

Decuir-Viruez, Maria Luisa

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## Institutions and Regional Economic Growth: An Assessment of Mexican Regional Strategies 1970-2000

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**INSTITUTIONS AND REGIONAL ECONOMIC GROWTH:  
AN ASSESSMENT OF MEXICAN REGIONAL STRATEGIES 1970-2000.**

**Maria Luisa Decuir-Viruez**

**Department of Economics**

**University of Kent**

Canterbury, Kent CT2 7NP

Tel. (44) 1227 827679 Fax. (44) 1227 827850

Email: [luisadecuir@hotmail.com](mailto:luisadecuir@hotmail.com)/ [ld24@kent.ac.uk](mailto:ld24@kent.ac.uk)

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Different factors have been included in order to explain the causes of growth and the disparities observed in the last century. This paper examines the role of institutional factors in the growth rates observed among the 32 states in Mexico in the period 1970-2000. The institutional elements considered are the “strategies” of local governments, in order to assess if the active strategies (those that are participative, open to global economies and less dependent upon central authorities) have better results in terms of growth than the passive type (those that are dependent on central authorities and have restricted external links).

Following on from the documents presented at the ERSA Congresses of 2003/4/5, this paper presents the final assessment of the relationship between institutional elements and growth. This includes identification and measurement of the institutional elements (strategies) through Principal Components Analysis (PCA); and its evaluation with growth using Ordinary Least Squares Regressions (OLS).

The PCA results identified components related to hard and soft institutional elements (strategies and social networks). Meanwhile, the OLS results suggest that institutions matter; in the case of Mexico, the strategies taken by regional governments in the period 1970-2000 have had some influence in their paths of growth and levels of investment. Furthermore, after 1985 there is evidence that the active strategies are related to a positive performance, in contrast to the passive type.

## **1. Introduction.**

The question of unequal economic performance and territorial disparities has been unraveled through theories and models in which indicators of capital, investment, saving, productivity and some socioeconomic variables, such as education, have been used. However, the causes of uneven growth and disparities continue unexplained. For instance, the neoclassical theory predicts that poor countries will grow faster than wealthy countries, but in reality poor countries are falling back rather than catching up. The endogenous growth theories, in which technology and technological progress are the forces behind rising standards of living, conclude that differences in growth depend on the amount of human and physical capital assigned to research and development. At the same time, these studies that only emphasise technological factors led to a certain neglect of the role of social forces (Rodriguez-Pose, 1998b). Yet society matters, social and institutional features define the structure in which

economic activity is realised. They influence the quality of investment, the level of technical efficiency and the ability of the regions and countries to assimilate technology from abroad.

In the regional growth literature, some studies have maintained that differences in social and institutional variables shape the growth rate of per capita income of countries/regions and consequently their convergence rates (Cofey and Polese, 1984; Hall and Jones, 1996; Helliwell and Putnam, 1995; Knack and Keefer, 1997; Putnam, 1993; Rupasingha, 2000, 2002; Temple and Johnson, 1998). These studies are examples of how institutional features can explain growth in some regions, and added to other economic and social factors, the results can explain the higher levels of efficiency and growth (Rodriguez-Pose, 1996).

Following this idea, this paper focuses on the strategies taken by the governments to develop their economic activity as the institutional element. The term *strategies* refers to the main formal and informal institutional measures, which include plans, programmes, rules for promoting and guiding their economy as well as the informal agreements, actions and attitudes defining the main lines. From this point, we evaluate whether the institutions can explain the differences in the growth of each state in Mexico for the period 1970-2000. We propose that those strategies with a more active participation of local agents in the global competition and the less dependence on financial resources from central government, the higher the economic growth achieved. In contrast, the regions that remained isolated from the global dynamic and had a great dependence upon central government in terms of decisions and financial support, the lower the rate of growth they achieved in the period 1970-2000.

Focusing on the case of Mexico in the period 1970-2000, we start identifying and measuring these institutional features (strategies) at regional level through the creation of a composite

variable using Principal Components Analysis (PCA). In a second stage, we analyse and evaluate the links between these elements and the differences in their growth rates through a series of Ordinary Least Squares (OLS) regressions. Section 2 presents the details of the methodology and data employed, followed by the main results in section 3.

## **2. Methodology**

### *2.1 Data*

The first step of the research involved the identification of the “strategies” with empirical evidence. Considering the previous works that introduced and measured institutional elements (Hall and Jones, 1996; Helliwell and Putnam, 1995; Knack and Keefer, 1997; Putnam, 1993; Rupasingha, 2000, 2002); we created a database of 20 variables for the 32 regional observations<sup>1</sup> in order to cover the main informal and formal institutional features in the period 1970 - 2000<sup>2</sup>. The aspects evaluated were: a) political force of public institutions, b) action capacity of governments, c) population composition and social context, d) external links, e) institutional density and f) infrastructure conditions<sup>3</sup>. Each one these aspects correspond to a group of variables explained in the following sections.

#### *a) Political force of public institutions*

Data on turnout and political preferences is included to demonstrate the strength of political force of local public institutions. Turnout (TU) in presidential elections is a proxy for the civic behaviour. The political preferences are shown by: trust in government (TG)<sup>4</sup> that refers to the

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<sup>1</sup> Data corresponds to 32 Mexican regions.

<sup>2</sup> Other sub-periods estimated are: the phase of import substitution model (1970-1985), the early liberalisation of the economy (1985-1994) and the NAFTA period (1994-2000).

<sup>3</sup> The aspects b) and d) are related to the indicators of formal (hard) institutions. The aspect f) refers to the physical (material) conditions of the regions, but also reveals how much local governments have achieved in their traditional role. The rest of the aspects give more information regarding the informal (soft) institutions of the regions.

<sup>4</sup> Because the PRI (Partido Revolucionario Institucional) controlled national and local governments for almost 70 years, the party is identified with the “official” government.

ratio of votes received by the official party (PRI) over the votes received by all the opposition parties; and trust in opposition party (TO) as the ratio of votes for the second political party PAN<sup>5</sup> over the votes received by the PRI.

**Table 1. Characteristics of variables used in Principal Component Analysis**

<b>Label</b>	<b>Variable</b>	<b>Source</b>
<b>TU0000</b>	Average turnout in presidential elections	Instituto Federal Electoral (IFE)
<b>TG0000</b>	Average voting preference in government (PRI)	
<b>TO0000</b>	Average voting preference in opposition parties	
<b>X0000</b>	Average ratio of exports to GDP	SIREM and Min. of Economy.
<b>PI0000</b>	Average ratio of public investment to GDP	INEGI
<b>PE10000</b>	Average ratio of public expenditure in economic promotion and infrastructure to GDP	
<b>PE20000</b>	Average ratio of public expenditure in administration to GDP	
<b>DEBT0000</b>	Average ratio of public debt to GDP	
<b>TI0000</b>	Average percentage of public income collected from taxes	
<b>IND0000</b>	Average percentage of indigenous population	
<b>LIT0000</b>	Average percentage of literate population	
<b>IS0000</b>	Average density of crimes per 10,000 inhabitants.	
<b>O0000</b>	Olson's type associations density (Average)	
<b>P0000</b>	Putnam's type associations density (Average)	
<b>U0000</b>	Percentage of urbanisation (Average)	
<b>E0000</b>	Percentage of houses with electricity service (Average)	
<b>W0000</b>	Percentage of houses with water service (Average)	
<b>D0000</b>	Percentage of houses with drainage service (Average)	
<b>DDF</b>	Logarithm of the distance to Mexico City	
<b>DUS</b>	Logarithm of the distance to the closest US city	

*Note: For PCA averages are estimated for periods: 1970-2000, 1970-1985, 1985-2000, 1985-1994 and 1994-2000.*

#### *b) Action Capacity of local governments*

The size and management of public resources and the degree of financial autonomy (capacity of income generation) illustrate this aspect. The indicators are the ratios of public expenditure for economic promotion and infrastructure purposes (PE1) and for administrative purposes (PE2), public debt (DEBT), public investment (PI) and the proportion of local income obtained through tax collection (TI).

<sup>5</sup> PAN: *Partido Acción Nacional.*

*c) Population Composition and Social Context.*

The degree of polarisation can modify social links and, consequently, has an effect on the local strategies. The percentage of indigenous (IND) and literate population (LIT) are the variables that identify polarisation. A population with an important ethnic group and low literacy levels implies difficulties in communication among individuals and the need for extra public resources (Rupasingha, et al, 2002). Additionally, in order to include the fragility of social links, we include the crime density (the federal jurisdiction offences<sup>6</sup> per 10,000 people).

*d) External Links*

The ratio of exports (X) and foreign direct investment (FDI) with respect to GDP are included as indicators of the region's relationships abroad. These aspects cover one of the most important transformations that the Mexican economy experienced in the Eighties<sup>7</sup>.

*e) Institutional Density*

Following Rupasingha, Goetz and Freshwater (2002), institutional density is measured as the number of associations per 10,000 inhabitants. Two types of associations were considered, in accordance with their objectives: rent-seeking aims (Olson-type: O) or social network development (Putnam-type: P)<sup>8</sup>.

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<sup>6</sup> The offences include all reported actions that violate health, security, communication, fiscal and private property laws.

<sup>7</sup> Previous to 1980, exports data is registered according to the addresses of customs offices; in the Eighties there are a couple of years reporting exports by state with a different criterion. In the Nineties, data is reported according to the addresses of the exporting companies. Unfortunately, this data has not been officially published since 2000 and only the consultancy SIREM has produced some estimations. The FDI data is only available for the period 1994-2000.

<sup>8</sup> Olson-type associations include the entrepreneurial, commercial and production groups; meanwhile Putnam-type associations refer to the social, religious and handicapped assistance groups, civil organisations, social, recreational and sport associations.

### *f) Infrastructure Conditions*

Finally, infrastructure indicators were included in order to have information on the material conditions in which the economic activity takes place and the degree of achievement of local governments. The variables used are: urbanisation, given by the percentage of population that lives in communities of more than 2500 habitants (U); and the percentage of houses with water, electricity and drainage services (W,E and D). Other variables considered are the distances to the principal markets: Mexico City and the closest US city.

### *2.2 Principal Components Analysis*

The second step consisted in the creation of a variable (or a set of variables) that could embody the institutional elements (the strategies and networks), for this purpose, we used one factorial analysis technique. These methods are concerned with describing the variance of a group of observations on three or more variables (Bryman and Cramer, 2001). The total variance is divided in to *common* and *unique variances*. The former refers to the variance shared by the variables; the latter separates into *specific variance* and *error variance*. The method used for our purpose was the Principal Components Analysis (PCA) that attempts to explain all the variance of a group of variables, including the unique variance<sup>9</sup>. PCA helped to identify groups of inter-related variables, reduced the number of variables and transformed the data.<sup>10</sup>. Its main advantage is to reduce dimensionality in a dataset while retaining those characteristics that contribute most to its variance. The variables obtained are called components or factors; each one is a linear combination of the original variables and can be

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<sup>9</sup> Rummel (1970). "Understanding Factor Analysis". *The Journal of Conflict Resolution*. Pp. 444-480.

<sup>10</sup> This research uses an exploratory PCA as it aims to reduce a large number of variables into a smaller set and describe the pattern of interrelationships among variables. PCA was preferred over Factorial Analysis (FA) because it allows one to analyse all the variances of the data. The results obtained using FA show very similar outcomes to the PCA option: a slight variation in loadings but a similar grouping of variables.

graphically represented.<sup>11</sup> New axes are given by the components that are orthogonal to each other, starting from the one that has the greatest variance.

### *Algebraic Model*

The basic idea of PCA is to find a linear combination of a set of variables  $x_1$  to  $x_j$  for a group of  $n$  observations, trying to extract the maximum variance from these variables<sup>12</sup>. The algebraic model of PCA has the following characteristics:

$$C_1 = u_{11}z_1 + u_{12}z_2 + \dots + u_{1j}z_j$$

$$C_2 = u_{21}z_1 + u_{22}z_2 + \dots + u_{2j}z_j$$

$$C_n = u_{n1}z_1 + u_{n2}z_2 + \dots + u_{nj}z_j$$

where  $u_{nj}$  = factor-score coefficients,  $z_j$  = standardised variables (z-score) and  $C_i$  is a linear combination. In matrix notation, this model is:  $\mathbf{C} = \mathbf{X} \mathbf{U}$ . The matrix size is  $n \times j$ .  $n$ -observations for  $j$  variables.  $\mathbf{X}$  is given by the original data matrix in standardised scores.  $\mathbf{U}$  is the factor-score coefficients  $u_{nj}$ . The component scores are collected in the  $(n \times j)$  matrix  $\mathbf{C}$ .

Another form of explaining PCA model is to assume each original variable is a linear combination of the  $n$ -components:

$$z_1 = \alpha_{11}C_1 + \alpha_{12}C_2 + \alpha_{13}C_3 + \dots + \alpha_{1n}C_n$$

$$z_2 = \alpha_{21}C_1 + \alpha_{22}C_2 + \alpha_{23}C_3 + \dots + \alpha_{2n}C_n$$

$$z_j = \alpha_{j1}C_1 + \alpha_{j2}C_2 + \alpha_{j3}C_3 + \dots + \alpha_{jn}C_n$$

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<sup>11</sup> Patterns can be represented in a vector space, in which the angle between vectors measures the relationship between two variables or defined characteristics. The closer to 90 degrees the angle is, the less relationship exists. An uncorrelated pair of vectors will have a right angle, meanwhile the closer to 0 degree the stronger the relationship is. Obtuse angles mean a negative relationship and angles of 180 degrees belong to data that is inversely related. If the characteristics are highly correlated they will cluster together, and these clusters are the patterns.

<sup>12</sup> In our case,  $j$  is equal to 20 variables and  $n$  is 32 observations (states) in the complete sample. In the restricted sample, three observations were deleted (Campeche, Distrito Federal and Quintana Roo).



In matrix notation this is  $\mathbf{X} = \mathbf{C} \mathbf{A}'$ . The coefficients of matrix  $\mathbf{A}$  are called component loadings, which are the beta weights of a multiple regression of a variable as a function of the  $n$ -components. The set of constants ( $\alpha$ ) are the loadings of each variable, which measures how much a specific function is related to  $z$ ; in other words, it reports the degree and direction of the relationship of the variables with a specific pattern. A set of scores is also generated for each case on the components obtained.

Before applying this technique, the suitability of the data is assessed with a series of criteria<sup>13</sup> that guarantee the factorability. The analysis generates linear combinations of the original variables. The new variables show the essence of the original variables in which the first component absorbs the highest shared variance. The second is the next largest amount of variance that is not related to the first one. The loading expresses the relationship between each variable and the component. According to some authors (Stevens, 1992; Bryman and Cramer, 2001; Field, 2000), reliable components have 10 or more loadings greater than 0.40<sup>14</sup>. Those items, which load most highly on it, determine the meaning of a factor.

In order to improve the interpretation of results, the components are rotated. This transformation tries to push factor loadings into a high or low extreme; therefore, the variance accounted changes for some of the components: high factor loadings get higher and low ones become lower. We used an orthogonal rotation method (Varimax), which keeps axes perpendicular to each other and maximises the variances of squared loadings. It amplifies the

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<sup>13</sup> The parameters considered were: a) Data Screening: Correlation values should lie between 0.30 and 0.90 b) Determinant of correlation matrix should be higher than 0.00001 to avoid multicollinearity. c) Kaiser-Myer-Olkin (KMO) test should report a value greater than 0.60 to have compact and reliable correlations. d) Bartlett's test of sphericity should be statistically significant, in order to prove that the correlation in the sample is adequate. e) Anti-Image Matrix should be factorable: numerous pairs are significant and small values are in the off-diagonal of this matrix. The values in the diagonal should be greater than 0.5 if the sample is adequate. Any smaller value should be considered as a sign that the variable has to be dropped from the analysis. f) Communalities. As these values show the amount of variability accounted for by each observation, they should be greater than 0.60 (for a sample of less than 100 observations).

<sup>14</sup> A value of 0.4 implies that the item accounts for 16 percent of the variance.

dispersion of loadings within the factors; the smaller the number of variables highly loaded onto each factor results in a more interpretable cluster<sup>15</sup>.

2.3. Ordinary Least Squares Regressions

The third step involved the evaluation of the components obtained through PCA with the rates of growth using Ordinary Least Squares Regression (OLS). The analysis takes the model of Barro (1991) as base and integrates traditional variables along with the institutional composite variables. The basic methodology consists of running a cross-sectional regression with the form:

$$Y = \alpha + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n + \varepsilon \dots\dots\dots (1)$$

where *Y* is the vector of rates of economic growth, and *x*<sub>1</sub>...*x*<sub>*n*</sub> are vectors of explanatory variables, which vary across researchers and studies<sup>16</sup>. Based on this model and considering the classification of Levine and Renelt (1992)<sup>17</sup>, the model estimated in this section has the following structure:

$$Y = \alpha + \beta_iI + \beta_mM + \beta_zZ + u \dots\dots\dots (2)$$

where *Y* is the average annual growth rate of per capita GDP growth (the dependent variable); *I* is a set of variables that is always included in the regression, *M* is the set of variables of interest, and *Z* is a subset from a pool of variables identified as potentially important explanatory variables of growth.

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<sup>15</sup>Other rotation methods are *Quartimax*, *Equamax*, *Oblimin* and *Promax*. *Quartimax* attempts to maximise the spread of factor loadings for the variables across all factors. *Equamax* combines the criteria of *Varimax* and *Quartimax*. In *Oblimin*, the factors are allowed to correlate -given by a delta value- (a value of zero implies that high correlation between factors is not allowed). *Promax* is a faster procedure for very large data sets.

<sup>16</sup> Sala-i-Martin, X (1997) surveyed different studies, in which he found that around 60 variables have to be significant in at least one regression.

<sup>17</sup> After considering a large number of variables from different growth studies, Levine and Renelt attempt to identify how robust or fragile the results are when some changes are introduced. These authors used a variant of Learner (1983) extreme-bounds analysis (EBA) and the model of Kormendi and Meguire (1985) model. For these references, see Levine and Renelt (1992).

*I-variables:  $I = \{LGDP, K, POP, HE\}$*

The I-variables, which form the basic regression, are: the initial level of real GDP per capita (LGDP), the average ratio of deposits in commercial banks to GDP (K) as a proxy of investment<sup>18</sup>, the average ratio of high-school graduates to economic active population (HE) as proxy of human capital and the average annual rate of population growth (POP)<sup>19</sup>.

This regression is an augmented Solow-model that includes human capital, mainly because it plays a special role in the models of endogenous growth of Romer (1990). This capital is a key input to the research sector, able to generate new products and ideas that cause technological progress; it makes it easier for a country to absorb the new products and ideas that have been discovered elsewhere, and so able to catch up the technological leaders. The variable HE was the most adequate measure for human capital in our model, as it represents the proportion of the educated sector that is potentially involved in the labour market.

*Z-Variables:  $Z = \{(TROP, GDP1, GDP3), (PE, PI, X)\}$*

Considering the works of Sachs (1997), Sala-i-Martin (1997) and Barro (1991), the Z-set in our model contains measures of geography, economic policies and productive structure. A first sub-set includes the percentage of humid tropical land (TROP), the fraction of regional GDP in the agricultural and industrial sectors (GDP1 and GDP3, respectively). The second sub-set of variables refers to indicators of fiscal and trade policies, which include the average

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<sup>18</sup> *This variable was the best option for providing information on investment, assuming that saving is equal to investment. For the period 1970-2000, there is no information on regional capital stock or private investment. After 2000, INEGI (National Institute of Statistics) has published regional data on gross fixed capital formation (GFCF) that started in 1994. In order to calculate regional capital stock, it is necessary to have data on GFCF, classified by sector with information of the life duration and depreciation rates, which through the method of perpetual inventory could estimate the variable of interest (Hofman, 2000).*

<sup>19</sup> *In the studies surveyed by Levine and Renelt (1992), labour, physical and human capital are the most used variables in the growth models. The final selection of variables for our model tested different options and only the most complete series were included (i.e. primary and secondary enrolment, fertility rate were not available for the whole period).*

rates of public expenditure and investment to GDP (PE7000 and PI7000) and the share of exports in GDP (X7000)<sup>20</sup>. These last indicators are not included in the regression when the variables of interest (M-set: Components or factors: F13, F23 and F33) are used, because they form part of these composite variables.

$$M\text{-Variables: } M = \left\{ \begin{array}{l} \text{Institutional} \\ \text{Factors} \end{array} \right\} = \{F13, F23, F33\}$$

This set is formed by the different components generated as section 2.2 explains which represent different types of strategies by local governments and some features of their social networks for four different periods (1970-2000, 1970-1985, 1985-1994 and 1994-2000)<sup>21</sup>. This section aims to assess the relationship between the strategies identified and growth, directly added to the augmented-Solow model and indirectly through their effects on investment (using interaction variables).

**Table 2. Characteristics of variables used in Ordinary Least Square (OLS)**

Label	Variable	Source
<b>LGDP00</b>	Logarithm of initial per capita GDP growth by state.	INEGI and DGAPA research project (IN308797)
<b>GDP0000</b>	Per capita GDP growth by state	
<b>K0000</b>	Proxy for investment, average ratio of the deposits in Commercial Banks to GDP	Bank of Mexico, National Banking Commission (CNBV) and Presidential Office
<b>HE0000</b>	Proxy for human capital, average ratio of high school graduates to economically active population	Ministry of Education (SEP) and INEGI
<b>POP0000</b>	Population growth rate	INEGI
<b>TROP</b>	Percentage of tropical land.	
<b>GDP100</b>	Percentage of agricultural GDP	
<b>GDP300</b>	Percentage of industrial GDP	
<b>PE0000</b>	Average ratio of public expenditure to output	
<b>PI0000</b>	Average ratio of public investment to output	
<b>X0000</b>	Average ratio of exports to output	SIREM and Ministry of Economy (SE)

*Periods : 1970-2000 , 1970-1985, 1985-2000, 1985-1994 and 1994-2000*

<sup>20</sup> Any monetary, uncertainty or political-instability indicators are considered as Levine and Renelt (1992) do.

<sup>21</sup> In order to compare phases of a similar length, the model was also applied for the period 1985-2000.

### 3. Results

As mentioned before, PCA and OLS methods were applied to a restricted sample (29 regions)<sup>22</sup> for different time-periods: an overall phase 1970-2000, and the sub-periods: the phase of import substitution model (1970-1985), the early liberalisation of the economy (1985-1994) and the NAFTA period (1994-2000)<sup>23</sup>.

#### 3.1. Principal Components

As mentioned in the previous section, the suitability of data for factor analysis was assessed. The correlation matrix revealed high scores for some variables (electricity, drainage and urbanisation services) in the samples 1970-2000 and 1970-1985. The determinants of the different correlation matrix suggests some problems of multicollinearity as the value is smaller than 0.0001<sup>24</sup>; however, the value is different from zero. The samples passed the Kaiser-Meyer-Oklin (KMO) and Bartlett's tests, which indicate that the data was appropriate for PCA. Finally, considering the communalities, only one variable had a low proportion of the variance: X7085.

The number of components was defined by the following criteria: a) an eigenvalue greater than one (Keiser's criteria)<sup>25</sup>, b) a component that shows a break in the graph of the scree test<sup>26</sup>, c) a component that independently explains more than 10 percent of the variance, d) a

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<sup>22</sup> The regions taken out from the sample are : Quintana Roo, Distrito Federal and Campeche.

<sup>23</sup> Additionally, the period 1985-2000 was estimated in some of the techniques in order to have periods of a similar length. When this research started, the latest available and complete data was for the year 2000; after this, some of the variables have been updated, but not uniformly.

<sup>24</sup> If the value is zero, it implies variables are lineally dependent and cannot be used for factorial analysis. Multicollinearity is not a problem in PCA, as matrix inversion is not required (Tabachnick, 1983).

<sup>25</sup> This criterion selects those factors which have an eigenvalue greater than one (Kaiser, 1960), this represents just a single variable is not correlating with any other. It is recommended to be used when the number of variables is less than 30 and average communality is greater than 0.70 (Bryman and Cramer, 2001). This value is associated with the importance of the factor. The drawback of this criterion is that it retains too many components.

<sup>26</sup> This is the graph of the descending variance accounted for by the factors initially extracted. The most important factors account for the most variance and are presented first. The plot shows a break (slope or elbow) between the steep slope of the initial factors and the moderate one of the later factors. The Cattell's criterion

group of components, of which the accumulated variance explains 60 percent at least. Other criteria used were: e) the existence of three significant loadings, f) variables with heavy loading and a meaningful relationship and g) a simple structure, in other words, no correlated components. Following the criteria a), b), c) and d), PCA found that there were certainly two components for all periods. A third component was included with the allowance of including components that explains variance close to 10 percent (more than 9 percent).

So far, PCA identified three patterns among the set of 20 variables for 29 observations in the overall period 1970-2000. It was possible to recognise two types of hard institutions (with different management of public finances and material conditions) and one component related to soft-institutional features. The main results can be seen in table 3, 4 and 5.

Considering the evolution of components by sub-periods, it is obvious when the weights of the variables change or how the interactions are modified. In this perspective, component one (characterised by strong material and homogenous social conditions), has two modifications. The first change shows how public finances are controlled during the first fifteen years through a reduction of public investment and after 1985 with decreasing public debt. The second movement is the switch from a low to a high turnout between periods 1970-1985 and 1994-2000.

In the period 1994-2000, an interesting evolution of the components is the appearance of a second pattern that has sound public finances (component 2). This strategy has both decreasing public expenditure and investment, and achieves to reach a certain level of financial autonomy and expands its export activity.

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*suggests keeping the factors, which lie before the point at which the eigenvalues seem to level off. Everything after the break is debris, which explains very little of the remaining shared variance (Cattell, 1966). The drawback of this criterion is that it retains too few components.*

The trajectory of component 2 (1970-2000) can be identified with increasing public expenditure and investment from 1970 to 1994 ; moreover, after 1985 this strategy presents less favourable conditions, as it has a lower capacity for generating income, a deficient infrastructure and a decreasing export activity.

The variables regarding networks grouped in component 3 do not have a clear interpretation. The variables related to the forces of polarisation in the population did not have strong relationships in that component. With the exception of the public expenditure performance in 1970-1985, the trajectory of this component does not only have any relevant change, but also exposes waning social links. To find a possible explanation of this component requires considering which variable has a higher loading: association densities or crime rates.

PCA made it possible to evaluate the patterns discovered among the n-observations (29 states), in which each region (state) received a particular score that was weighted proportionally to its involvement in a pattern<sup>27</sup>. These factor scores or composite variables are interpreted as any variable, and help to compare cases on the patterns or show features that may not be shared (See Table A3). These scores are used in the following section in which strategies and growth rate are assessed. The components or factors are labelled with a number according to the pattern (1,2 or 3) and the period they define (7000, 7085,8594 and 9400).

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<sup>27</sup> Variables might not be at all related to a given pattern. To determine the score for a case on a pattern, the case's data on each variable is multiplied by the pattern weight for that variable. The sum of these weight-times-data products for all the variables yields the factor score. Cases will have high or low factor scores as their values are high or low on the variable entering a pattern.

**Table 3. Characteristics of Components**

<i>Components</i>	<i>Characteristics</i>
<b><i>Period 1970-2000 (Variance explained by the component/factor)</i></b>	
<b><i>Component 1 F137000 (40%)</i></b>	Strategies based on good provision of infrastructure and homogenous social composition –given a high literacy level and low rate of ethnicity. Regions with a preference for opposition parties, reduced public debt and enlarged export activity for the overall period.
<b><i>Component 2 F237000 (13 %)</i></b>	Strategies based on expansionary policies and reliance on central government resources (public investment and expenditure), with poor provision of services. Regions also distinguished by a preference for the PRI in elections.
<b><i>Component 3 F337000 (9%)</i></b>	Networks with positive relationship between institutional and crime densities, as well as an intermediate level of literacy. The Olson’s type association’s density dominates the component.
<b><i>Period 1970-1985</i></b>	
<b><i>Component 1 F137085 (36%)</i></b>	Strategies based on a good provision of infrastructure, homogenous social composition and control of central government resources (public investment). Additionally, the observations defined by this component have a low turnout.
<b><i>Component 2 F237085 (16 %)</i></b>	Networks defined by the positive relationship among institutional and crime density with an expanding public expenditure in administrative objectives. The variable with the highest loading is the density for Olson-type associations.
<b><i>Component 3 F337085 (8%)</i></b>	Strategies based on central government resources and low financial autonomy. This component has positive loadings for public investment and expenditure in economic promotion.



**Table 4. Characteristics of Components**

<i>Period 1985-1994 (Variance explained by the component/factor)</i>	
<b><i>Component 1</i></b> <b><i>F138594</i></b> <b><i>(38%)</i></b>	Strategies based on a good provision of infrastructure, control of public debt and homogenous social composition. The strategies supported by good provision of public services illustrate a positive relationship with Putnam-type institutional densities.
<b><i>Component 2</i></b> <b><i>F238594</i></b> <b><i>(12 %)</i></b>	Strategies based on expansionary policies with poor provision of infrastructure. This component illustrates increasing public expenditure and investment, low generation of public income with poor infrastructure. At the same time, the observations have a poor participation in export activity and strong preference for PRI.
<b><i>Component 3</i></b> <b><i>F338594</i></b> <b><i>(9%)</i></b>	Networks with positive loadings for association with economic objectives, crime density and an intermediate level of literacy.
<i>Period 1994-2000</i>	
<b><i>Component 1</i></b> <b><i>F139400</i></b> <b><i>(42%)</i></b>	Strategies based on good provision of infrastructure, homogenous social composition and controlled public debt. There is a positive loading for the associations with social purposes. A specific feature is the increase in turnout levels.
<b><i>Component 2</i></b> <b><i>F239400</i></b> <b><i>(11 %)</i></b>	Strategies based on controlled public finances. The results show a second pattern of strategies, one that includes reductions in public expenditure and investment, as well as an increase in income generation. This also coincides with an important export activity.
<b><i>Component 3</i></b> <b><i>F339400</i></b> <b><i>(10%)</i></b>	Networks identified with a positive relationship among its associations with economic objectives, crime density and an intermediate level of export activity. These networks have a high coverage of associations but also might suffer from serious problems of insecurity.

**Table 5. Rotated Component Matrix**

<b>1970-2000</b>				<b>1970-1985</b>				<b>1985-1994</b>				<b>1994-2000</b>			
	<b>1</b>	<b>2</b>	<b>3</b>		<b>1</b>	<b>2</b>	<b>3</b>		<b>1</b>	<b>2</b>	<b>3</b>		<b>1</b>	<b>2</b>	<b>3</b>
<b>IND7000</b>	-0.81			<b>DUS1</b>	-0.70			<b>IND8594</b>	-0.77			<b>IND9400</b>	-0.67		
<b>DUS1</b>	-0.68			<b>IND7085</b>	-0.69			<b>DEB8594</b>	-0.61			<b>TG9400</b>	-0.52	-0.73	
<b>DEB7000</b>	-0.60			<b>TG7085</b>	-0.58			<b>TG8594</b>	-0.43	0.52		<b>DEB9400</b>	-0.50		
<b>X7000</b>	0.52			<b>PI7085</b>	-0.52		0.42	<b>DUS1</b>	-0.42	0.47		<b>TO9400</b>	0.61	0.60	
<b>TO7000</b>	0.58	-0.60		<b>TU7085</b>	-0.43		0.52	<b>P8594</b>	0.42			<b>U9400</b>	0.62	0.61	
<b>U7000</b>	0.66	-0.50		<b>LIT7085</b>	0.73	0.54		<b>TO8594</b>	0.57	-0.62		<b>LIT9400</b>	0.66	0.46	0.45
<b>W7000</b>	0.66	-0.53		<b>TO8594</b>	0.73			<b>U8594</b>	0.72	-0.43		<b>P9400</b>	0.67		
<b>E7000</b>	0.69	-0.47		<b>U7085</b>	0.78	0.41		<b>E8594</b>	0.73			<b>TU9400</b>	0.74		
<b>LIT7000</b>	0.74		0.47	<b>E7085</b>	0.82			<b>LIT8594</b>	0.76		0.42	<b>E9400</b>	0.75		
<b>D7000</b>	0.85			<b>W7085</b>	0.82			<b>W8594</b>	0.80	-0.43		<b>W9400</b>	0.76	0.53	
<b>DDF</b>			0.81	<b>D7085</b>	0.90			<b>D8594</b>	0.88			<b>D9400</b>	0.82		
<b>IS7000</b>			0.71	<b>DDF</b>		0.92		<b>DDF</b>			0.73	<b>DDF</b>			0.76
<b>O7000</b>			0.88	<b>DEB7085</b>				<b>IS8594</b>			0.86	<b>DUS1</b>		-0.69	
<b>P7000</b>		-0.41	0.62	<b>IS7085</b>		0.73		<b>O8594</b>			0.86	<b>IS9400</b>			0.83
<b>PE17000</b>		0.88		<b>O7085</b>		0.87		<b>PE18594</b>		0.82		<b>O9400</b>			0.61
<b>PE27000</b>		0.63		<b>P7085</b>		0.64	-0.41	<b>PE28594</b>		0.54		<b>PE19400</b>		-0.73	
<b>PI7000</b>		0.84		<b>PE17085</b>			0.67	<b>PI8594</b>		0.79		<b>PE29400</b>		-0.46	
<b>TG7000</b>		0.85		<b>PE27085</b>		0.82		<b>TI8594</b>		-0.45		<b>PI9400</b>		-0.79	
<b>TI7000</b>				<b>TI7085</b>			-0.64	<b>TU8594</b>				<b>TI9400</b>		0.59	
<b>TU7000</b>				<b>X7085</b>				<b>X8594</b>		-0.50		<b>X9400</b>		0.73	0.42

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.  
Rotation converged in 5,6,8 and 5 iterations.

### *3.2. Ordinary Least Squares*

Model (2) was applied to the restricted sample of 29 observations; its estimations correspond to the following periods: 1970-2000, 1970-1985<sup>28</sup>, 1985-1994 and 1994-2000. Different model specifications were tested; the most significant are presented in this section<sup>29</sup>. In the following sections, we refer to the components as factors, interchangeably.

#### *Period 1970 – 2000*

For this period, the traditional variables (K, HE and LPOP) are not statistically significant in any of the specifications, although the convergence coefficient (LGDP70) shows a significant value (Table 6). For the overall period, in the restricted sample, the states that grew at faster rates were the small economies (in terms of per capita GDP)<sup>30</sup>; however this tendency is reversed after 1985. The variable TROP shows that an increase of 1 percentage point of the tropical land is related to a decrease of 2 percent of the growth of GDP per capita (regressions 2 and 3 in table 6). Humid tropical land has represented an obstacle for achieving higher rates of growth, as regions with these conditions tend to have a population with less healthy people, less possibilities of being involved in the education system (Esquivel, 2000), hence reaching low levels of productivity.

In the long-run period (1970-2000), variables related to economic policies (PE, PI and X) do not show any statistically significant results<sup>31</sup>. According to regression 4, factors 137000 and 237000 show two relevant connections; however, because of being a composite variable, its

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<sup>28</sup> *Period 1985-2000 was added in order to compare the fifteen years after and before the opening of the Mexican economy. Moreover, the results from period 1994-2000 have to be taken carefully, as they refer to a very short period.*

<sup>29</sup> *Diagnostic tests were applied in order to find evidence of non-normality of residuals, heteroskedasticity, misspecification, autocorrelation and multicollinearity.*

<sup>30</sup> *According to our results for  $\beta$  and  $\sigma$  convergence, the Mexican regions in the overall period 1970-2000 show a weak convergence process ( $\beta = -0.24$ ); meanwhile the sub-period 1970-1985 illustrates a strong convergence tendency ( $\beta = -1.94$ ) and the sub-periods 1984-1994 and 1994-2000 do not show evidence of convergence ( $\beta = +2.51$  and  $+0.43$ ). (Decuir-Viruez, 2003).*

<sup>31</sup> *This result is expected as they have changed throughout the period.*

interpretation is different from the rest. An increase in the score of factor 137000 is associated with a positive effect on the rate of growth. As mentioned in the previous section, this factor identifies strategies in which local governments have provided good levels of infrastructure, accompanied by a controlled public debt and increased export activity (table 3). These actions have taken place in regions with a homogenous social composition, with preference for opposition. Therefore, regions with these characteristics have had higher rates of growth in the period 1970-2000<sup>32</sup>. In contrast, an increase in the score of factor 237000 is associated with a decrease in growth. Variable F237000 identifies strategies based on expansionary policies and reliance on central government resources, with a poor provision of services<sup>33</sup>. This result implies that lower rates of growth are identified with local governments that did not fulfil their traditional role as infrastructure supplier and had a strong financial dependence upon central government<sup>34</sup>. In terms of the interaction of the factors with the investment proxy, the results report a similar connection: positive for factor 1 and negative for factor 2 (regression 7 in table 6).

These results coincide with the hypothesis of this research: the strategies with a more active participation in the global competition and the less dependence on financial resources from central government have obtained higher rates of growth. In this case, the factor identifying this strategy is connected positively with growth (F137000). In contrast, the regions that remained dependent upon central government, have lower rates of growth (F27000). In the analysis of sub-periods, it is possible to identify how these strategies changed through time and their relationship with growth.

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<sup>32</sup> According to the factor loadings, this situation correspond to the states of Aguascalientes, Baja California, Chihuahua, Coahuila, Jalisco, Mexico, Nuevo Leon, Sonora, Tabasco and Tamaulipas (See table A3 in the appendix).

<sup>33</sup> According to table 6, the growth rates of per capita GDP are significantly correlated with tropical land and F237000.

<sup>34</sup> Table 6 shows that Chiapas, Tabasco and Veracruz have followed this tendency.

**Table 6. Estimations of Growth and Factors 1970-2000**

Dependent Variable LGDP	Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>C</b>	5.15	<b>6.81 *</b>	6.85	<b>15.46 *</b>	9.14	<b>11.24 *</b>	<b>13.79 *</b>
	1.58	<b>2.53</b>	1.63	<b>2.80</b>	1.49	<b>2.51</b>	<b>2.64</b>
<b>LGDP70</b>	-0.63	<b>-0.69 **</b>	-0.78	<b>-1.79 *</b>	-0.95	<b>-1.12 **</b>	<b>-1.59 *</b>
	-1.52	<b>-1.99</b>	-1.31	<b>-2.83</b>	-1.24	<b>-2.02</b>	<b>-2.63</b>
<b>K7800</b>	0.05	0.00	0.00	0.03	-0.01	-0.03	0.01
	1.63	-0.12	0.14	0.94	-0.37	-1.21	0.40
<b>HE7600</b>	-0.08	-0.11	-0.09	0.05	-0.03	-0.05	0.15
	-0.19	-0.30	-0.18	0.11	-0.07	-0.15	0.37
<b>LPOP7000</b>	0.18	0.20	0.25	0.42	0.26	0.22	0.31
	0.37	0.51	0.55	0.95	0.63	0.62	0.71
<b>GDP170</b>		0.01	0.02		0.01	0.00	
		0.54	0.72		0.42	0.15	
<b>GDP370</b>		-0.02	-0.01		-0.03	<b>-0.04 **</b>	
		-1.37	-0.52		-1.19	<b>-1.98</b>	
<b>TROP</b>		<b>-0.02 *</b>	<b>-0.02 *</b>		-0.01	-0.01	
		<b>-3.74</b>	<b>-2.73</b>		-1.16	-1.71	
<b>PI7000</b>			0.06				
			0.87				
<b>PE7000</b>			-0.01				
			-0.16				
<b>X7000</b>			0.02				
			0.35				
<b>F137000</b>				<b>0.38 **</b>	0.12		
				<b>1.96</b>	0.52		
<b>F237000</b>				<b>-0.36 *</b>	-0.25		
				<b>-2.68</b>	-1.10		
<b>F337000</b>				0.18	-0.01		
				1.11	-0.07		
<b>F137000*LK7800</b>						0.01	<b>0.02 **</b>
						1.32	<b>1.84</b>
<b>F237000*LK7800</b>						<b>-0.03 *</b>	<b>-0.03 *</b>
						<b>-2.32</b>	<b>-2.71</b>
<b>F337000*LK7800</b>						0.00	0.01
						-0.05	0.57
<b>R<sup>2</sup></b>	0.16	0.53	0.55	0.40	0.57	0.66	0.42
<b>Adjusted R<sup>2</sup></b>	0.01	0.37	0.30	0.20	0.32	0.48	0.22
<b>F-statistic</b>	1.10	3.33	2.19	2.01	2.34	3.55	2.13
<b>Prob(F-statistic)</b>	0.38	0.02	0.07	0.10	0.06	0.01	0.08
<b>Multicollinearity</b>	No	No	No	No	No	No	No
<b>Autocorrelation</b>	No	ND	ND	ND	ND	ND	ND
<b>Heteroskedasticity</b>	No	No	No	No	No	No	No
<b>Specification Errors</b>	No	No	No	No	No	Yes	No
<b>Normality</b>	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>No. Observations</b>	29	29	29	29	29	29	29

\*5 % significance level, \*\* 10% significance level. ND/ Non-defined

### *Period 1970-1985*

Considering the first fifteen years before the opening of the Mexican Economy, there is evidence of regional convergence as regression 1 shows a statistically significant negative value (table 7). In regression 3 and 6 (table 6), the variable TROP shows that an increase of 1 percent of the tropical land is related to an increase of 1 percent in the growth of GDP per capita for the period 1970-1985. The convergence process occurred in this period, the smaller economies showed a better performance despite their disadvantages: humid tropical land and modest flows of private investment or human capital. During these years, these regions were important in the national model<sup>35</sup>, in which they were important beneficiaries of public investment.

Any of the factors (F13, F23 and F33) show a relevant relationship with growth in this period. However, the interaction of F137085 with the investment proxy has a positive relationship with growth. This suggests that investment was encouraged by strategies based on good provision of infrastructure, homogenous social composition, and controlled public investment, which, finally, could stimulate a diminutive positive effect on growth. These results suggest that the strategy with better performance in the period 1970-1985 is not characterised by the elements defined in the hypothesis<sup>36</sup>.

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<sup>35</sup> *These states were suppliers of raw materials (agricultural products and oil).*

<sup>36</sup> *Although, the results for the period 1985-2000 are not presented in this document, it is important to make the following comments. The factor 138500 that identifies strategies with good infrastructure, control of public investment and expenditure and a medium level of financial autonomy showed a positive relationship with growth. Therefore, regions with better performance were those whose local governments accomplished their role, had sound public accounts, accompanied by less dependence upon central government and increased their income generation capacity.*

**Table 7. Estimations of Growth and Factors 1970-1985**

Dependent Variable	Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>LGDP 7085</b>							
<b>C</b>	<b>7.82 *</b>	<b>7.96 *</b>	<b>6.99 *</b>	6.52	<b>9.04 **</b>	<b>12.19 *</b>	<b>10.84 *</b>
	2.56	2.56	2.20	1.46	1.86	3.27	2.75
<b>LGDP70</b>	<b>-0.71 **</b>	<b>-0.78 **</b>	-0.59	-0.57	-0.87	<b>-1.24 *</b>	<b>-1.03 *</b>
	-1.77	-1.87	-1.37	-1.06	-1.44	-2.63	-2.15
<b>K7883</b>	-0.02	-0.01	-0.01	-0.02	-0.01	-0.03	<b>-0.03</b>
	-1.29	-0.78	-0.62	-0.93	-0.85	-1.59	<b>-1.86</b>
<b>HE7685</b>	-0.01	0.05	-0.03	0.07	0.04	-0.01	-0.07
	-0.04	0.15	-0.12	0.24	0.14	-0.05	-0.27
<b>LPOP7080</b>	-0.28	-0.26	-0.33	-0.42	-0.34	-0.09	-0.19
	-0.74	-0.66	-0.84	-1.08	-0.91	-0.26	-0.50
<b>GDP170</b>		0.01	0.00		0.01	0.01	
		0.78	-0.08		0.55	0.58	
<b>GDP370</b>		0.00	-0.01		0.00	0.00	
		0.12	-0.56		-0.32	-0.15	
<b>TROP</b>		0.00	<b>0.01 **</b>		0.01	<b>0.01 **</b>	
		1.10	1.86		1.67	1.96	
<b>PI7085</b>			-0.02				
			-0.85				
<b>PE7085</b>			0.00				
			0.02				
<b>X7085</b>			-0.02				
			-1.46				
<b>F137085</b>				0.01	0.19		
				0.06	1.04		
<b>F237085</b>				-0.14	-0.10		
				-1.05	-0.71		
<b>F337085</b>				-0.12	-0.06		
				-1.31	-0.66		
<b>F137085*LK7883</b>						<b>0.02 *</b>	<b>0.01 **</b>
						2.61	1.93
<b>F237085*LK7883</b>						0.00	0.00
						-0.31	-0.39
<b>F337085*LK7883</b>						0.00	0.00
						0.44	0.05
<b>R<sup>2</sup></b>	0.54	0.60	0.66	0.62	0.71	0.75	0.66
<b>Adjusted R<sup>2</sup></b>	0.47	0.47	0.48	0.49	0.55	0.61	0.54
<b>F-statistic</b>	7.13	4.51	3.56	4.81	4.43	5.41	5.71
<b>Prob(F-statistic)</b>	0.00	0.00	0.01	0.00	0.00	0.00	0.00
<b>Multicollinearity</b>	No	No	No	No	No	No	No
<b>Autocorrelation</b>	No	No	ND	No	ND	ND	ND
<b>Heteroskedasticity</b>	No	No	No	No	No	No	No
<b>Specification Errors</b>	No	No	No	No	No	No	No
<b>Normality</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>No. Observations</b>	29	29	29	29	29	29	29

\*5 % significance level, \*\* 10% significance level. ND/ Non-defined

### *Period 1985-1994*

For this period, an increase in 1 percentage point of tropical land (TROP) is associated with a decrease of 0.07 percentage point in growth. The effect on growth of public investment and exports is positive (0.27 and 0.16 percentage points, respectively), and negative for public expenditure (0.35 percentage points). During this period, despite the macroeconomic difficulties, some of the regions continued receiving important resources from central government. Some of the principal beneficiaries had less negative rates of growth. Others reduced their public expenditure –forced to do so by the national reforms–; a measure that is related to better results in terms of growth. As regression 3 shows in table 8, exports have positive effects on growth; however, these were limited to those states that were ready for participating in global markets.

Factor 138594 is positively related to growth, which identifies strategies based on a good provision of infrastructure, control of public debt and a homogenous social composition (tables 4 and 8)<sup>37</sup>. In contrast, a negative effect is shown by factor 238594, associated with local governments that maintained expansionary policies with a poor provision of infrastructure, low export activity and a strong preference for PRI<sup>38</sup>. A similar situation is found in its interaction with capital in regression 7 (table 8); therefore regions with these characteristics were less likely to increase their investment levels and growth. These results show how the type of strategies they designed or decided to follow widened the gap between states. Meanwhile, factor 338594 shows a positive relationship with growth: the variable identifies networks positive loadings of association with economic objectives (Olson-type), crime density and an intermediate level of literacy. The positive sign can be attributed to the dominance of Olson's type association density in the component.

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<sup>37</sup> *This strategy corresponds to the states of Aguascalientes, Colima, Nuevo Leon, Mexico and Jalisco among others (see table A3).*

<sup>38</sup> *Chiapas, Tlaxcala, Veracruz and Tabasco have the higher loadings in this component (see table A3).*



**Table 8. Estimations of Growth and Factors 1985-1994**

Dependent Variable	Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>GDP 8594</b>							
<b>C</b>	-0.95	-4.89	-8.14	<b>28.30 *</b>	25.17	9.75	25.88
	-0.07	-0.47	-0.78	<b>2.29</b>	1.59	0.54	1.60
<b>LGDP85</b>	0.06	0.68	0.76	<b>-3.22 *</b>	-2.83	-0.99	-2.94
	0.03	0.57	0.65	<b>-2.39</b>	-1.58	-0.50	-1.65
<b>K8594</b>	0.18	0.12	<b>0.21 *</b>	0.08	0.07	0.08	0.04
	1.68	1.38	<b>2.55</b>	1.18	0.73	0.60	0.39
<b>HE8594</b>	-0.80	-1.06	-0.96	-0.21	-0.23	-0.71	0.03
	-0.57	-1.05	-1.07	-0.23	-0.21	-0.59	0.02
<b>LPOP8090</b>	-1.01	-0.62	1.00	0.87	0.72	-0.15	0.35
	-0.72	-0.62	1.01	1.02	0.72	-0.14	0.31
<b>GDP185</b>		-0.02	0.01		0.00	-0.01	
		-0.36	0.17		0.02	-0.10	
<b>GDP385</b>		0.00	0.02		-0.01	-0.01	
		-0.03	0.65		-0.21	-0.12	
<b>TROP</b>		<b>-0.07 *</b>	<b>-0.07 *</b>		-0.01	-0.05	
		<b>-4.78</b>	<b>-4.13</b>		-0.28	-1.92	
<b>PI8594</b>			<b>0.27 **</b>				
			<b>1.73</b>				
<b>PE8594</b>			<b>-0.35 *</b>				
			<b>-2.58</b>				
<b>X8594</b>			<b>0.16 **</b>				
			<b>2.01</b>				
<b>F138594</b>				<b>1.00 *</b>	<b>0.89 **</b>		
				<b>2.57</b>	<b>1.76</b>		
<b>F238594</b>				<b>-1.71 *</b>	<b>-1.60 *</b>		
				<b>-5.88</b>	<b>-2.18</b>		
<b>F338594</b>				<b>0.78 *</b>	0.69		
				<b>2.54</b>	1.71		
<b>F138594*LK8594</b>						0.03	0.06
						0.61	1.36
<b>F238594*LK8594</b>						-0.08	<b>-0.20 *</b>
						-0.85	<b>-3.76</b>
<b>F338594*LK8594</b>						0.04	0.06
						0.83	1.41
<b>R<sup>2</sup></b>	0.15	0.63	0.77	0.75	0.75	0.66	0.57
<b>Adjusted R<sup>2</sup></b>	0.00	0.50	0.64	0.66	0.61	0.47	0.42
<b>F-statistic</b>	1.02	5.04	6.01	8.82	5.39	3.48	3.93
<b>Prob(F-statistic)</b>	0.42	0.00	0.00	0.00	0.00	0.01	0.01
<b>Multicollinearity</b>	No	No	No	No	No	No	No
<b>Autocorrelation</b>	No	No	ND	No	No	No	No
<b>Heteroskedasticity</b>	No	No	No	No	No	No	No
<b>Specification Errors</b>	No	No	No	No	No	No	Yes
<b>Normality</b>	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>No. Observations</b>	29	29	29	29	29	29	29

\*5 % significance level, \*\* 10% significance level. ND/ Non-defined

*Period 1994-2000*

The correlations estimated for this period anticipated that the growth rate of per capita GDP was negatively correlated to human capital, public investment and expenditure and, tropical land. The basic regression in table 9 shows that the proxy for human capital has a negative relationship with growth (an increase of 1 percentage point is related to a decrease of 1.36 percentage points)<sup>39</sup>.

In regression 4, factor 239400 has a positive relationship with growth, related to strategies based on sound public finances, as well as an increase in income generation and export activity. Therefore, a better performance corresponded to regions with local governments that controlled their finances, promoted their financial autonomy and external links, which coincides with the initial hypothesis. The states that represent this strategy are: Aguascalientes, Colima, Jalisco and Morelos (see table A3).

Meanwhile, factor 339400, related to social networks, had a negative relationship with growth. An analogous situation is found in its interaction with capital in regression 7 (table 9). These results can be attributed to the important weight that crime density has in the component; this confirms that the lack of security during these years negatively affected the performance of the regions with higher scores in this aspect.

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<sup>39</sup> *This last result contradicts the theory; however, it has been alleged that a better quality data can help to obtain the right sign (De la Fuente and Doménech; 2000).*

**Table 9. Estimations of Growth and Factors 1994-2000**

Dependent Variable	Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>GDP 9400</b>							
<b>C</b>	-2.20	-0.08	9.38	-0.03	-0.20	-0.82	-1.87
	-0.42	-0.01	1.24	0.00	-0.02	-0.10	-0.25
<b>LGDP94</b>	0.73	0.38	-0.63	0.27	0.32	0.43	0.55
	1.30	0.59	-0.76	0.28	0.28	0.48	0.64
<b>K9400</b>	-0.03	-0.02	-0.02	-0.04	-0.05	<b>-0.07 *</b>	<b>-0.05 *</b>
	-1.02	-0.78	-0.81	-1.56	-1.51	<b>-2.16</b>	<b>-2.06</b>
<b>HE9400</b>	<b>-1.36 *</b>	<b>-0.98 **</b>	-0.50	-0.01	0.13	0.07	-0.31
	<b>-3.13</b>	<b>-1.83</b>	-0.73	-0.01	0.19	0.10	-0.57
<b>LPOP9400</b>	-0.08	0.08	0.10	-0.07	-0.11	-0.05	-0.09
	-0.17	0.16	0.20	-0.16	-0.24	-0.12	-0.21
<b>GDP194</b>		0.02	0.01		-0.01	-0.01	
		0.47	0.13		-0.20	-0.33	
<b>GDP394</b>		0.02	0.02		-0.02	-0.01	
		0.95	0.76		-0.58	-0.39	
<b>TROP</b>		-0.01	-0.01		0.00	-0.01	
		-1.24	-0.51		0.04	-1.21	
<b>PI9400</b>			-0.02				
			-0.15				
<b>PE9400</b>			-0.08				
			-1.26				
<b>X9400</b>			0.10				
			1.18				
<b>F139400</b>				0.08	0.08		
				0.35	0.30		
<b>F239400</b>				<b>0.66 *</b>	0.71		
				2.15	1.60		
<b>F339400</b>				<b>-0.40 **</b>	<b>-0.47 **</b>		
				<b>-1.82</b>	<b>-1.75</b>		
<b>F139400*LK9400</b>						0.00	0.00
						-0.06	-0.06
<b>F239400*LK9400</b>						0.03	0.04
						1.45	1.70
<b>F339400*LK9400</b>						<b>-0.04 *</b>	<b>-0.03 *</b>
						<b>-2.21</b>	<b>-2.12</b>
<b>R<sup>2</sup></b>	0.38	0.44	0.53	0.58	0.59	0.61	0.57
<b>Adjusted R<sup>2</sup></b>	0.27	0.25	0.27	0.44	0.36	0.40	0.43
<b>F-statistic</b>	3.61	2.34	2.04	4.10	2.54	2.84	4.02
<b>Prob(F-statistic)</b>	0.02	0.06	0.09	0.01	0.04	0.03	0.01
<b>Multicollinearity</b>	No	No	No	No	No	No	No
<b>Autocorrelation</b>	ND	ND	ND	ND	ND	ND	ND
<b>Heteroskedasticity</b>	No	No	No	No	No	No	No
<b>Specification Errors</b>	No	No	No	No	No	No	No
<b>Normality</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>No. Observations</b>	29	29	29	29	29	29	29

\*5 % significance level, \*\* 10% significance level. ND/ Non-defined

#### **4. Conclusions**

The results presented in this paper identified and evaluated the role of institutions, in terms of strategy, in the regional economic growth of Mexico. The PCA identified two types of institutional elements: the hard and the soft features, the first one relates to the kind of strategies taken by governments and the second represents the characteristics of social networks.

The analysis of the overall period (1970-2000) shows that there are two types of strategies. The first one is characterised by a good management of public finances, especially by the reduction of public expenditure, and by a participation in the global markets through exports (active strategy). The second type is characterised by traditional policies, flows of public expenditure and investment, which defined a greater dependence upon central authorities. Both components were statistically significant in the assessment of period 1970-2000; results indicate that the active strategies have a positive relationship with growth, in contrast with the traditional strategies that have a negative impact. The same effects on growth are observed when these strategies interact with capital accumulation. Therefore, the regions with better results were those that had active strategies and, moreover, had greater accumulation of capital. The analysis by sub-periods provides information of the changes in the patterns and their relationship with growth. Therefore, it is possible to see that after 1985, the characteristics of regional growth in Mexico changed. The strategies that followed the macroeconomic adjustment programme had a positive impact on growth. Meanwhile, the traditional strategies had a negative relationship with growth and with capital accumulation. Finally, after the formalisation of the NAFTA in 1994, the strategies with less dependence upon central government and better public finances are the only ones with a positive relationship with growth.

## Appendix

**Table A1. Characteristics of variables used in Principal Component Analysis**

### *Descriptive Statistics*

	Min	Max	$\bar{X}$	$\sigma$		Min	Max	$\bar{X}$	$\sigma$
<b>TU7000</b>	57.2	74.0	65.4	4.4	<b>IND7085</b>	0.3	54.3	8.7	12.8
<b>TU7085</b>	56.7	82.4	68.6	6.7	<b>IND8594</b>	0.3	48.6	8.3	12.2
<b>TU8500</b>	53.1	73.7	64.8	4.8	<b>IND8500</b>	0.3	44.8	7.9	11.5
<b>TU8594</b>	51.6	77.7	65.8	5.8	<b>IND9400</b>	0.1	40.8	7.2	10.9
<b>TU9400</b>	59.4	75.5	69.1	3.9	<b>LIT7000</b>	65.9	93.2	83.2	8.1
<b>TG7000</b>	1.7	30.9	7.7	7.2	<b>LIT7085</b>	58.2	90.4	77.7	10.1
<b>TG7085</b>	2.4	61.7	14.4	14.9	<b>LIT8500</b>	69.7	95.1	86.6	7.2
<b>TG8500</b>	1.3	19.6	5.4	4.7	<b>LIT8594</b>	66.0	94.4	84.7	8.1
<b>TG8594</b>	1.6	25.8	6.8	6.2	<b>LIT9400</b>	73.5	96.0	88.8	6.3
<b>TG9400</b>	0.9	4.5	1.7	0.8	<b>IS7000</b>	0.5	9.5	2.2	1.8
<b>TO7000</b>	0.2	0.8	0.4	0.2	<b>IS7085</b>	0.3	11.1	1.7	2.0
<b>TO7085</b>	0.0	0.4	0.2	0.1	<b>IS8500</b>	0.7	7.9	2.9	1.8
<b>TO8500</b>	0.2	0.9	0.5	0.2	<b>IS8594</b>	0.6	5.6	2.4	1.4
<b>TO8594</b>	0.1	0.7	0.3	0.2	<b>IS9400</b>	0.9	11.5	3.8	2.7
<b>TO9400</b>	0.3	1.4	0.8	0.3	<b>O7000</b>	0.2	1.4	0.6	0.3
<b>X7000</b>	0.0	9.7	1.6	2.5	<b>O7085</b>	0.1	0.7	0.3	0.2
<b>X7085</b>	0.0	5.2	0.5	1.2	<b>O8500</b>	0.3	2.1	1.0	0.4
<b>X8500</b>	0.0	8.5	1.4	2.2	<b>O8594</b>	0.2	1.9	0.8	0.4
<b>X8594</b>	0.0	16.0	2.2	3.7	<b>O9400</b>	0.5	2.4	1.3	0.5
<b>X9400</b>	0.0	11.3	1.8	2.9	<b>P7000</b>	1.1	3.3	2.0	0.6
<b>PI7000</b>	1.8	18.3	5.7	3.4	<b>P7085</b>	0.4	2.3	1.2	0.5
<b>PI7085</b>	3.0	20.1	9.5	4.6	<b>P8500</b>	1.4	4.6	2.7	0.7
<b>PI8500</b>	1.4	12.8	4.6	2.8	<b>P8594</b>	0.9	3.5	2.1	0.6
<b>PI8594</b>	1.2	17.4	4.2	3.2	<b>P9400</b>	2.4	7.4	4.0	1.1
<b>PI9400</b>	1.0	20.7	3.9	3.9	<b>U7000</b>	35.8	88.0	63.0	15.7
<b>PE17000</b>	0.5	3.6	1.1	0.6	<b>U7085</b>	29.5	84.8	56.2	16.4
<b>PE17085</b>	0.4	1.6	0.9	0.4	<b>U8500</b>	38.7	90.9	66.4	15.6
<b>PE18500</b>	0.5	5.9	1.3	1.0	<b>U8594</b>	35.7	89.7	63.9	16.1
<b>PE18594</b>	0.4	4.9	1.3	0.8	<b>U9400</b>	42.1	92.7	69.7	15.2
<b>PE19400</b>	0.3	4.5	1.1	0.8	<b>E7000</b>	55.0	85.2	71.2	8.1
<b>PE27000</b>	1.0	6.1	2.4	1.1	<b>E7085</b>	30.1	73.0	51.5	11.9
<b>PE27085</b>	0.8	2.7	1.6	0.5	<b>E8500</b>	65.7	94.7	83.7	8.3
<b>PE28500</b>	1.1	6.8	2.5	1.3	<b>E8594</b>	54.6	92.7	78.1	11.2
<b>PE28594</b>	1.0	4.1	2.1	0.7	<b>E9400</b>	77.4	97.5	90.9	5.2
<b>PE29400</b>	0.9	9.1	3.0	1.8	<b>W7000</b>	51.7	91.2	71.6	11.2
<b>DEB7000</b>	0.1	7.7	0.6	1.4	<b>W7085</b>	38.0	85.4	59.8	13.2
<b>DEB7085</b>	0.0	1.6	0.2	0.3	<b>W8500</b>	57.3	93.9	78.1	11.5
<b>DEB8500</b>	0.0	5.0	0.4	0.9	<b>W8594</b>	50.5	91.8	73.4	12.9
<b>DEB8594</b>	0.0	6.5	0.5	1.2	<b>W9400</b>	62.2	97.0	83.5	10.4
<b>DEB9400</b>	0.0	11.8	0.8	2.1	<b>D7000</b>	29.7	79.5	58.0	12.9
<b>TI7000</b>	4.2	20.4	12.5	4.2	<b>D7085</b>	21.2	72.5	47.9	13.9
<b>TI7085</b>	7.2	36.6	22.3	7.4	<b>D8500</b>	30.3	84.5	59.7	13.3
<b>TI8500</b>	0.2	5.5	1.8	1.4	<b>D8594</b>	22.7	79.1	51.7	14.1
<b>TI8594</b>	0.2	5.8	2.1	1.6	<b>D9400</b>	38.2	91.1	68.1	12.9
<b>TI9400</b>	0.2	5.5	2.0	1.5	<b>DDF</b>	64.0	4309.0	828.7	891.7
<b>IND7000</b>	0.2	47.5	8.0	11.8	<b>DUS</b>	170.0	2034.0	955.9	439.8

*Note: This includes the descriptive statistics of the original variables for periods: 1970-2000, 1970-1985, 1985-2000, 1985-1994 and 1994-2000.*

**Table A2. Characteristics of variables used in Ordinary Least Square (OLS)**

<i>Descriptive Statistics</i>									
	Min	Max	$\bar{X}$	$\sigma$		Min	Max	$\bar{X}$	$\sigma$
<b>F137000</b>	-3.1	1.5	0.0	1.0	<b>K7800</b>	4.7	24.1	14.3	5.1
<b>F237000</b>	-1.3	3.8	0.0	1.0	<b>K7883</b>	3.3	38.7	18.4	7.7
<b>F337000</b>	-1.4	3.1	0.0	1.0	<b>K8500</b>	5.0	26.5	12.1	5.5
<b>F137085</b>	-2.1	1.7	0.0	1.0	<b>K8594</b>	3.7	21.3	10.1	4.7
<b>F237085</b>	-1.2	3.3	- 0.0	1.0	<b>K9400</b>	5.6	33.2	14.3	6.9
<b>F337085</b>	-2.0	2.4	- 0.0	1.0	<b>LGDP70</b>	8.2	9.8	9.0	0.4
<b>F138500</b>	-2.3	1.4	- 0.0	1.0	<b>LGDP85</b>	8.8	10.0	9.4	0.3
<b>F238500</b>	-1.5	2.3	- 0.0	1.0	<b>LGDP94</b>	8.7	10.1	9.3	0.4
<b>F338500</b>	-2.4	1.7	0.0	1.0	<b>PE7000</b>	4.5	19.8	7.9	3.2
<b>F138594</b>	-3.2	1.4	0.0	1.0	<b>PE7085</b>	2.0	7.5	3.7	1.4
<b>F238594</b>	-1.9	3.5	- 0.0	1.0	<b>PE8500</b>	4.9	24.2	9.3	4.1
<b>F338594</b>	-1.4	2.8	0.0	1.0	<b>PE8594</b>	4.0	14.3	7.0	2.7
<b>F139400</b>	-2.6	1.9	0.0	1.0	<b>PE9400</b>	5.1	28.7	10.6	5.0
<b>F239400</b>	-3.0	1.9	- 0.0	1.0	<b>PI7000</b>	1.8	18.3	5.7	3.4
<b>F339400</b>	-1.4	2.2	- 0.0	1.0	<b>PI7085</b>	3.0	20.1	9.5	4.6
<b>GDP170</b>	5.3	33.5	19.2	7.8	<b>PI8500</b>	1.2	17.4	4.2	3.2
<b>GDP185</b>	1.7	29.7	13.6	6.6	<b>PI8594</b>	1.6	11.0	4.8	2.7
<b>GDP194</b>	1.5	18.1	8.8	4.5	<b>PI9400</b>	1.0	20.7	3.9	3.9
<b>GDP370</b>	6.8	48.1	17.6	9.2	<b>POP7000</b>	1.2	4.2	2.5	0.7
<b>GDP385</b>	4.4	40.2	19.1	10.0	<b>POP7080</b>	1.6	7.0	3.3	1.1
<b>GDP394</b>	2.9	30.6	16.3	8.2	<b>POP8000</b>	1.2	5.1	2.9	1.0
<b>GDP7000</b>	0.2	2.7	1.4	0.7	<b>POP8090</b>	1.2	4.4	2.4	0.8
<b>GDP7085</b>	0.6	7.5	2.5	1.5	<b>POP9000</b>	0.6	4.1	2.0	0.8
<b>GDP8500</b>	-5.7	3.1	0.3	1.6	<b>TROP</b>	0.0	100.0	11.2	23.4
<b>GDP8594</b>	-9.3	2.8	-0.7	2.4	<b>X7000</b>	0.0	9.5	2.0	2.9
<b>GDP9400</b>	-0.2	3.9	1.9	1.1	<b>X7085</b>	0.0	26.0	2.9	6.3
<b>HE7600</b>	0.8	2.2	1.5	0.3	<b>X8500</b>	0.0	10.8	2.0	2.9
<b>HE7685</b>	0.4	2.0	1.1	0.4	<b>X8594</b>	0.0	14.1	2.4	3.9
<b>HE8500</b>	1.0	2.4	1.7	0.4	<b>X9400</b>	0.0	11.3	1.8	2.9
<b>HE8594</b>	0.9	2.6	1.6	0.4					
<b>HE9400</b>	1.1	3.1	1.7	0.4					

*Note: This includes the descriptive statistics of the components identified (F1, F2 and F3)*

**Table A3. Factor Loadings for 29 Regions**

Component	1970-2000			1970-1985			1985-1994			1994-2000		
	1	2	3	1	2	3	1	2	3	1	2	3
Region/Label	f137000	f237000	f337000	f137085	f237085	f337085	f138594	f238594	f338594	f139400	f239400	f339400
<i>Aguascalientes</i>	<b>0.99</b>	-0.66	-0.35	<b>1.39</b>	-0.56	-0.26	<b>1.44</b>	-0.09	-0.75	<b>1.55</b>	0.09	-0.77
<i>Baja California</i>	<b>1.33</b>	-0.23	1.23	<b>1.21</b>	<b>2.18</b>	-0.74	<b>0.74</b>	-0.96	0.85	-0.61	<b>1.80</b>	<b>1.90</b>
<i>Baja California Sur</i>	-0.57	0.26	<b>3.13</b>	-0.65	<b>3.31</b>	-1.19	0.06	<b>0.51</b>	<b>2.79</b>	0.86	-0.64	<b>2.16</b>
<i>Chiapas</i>	-1.01	<b>2.36</b>	-0.23	-2.04	0.13	-0.52	-1.39	<b>1.78</b>	-0.04	-1.90	-1.43	0.00
<i>Chihuahua</i>	<b>0.99</b>	-0.85	-0.02	<b>1.09</b>	0.01	1.18	0.15	-1.91	0.15	-0.96	<b>1.95</b>	1.24
<i>Coahuila</i>	<b>0.92</b>	-0.34	0.18	<b>0.86</b>	0.08	0.52	0.34	-1.21	0.30	0.18	<b>0.82</b>	0.22
<i>Colima</i>	0.29	-0.20	1.40	0.43	0.77	0.08	<b>1.14</b>	0.85	0.85	<b>1.89</b>	-0.88	0.53
<i>Durango</i>	-0.04	-0.48	0.00	0.16	0.04	0.50	-0.02	-0.35	0.02	-0.15	0.30	0.12
<i>Guanajuato</i>	0.21	-0.39	-1.08	0.35	-0.97	-0.30	0.01	-0.39	-1.05	0.73	0.19	-1.40
<i>Guerrero</i>	-1.34	0.09	-0.38	-1.20	-0.67	<b>1.54</b>	-1.61	-0.22	-0.29	-1.59	-0.59	-0.22
<i>Hidalgo</i>	-0.75	0.38	-1.29	-0.89	-1.16	-0.93	-1.00	-0.05	-1.23	-0.98	-0.18	-0.92
<i>Jalisco</i>	<b>0.69</b>	-1.00	-0.27	<b>1.21</b>	-0.49	0.39	<b>0.96</b>	-0.82	-0.17	<b>1.19</b>	<b>0.61</b>	-0.82
<i>México</i>	<b>0.85</b>	-0.58	-1.42	<b>1.25</b>	-1.19	-1.00	<b>0.98</b>	-0.72	-1.43	0.58	<b>0.75</b>	-1.28
<i>Michoacán</i>	0.06	0.27	-0.47	-0.26	-0.34	0.66	-0.08	0.10	-0.48	0.19	-0.53	-0.72
<i>Morelos</i>	0.25	-0.67	0.17	<b>0.58</b>	-0.50	0.47	<b>0.95</b>	-0.09	-0.07	<b>1.39</b>	-0.28	-0.19
<i>Nayarit</i>	-0.58	0.17	<b>1.65</b>	-0.43	0.65	1.45	-0.46	0.29	<b>2.11</b>	0.44	-1.10	1.18
<i>Nuevo León</i>	<b>1.48</b>	-0.68	-0.26	<b>1.70</b>	0.21	0.52	<b>1.44</b>	-0.39	-0.25	0.55	<b>1.36</b>	-0.31
<i>Oaxaca</i>	-3.11	-0.70	-0.45	-2.09	-0.65	0.08	-3.16	-0.69	-0.31	-2.56	-0.04	-0.66
<i>Puebla</i>	-0.27	-0.29	-1.16	-0.18	-1.03	0.82	-0.14	-0.06	-1.14	-0.55	0.32	-1.03
<i>Querétaro</i>	-0.08	-0.27	-1.00	0.05	-1.22	-0.86	0.24	0.11	-1.09	0.32	0.18	-1.04
<i>San Luis Potosí</i>	-0.64	-0.33	-0.54	-0.31	-0.67	-0.03	-0.83	-0.40	-0.40	-0.67	0.15	-0.57
<i>Sinaloa</i>	-0.28	-0.10	0.62	-0.30	0.59	0.60	0.00	-0.05	0.24	0.07	-0.37	1.12
<i>Sonora</i>	<b>0.67</b>	-0.27	0.79	<b>0.69</b>	0.89	0.00	<b>0.64</b>	-0.21	0.91	0.19	<b>0.95</b>	1.25
<i>Tabasco</i>	<b>0.65</b>	<b>3.78</b>	-0.07	-1.28	0.19	-2.04	0.37	<b>3.52</b>	-0.27	0.03	-3.05	1.08
<i>Tamaulipas</i>	<b>1.01</b>	0.44	0.66	0.46	0.43	-0.13	-0.01	-0.25	1.82	-0.23	<b>0.86</b>	1.35
<i>Tlaxcala</i>	0.46	0.42	-1.03	0.26	-0.60	-2.02	<b>0.84</b>	<b>1.07</b>	-0.99	0.52	0.02	-0.77
<i>Veracruz</i>	-0.22	<b>0.95</b>	-0.34	-0.73	0.18	-0.62	-0.37	<b>1.13</b>	-0.17	-0.49	-0.80	-0.51
<i>Yucatán</i>	-1.86	-1.30	0.88	-1.23	0.84	<b>2.36</b>	-1.09	-0.66	0.58	-0.17	0.11	-0.61
<i>Zacatecas</i>	-0.10	0.23	-0.37	-0.13	-0.46	-0.51	-0.13	0.15	-0.49	0.21	-0.57	-0.35

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