electricity, for water supply to cities, irrigation or flood protection.
Ministry of Foreign Affairs	Promote technical and financial co-ordination with agencies and institutions of the United States of America to carry out programmes associated with the management and preservation of water in the transboundary catchments and aquifers.
Ministry of Tourism	Actions to achieve a better use and preservation of water in tourist sites and recreational areas.
Ministry of Economy	Take part in the formulation of the official standards for the water sector.
National Forestry Commission	Soil and water conservation actions in the upstream parts of catchments, with the aim of decreasing the entrainment of solids to riverbeds and dams.
Attorney General's Office for Environmental Protection	Actions to monitor water quality in the country's rivers and lakes and to apply the corresponding sanctions.
Mexican Institute for Water Technology	Develop research and technology for water resources.
Ministry of Civil Service	Promote actions in favour of good governance and institutional development and co-ordinate the actions associated with the certification of capacities in the federal civil service.
River Basin Councils and their auxiliary bodies	Take part in the Integrated Water Resources Management of watersheds and aquifers, so as to favour social wellbeing, economic development and the preservation of the environment.
Water Advisory Council	Strategies for a better use and preservation of water.
Research and Technology Institutes	Research and technological development for the preservation of water.
Ministry of Social Development	Support rural communities for the development of drinking water, sewerage and sanitation infrastructure.

Source: CONAGUA (2010) Statistics on Water in Mexico 2010 Edition, SEMARNAT, Mexico.

Table 4.5. **Comparison of Mexican states' legal frameworks**

States	Law's publication date	Regulating body	Rates include			
			Costs	Depreciation	Sewage costs	Sanitation costs
Aguascalientes	2005	Board of Governors	yes	yes	yes	yes
Baja California	1969	State Congress	yes	n/a	n/a	n/a
Baja California Sur	2001	Board of Governors	yes	n/a	yes	n/a
Campeche	1992	Board of Governors	yes	yes	yes	yes
Coahuila	2006	Board of Governors	yes	yes	n/a	n/a
Colima	2000	Board of Governors	yes	yes	yes	yes
Chiapas	2000	Board of Governors	yes	yes	yes	yes
Chihuahua	2004	State Council	yes	n/a	yes	yes
Durango	2005	City Council	yes	yes	yes	yes
Guanajuato	2000	City Council	yes	yes	yes	yes
Guerrero	2002	City Council	yes	yes	yes	yes
Hidalgo	1999	State Congress	yes	n/a	yes	yes
Jalisco	2007	State Congress	yes	yes	yes	yes
Mexico City (Federal District)	2003	Legislative Assembly	yes	n/a	n/a	n/a
Michoacán de Ocampo	2004	City Council	yes	yes	n/a	n/a
Morelos	2002	State Congress	yes	yes	yes	yes
Nayarit	1995	Board of Governors	yes	yes	yes	yes
Nuevo León	1997	State Executive	yes	yes	yes	yes
Oaxaca	1993	Board of Governors	yes	yes	yes	yes
Puebla	1994	State Congress	yes	n/a	n/a	n/a
Querétaro	1992	Board of Governors	yes	yes	yes	yes
Quintana Roo	1996	Board of Governors	yes	n/a	n/a	n/a
San Luis Potosí	2001	State Congress	yes	yes	yes	yes
Sinaloa	2002	Board of Governors	yes	n/a	yes	yes
Sonora	2006	State Congress	yes	yes	yes	yes
State of Mexico	1999	Board of Governors	yes	yes	yes	yes
Tabasco	2005	State Congress	yes	yes	yes	yes
Tamaulipas	2006	State Executive	yes	yes	yes	yes
Tlaxcala	2001	City Council	n/a	n/a	n/a	n/a
Veracruz	2001	Board of Governors	yes	yes	yes	yes
Yucatán	1982	State Congress	yes	n/a	n/a	n/a
Zacatecas	1994	Board of Governors	yes	yes	yes	yes

Note: N/A means unspecified.

Source: CONAGUA (2010) Statistics on Water in Mexico 2010 Edition, SEMARNAT, Mexico.

Guidelines for effective water governance

The *Multilevel Governance Framework*, organised around eight categories of "gaps", can be a useful diagnostic tool for policymakers in Chihuahua and Mexico to address water governance challenges:

i. Involve sub-national governments in designing water policy, beyond their roles as "implementers" and allocate human and financial resources in line with responsibilities. Regional and local actors are already key players in OECD countries' water policy implementation. But they can also play a crucial role in identifying policy complementarities and synergies at the local level. They are the most likely to understand local needs, territorial challenges and engage relevant interlocutors. Whenever possible, discretion should be accorded to the local level for implementation of integrated management. Only when solutions cannot be realised at this level should consideration be given to the next level in the hierarchy, i.e. the regional, state or national level. The need often arises to co-ordinate planning and management between agencies and areas at the national or international level.

Caution is also necessary with the process of "total" decentralisation of water governance. Basin-level management, for example, may require national or international governance to avoid inequities in water allocation within a water basin and also ensure that the public good aspects and values of water are given sufficient recognition. Strategic planning and incentives for policy coherence at all levels can actually limit local "capture" and specific "vested" interests may compromise integrated policy.

ii. Adopt horizontal governance tools to foster coherence across water-related policy areas and enhance inter-institutional co-operation across ministries and public agencies. Integrated water policy requires platforms for dialogue and exchanges between policymakers at central government level. The process of integration should be ensured through the establishment of highly visible inter-ministerial and inter-departmental councils and committees, with responsibility to ensure substantive dialogue and co-ordination. These bodies could also be responsible for final negotiation and bargaining, together with performance evaluation on the achievement of integrated management of natural resources. They need to be designed coherently, be consistent with the institutional organisation of water policy, and offer high-level political commitment for ambitious water policy reforms.

iii. Create, update and harmonise water information systems and databases for sharing water policy needs at basin, country and international levels. Assessing the effectiveness of water information systems and databases in bridging the information gap is a difficult task. It requires conducting a cost-benefit analysis at local, regional, national and international levels, to determine how current water information and data are collected and used by policymakers, and the costs and benefits of collecting, analysing and communicating this information. Increased efforts are needed to communicate messages from the reporting and analysis of water data to policy advisors and the wider public. That also implies assessing institutional obstacles and opportunities by identifying areas of institutional overlap and synergies in water data collection; mobilising local stakeholders when designing water information systems; fostering co-ordination between data producers and users; and encouraging multi-disciplinary approaches.

iv. Encourage performance measurement to evaluate and monitor the outcomes of water policy at all levels of government. The diversity of tools in place shows that there is no optimal design for an indicator-based performance measurement system in the water sector. Its development should be a collaborative effort between the national and sub-national level and agencies, and the information it yields ought to cover inputs, processes and outputs that are relevant for ongoing activities. For such information to be used in an effective fashion, clear objectives for the data need to be established and proper indicators selected. Systems are needed that can generate, validate and distribute the data; the information must be used in an appropriate and timely fashion; incentive mechanisms can be considered to encourage actors to follow a particular course of action; and strategies for how the performance information will be used – whether "benchmarking" or "bench learning" – should be planned for.

v. Respond to the fragmentation of water policy at the sub-national level by facilitating co-ordination across sub-national actors and between levels of government. River basin management, intermunicipal co-operation and co-ordinated bodies at local and regional levels can help bridge co-ordination gaps, ensure a holistic and hydrological approach to water policy and create critical mass for water investment at the territorial level. Coherence involves both water resources and water uses (for urban or rural areas) for an integrated hydro-institutional system throughout the water cycle. Such tools need to be backed up by scientific, institutional, economic and financial information, a clear definition of their roles and functions, strong advocacy for their effective use as well as a co-ordination of their actions when they are used simultaneously.

vi. Foster capacity-building at all levels of government. This implies combining investment in physical water and sanitation "hard" infrastructure with the provision of "soft' infrastructure, which is essentially the institutions upon which water outcomes rely. The development of skills, technical expertise and knowledge and the availability of staff and time are preconditions for effective governance of water policy. Often, policymakers focus on the construction and maintenance of water networks, offering a "technical" response to water challenges. This has proved to be insufficient to face climate change, risk management (floods, droughts) and cross-border issues in the water sector. Institutional strengthening and capacity-building at all levels is crucial for effective water policies in response to the challenges of the 21st century. In the context of fiscal and budgetary constraints, such capacity building is a prerequisite for channelling limited financial resources most effectively, in both developed and developing countries.

vii. Encourage a more open and inclusive approach to water policymaking through public participation in water policy design and implementation. Public participation should be encouraged both in the planning process and in critical reviews of implementation, and would highlight areas where further integration is required. Broader involvement of citizens, interested parties and non-governmental organisations (NGOs) is also vital for successful integrated water policy design and implementation. Widening public participation is a means to increase transparency of environmental policies and encourage citizens' compliance with it. Transparency in establishing and implementing goals and reporting standards is an important way to empower citizens and influence the direction of environmental protection.[9]

viii. Assess the effectiveness and adequacy of existing governance instruments for co-ordinating water policy at horizontal and vertical levels. To be relevant and credible, the assessment of water governance arrangements has to be conducted within a policy dialogue, at the scale of a given territorial area (national, rural, urban, basin or cross-border), and in the light of current, past and future reforms in the water sector.

Notes

1. These problems were underscored by the IMIP (2002), which clarified that "*...the urban footprint will grow at a rate difficult to guarantee its order. This will accentuate the vicious circle of chaotic growth and low urban productivity. The infrastructure deficit will increase as will the deficit for maintenance of infrastructure and facilities. This will negatively affect health, education, culture and attention to groups with special needs: children, women, the disabled, the elderly, migrants, and indigenous people"(OECD translation)*

2. The transport sector also has public health implications. In Ciudad Juárez, for example, the Programa de Gestión de la Calidad del Aire en Ciudad Juárez 2006-2012 found that the transport sector generated 91% of carbon monoxide (CO) emissions and 51% of nitrogen oxide (NOx) (IMIP, 2009).

3. This estimate is at 20% of the value of the home. The Instituto de Vivienda del Estado de Chihuahua (IVI, 2011) also conducted this exercise at 10% and 5% of the value of the home.

4. This is called the Veneziana Energia Risorse Idriche Territorio Ambiente Servizi (VERITAS).

5. Programming terms and conditions, regulations or even legislation could push this principle further, to include bonus schemes covering not only infrastructure programming but strategic policy planning for a region's long-term growth. Co operation would be rewarded and isolationist or sectarian approaches penalised. At present, inter-municipal co operation for infrastructure funding in Canada does not explicitly provide a bonus for a horizontal partnership, but it will not reward the absence of such partnering.

6. As of 2006, there are 582 micropolitan statistical areas in the United States and Puerto Rico. The majority (83.5%) of micropolitan areas are confined to one county, 13.2% cover two counties, 3.0% encompass three counties and 2 micropolitan areas span four counties. For more information see Office of Management and Budget (2010) and Miller, K. (2006). "2010 Standards for Delineating Metropolitan and Micropolitan Statistical Areas", Federal Register / Vol. 75, No. 123, 28 June, *www.whitehouse.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf*; Miller, K. (2006), "Micropolitan Areas Overview", Rural Policy Research Institute Internal Working Paper, *www.rupri.org/Forms/WP1.pdf*.

7. Scott (2009) indicates that in 2008 charges for electricity for irrigation uses covered no more 28% of the cost of electricity.

8. OECD 2011, Water Governance in OECD countries : A Multilevel Approach, OECD Publishing, Paris.

9. For background information on citizens' engagement in public policies, see OECD (2009), *Focus on Citizens: Public Engagement for Better Policy and Services*, Studies on Public Engagement and OECD, *Innovation and Public Services: Working Together with Citizens for Better Outcomes,* forthcoming.

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Annex A

Growth Accounting

Economic growth can take place by increasing the amount and types of labour and capital used in production, as well as by improving overall efficiency in the way factors of production are employed, *i.e.* higher total factor productivity (TFP). Growth accounting means breaking down growth of GDP into the contribution of labour input, capital input and TFP. The growth accounting approach is based on the microeconomic theory of production and directly related to the calculation of TFP growth, measured by deducting from output growth, the growth of labour and capital inputs.

Therefore, departing from a traditional Cobb-Douglas production function, we allow technology to enter the equation so that:

$$P_t Q_t = w_t L_t + r_t K_t$$

$$Y = \alpha L_t + (1 - \alpha) K_t$$

Where P is prices, Q is quantities, t is time, w is wages, L is labour, r are returns on capital and K is capital. Introducing technology:

$$Y = A + \alpha L_t + (1 - \alpha) K_t$$

Where A is technology. To calculate the Solow residual as indicated above, we assume:

A functional relation of inputs and output. that is, output is a function of capital and labour.

Neo-classical smoothness and curvature properties.

Factor returns are equal to factor's marginal product.

Constant returns to scale

Technical change has the Hicks' neutral form

An increase in the quantities of factors of production imply movements along the production curve, while increases in A imply shifts of the function and curve.

$$\frac{\Delta\, Q_t}{Q_t} = \frac{\Delta\, A_t}{A_t} + \frac{\delta Q_t}{\delta K_t}\frac{K_t}{K_t}\frac{\Delta\, K_t}{K_t} + \frac{\delta Q_t}{\delta L_t}\frac{L_t}{Q_t}\frac{\Delta\, L_t}{L_t}$$

As the elasticities of capital and labour are:

$$s_t^k = \frac{\delta Q_t}{\delta K_t}\frac{K_t}{K_t}$$

$$s_t^L = \frac{\delta Q_t}{\delta L_t}\frac{L_t}{Q_t}$$

We can re-write it as:

$$\frac{\Delta\, Q_t}{Q_t} = \frac{\Delta\, A_t}{A_t} + s_t^K \frac{\Delta\, K_t}{K_t} + s_t^L \frac{\Delta\, L_t}{L_t}$$

And the Solow's residual is:

$$R_t = \frac{\Delta\, A_t}{A_t} = \frac{\Delta\, Q_t}{Q_t} - s_t^K \frac{\Delta\, K_t}{K_t} + s_t^L \frac{\Delta\, L_t}{L_t}$$

The $\frac{\Delta Q_t}{Q_t}$ should be measured as gross of depreciation since we want to measure the number of units actually produced, and K_t should be measured net of depreciation.

For discrete time analysis like the one we employ in this review the final equation is:

$$LN\frac{\Delta\, A_t}{A_t} = LN\frac{\Delta\, Q_t}{Q_t} - \left[\left(\frac{s_t^K + s_{t-1}^K}{2}\right) LN\left(\frac{K_t}{K_{t-1}}\right)\right] - \left[\left(\frac{s_t^L + s_{t-1}^L}{2}\right) LN\left(\frac{L_t}{L_{t-1}}\right)\right]$$

To calculate the stock of capital we would need a term that reflects user's costs including rate of return, depreciation, capital gains for holding assets, price of assets and tax rates on capital. However, Mexico does not have this kind of data at sub-national level.

Annex B

Cross-Border Economic Co-operation in Chihuahua

Cross-border co-operation: An overview

Over the course of the past decades, there have been various forms of cross-border development programmes in different parts of the world. They include, among others, the European Territorial Co-operation (formerly called the INTERREG programmes) launched in the European Union (EU), the Indonesia-Malaysia-Singapore Growth Triangle (IMS-GT, formerly entitled the "Singapore-Johor-Riau Growth Triangle"), the Greater Tumen Initiative (GTI, formerly known as the Tumen River Area Development Programme, or TRADP), China's Special Economic Zones (SEZs), and the US-Mexico Border Industrialisation Programme (BIP) (called "*maquiladoras*" in Mexico). The creation and organisation of these cross-border development programmes have provided many valuable times-series data and other specific information. Obviously, this will help scholars and practitioners involved in cross-border co-operation to assess the effectiveness of such instruments, and eventually derive useful policy implications.

The first post-war initiative of cross-border co-operation was established in 1958, by the German-Dutch border region, with the creation of the euroregion (EUREGIO). Similar inter-state structures on cross-border co-operation (such as the Association of European Border Regions) were established during the 1960s and the 1980s in western and northern Europe. The cross-border co-operation was further promoted when the Single European Act (SEA) was implemented in 1987. After the adoption of a first list of 14 pilot cross-border actions in 1989, the European Community launched in 1990 a dedicated initiative: INTERREG, which was renamed as the European Territorial Co-operation (ETC) in 2007. One of the major tasks of the ETC is to foster cross-border co-operation by helping "regions located on either side of internal or external borders of the European Union into strong economic and social poles. In particular cross-border actions are encouraged in the fields of entrepreneurship, improving joint management of natural resources, supporting links between urban and rural areas, improving access to transport and communication networks, developing joint use of infrastructure, administrative co-operation and capacity building, employment, community interaction, culture and social affairs."[1] From 2007 to 2013, territorial co-operation in European Union (EU)

[1] Cited from the official website of INTERACT – an organization co-financed by the European Regional Development Fund (ERDF). Available at http://www.interact-eu.net/etc/etc_2007_13/4/2. Accessed on April 15, 2011.

comprehends 75 programmes in cross-border areas including external EU borders (Interact, 2011).

The Indonesia-Malaysia-Singapore Growth Triangle (IMS-GT) was established by Indonesia, Malaysia and Singapore, aiming at strengthening the trilateral economic links and to make fuller use of the complementarities among the three neighbouring countries. The predecessor of the IMS-GT, the "Singapore-Johor-Riau Growth Triangle" (SIJORI-GT), started in 1989. The SIJORI-GT was a partnership arrangement between Singapore, Johor (in Malaysia), and Riau Islands (in Indonesia) that combines the competitive strengths of the three partners to make the sub-region more attractive to regional and international investors. More specifically, it was designed to link the infrastructure, capital, and expertise of Singapore with the abundance of natural and labour resources of Johor and Riau, relocating labour-intensive industries to such neighbouring places as the Malaysian state of Johor and the island of Batam in the Indonesian province of Riau. As more Malaysian and Indonesian states joined the grouping, the IMS-GT was formed in 1994, which includes Singapore, the Malaysian state of Johor in addition to other contiguous states, and the Indonesian province of Riau and its contiguous provinces, with a total area of 334 thousand sq. km and a population of 35 million.[2] Within the IMS-GT, government's role would be to support, encourage and facilitate flow of goods, services, investments, and people. The pioneering experience of the IMS-GT has led to the development of other growth areas in ASEAN. For example, the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT) represents the second major ASEAN effort at linking the three complementary areas that belong to Indonesia, Malaysia and Thailand (Heng, 2006).

The US-Mexico border development: A comparison with the Chinese case

There are at least two channels through which cross-border economic co-operation or integration could have beneficial effects. First, an increase in the flow of cross-border trade may increase the demand for transportation and distribution services produced at the border. The border serves then, as a land port. Second, depending on the level of transport costs, trade patterns would lead to industrial location in border regions. The border functions then, as an international production centre (see Hanson, 1996). Indeed, sharing a common land border will generally promote international trade and economic co-operation. For example, bilateral trade between France and the UK will be due to their proximity but with Germany will be further boosted by the effect of their common border in addition to their proximity.

During the Second World War, Mexico and the United States signed an agreement that allowed Mexican labourers, chiefly agricultural workers, to work in the US. This programme was conceived as a temporary measure to ease the manpower shortage created in the latter by the requirements of the army during the war. After the war, Mexico came to depend on the programme as a source of foreign exchange earnings and as an outlet for its excess supply of labour (Guo, 1996). The programme continued until 1964 when it was unilaterally terminated by the US, which led to a substantial increase in unemployment in Mexico's border regions, and partly as a measure to alleviate this problem, a new programme that would permit United States' firms to import into Mexico capital equipment and materials for re-export was created in 1966. In Mexico, the plants set up under the Border Industrialisation Programme (BIP) are called "maquiladoras" and

[2] Data source*: www.cpu.gov.hk/english/documents/conference/e-sychia.rtf*. Accessed on May 15, 2011.

the industry is called the "*maquila*" industry. Most of Mexico's assembly activities are located along the border with the United States, concentrating on cities in border-states from Tijuana, just south of San Diego, California, on the Pacific Ocean, to Matamoros across the border from Brownsville, Texas, near the Gulf of Mexico. The development in Mexico's northern border area has been strongly influenced by the proximity to the US. NAFTA came to strengthen the location advantages of the region. All these geographical and institutional factors have established the State of Chihuahua as one of the leading entities in economic growth and development in Mexico. Thanks to the Maquiladora Export Industry (IME) – which requires a variety of services to mobilize their supplies and finished goods to and from the United States – and the enactment of the NAFTA, one of the fastest growing sectors in the economy of Chihuahua was the transportation, storage and communications sector. The period of 1993-2006, measuring the sector's growth based on GDP at constant prices for 1993, registered an extraordinary growth of 191.3% (CODECH, 2010).

On the opposite side of the world, there is just a similar cross-border story, which is believed to be the most important episode for China's economic miracle (Lee, 1995; Shen et al., 2000). For the second half of the 19th and much of the 20th centuries, Hong Kong and mainland China were separated by an international boundary marked by a river called "Shenzhen". The proposal for establishing Special Economic Zones (SEZs) was approved by the National People's Congress of China in 1980. Since then, in order to attract FDI, China and the Guangdong province have enacted a series of special laws and regulations and favourable measures related inter alia to the industrial and commercial registration, economic contract, technology import, labour and personnel and real estate for the Shenzhen SEZ.

Among the most important factors contributing to Guangdong province's rapid economic growth are its geographical adjacency to Hong Kong and its cultural linkages to the dynamic economies in Southeast Asia. As a coastal province, Guangdong has an important number of natives and their descendants scattered throughout countries in the region, particularly in Hong Kong and other Southeast Asian economies. During the past decades, especially as the results of the handover of Hong Kong from the UK to China in 1997 and the implementation of the Closer Economic Partnership Arrangement (CEPA) in 2003, the development of Hong Kong has positively influenced that of Guangdong, and vice versa. What is more, there are many mutual complementarities between Guangdong and Hong Kong in terms of, among others, natural resource endowment, industrial structure, and marketing and managing skills. Through cross-border co-operation, the above comparative advantages have contributed to the economic growth of both Guangdong and Hong Kong substantially.

Chihuahua: The quest for effective cross-border co-operation

Cross-border co-operation can help border regions develop by better taking advantage of: (i) comparative advantages stemming from various factor-price differences between the two (or more) sides of the border; and (ii) economies of scale, which are created after the (partial) removal of border-control policies. However, cross-border co-operation under contrasting regional development stages can be summarised into four basic categories:

i) Successful cross-border economic co-operation, if regional diminish at first and vanish eventually.

ii) Effective cross-border economic co-operation, if regional disparities diminish but never disappear.

iii) Ineffective cross-border economic co-operation, when regional disparities persist.

iv) Failed cross-border economic co-operation, if regional disparities increase.

Per capita GDP differences between Chihuahua and Texas seem to widen. In other words, Chihuahua's performance relative to that of Texas seems to have worsened for some, if not all, years from the late 1990s till the mid-2000s. After computing Chihuahua's per capita GDPs relative to Texas's (in percent), it seems that there are approximately two cycles of cross-border economic divergence-convergence in the state of Chihuahua. The first divergence-convergence cycle occurred during the period from 1992 or 1993 to 2000, while the second one ranged from 2000 to 2008. This phenomenon may be accidental. If not, there may be other political and institutional reasons responsible to Chihuahua's cross-border growth cycles.

Usually, a range of socio-economic complementarities can be found in border regions, which play a very positive role in promoting cross-border trade and economic co-operation. However, sharing a border, not only means sharing the dynamism, but also the problems. In the state of Chihuahua, after several decades of economic co-operation with the United States, there are still various obstacles to further and more effective co-operation:

i) Political/administrative differences weaken the efficiency of economic co-operation between the two sides the U.S.-Mexico border. In contrast to the U.S., Mexico is still centralised. Political power continues to partly flow from the President in Mexico City as do economic resources. Thus, local governments are relatively weak in Mexico. Traditionally, Mexican municipalities have had no secure and adequate source of funding so they have relied on state and federal transfers. For a long period of time, there were no civil service in Mexico (at present, civil service is available only for the federal level, but not for states and municipalities), so with each new municipal governor, or president, there was massive turnover in administrative staff. This made continuity in programmes difficult and works against continuity in cross-border co-operation. In addition, there are few direct governmental and administrative counterparts across the US-Mexico border (Ganster, 1996). In most circumstances, legislative and policy differences may hinder the effective management of cross-border economic activities. For example, both the United States and Mexico have set health-based ambient air quality standards. Cross-border problems persist, however, since each side (the US and Mexico) has its own standards to protect public health with an adequate margin of safety.[3] This would lead to difficulties in the adoption of common production standards, as well as the co-ordination of cross-border trade, investment and other business activities.

ii) Significant cross-border economic divergence may affect Chihuahua's economic co-operation and integration with the US economy. Economic divergence has both positive and negative effects on cross-border co-operation. A positive can be found in cross-border economic differences imply comparative advantages.

[3] For example, the standard of Ozone (O3) (one-hour average) is 0.11 ppm for Mexico, while it is 0.12 ppm for the United States; the standard of Sulfur Dioxide (SO2) (the arithmetic mean of 24 hours) is 0.33 ppm for Mexico, while it is 0.14 ppm for the United States (NEPA, 2007).

For example, richer regions typically with relatively more abundant capital, advanced technology and efficient managing skills, can complement relatively poorer regions' supply of relatively cheaper labour and natural resources. That is, economic divergence is a strong driving force for the optimal factor (labour, capital, technology, and natural resources) allocation across the border, it also contains components hindering cross-border economic co-operation. In any circumstances, worsening gaps of wealth and income would motivate the poor to engage in crime, riots and other disruptive activities. As a consequence, it is also believed that inequality could become an impediment to economic development. The border-states in Mexico, including the state of Chihuahua, have above-average levels of income, but the border areas of profound poverty persist in Mexico. During the recent decades, the rise of *maquiladoras* and the signing of NAFTA in 1994 have attracted many younger men and women and their families to the US-Mexico border region in search of better economic opportunities. However, crime activity has also increased dramatically. Raising standards of living in the border region will require large-scale poverty alleviation programmes that are complementary to economic policies.

iii) Cultural difference sometimes impedes international trade and economic co-operation. More often than not, political boundaries not only create different political and economic systems, but they also increase to a certain extent cross-border cultural differences among which: ethnicity, language, religion and more generalised cultural norms (such as individualism and collectivism).

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