Regional Economic Growth in Mexico

Recent Evolution and the Role of Governance

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Abstract

There has been substantial research in recent years examining the regional evolution of economic growth across states in Mexico—with a particular focus on the post North American Free Trade Agreement period. There is also a vast literature using cross-country regressions to examine institutional determinants of economic growth, including government transparency, or “corruption,” as a key institutional variable. This paper uses more recently available data for Mexican states to both update the general state convergence/divergence literature, and incorporate into the analysis more recently

developed state level indicators of institutional factors related to government transparency. The authors do not find a systematic relationship between measures of government transparency and gross domestic product per capita growth in Mexico during 2001–2005; however, they do find that corruption is negatively associated with the level of state gross domestic product per capita. The contrasting results may imply that more years of data are necessary to be able to establish statistically significant relationships between state growth rates and measures of corruption.

This paper—a product of the Agriculture and Rural Development Unit, Latin America and Caribbean Region—is part of a larger effort in the department to understand regional dimensions of economic development. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at eweiss@worldbank.org.

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Regional economic growth in Mexico: Recent evolution and the role of governance

Eli Weiss and David Rosenblatt

1. Introduction

The evolution of how economists perceive corruption and its impact on economic development has changed radically in the last few decades. The “grease the wheel of growth” view dating back to the 1960s was gradually overtaken by a “sand the wheel of growth” approach. On the theoretical side, development economists began to incorporate concepts from the growing field of the economics of institutions. Since the mid 1990s, many economists have tried to empirically analyze the relationship between corruption and economic growth by using cross-country data, and these studies added an important new dimension to the empirical literature on economic convergence/divergence and the determinants of the cross country patterns of growth. This new line of research was made possible by the development of new measures of quality of governance, or “corruption”, at the international level.

Since 2001, the non-governmental organization “*Transparencia Mexicana*” is constructing every second year a National Index of Corruption and Good Governance, based on behaviors of corruption, (in contrast to the perception based index of Transparency International). The creation of this new measure allows us to incorporate governance into traditional growth regressions of state growth in Mexico.

This paper is organized as follows. First, we summarize the evolution of the literature concerning corruption and growth. Section 3 describes the regional growth in Mexico, first with a literature review and then with a descriptive analysis, by going more into detail in questions of convergence and divergence across Mexican states. In section 4 we implement a cross-state econometric growth model for Mexico, following the past literature, but now including a corruption variable and other control variables for the institutional environment. The last section summarizes the main conclusions.

2. Growth and Corruption

The literature on the relationship between corruption and economic development demonstrates a dramatic shift in perspectives over the last fifty years. Leff (1964), a pioneer in exploring this subject, viewed corruption as “grease money” to lubricate the squeaky wheels of a rigid administration. Other authors from this period (Leys 1965, Bailey 1966) explained that corruption can amend a bureaucracy by improving the quality of its civil servants, arguing that if wages in government service are insufficient, the existence of perks may constitute a complement that may attract able civil servants, who would have otherwise opted for another line of business. Huntington (1968) went even further stating that “in terms of economic growth, the only thing worse than a society with a rigid and over-centralized, dishonest bureaucracy is one with a rigid, over-centralized, honest bureaucracy”, adding that corruption can help surmount tedious bureaucratic regulations and foster growth. Huntington took an historical approach: he drew on the experience observed in the 1870s and 1880s in the United States, where corruption by railroad, utility and industrial corporations allegedly resulted in faster growth. One of the only early papers which argued the converse was by Myrdal (1968), stating that corrupt civil servants may cause delays that would not appear otherwise, just to get the opportunity to extract a bribe, and that civil servants at each stage can have some form of veto power or some capacity to slow down a project. In the 1980s, many authors maintained a positive attitude towards corruption’s influence on development. For example, Lui (1985) argued that corruption can efficiently lessen the time spent in queues and that a system built on bribery for allocating licenses and government contracts may lead to an outcome in which the most efficient firms will be able to afford to pay the highest bribes. Finally, another argument was that corruption may enhance the choice of the right decisions by officials (Beck and Maher 1986, Lien 1986), because if bureaucrats do not have enough information or are not competent for some decisions, corruption can, according to the authors, replicate the outcome of a competitive auction. This argument was rejected later on by Rose-Ackermann (1997) who provides evidence that a firm may be able to pay the highest bribe simply because it compromises on the quality of the goods it will produce, if it gets a license.

In 1990, Douglass North changed the overall perception of corruption in the literature, arguing that malfunctioning government institutions constitute a severe obstacle to investment, entrepreneurship, and innovation. He emphasized the importance of an efficient judicial system to enforce contracts and the security of property rights over physical capital as a crucial determinant of economic performance (North 1990). Other authors added that property rights have a greater impact on investment and growth than political economy variables (Knack and Keefer 1995); that innovators and entrepreneurs are hit hardest by corruption as they must obtain government-supplied goods such as licenses and permits to start, whereas established producers do not (Shleifer and Vishny 1993); and that corruption and rent-seeking may have a negative impact on growth, if they create incentives for highly talented individuals to go toward rent-seeking and other

unproductive activities rather than toward productive activities (Baumol 1990, Murphy et al. 1991, Ehrlich and Lui 1999). The corrupt action by itself does not impose the largest social cost (Murphy et al. 1993), but instead, the primary social losses of corruption come from sustaining inefficient firms and the reallocation of talent, technology and capital away from their most socially productive uses. When profits or potential profits are taken away from firms through corruption, entrepreneurs choose not to start firms or to expand less rapidly. Corrupt officials have an incentive to create distortions in the economy to preserve their illegal source of income as, for example, the rationing of the provision of a public service only to be able to decide to whom to allocate that service in exchange for a bribe, or the incentive to limit new civil servants' (especially competent ones) access to key positions in order to preserve the rent from corruption (Kurer 1993). This can improve the situation of the bribers, but nothing is gained from corruption at the aggregate level. Mauro (2002) explains with a multiple equilibrium model, that when corruption is widespread, individuals do not have incentives to fight it, even if everybody would be better off without it.

Since the second half of the 1990s, various authors focused their attention on the macroeconomic channels, through which corruption affects growth. The work of Mauro (1995) constitutes the pioneer study in international comparison. He emphasizes that corruption may constitute a main obstacle to investment thereby reducing economic growth. Davoodi and Tanzi (1997) find that corruption is associated with lower government revenues, higher public investment, but lower expenditures on operations and maintenance and finally lower quality of public infrastructure. The results of Balamoune-Lutz et al. (2008), indicate that corruption has a positive effect on public investment, while it has a negative effect on private investment, because corrupt bureaucrats seek to increase capital expenditure (over maintenance expenditures) to maximize private gains (rent-seeking) and discourage private investment, suggesting that corruption increases the costs of doing business while raising uncertainty over expected returns to capital. The tax system may become less progressive and low level of taxation may lead to higher fiscal deficits, which in turn may lower the growth rate (Fisher 1993, Johnson, Kaufmann, Zoido-Lobaton 1999). Mauro (1998) provides evidence that corrupt countries are spending less on education and health, and because social spending is assumed to promote growth, it must be concluded that this might be another channel through which corruption may affect growth negatively. Education stands out as a particularly unattractive target for rent-seekers, because its provision typically does not require high-technology inputs to be provided by oligopolistic suppliers.

The empirical literature tries to estimate the effects of corruption on growth. Mauro (1995) is the first attempt to study the relationship between corruption and growth in a large cross-section of countries. He finds that a reduction in corruption equivalent to two points in the corruption index, through its positive effect on the investment-GDP ratio, could raise growth rate by about 0.5%. Mo (2001) shows that a 1% increase in the corruption level reduces the growth rate by about 0.72% or, expressed differently, a one-unit increase in the corruption index reduces the growth rate by 0.545 percentage points. Davoodi and Tanzi (2000) say that countries with a higher corruption rate tend to have a lower growth rate by finding a correlation coefficient of -0.32, which is statistically significant. Alonso-Terme et al. (2002) provide evidence that a one-standard deviation increase in the growth rate of corruption (a deterioration of 0.78 percentage points) reduces income growth of the poor by 4.7 percentage points per year, which is considerable given the average income growth of 0.6% a year. Comparing differences among regions, De Camacho et al. (2006) find that a 10% decrease in corruption increases the growth rate of income by about 1.7%, in OECD and Asian

countries, 2.6% in Latin American countries, and by 2.8% in African countries, whereas Meon et al. (2008) argue that corruption is always detrimental in countries where institutions are effective, but may be positively associated with efficiency in countries where institutions are ineffective. Finally corruption is likely to be much more damaging to investment and growth in small as opposed to large developing countries (Bonnett and Rock 2004). Taking Foreign Direct Investment as a determinant of growth, Wei (1997) argues that the less predictable is the level of corruption, the greater is the impact of corruption on FDI and finds that an increase in uncertainty from the level in Singapore to that of Mexico is equivalent to raising the tax rate on multinational firms by 32 percentage points, and Wei (1997) shows that an increase in the corruption index by one point reduces the flow of FDI into a country by about 11 percent, which is equivalent to a 3.6 percentage points increase in the marginal tax rate.

There has been a substantial literature that has analyzed the relationship between corruption and growth in large cross-sections of countries, but only very few articles have studied the relationship in a cross-section of regions inside a single country. Using state level cross-section data from the United States, Akai et al. (2005) found a negative effect of corruption on economic growth over the medium and long term time spans, but insignificant effects in the short-term. The case of Mexico could be illustrative of other emerging market economies.

3. Regional Growth in Mexico

a) Literature Review

Given the large regional disparities and income inequality which exist in Mexico, the literature has examined the extent of convergence or divergence among Mexican states during the last decades. Most of the authors have focused their analysis on the consequences of trade liberalization reforms on the convergence process in Mexico, especially after having joined the General Agreement on Tariffs and Trade (GATT) in 1986 and the North American Free Trade Agreement (NAFTA) in 1994. They are concordant with the fact that there was a process of convergence among Mexican States during several decades, which broke down in 1985 after trade reforms were adopted. Most of the literature uses the Barro and Sala-i-Martin (1992) methodology to analyze the convergence-divergence evolution among Mexican states.

For instance, Chiquiar (2004) finds that the trade reforms induced a process of regional divergence in per-capita output levels, because only some of the richer states had appropriate infrastructure to take advantage of the new sources of growth. He concludes that Mexico's liberalization has increased the ties between northern Mexico and the U.S. and at the same time has weakened the ties between northern and southern Mexico. Aguayo-Tellez (2006) finds that the variance of average income across Mexican states fell by 60% during the period 1940-1985, but started to diverge after the adoption of trade liberalization policies and other market-oriented reforms. As an explanation, he points to the rise in the education premium, which hindered the progress of poor states and increased the variance of average state wages and labor earnings. Other factors include the initial level of education, the size of the agricultural sector and the distance from the U.S. border, while public infrastructure does not affect divergence in his state-level regression. Esquivel and Messmacheer (2002) conclude that output per capita converged across states in Mexico only during the 1970s, while remaining relatively stable in the 1960s and 1980s and diverging in the 1990s. Esquivel (1999) finds that regional disparities in Mexico declined at a rate of 1.2% per year

between 1940 and 1995, whereas from 1940 through 1960 there was a relatively rapid process of regional convergence in Mexico, and from 1960 through 1995 this process suddenly stopped and it even began to revert itself. Sanchez-Reaza and Rodriguez-Pose (2002) show that the final stages of the import substitution period were dominated by convergence trends, whereas the period of trade liberalization (GATT) and economic integration (NAFTA) led to divergence. Using techniques from spatial economics literature, Aroca, Bosch and Maloney (2005) find that divergence has emerged in the form of several income clusters that only partially correspond to traditional geographic regions. They argue that the increased divergence lies not on the border but in the sustained underperformance of the southern states and to a lesser extent in the superior performance of an emerging convergence club in the North-center of the country.

Some authors studied the regional dynamics of the manufacturing sector in Mexico in recent decades. Krugman and Livas Elizondo (1996) observe a relation between trade policy and urban development. They argue that closed domestic markets have been a key factor in the emergence of the huge metropolises in the developing world, as a result of a self-reinforcing process of agglomeration. Firms manufacturing for the Mexican domestic market chose production sites with good access to consumers. Moreover the variety of goods produced near Mexico City ensured that it offered the best access to such inputs, generating powerful backward and forward linkages. The authors conclude that significant economies of scale and industrialization oriented primarily toward the domestic market, which were leading to concentration of manufacturing employment in Mexico City, were the result of the import substitution policy applied from the mid-1940s to the mid-1980s. Once the economy opened up in the 1980s, firms started selling a larger fraction of their output to foreigners and purchasing inputs from abroad and it began a dramatic shift of manufacturing away from Mexico City, especially to northern States (Figure 1). Hanson (1998) finds that trade liberalization has contributed to the decomposition of the manufacturing belt in and around Mexico City and the formation of broadly specialized industry centers located in northern Mexico, relatively close to the United States, and attributes as a main reason the economies of transport cost.

Figure 1: Manufacturing value-added of Mexico City's Metropolitan area and of the northern Border States, in percentage of Mexico's total Manufacturing industry.

Source: Calculations based on information from INEGI

Various authors (Brown et al., 1992; Levy and Van Wijnbergen, 1995; Veeman et al., 2002) have analyzed the regional effects of agriculture sector liberalization. Some regions of Mexico, mostly in the north, already had experienced enormous growth in agricultural productivity for several decades following World War II, based on large investments in irrigation and mechanization and the introduction of fertilizers, while the center and the south have been characterized by small plots, limited capital investment, subsistence production, and income supplementation by seasonal work on commercial farms. After liberalization of the agricultural sector, the southern peasants have been hit by the elimination of protection on the products they traditionally concentrate on, as for example maize, while the northern agricultural activities could benefit from opening markets for products for which Mexico holds a comparative advantage, such as fresh fruits and vegetables.

Equivel and Messmacher (2002) argue that the divergent process of the 1990s was mostly driven by the divergence observed in labor productivity associated with education and infrastructure, while Harrison and Hanson (1999) find an increase in the relative wage of skilled workers after Mexico's trade liberalization, where foreign direct investment, export orientation and technological change played an important role.

b) Descriptive Data

b.1) Growth in Mexico

Figure 2 displays the evolution of GDP per capita in Mexico since 1960 and distinguishes between three different phases. The first period started in 1930 and lasted until the end of the 1970s and is called the “Mexican Miracle” because of a long time of economic growth, spurred by a model of import substitution industrialization (ISI), which protected and promoted the development of national industries. The second period from 1981 to 1995 is called the “the lost decade and a half”, because of its negative average GDP per capita growth, caused by two economic crises (in 1981/82 and 1994/95). Finally, there is a third “post-crisis” growth period that extended up until last year's external shocks.

Figure 2: GDP per capita (constant Mexican Pesos), 1960 – 2007

Source: Elaborated with data from the World Development Indicators

b.2) Regional growth in Mexico¹

GDP per capita growth in Mexican states has been distributed in different ways throughout the years, as shown in the histograms of Figure 3. In the period from 1970 to 1985, all states experienced a positive annual growth between 0.6 and 5.3 percent, but the distribution was biased towards the smaller values, with a mode between 1.5 and 2 percent. During the “lost decade” between 1985 and 1995, the distribution of annual GDP per capita growth had a much larger standard deviation with growth rates ranging from -4.1 percent to +4.2 percent, but with 80 percent of the states having negative growth during this period, with a mode between 0 and minus 0.5 percent. The last period from 1995 to 2006 had again a much smaller standard deviation and with exception of the tourism-oriented state of Quintana Roo, which had negative growth, the values ranged from 0.8 to 3.4 percent.

Figure 3: Number of Mexican states per annual GDP per capita growth rate (grouped by half percentage point ranges) for three different time periods between 1970 and 2006.

Source: Calculations based on information from INEGI, excluding Campeche and Tabasco.

We replicate a table from Chiquiar (2004) with more recent data (Table 1). The author divided the country in five regions, the border, northern central, southern central, Mexico City² and the south. In order to visualize the patterns of convergence-divergence among Mexican regions, Figure 4 compares their per-capita GDP with the national average. First, we can observe that the regions

¹ As suggested by Chiquiar (2004), we exclude in this section the states of Campeche and Tabasco from the analysis, because a very large and volatile share of these states' GDP is generated from the exploitation of oil reserves by the government-owned oil company PEMEX. The growth rates are in consequence strongly affected and their per-capita output overestimated and not representative of their welfare, as the profits are going directly to the federal government.

² As used in recent literature (Aguayo-Tellez, 2006; Aroca, Bosch, Maloney, 2005; Chiquiar, 2004), Mexico State was merged with the Federal District because together they form the metropolitan area of Mexico City and have long been part of a common industrial aggregate with strong labor market links between them. In addition many private enterprises report profits in the Federal District, where their headquarters are located, and not in Mexico State, where the plants are located. Finally the population in the Federal District remained stable over the last two decades, while doubling in Mexico State, which leads to overestimate the Federal District's per capita income.

can be divided into two groups, Mexico City and the Border States on one hand and the rest of the country on the other hand.

Table 1: Per capita GDP by state and annual per capita growth, divided per region

	Per capita GDP (national average=100)					Annual per capita growth (percentage)				
	1970	1985	1993	2001	2006	1970-85	1985-94	1994-95	1995-01	2001-06
National	100	100	100	100	100	1.77	0.22	-7.95	2.79	1.61
Border	129	125	130	136	141	1.59	0.71	-7.05	3.32	2.24
Baja California	145	129	128	125	123	0.96	0.21	-9.29	2.64	1.14
Coahuila	120	120	121	135	142	1.80	0.23	-2.15	3.70	2.59
Chihuahua	101	102	128	138	146	1.86	2.88	-8.50	4.02	2.71
Nuevo León	167	165	166	174	181	1.70	0.40	-8.43	3.49	2.49
Sonora	139	120	116	124	126	0.78	0.15	-3.91	2.73	2.01
Tamaulipas	105	103	100	104	107	1.67	0.16	-7.50	2.93	2.19
Northern central	73	79	80	81	85	2.38	0.26	-6.09	2.70	2.61
Aguascalientes	79	85	108	124	126	2.31	3.12	-5.72	4.39	1.97
Baja California Sur	139	116	132	125	121	0.57	1.39	-3.43	1.50	0.87
Durango	72	91	81	85	91	3.38	-0.93	-4.50	2.81	3.04
Nayarit	76	79	66	61	61	2.11	-1.94	-10.89	2.31	1.45
San Luis Potosí	58	70	73	73	80	3.04	0.91	-12.34	3.19	3.64
Sinaloa	94	85	87	81	81	1.12	0.05	-4.15	1.58	1.67
Zacatecas	51	60	55	56	61	2.81	-0.85	0.44	1.94	3.30
Southern central	75	79	73	74	75	2.12	-0.59	-7.22	2.88	1.73
Colima	86	107	103	97	99	3.31	-0.29	-6.09	1.42	2.17
Guanajuato	71	70	69	75	79	1.71	0.04	-5.22	3.67	2.56
Hidalgo	54	69	66	61	59	3.51	-0.59	-13.07	2.76	0.96
Jalisco	104	107	101	99	95	1.96	-0.53	-9.48	2.98	0.78
Michoacán	52	56	55	57	59	2.19	0.25	-3.11	2.33	2.08
Morelos	84	86	99	89	92	1.92	1.43	-12.06	2.35	2.19
Puebla	62	68	64	68	68	2.37	-0.54	-10.06	4.44	1.61
Querétaro	79	108	105	117	115	3.97	0.14	-5.80	3.91	1.22
Tlaxcala	46	75	53	56	51	5.25	-3.62	-5.79	3.21	-0.14
Veracruz	81	76	61	58	60	1.31	-2.01	-3.26	0.84	2.31
Mexico City	162	144	154	146	140	0.98	0.85	-10.18	2.48	0.78
Distrito Federal	192	190	244	250	242	1.70	3.10	-8.76	3.24	0.92
Est. de México	108	99	83	79	78	1.19	-1.87	-11.45	2.80	1.39
South	49	62	60	57	56	3.44	-0.24	-5.73	1.71	1.12
Chiapas	49	68	45	43	40	3.95	-4.33	-2.24	1.04	0.46
Guerrero	52	57	58	53	51	2.44	0.45	-6.22	0.77	1.16
Oaxaca	35	51	45	43	42	4.32	-1.11	-5.62	1.45	1.27
Quintana Roo	100	110	188	149	130	2.42	5.95	-10.21	-0.05	-1.21
Yucatán	72	71	77	80	79	1.72	1.29	-7.96	3.21	1.40

Source: Calculations based on information from INEGI, excluding Campeche and Tabasco.

Between 1970 and 1985 there was clearly a process of convergence, where Mexico City experienced a sharp decline of per capita GDP compared to the Mexican average and the South could catch up. In a less extreme way the Border States' growth lagged the national average, and the northern and southern central regions surpassed the average. After the trade liberalization reforms in the mid-eighties the convergence pattern radically changed. The Border States have gradually increased their share, whereas Mexico City increased its share after the signing of the GATT, but started to lose its share after the introduction of NAFTA. There has been convergence between Mexico City and the Border States and in 2006 the Border States for the first time had a larger GDP per capita than the metropolitan area of Mexico City. The poorest region, the south, experienced a gradually decreasing share, which supports the stylized fact that Mexico experienced divergence after 1985.

Figure 4: Per capita GDP per region (national average=100)

Source: Calculations based on information from INEGI, excluding Campeche and Tabasco.

The southern central region experienced in 2006 the same weight in GDP per capita compared to the national average as in 1970. The northern central region didn't undergo a change of its welfare from 1985 till 2001, but could increase its per capita GDP compared to the national average since then.

Another option to divide the Mexican states, other than the method used by Chiquiar, is by clusters as identified by Aroca, Bosch and Maloney (2005), who used kernel regressions to trace empirical patterns of regional growth in the form of several income clusters that only partially correspond to traditional geographic regions. A first cluster constitutes especially rich states, which are spatially very independent and located -in three different regions of the country, with Mexico City in the center, Nuevo Leon in the north and Quintana Roo (driven by Cancun related tourism) in the south. The second cluster mainly includes northern states and some successful central states. The third cluster finally includes all other states.

Table 2 shows the results and Figure 5 helps to visualize the pattern of convergence/divergence. For the period from 1970 to 1985 we observe a process of convergence, similar to the results per regions. The states of cluster 1 saw their welfare decrease in comparison with the national average, cluster 3 gained weight and the second cluster stayed stable.

Figure 5: Per capita GDP per cluster (national average=100)

Source: Calculations based on information from INEGI, excluding Campeche and Tabasco.

Between 1985 and 1993, the whole process of growth “catch-up” of cluster 3 was restored to the level of 1970 and it has maintained itself at this level until 2006. Cluster 1 increased its relative standing during the 1970s to early 1980s, but later lost ground culminating in the same relative per capita GDP compared to national average in 2006 as in 1985. Cluster 2 stayed relatively stable until 1993, but later increased its relative income per capita during the last growth period.

Table 2: Per capita GDP by state and annual per capita growth, divided per cluster

	Per capita GDP (national average=100)					Annual per capita growth (percentage)				
	1970	1985	1993	2001	2006	1970-85	1985-94	1994-95	1995-01	2001-06
National	100	100	100	100	100	1.77	0.22	-7.95	2.79	1.61
Cluster 1	162	146	156	150	146	1.08	0.89	-9.89	2.57	1.02
Distrito Federal	192	190	244	250	242	1.70	3.10	-8.76	3.24	0.92
Est. de México	108	99	83	79	78	1.19	-1.87	-11.45	2.80	1.39
Nuevo León	167	165	166	174	181	1.70	0.40	-8.43	3.49	2.49
Quintana Roo	100	110	188	149	130	2.42	5.95	-10.21	-0.05	-1.21
Cluster 2	103	103	104	110	111	1.74	0.45	-6.81	3.33	1.90
Aguascalientes	79	85	108	124	126	2.31	3.12	-5.72	4.39	1.97
Baja California	145	129	128	125	123	0.96	0.21	-9.29	2.64	1.14
Baja California Sur	139	116	132	125	121	0.57	1.39	-3.43	1.50	0.87
Chihuahua	101	102	128	138	146	1.80	1.06	-8.50	3.58	2.59
Coahuila	120	120	121	135	142	1.86	2.04	-2.15	4.14	2.71
Colima	86	107	103	97	99	3.31	-0.29	-6.09	1.42	2.17
Guanajuato	71	70	69	75	79	1.71	0.04	-5.22	3.67	2.56
Jalisco	104	107	101	99	95	1.96	-0.53	-9.48	2.98	0.78
Querétaro	79	108	105	117	115	3.97	0.14	-5.80	3.91	1.22
Sonora	139	120	116	124	126	0.78	0.15	-3.91	2.73	2.01
Tamaulipas	105	103	100	104	107	1.67	0.16	-7.50	2.93	2.19
Cluster 3	62	69	63	61	62	2.46	-0.85	-6.44	2.19	1.85
Chiapas	49	68	45	43	40	3.95	-4.33	-2.24	1.04	0.46
Durango	72	91	81	85	91	3.38	-0.93	-4.50	2.81	3.04
Guerrero	52	57	58	53	51	2.44	0.45	-6.22	0.77	1.16
Hidalgo	54	69	66	61	59	3.51	-0.59	-13.07	2.76	0.96
Michoacán	52	56	55	57	59	2.19	0.25	-3.11	2.33	2.08
Morelos	84	86	99	89	92	1.92	1.43	-12.06	2.35	2.19
Nayarit	76	79	66	61	61	2.11	-1.94	-10.89	2.31	1.45
Oaxaca	35	51	45	43	42	4.32	-1.11	-5.62	1.45	1.27
Puebla	62	68	64	68	68	2.37	-0.54	-10.06	4.44	1.61
San Luis Potosí	58	70	73	73	80	3.04	0.91	-12.34	3.19	3.64
Sinaloa	94	85	87	81	81	1.12	0.05	-4.15	1.58	1.67
Tlaxcala	46	75	53	56	51	5.25	-3.62	-5.79	3.21	-0.14
Veracruz	81	76	61	58	60	1.31	-2.01	-3.26	0.84	2.31
Yucatán	72	71	77	80	79	1.72	1.29	-7.96	3.21	1.40
Zacatecas	51	60	55	56	61	2.81	-0.85	0.44	1.94	3.30

Source: Calculations based on information from INEGI, excluding Campeche and Tabasco.

We supplement the previous descriptive figures by plotting the logarithm of the initial GDP per capita with the average growth rate of the corresponding period (Figure 6). The first scatter plot shows that states with a low GDP per capita in 1970 grew faster in the following 15 years than the richer states. This convergence process is supported by the significant negative value of the regression (Table 3). The trend of the poor states catching up with the rest of the country and thereby reducing inequalities among regions was broken down after 1985. Between the mid 1980s and the mid 1990s there was a reverse trend of divergence, which was significant at the 5 percent level. On first inspection, richer states did not grow faster following 1995, but after excluding from the sample the only rich southern state, Quintana Roo, which had negative growth during this period, we observe that initial richer states grew faster than the one which were relatively poor in 1995. The positive coefficient of the regression is significant at the 10 percent level.

Figure 6: Initial State GDP per capita and average annual growth rate of GDP per capita for three different time periods between 1970 and 2006.

Source: Calculations based on information from INEGI, excluding Campeche and Tabasco.

Table 3: Regression results of initial State GDP per capita and average annual growth rate of GDP per capita for three different time periods between 1970 and 2006.

	1970-1985	1985-1995	1995-2006	1995-2006 w/o QR
Coefficient	-0.0196118	0.0200788	0.0018592	0.0065042
<i>t</i> -statistic	-5.58	2.07	0.45	1.93
<i>p</i> -value	0.000	0.047	0.653	0.064
R ²	0.5263	0.1331	0.0073	0.1215

4. Corruption and Growth across Mexican States

In this section we build a growth regression based on cross-state data in order to figure out how corruption influences the path of economic development. By controlling for many other variables, we can identify which ones were of importance to promote growth in the analyzed period from 2001 to 2005.

a. Description of the Data

a.1. Perception versus behavior of corruption

The index we use to proxy corruption in the 32 Mexican states is drawn by *Transparencia Mexicana* (TM) a non-governmental organization based in Mexico City. They started to build a National Index of Corruption and Good Governance (ICBG) in 2001, which has been published every second year since then. The focus is on households, not on companies and the barriers of doing business. It includes corruption in 35 public services offered by the three levels of government and individuals, using a scale with values between 0 and 100, a small number associated with less corruption. The index is based on experiences of almost 15,000 households with the same structure like the one used for the national census of the Mexican Statistical Office. A challenge for TM was to select the appropriate services, since they vary by State. The formula is easy and understandable by everybody involved or interested to replicate it:

$$ICBG \text{ for one service} = \frac{\text{Number of times a service was obtained by paying a bribe}}{\text{Total number of times a single service was used}} * 100$$

The general ICBG we use in this paper contains all 35 services and looks as follows:

$$ICBG = \frac{\text{Number of times a bribe was given in 35 services}}{\text{Total number of times the 35 services were used}} * 100$$

This method is different than the one based on perception, as used by Transparency International, the global civil society organization leading the fight against corruption. Their annual Corruption Perception Index (CPI), which was first released in 1995 and ranks 180 countries, is calculated by the perceived level of corruption, as determined by expert assessments and opinion surveys. A perception index has the risk that the answers of the participants in the survey may be very sensitive to public policy changes. This potential shortcoming is thus avoided using the ICBG.

a.2. Correlation of corruption and growth

We wanted to explore the correlation between initial corruption levels with the (per capita) growth rate of the following couple of years. Due to the volatility of the results of the corruption index we preferred to take the average of the years 2001, 2003 and 2005 and analyze how it influences the per capita growth rate from 2001 to 2005.

The scatter plots in Figure 7 show the correlation between average corruption and average growth on the left and average per capita growth on the right. According to these figures there is a

significant correlation if the regression is made with the average GDP growth (Table 4). Nevertheless, this study focuses on the per capita GDP growth rate, which regression does not show any significant results, even less by excluding Mexico City, which is the clear statistical outlier of the sample.

Figure 7: Correlation between average corruption and average growth (left) and average per capita growth (right), 2001-2005.

Table 4: Regression results with Corruption (average 2001-05) as independent variable

Average growth 2001-05		
	All states	w/o Mexico City
Coefficient	-0.0016943	-0.0014455
<i>t</i> -statistic	-4.00	-2.45
<i>p</i> -value	0.000	0.021
R ²	0.1998	0.1029

All regressions are adjusted with a robust estimator

Average growth per capita 2001-05		
	All states	w/o Mexico City
Coefficient	-0.0003203	0.0000971
<i>t</i> -statistic	-0.70	0.16
<i>p</i> -value	0.487	0.873
R ²	0.0088	0.0005

a.3. Control variables

We extend the analysis to study whether the lack of significance between corruption and per capita growth remains by adding control variables, following Chiquiar (2005) for Mexico and numerous contributors to the cross-country growth regression literature. All variables included in this model are per Mexican state. This group of variables includes: i) *initial GDP per capita*, as suggested by the papers of Mauro (1995) and Barro (1996); ii) *distance to the U.S. border*, a variable much discussed in growth analytics for the specific case of Mexico, where exports to the United States account for 85 percent of the total Mexican exports. It is measured by the distance from the capitals of each Mexican state to the northern border; iii) *average schooling years* and *students per teacher*, assuming the hypothesis that education promotes growth; iv) *road density* and *share of*

households with access to electricity are added as infrastructure indicators; v) *initial shares of agriculture in GDP* and finally vii) *crime rate*. Some additional variables as telephone density, percentage of rural population and manufacture output were initially considered, but were removed from the model, as they did not appear significant in any of the regressions.

b. The Model

We estimated the equation with an Ordinary Least Squares (OLS) estimator and using a robust estimator, which corrects for heteroskedasticity in the data. We sequentially tested the variables and eliminated the ones without impact. All independent variables are initial level variables with exception of corruption, which represents an average as discussed above.

The regression has the following structure, where i are the Mexican states and k the initial level control variables:

$$\bar{g}_i = \alpha + \beta \bar{C}_i + \sum_{k=1}^k \gamma_k X_{i,t_0} + \varepsilon_i \quad (1)$$

Average per capita growth in each Mexican state is defined as following, with T being the number of growth rates in a certain period:

$$\bar{g}_i = \frac{1}{T} \sum_{t=1}^T g_{i,t} \quad (2)$$

Average corruption per state has the following formula, where C is the value of the corruption index for a given year:

$$\bar{C}_i = \frac{1}{3} [C_{i,t_0} + C_{i,t_0+2} + C_{i,t_0+4}] \quad (3)$$

For the time period we analyze in this paper, we obtain the following regression:

$$\frac{1}{4} \sum_{i=1}^4 g_{i,t} = \alpha + \beta \frac{1}{3} [C_{i,2001} + C_{i,2003} + C_{i,2005}] + \sum_{k=1}^k \gamma_k X_{i,2001} + \varepsilon_i \quad (4)$$

c. Empirical Estimates

The results, which are summarized in Table 5, do not support the hypothesis that corruption reduces growth of GDP per capita in Mexico during the analyzed period from 2001 to 2005, even by including the outlier, Mexico City, in the sample. The coefficients even have a positive sign, without ever being significant. Below we will see that corruption influences more the level of GDP per capita than its growth.

Looking at the results, it can be observed that many of the control variables are significant and that more than 73 percent of the dependent variable is explained by the model. According to the results, it seems that there is no process of convergence among Mexican states during this period. As shown by previous research and the descriptive statistics above, visualized in Figure 4, the model confirms a significant negative effect of the distance to the U.S. border on growth during the first five years of this century. The northern States could benefit from the proximity to its largest trade partner and the free trade agreement signed with the U.S and Canada. The education variables give us interesting results. On the one hand side we observe that the average schooling years seem to have a negative effect on growth, which is not in line with what Chiquiar (2005) found for Mexico in a previous period, but is supported by the work of Prichett (1996), who found that schooling creates no human capital and may not actually raise cognitive skills or productivity. On the other side the significant negative coefficient of student per teacher suggests that too large classes can decrease the quality of lectures and herewith decreases growth.

Interestingly, the share of agricultural output seems to be positively associated with growth. While states with very low agricultural activities like Mexico City and Quintana Roo experienced low or even negative growth rates, states with a high share of agricultural output, like Zacatecas, Sonora and Morelos, experienced above average GDP per capita growth rates between 2001 and 2005. In previous research, Chiquiar (2005) found that the share of agricultural output had a positive effect on growth from 1970 to 1985 and a strong negative effect from 1985 to 2001. In comparison to that, the share of the rural population as a percentage of total state population had a negative, but not significant coefficient and was removed from the model. Southern states, like Chiapas, Oaxaca and Tabasco have a high share of rural population, consisting of small-scale farmers. These states had in the analyzed period per capita growth rates, which were below national average. Surprisingly, the crime rate is strongly positively associated with growth, which may be explained in two different ways. First, there might be reverse causality. States with higher growth rates may experience more urbanization and with it more crime. Second, the crime rate is defined by the total offences reported to the police, which don't really measure the level of crime, since the victims don't complain as often in some states than in others. In states with weak institutions and judicial systems, and where citizens do not expect to get results from reporting an offense, the number of complaints is expected to be underestimated. Finally a higher level of infrastructure seems to promote GDP per capita growth. Especially the share of households with electricity seems to be important in promoting growth and so does the road network.

Table 5: Regression results

Dependent variable: Annual GDP per capita growth (2001-2005 Average)		
	Robust Standard Error	
	(1) Coefficient (t-statistic)	(2) w/o Mexico City Coefficient (t-statistic)
Corruption (Average 2001 - 05)	0.0002829 (0.75)	0.0004702 (0.90)
Log initial GDP per capita (2001)	0.0080369 (1.02)	0.0093048 (1.14)
Log distance to the U.S. border	-0.0170002*** (-7.24)	-0.016654*** (-6.84)
Average schooling years	-0.0061989* (-1.95)	-0.0059792* (-1.85)
Students per teacher	-0.0021309*** (-2.90)	-0.0021069*** (-2.86)
Agriculture output (% of GDP)	0.0010644*** (3.25)	0.0010988*** (3.25)
Crime rate	0.0072711*** (3.50)	0.0071875*** (3.46)
Roads/size of state	0.0546630** (2.22)	0.0540890* (2.17)
% Household with electricity	0.0011910** (2.55)	0.0012178** (2.54)
Constant	0.0965062 (1.34)	0.0785657 (1.01)
R ²	0.7391	0.7333

***significant at 1 percent level; ** significant at 5 percent level; * significant at 10 percent level

We have seen in the results of Table 5 that corruption does not seem to affect GDP per capita growth in the short-run. Nevertheless, we should analyze if corruption influences the level of GDP per capita. Looking at the scatter plot below (Figure 8), it seems that a lower level of corruption is associated with a higher GDP per capita, if we take out Mexico City as a statistical outlier with the highest level of income and corruption.

We add some control variables, which may influence the level of GDP per capita, such as distance to the border, share of agriculture and manufacture output and some education and infrastructure variables. Table 7 shows the results. They confirm the negative coefficient of corruption, which is getting significant when Mexico City is withdrawn of the sample. These contrasting results may imply that more years of data are needed in order to find a statistically significant relationship between the state corruption and economic growth. The impact on levels could be due to the lagged effect and longer-term impact on growth of longer standing differences in levels of corruption across states, which predate the creation of the *Transparencia Mexicana* index.

Figure 8: Correlation between average Corruption and the level of GDP per capita for

Table 6: Regression result with average corruption as independent variable

Log GDP per capita 2005		
	All states	w/o Mexico City
Coefficient	0.0067129	-0.0449979
<i>t</i> -statistic	0.18	-2.08
<i>p</i> -value	0.855	0.047
R ²	0.0024	0.0850

Table 7: Regression results

Dependent variable: Log GDP per capita 2005		
	Robust Standard Error	
	(1) with D.F. Coefficient (<i>t</i> -statistic)	(2) w/o D.F. Coefficient (<i>t</i> -statistic)
Corruption (Average 2001 - 05)	- 0.006828 (-0.72)	- 0.0167904* (-1.74)
Log distance to the U.S. border	- 0.127385 (-1.47)	- 0.1528877* (-1.75)
Average schooling years	0.2411094*** (4.79)	0.2181317*** (4.56)
Students per teacher	- 0.0583735*** (-3.05)	- 0.0578872*** (-3.19)
Agriculture output (% of GDP)	- 0.0264171*** (-3.43)	- 0.0237298*** (-3.14)
Manufacturing output (% of GDP)	- 0.0097303 (-1.68)	- 0.0085585 (-1.52)
Roads/size of state	- 1.05081* (-1.73)	- 0.8554757 (-1.56)
Constant	10.03614 (9.25)	10.40958 (9.85)***
R ²	0.8879	0.8767

***significant at 1 percent level; ** significant at 5 percent level; * significant at 10 percent level

5. Conclusions

In this paper we analyzed the regional growth patterns in Mexico with a special focus on the role of governance. We used the relatively recent creation of a state level corruption and good governance indicator and built a growth regression with cross-state data using traditional control variables from the neo-classical growth regressions literature. We also incorporated more recent state growth period extending into the mid 2000s.

Following the Mexico specific literature, we looked at the convergence process by two different approaches, one by geographical regions and one by income clusters, incorporating more recent years of data on state growth. The conclusion is that there has been convergence among Mexican states between 1970 and 1985, which is in line with the findings in the previous literature. When Mexico started to open its economy in the mid 1980s, a divergence process divided the country between winning and losing states. The Border States are the “winning” states, which could converge to the welfare of the metropolitan area of Mexico City. Together they form the higher income regions of Mexico, where we also include the southern tourism-related state of Quintana Roo. The rest of the country has relatively lost in per capita income terms since the mid 1980s. It should be noted that while divergence occurred over the 1995-2006 period, it appears to have slowed to a much slower pace of divergence relative to the 1985-1995 period (see Table 3).

Reviewing traditional growth regressions for Mexico’s states and including a corruption variable, this paper does not find any significant relationship between corruption and average per capita GDP growth in Mexico during the period 2001-2005. On the other hand, it finds that corruption is negatively associated with the level of GDP per capita. It could well be that these contrasting results imply that more years of data are needed in order to find a statistically significant relationship between the state corruption measure and economic growth. The impact on levels could be due to the lagged effect and longer term impact on growth of longer standing differences in levels of corruption across states. These differences may predate the creation of the *Transparencia Mexicana* Index. A statistical outlier is Mexico City with high income per capita and high corruption index values, as measured by *Transparencia Mexicana*. Similar to the existing literature, the results of the growth regression suggest that there are several other variables, which seem to be of importance for state growth in Mexico, like the proximity to the U.S. border and several infrastructure variables, including the share of households with electricity or the road network, some education supply indicators (e.g., student-teacher ratio) and structural variables (e.g., share of rural population). The additional years used in this paper do not lead to substantially different results in the more traditional neoclassical growth regressions.

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