

*Supplementary Information*  
Spatial Dependence in Regional Business Cycles:  
Evidence from Mexican States

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This online appendix provides details on data and the estimation results.

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## Online Appendix A. Data

### Figure OA.A. 1

Figure OA.A. 1 shows the seasonally adjusted Quarterly Indicator of State Economic Activity (*Indicador Trimestral de la Actividad Económica Estatal*, ITAEE) from 2003:Q1 to 2015Q4.

### Figure OA.A. 2

Figure OA.A. 2 shows the percentage changes of ITAEE, which are calculated by  $[\log(y_{t,n}) - \log(y_{t-1,n})] \times 100$ .

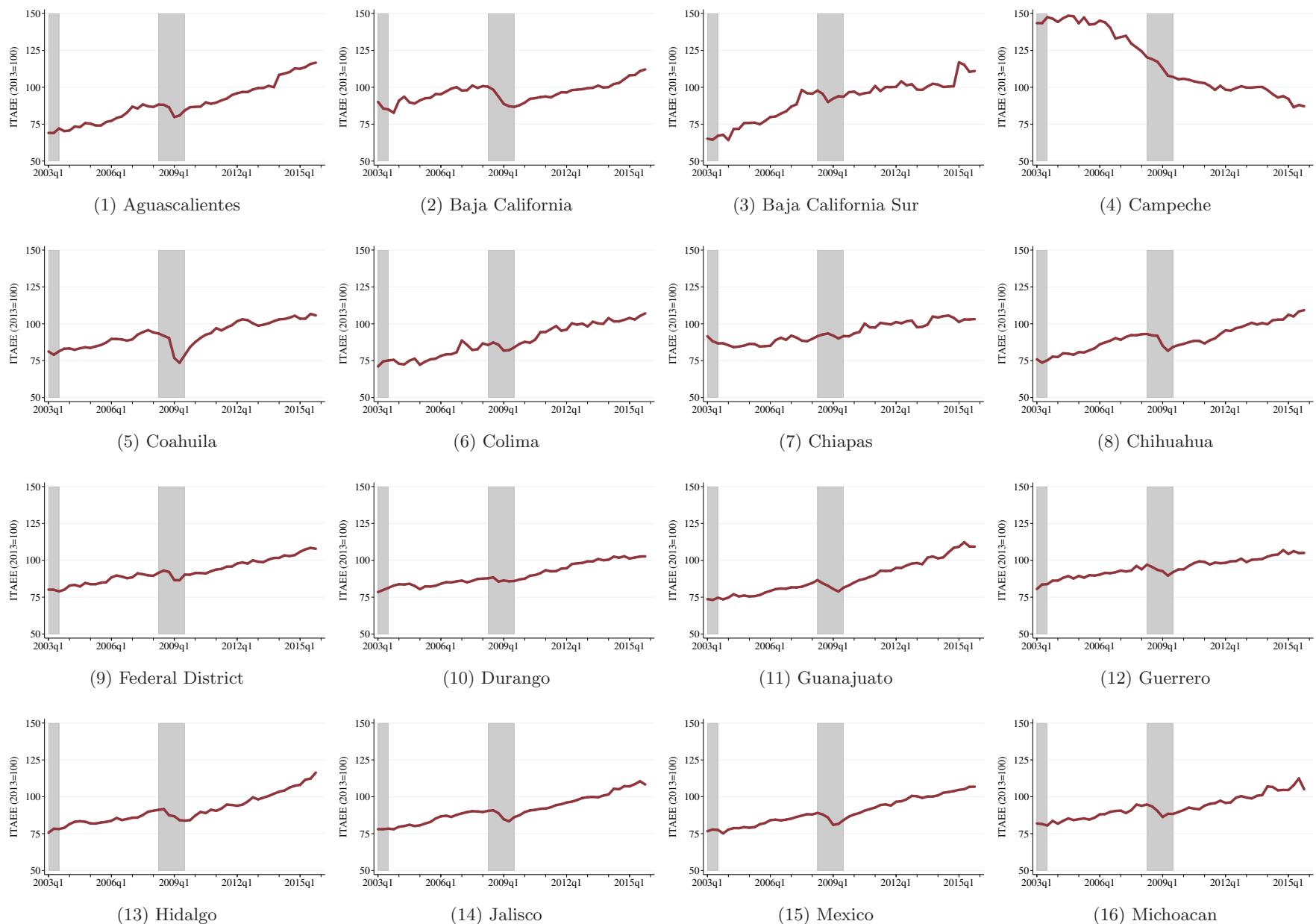


Figure OA.A. 1: Quarterly Indicator of State Economic Activity (ITAE)

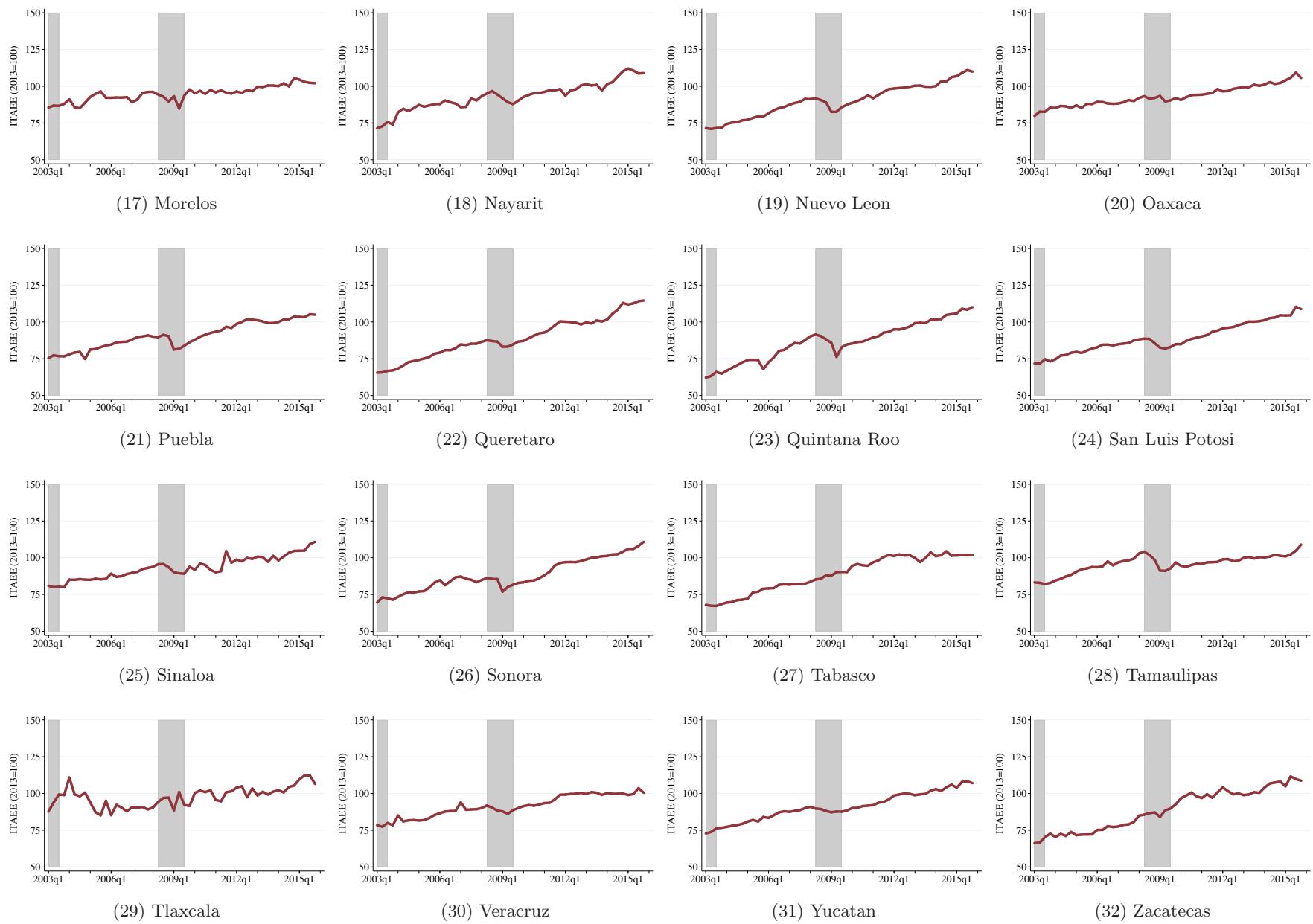


Figure OA.A. 1: ITAEE (Continued)

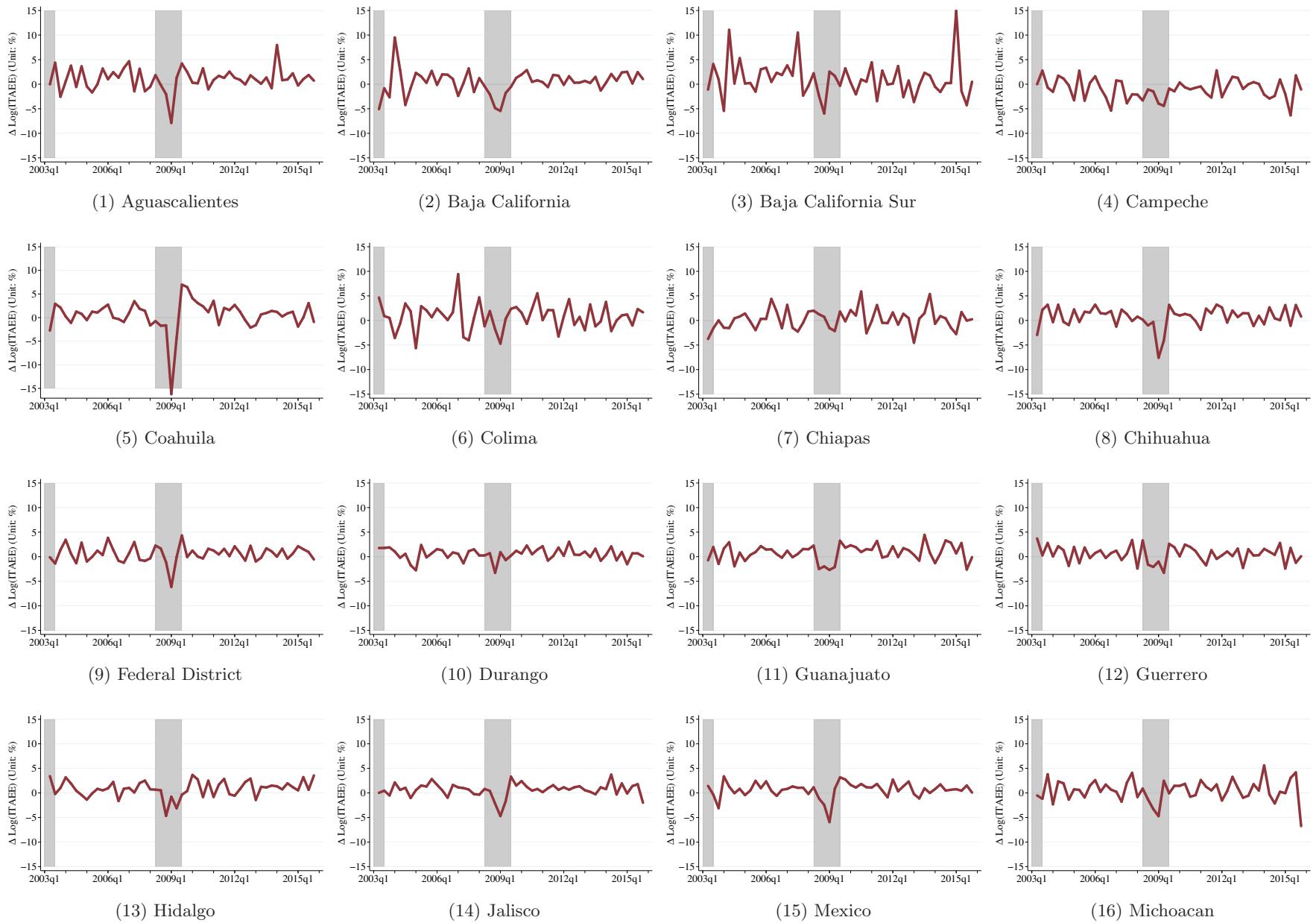


Figure OA.A. 2: Growth Rate of Quarterly Indicator of State Economic Activity (ITAAEE)

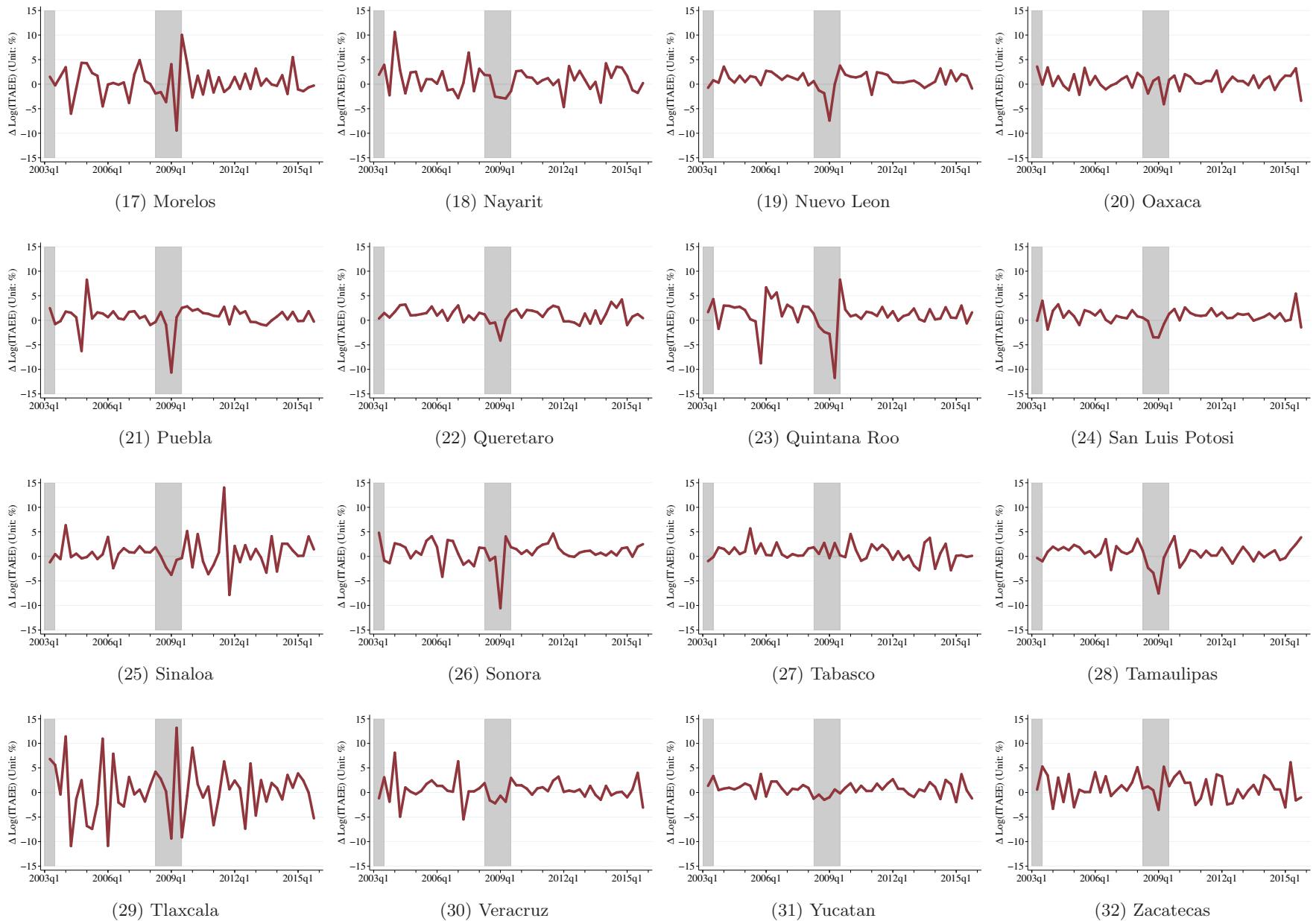


Figure OA.A. 2: Percentage Change of ITAEE (Continued)

## Online Appendix B. Estimation Results of Markov Switching Model

The estimation results here are obtained by estimating the standard Markov switching model:

$$\mathbf{y}_t = \boldsymbol{\mu}_0 \odot (\boldsymbol{\iota}_N - \mathbf{s}_t) + \boldsymbol{\mu}_1 \odot \mathbf{s}_t + \boldsymbol{\varepsilon}_t,$$

where  $\boldsymbol{\varepsilon}_t \sim \text{i.i.d. } N(\mathbf{0}, \boldsymbol{\Omega})$  and  $\boldsymbol{\Omega} = \text{diag}(\sigma_1^2, \dots, \sigma_N^2)$ .

### Table OA.B. 1

Table OA.B. 1 shows the point estimates and interval estimates of parameters.

### Figure OA.B. 1

Figure OA.B. 1 shows the probabilities of recession, which are calculated by  $1 - G^{-1} \sum_{g=1}^G s_{t,n}^{(g)}$ , where  $G$  is the number of iterations and the superscript  $(g)$  is the  $g$ th iteration.

### Figure OA.B. 2

Figure OA.B. 2 shows the histogram and density plots of parameters by state. The solid line indicates density estimates obtained by kernel density estimation.

### Figure OA.B. 3

Figure OA.B. 3 shows the autocorrelation plots of parameters by state.

### Figure OA.B. 4

Figure OA.B. 4 shows the trace plots of parameters by state.

Table OA.B. 1: Estimated Parameters of Markov Swithcing Model

| Code | State               | $\mu_0$ |        |                | $\mu_1$ |        |               |
|------|---------------------|---------|--------|----------------|---------|--------|---------------|
|      |                     | Mean    | Median | 95% CI         | Mean    | Median | 95% CI        |
| 1    | Aguascalientes      | -0.69   | -0.61  | [-2.78, 0.95]  | 1.18    | 1.18   | [0.52, 1.90]  |
| 2    | Baja California     | -1.47   | -1.53  | [-3.15, 0.34]  | 0.90    | 0.91   | [0.12, 1.64]  |
| 3    | Baja California Sur | -0.34   | -0.24  | [-2.19, 1.00]  | 1.11    | 1.09   | [0.14, 2.20]  |
| 4    | Campeche            | -1.42   | -1.36  | [-2.57, -0.59] | -0.16   | -0.25  | [-1.10, 1.23] |
| 5    | Coahuila            | -1.45   | -1.43  | [-3.59, 0.49]  | 0.97    | 0.97   | [0.08, 1.87]  |
| 6    | Colima              | -0.32   | -0.20  | [-2.13, 0.91]  | 0.96    | 0.93   | [0.19, 1.92]  |
| 7    | Chiapas             | -0.63   | -0.54  | [-2.16, 0.40]  | 0.49    | 0.44   | [-0.18, 1.46] |
| 8    | Chihuahua           | -2.12   | -2.21  | [-3.95, 0.15]  | 1.02    | 1.02   | [0.51, 1.51]  |
| 9    | Federal District    | -0.85   | -0.70  | [-3.09, 0.62]  | 0.74    | 0.72   | [0.23, 1.30]  |
| 10   | Durango             | -0.69   | -0.50  | [-2.59, 0.59]  | 0.70    | 0.68   | [0.29, 1.26]  |
| 11   | Guanajuato          | -1.13   | -1.22  | [-2.53, 0.58]  | 1.08    | 1.08   | [0.55, 1.63]  |
| 12   | Guerrero            | -0.38   | -0.21  | [-2.14, 0.66]  | 0.73    | 0.69   | [0.18, 1.51]  |
| 13   | Hidalgo             | -1.07   | -1.13  | [-2.65, 0.66]  | 1.12    | 1.11   | [0.62, 1.66]  |
| 14   | Jalisco             | -1.93   | -1.99  | [-3.14, -0.26] | 0.88    | 0.88   | [0.52, 1.22]  |
| 15   | México              | -2.23   | -2.28  | [-3.61, -0.46] | 0.93    | 0.93   | [0.54, 1.28]  |
| 16   | Michoacán           | -0.81   | -0.64  | [-3.00, 0.60]  | 0.68    | 0.66   | [0.03, 1.44]  |
| 17   | Morelos             | -0.49   | -0.39  | [-2.09, 0.62]  | 0.62    | 0.58   | [-0.24, 1.75] |
| 18   | Nayarit             | -0.31   | -0.20  | [-2.08, 0.90]  | 1.07    | 1.02   | [0.24, 2.20]  |
| 19   | Nuevo León          | -1.97   | -2.00  | [-3.57, -0.11] | 1.10    | 1.10   | [0.68, 1.52]  |
| 20   | Oaxaca              | -0.34   | -0.13  | [-2.31, 0.70]  | 0.69    | 0.66   | [0.18, 1.39]  |
| 21   | Puebla              | -1.16   | -0.91  | [-4.07, 0.68]  | 0.89    | 0.89   | [0.19, 1.64]  |
| 22   | Querétaro           | -0.49   | -0.43  | [-2.17, 0.88]  | 1.36    | 1.35   | [0.85, 1.94]  |
| 23   | Quintana Roo        | -1.60   | -1.68  | [-3.91, 0.83]  | 1.50    | 1.53   | [0.58, 2.31]  |
| 24   | San Luis Potosí     | -1.36   | -1.44  | [-2.94, 0.53]  | 1.02    | 1.02   | [0.59, 1.43]  |
| 25   | Sinaloa             | -0.38   | -0.28  | [-2.13, 0.79]  | 0.80    | 0.77   | [-0.04, 1.82] |
| 26   | Sonora              | -1.04   | -0.93  | [-3.56, 0.84]  | 1.16    | 1.15   | [0.47, 1.88]  |
| 27   | Tabasco             | -0.27   | -0.16  | [-2.03, 0.82]  | 0.96    | 0.93   | [0.42, 1.63]  |
| 28   | Tamaulipas          | -2.13   | -2.24  | [-3.77, 0.14]  | 0.85    | 0.85   | [0.34, 1.34]  |
| 29   | Tlaxcalá            | -0.61   | -0.55  | [-2.28, 0.74]  | 0.71    | 0.67   | [-0.48, 2.04] |
| 30   | Veracruz            | -0.40   | -0.26  | [-2.16, 0.68]  | 0.67    | 0.63   | [0.00, 1.58]  |
| 31   | Yucatán             | -0.23   | -0.09  | [-1.97, 0.82]  | 0.90    | 0.88   | [0.45, 1.48]  |
| 32   | Zacatecas           | -0.23   | -0.10  | [-2.06, 1.02]  | 1.11    | 1.08   | [0.37, 2.09]  |

Notes: 95% CI indicates 95% credible interval.

Table OA.B. 1: Estimated Parameters (Continued)

| Code | State               | $\sigma^2$ |        |                | $p_{11}$ |        |              | $p_{00}$ |        |              |
|------|---------------------|------------|--------|----------------|----------|--------|--------------|----------|--------|--------------|
|      |                     | Mean       | Median | 95% CI         | Mean     | Median | 95% CI       | Mean     | Median | 95% CI       |
| 1    | Aguascalientes      | 4.80       | 4.68   | [3.15, 7.28]   | 0.93     | 0.95   | [0.74, 1.00] | 0.76     | 0.77   | [0.47, 0.95] |
| 2    | Baja California     | 4.58       | 4.42   | [2.71, 7.27]   | 0.93     | 0.95   | [0.78, 1.00] | 0.75     | 0.77   | [0.50, 0.95] |
| 3    | Baja California Sur | 13.22      | 12.88  | [9.00, 19.38]  | 0.92     | 0.95   | [0.70, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 4    | Campeche            | 3.84       | 3.77   | [2.42, 5.73]   | 0.86     | 0.89   | [0.62, 0.99] | 0.84     | 0.87   | [0.57, 0.98] |
| 5    | Coahuila            | 8.38       | 8.12   | [5.36, 12.70]  | 0.93     | 0.95   | [0.75, 1.00] | 0.77     | 0.78   | [0.51, 0.95] |
| 6    | Colima              | 7.17       | 7.01   | [4.79, 10.54]  | 0.91     | 0.94   | [0.68, 1.00] | 0.77     | 0.79   | [0.48, 0.96] |
| 7    | Chiapas             | 4.08       | 3.97   | [2.72, 5.98]   | 0.92     | 0.95   | [0.68, 1.00] | 0.78     | 0.79   | [0.49, 0.96] |
| 8    | Chihuahua           | 2.88       | 2.77   | [1.81, 4.60]   | 0.95     | 0.96   | [0.85, 1.00] | 0.73     | 0.75   | [0.46, 0.94] |
| 9    | Federal District    | 2.60       | 2.54   | [1.68, 3.93]   | 0.93     | 0.96   | [0.73, 1.00] | 0.75     | 0.76   | [0.46, 0.96] |
| 10   | Durango             | 1.47       | 1.44   | [0.86, 2.27]   | 0.92     | 0.94   | [0.71, 1.00] | 0.75     | 0.77   | [0.45, 0.96] |
| 11   | Guanajuato          | 2.17       | 2.09   | [1.28, 3.50]   | 0.93     | 0.94   | [0.77, 0.99] | 0.75     | 0.76   | [0.48, 0.94] |
| 12   | Guerrero            | 2.66       | 2.60   | [1.68, 3.96]   | 0.91     | 0.93   | [0.67, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 13   | Hidalgo             | 2.23       | 2.15   | [1.44, 3.42]   | 0.93     | 0.95   | [0.78, 0.99] | 0.76     | 0.78   | [0.50, 0.95] |
| 14   | Jalisco             | 1.34       | 1.29   | [0.87, 2.11]   | 0.96     | 0.97   | [0.88, 1.00] | 0.76     | 0.78   | [0.50, 0.95] |
| 15   | México              | 1.53       | 1.47   | [0.97, 2.48]   | 0.95     | 0.95   | [0.86, 0.99] | 0.72     | 0.73   | [0.46, 0.93] |
| 16   | Michoacán           | 4.50       | 4.41   | [2.80, 6.77]   | 0.93     | 0.96   | [0.74, 1.00] | 0.77     | 0.79   | [0.49, 0.96] |
| 17   | Morelos             | 9.21       | 9.00   | [6.32, 13.37]  | 0.90     | 0.93   | [0.65, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 18   | Nayarit             | 6.68       | 6.54   | [4.42, 9.81]   | 0.90     | 0.93   | [0.66, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 19   | Nuevo León          | 2.14       | 2.07   | [1.40, 3.27]   | 0.96     | 0.96   | [0.88, 1.00] | 0.75     | 0.77   | [0.49, 0.94] |
| 20   | Oaxaca              | 2.62       | 2.56   | [1.75, 3.87]   | 0.92     | 0.95   | [0.69, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 21   | Puebla              | 4.99       | 4.90   | [2.78, 7.73]   | 0.93     | 0.95   | [0.74, 1.00] | 0.75     | 0.76   | [0.46, 0.96] |
| 22   | Querétaro           | 1.83       | 1.77   | [1.17, 2.81]   | 0.93     | 0.94   | [0.77, 1.00] | 0.76     | 0.78   | [0.51, 0.95] |
| 23   | Quintana Roo        | 7.15       | 6.86   | [4.09, 11.91]  | 0.93     | 0.94   | [0.77, 0.99] | 0.74     | 0.75   | [0.47, 0.94] |
| 24   | San Luis Potosí     | 1.88       | 1.81   | [1.22, 2.93]   | 0.95     | 0.96   | [0.84, 1.00] | 0.76     | 0.78   | [0.49, 0.95] |
| 25   | Sinaloa             | 9.24       | 9.01   | [6.35, 13.44]  | 0.91     | 0.94   | [0.68, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 26   | Sonora              | 4.69       | 4.58   | [2.85, 7.21]   | 0.93     | 0.95   | [0.73, 1.00] | 0.75     | 0.76   | [0.46, 0.95] |
| 27   | Tabasco             | 2.74       | 2.67   | [1.81, 4.00]   | 0.93     | 0.95   | [0.73, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 28   | Tamaulipas          | 2.66       | 2.55   | [1.68, 4.23]   | 0.95     | 0.96   | [0.83, 0.99] | 0.75     | 0.76   | [0.48, 0.94] |
| 29   | Tlaxcala            | 27.69      | 27.09  | [18.95, 39.97] | 0.90     | 0.93   | [0.66, 1.00] | 0.79     | 0.81   | [0.51, 0.97] |
| 30   | Veracruz            | 4.94       | 4.83   | [3.35, 7.18]   | 0.92     | 0.95   | [0.70, 1.00] | 0.79     | 0.81   | [0.49, 0.97] |
| 31   | Yucatán             | 1.76       | 1.71   | [1.15, 2.59]   | 0.93     | 0.95   | [0.71, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 32   | Zacatecas           | 5.84       | 5.73   | [3.87, 8.57]   | 0.91     | 0.94   | [0.67, 1.00] | 0.77     | 0.79   | [0.48, 0.97] |

Notes: 95% CI indicates 95% credible interval.

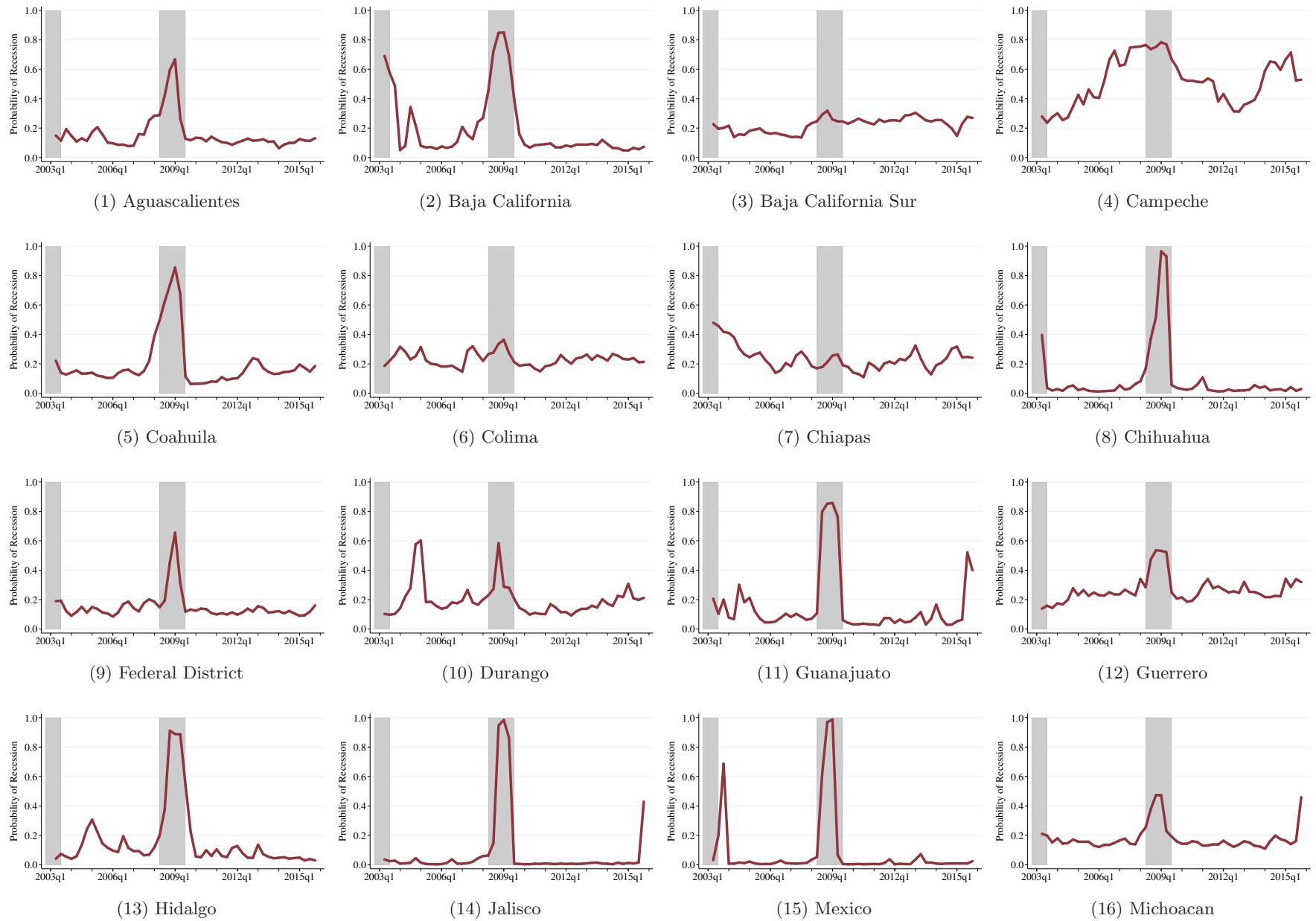


Figure OA.B. 1: Recession Probabilities from Markov Switching Model

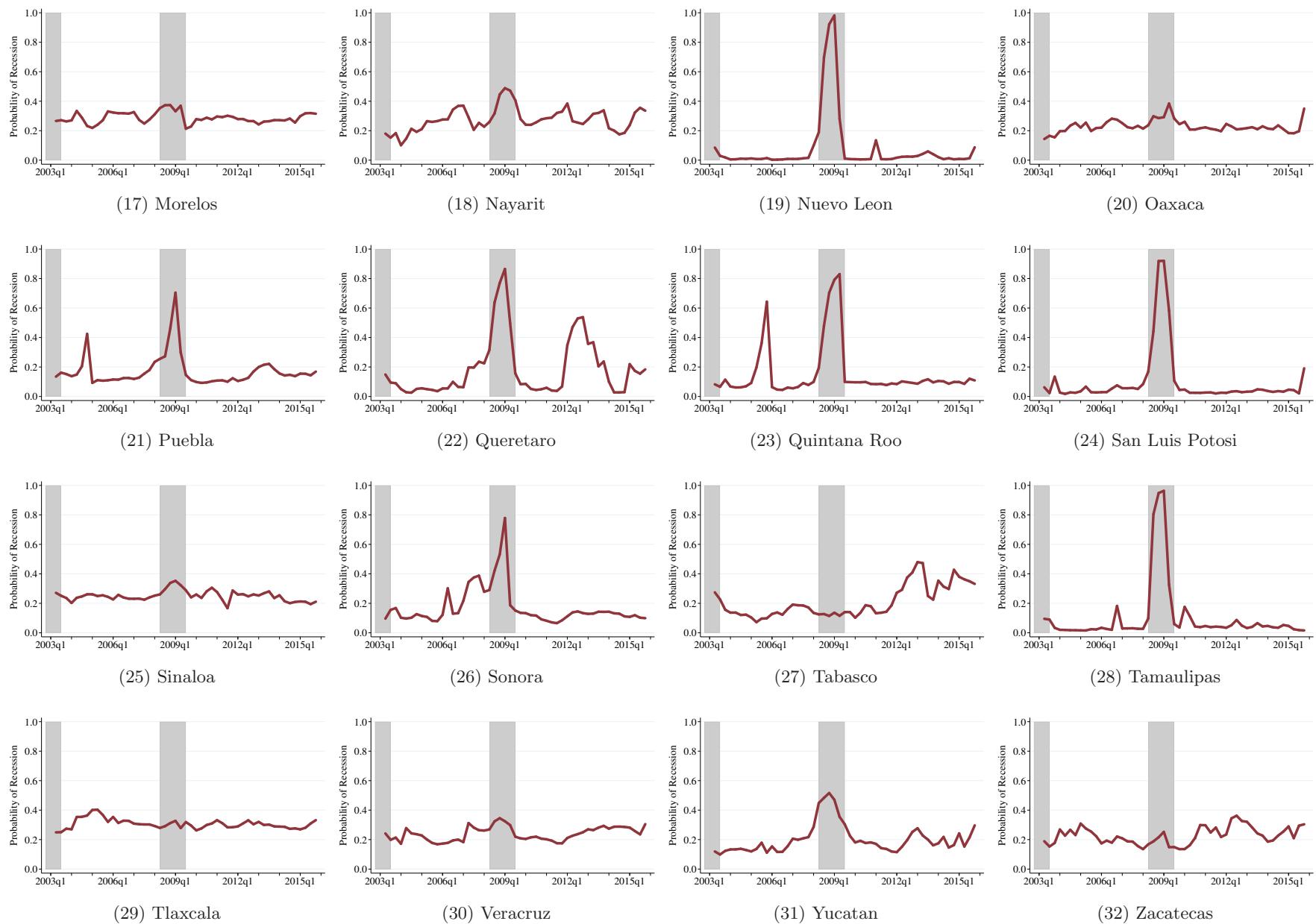


Figure OA.B. 1: Recessions Probabilities from Markov Switching Model (Continued)

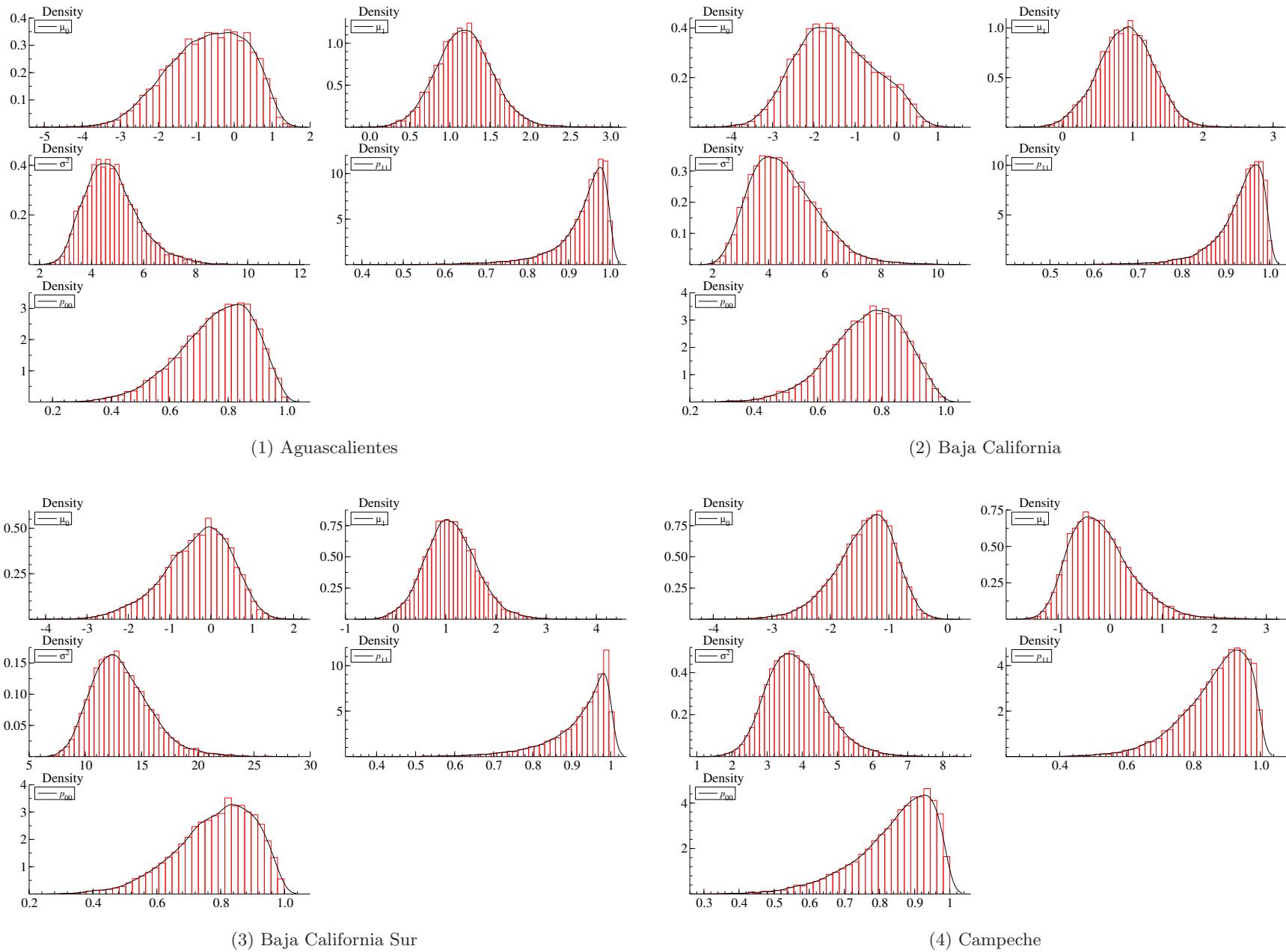
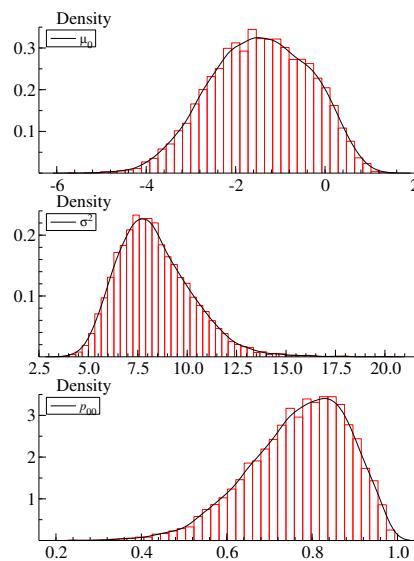
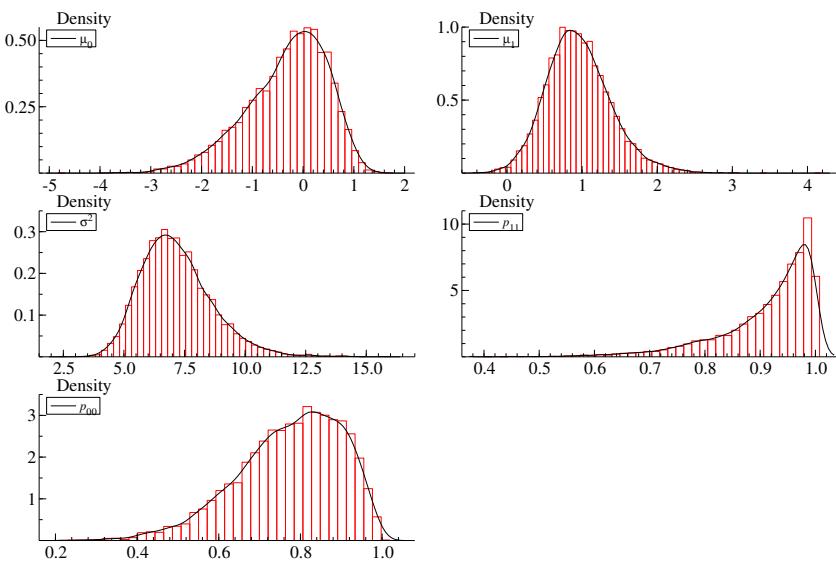


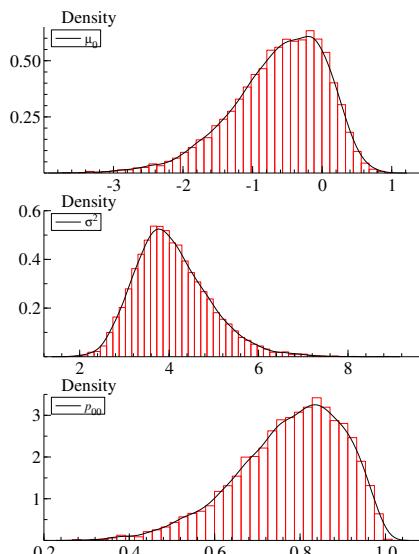
Figure OA.B. 2: Posterior Distributions from Markov Swithcing Model



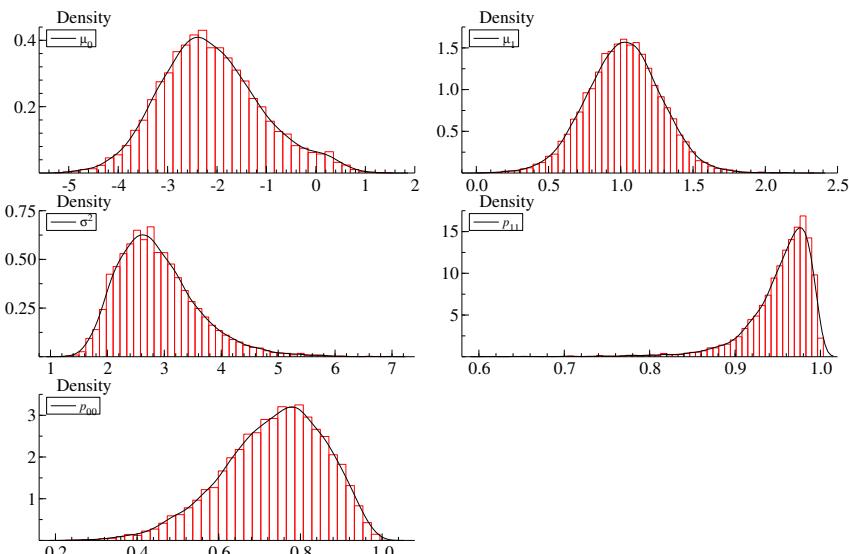
(5) Coahuila



(6) Colima

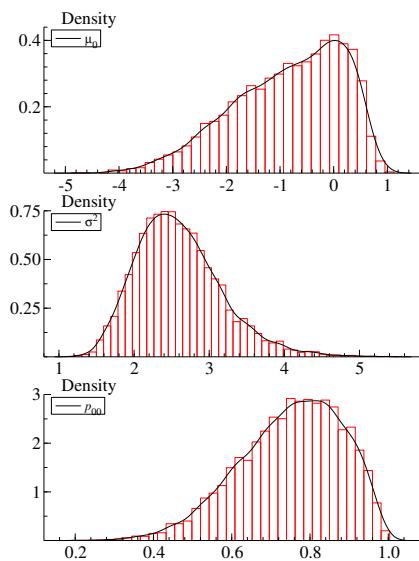


(7) Chiapas

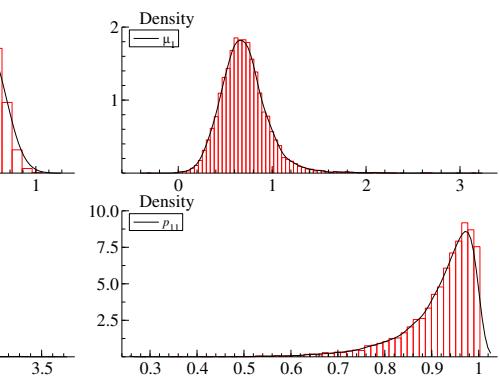
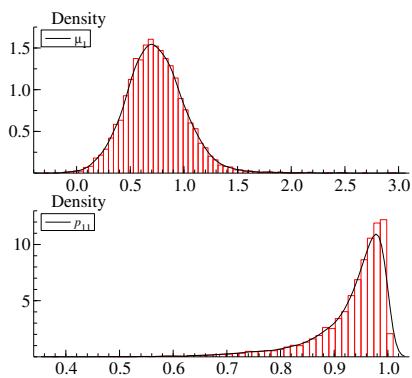


(8) Chihuahua

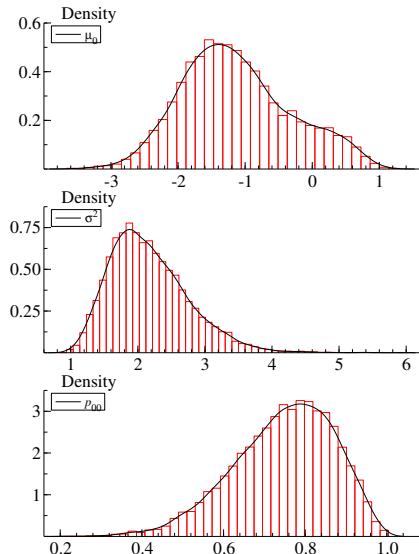
Figure OA.B. 2: Posterior Distributions from Markov Switching Model (Continued)



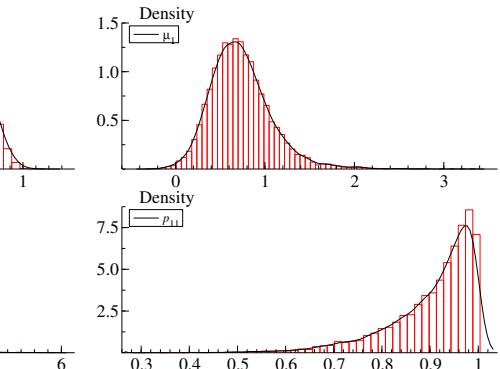
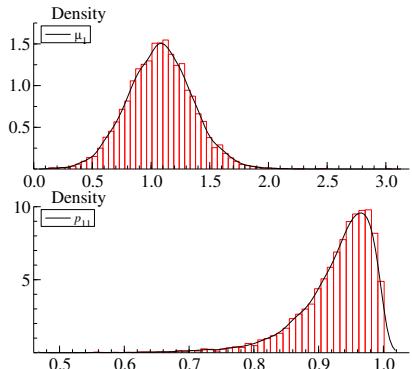
(9) Federal District



(10) Durango

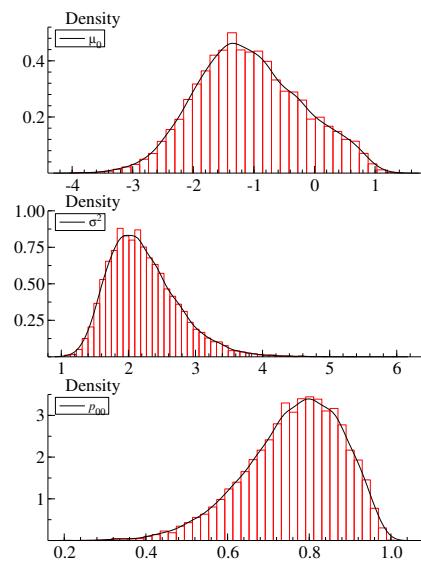


(11) Guanajuato

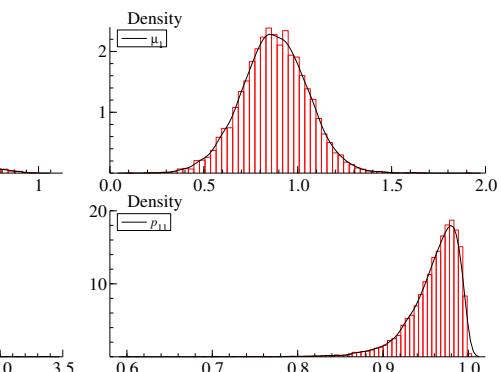
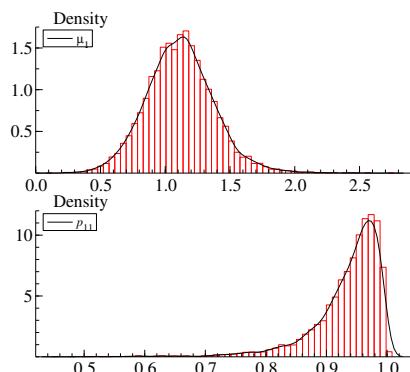


(12) Guerrero

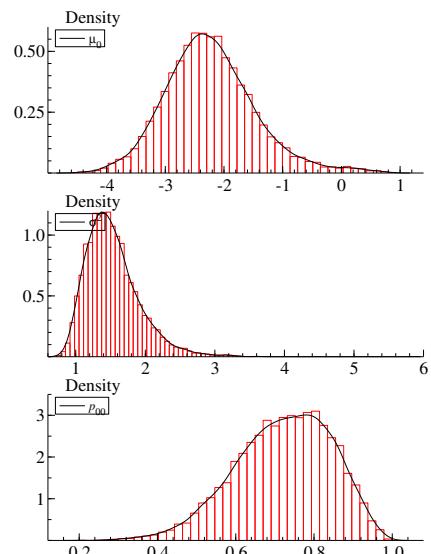
Figure OA.B. 2: Posterior Distributions from Markov Swithcing Model (Continued)



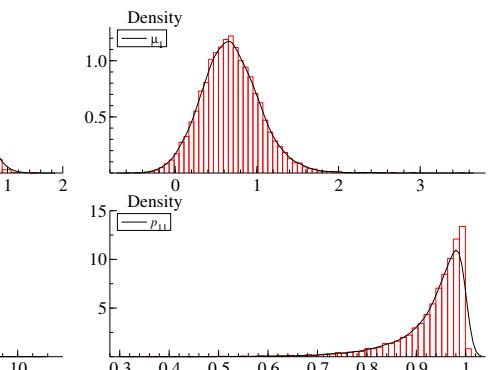
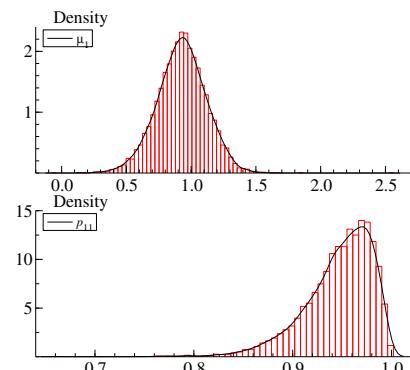
(13) Hidalgo



(14) Jalisco

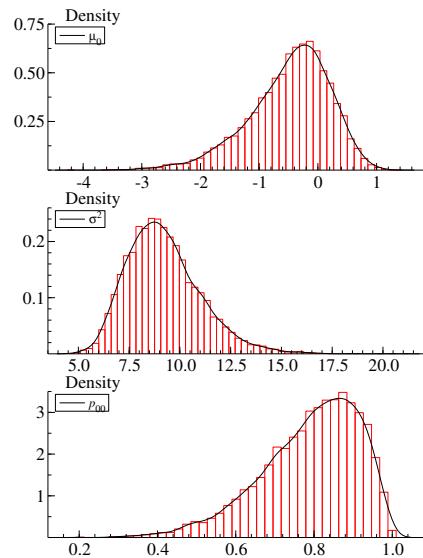


(15) Mexico

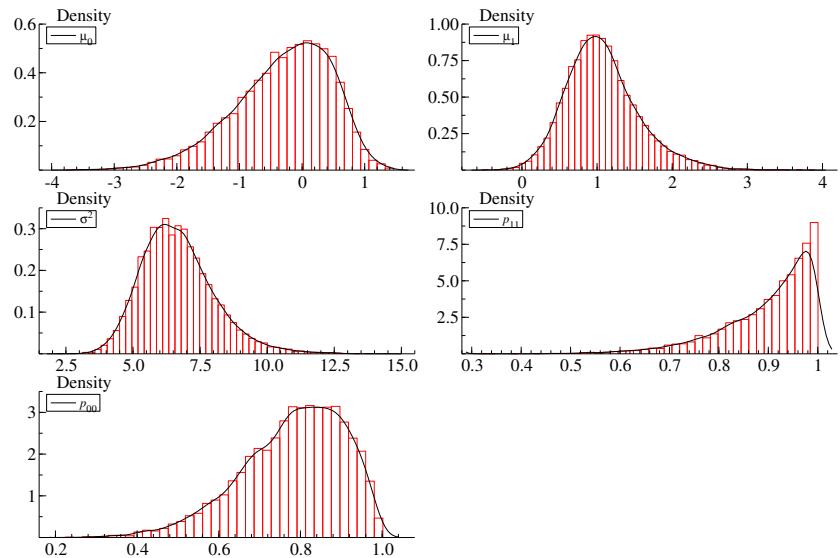


(16) Michoacan

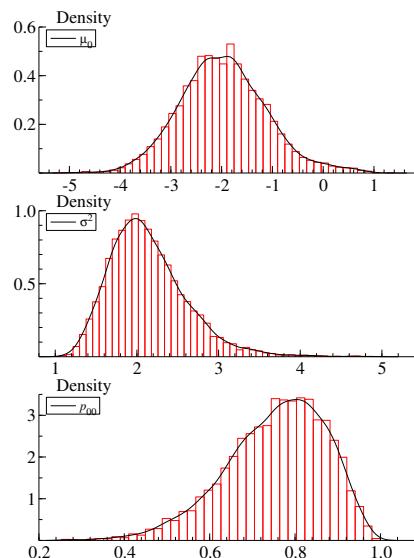
Figure OA.B. 2: Posterior Distributions from Markov Switching Model (Continued)



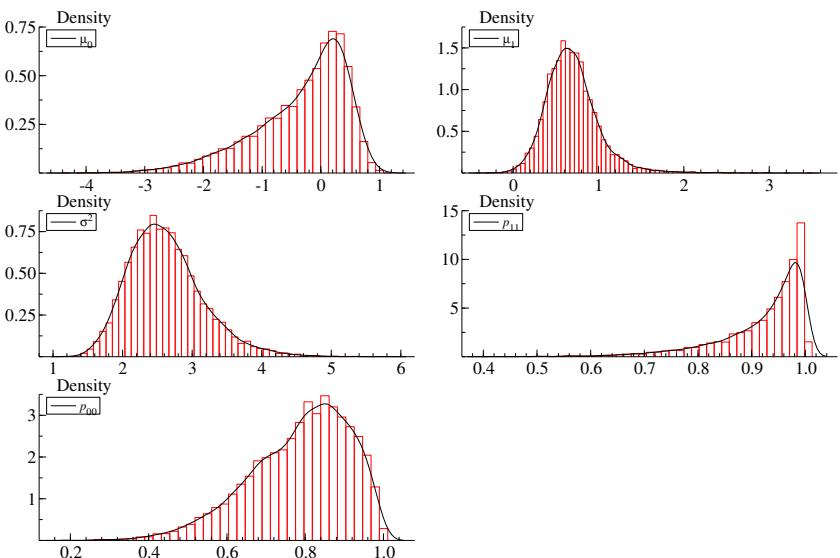
(17) Morelos



(18) Nayarit

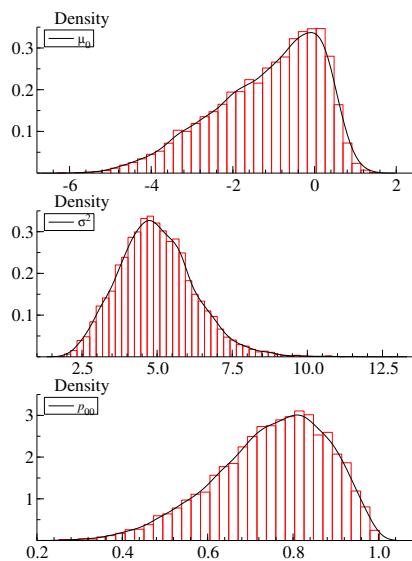


(19) Nuevo Leon

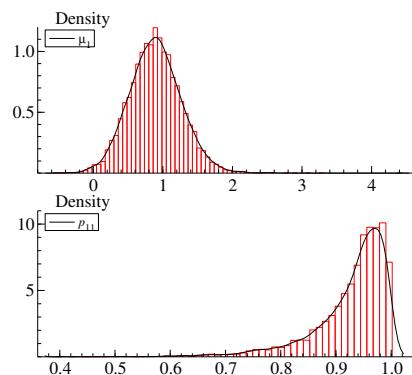


(20) Oaxaca

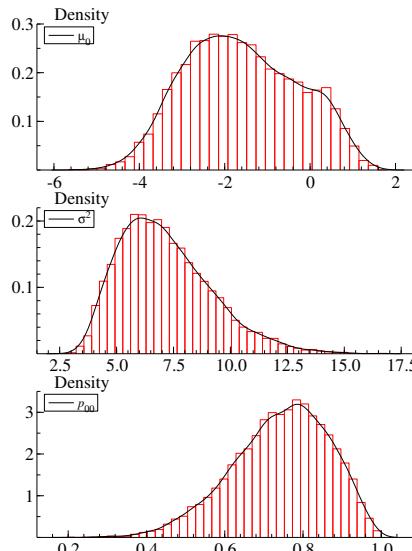
Figure OA.B. 2: Posterior Distributions from Markov Switching Model (Continued)



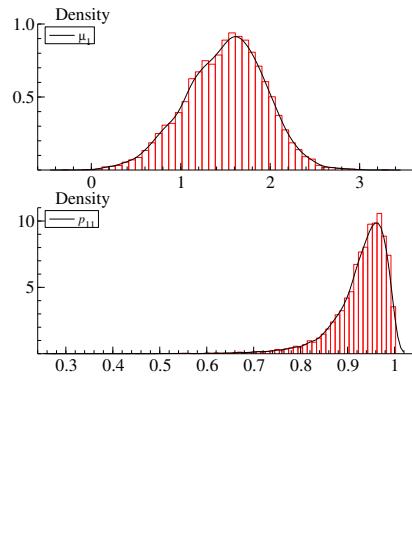
(21) Puebla



(22) Queretaro



(23) Quintana Roo



(24) San Luis Potosi

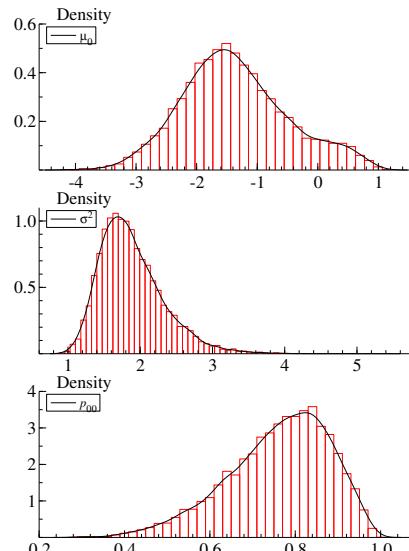
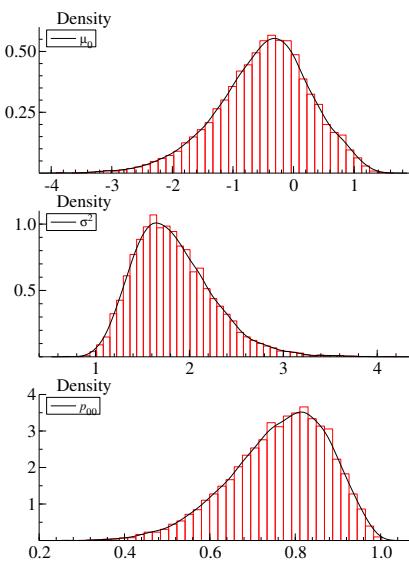
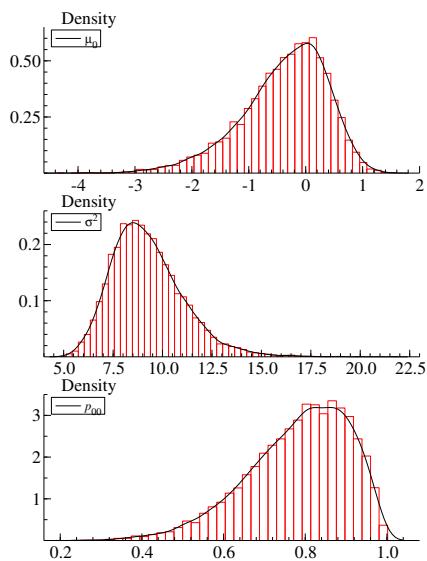
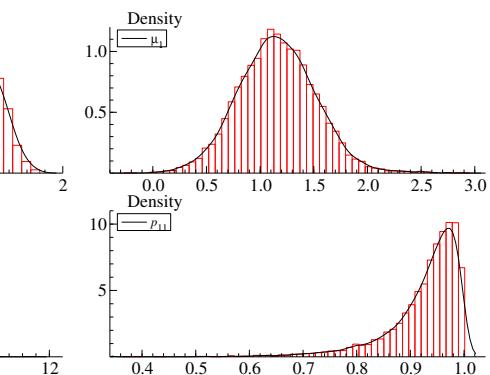
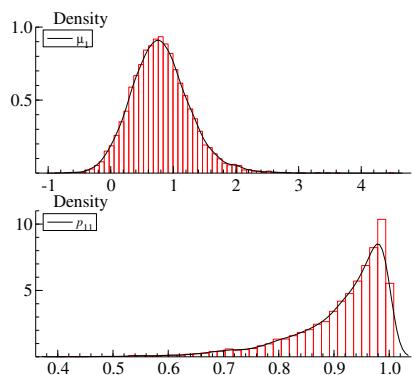


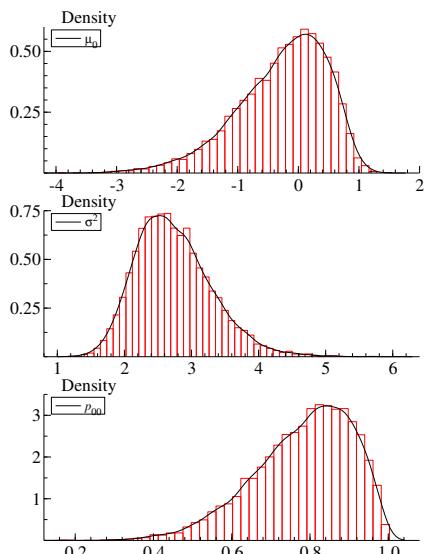
Figure OA.B. 2: Posterior Distributions from Markov Switching Model (Continued)



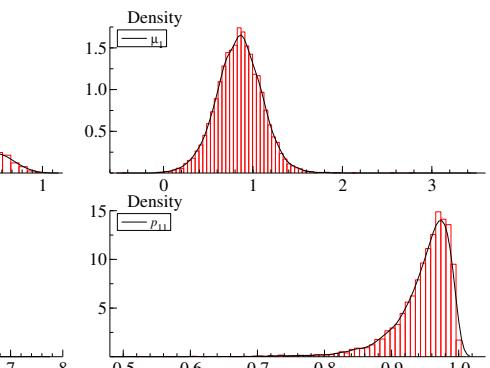
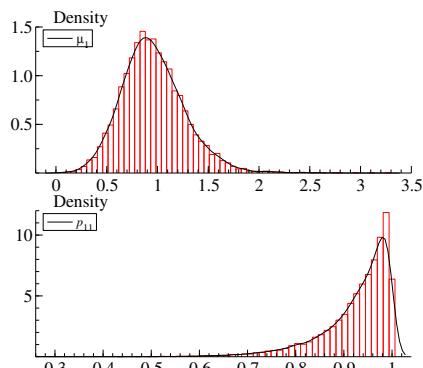
(25) Sinaloa



(26) Sonora

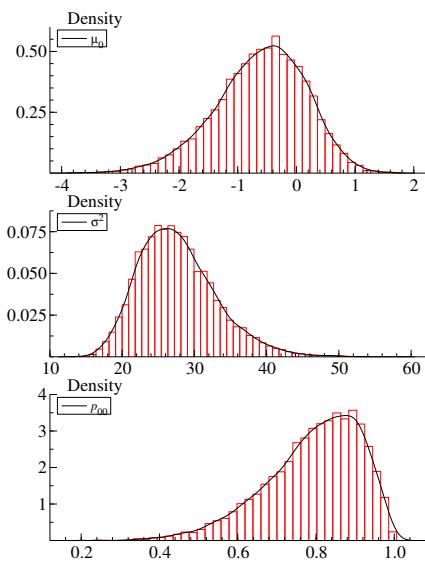


(27) Tabasco

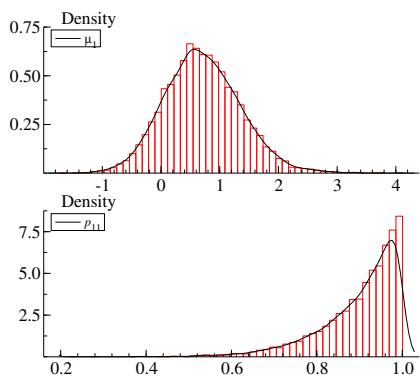


(28) Tamaulipas

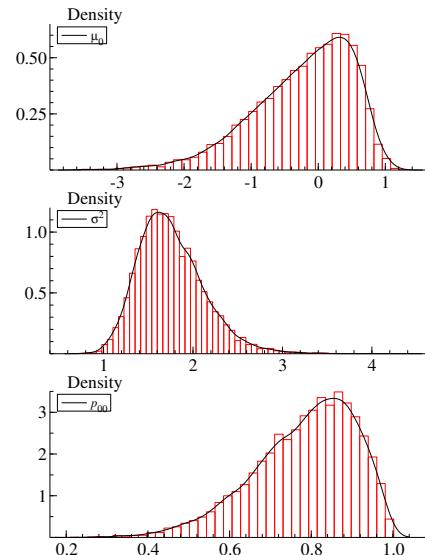
Figure OA.B. 2: Posterior Distributions from Markov Switching Model (Continued)



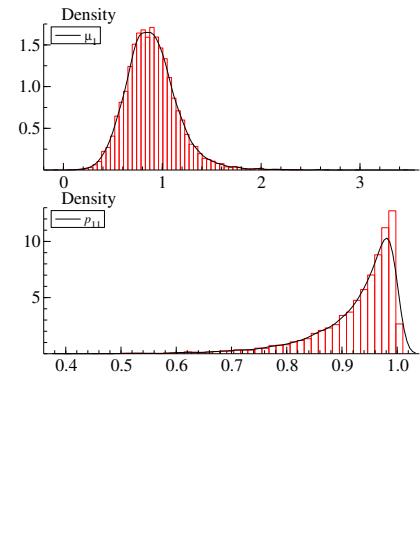
(29) Tlaxcala



(30) Veracruz



(31) Yucatan



(32) Zacatecas

Figure OA.B. 2: Posterior Distributions from Markov Switching Model (Continued)

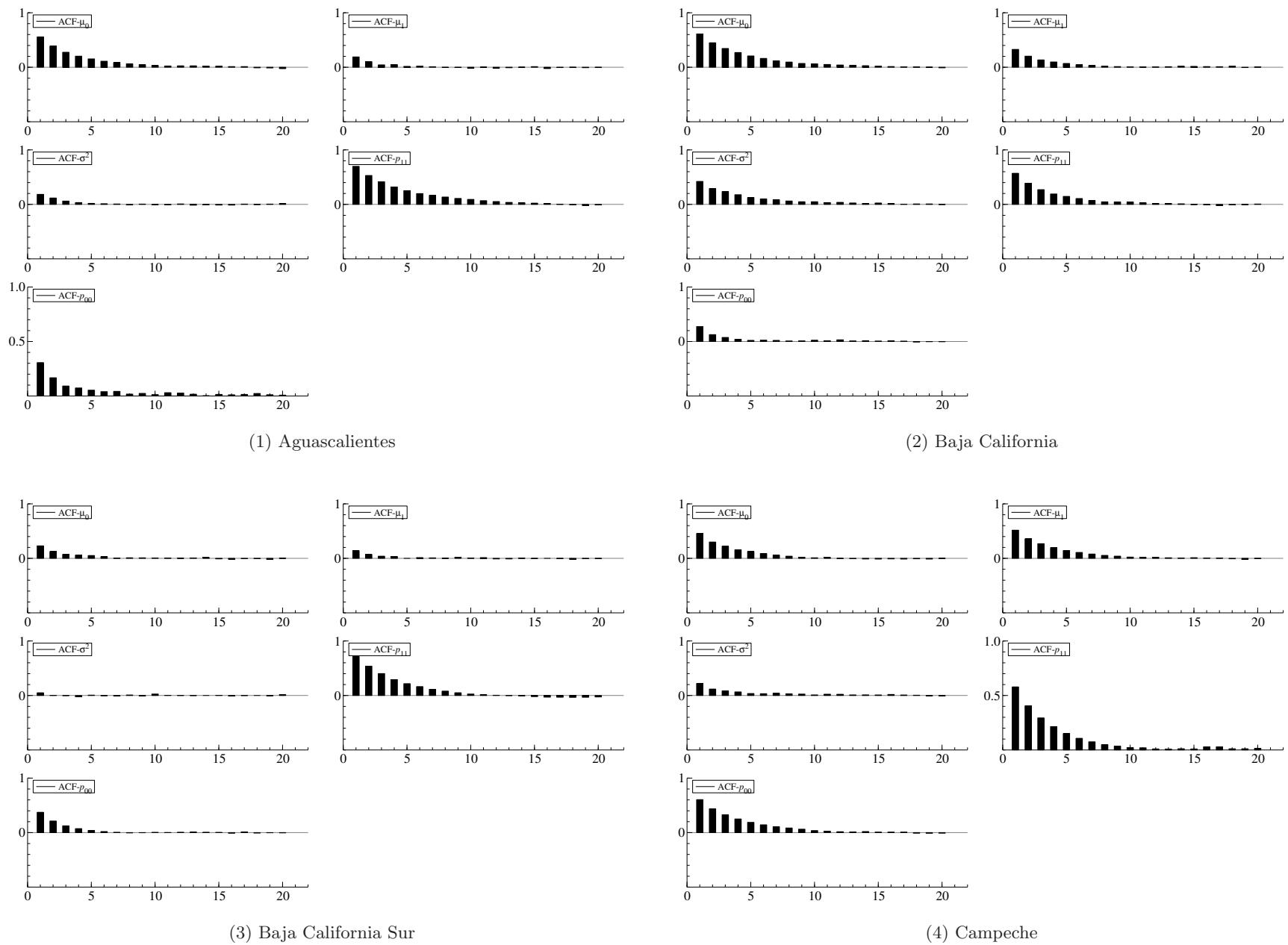
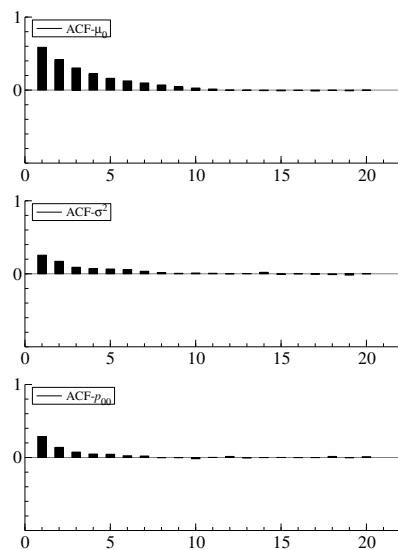
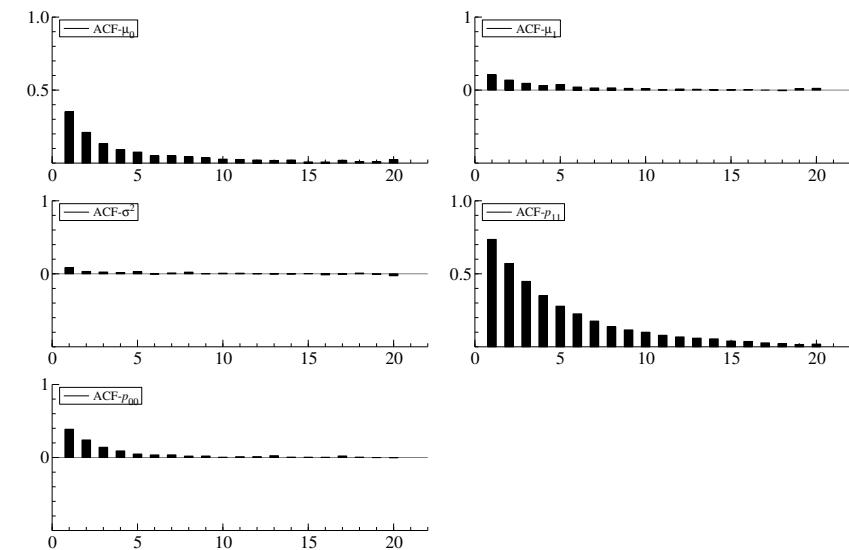


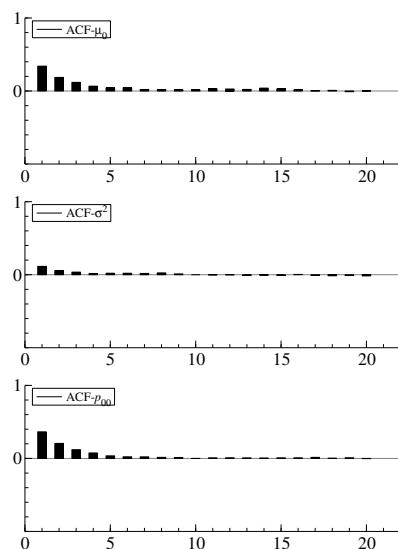
Figure OA.B. 3: Autocorrelation Function from Markov Switching Model



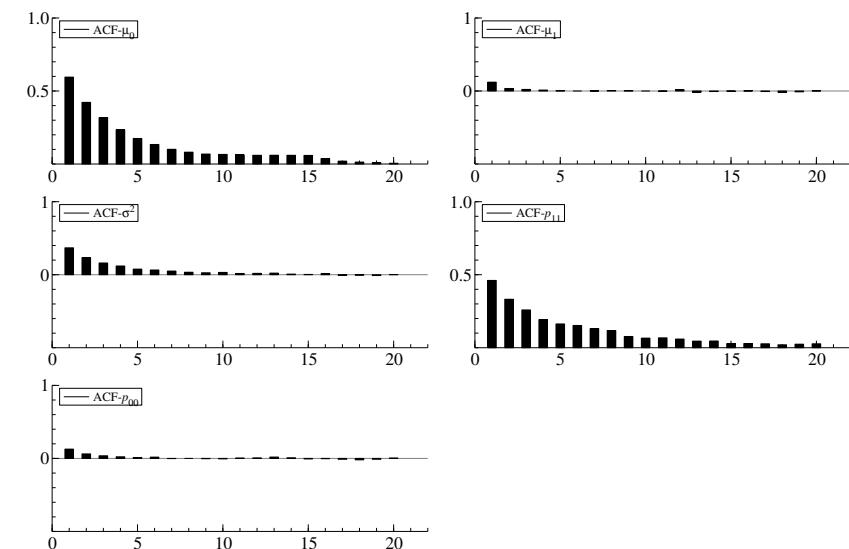
(5) Coahuila



(6) Colima

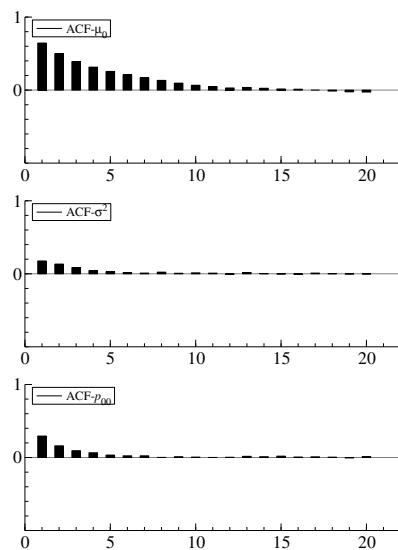


(7) Chiapas

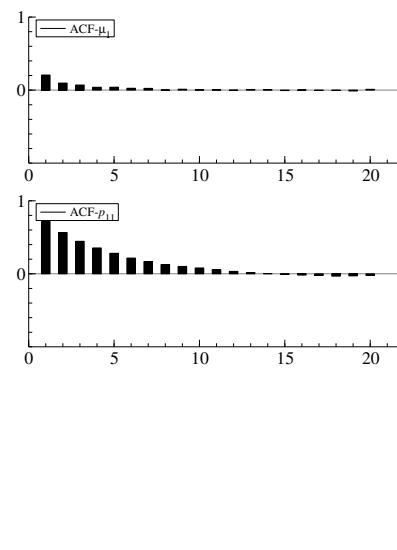


(8) Chihuahua

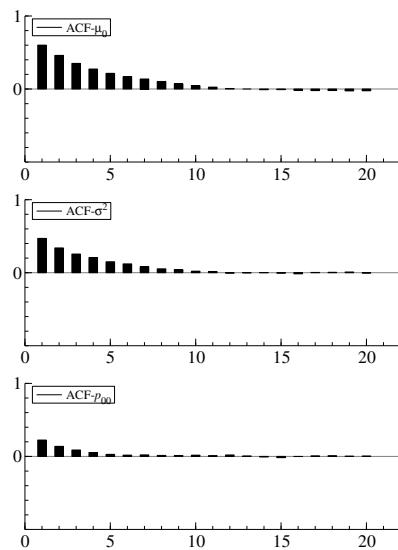
Figure OA.B. 3: Autocorrelation Function from Markov Swithcing Model (Continued)



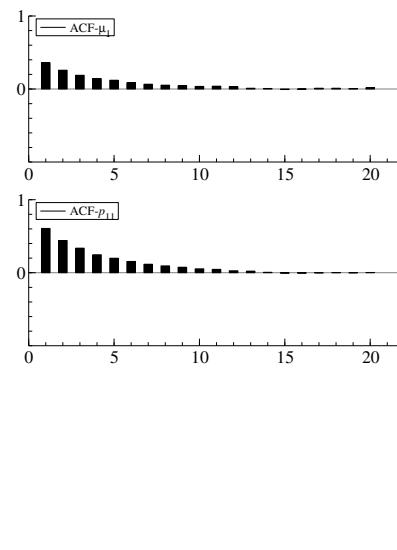
(9) Federal District



(10) Durango

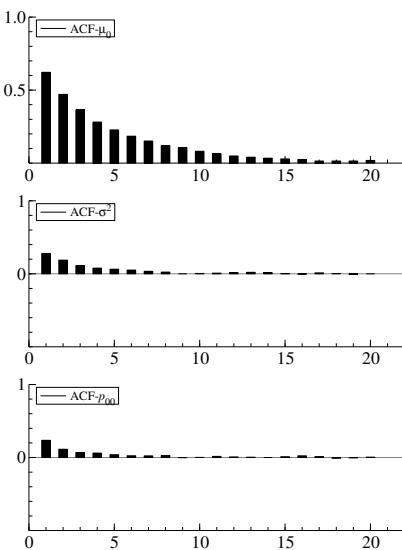


(11) Guanajuato

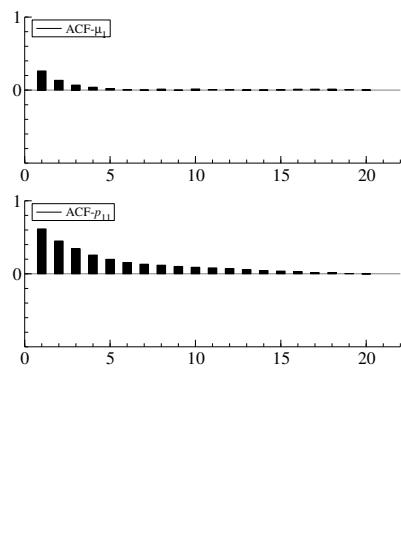


(12) Guerrero

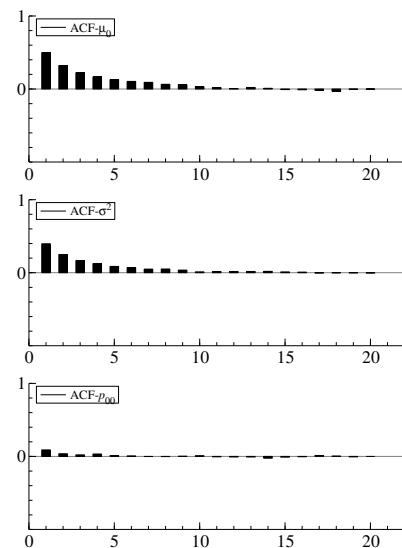
Figure OA.B. 3: Autocorrelation Function from Markov Swithcing Model (Continued)



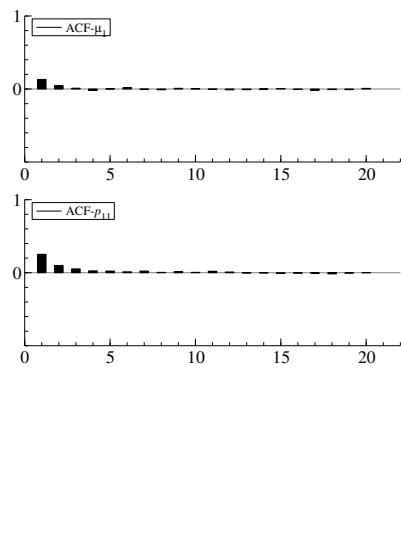
(13) Hidalgo



(14) Jalisco

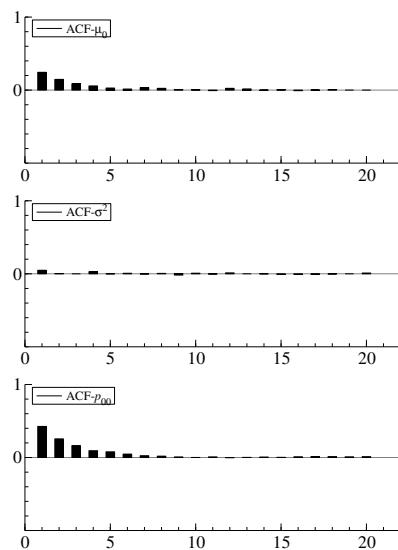


(15) Mexico

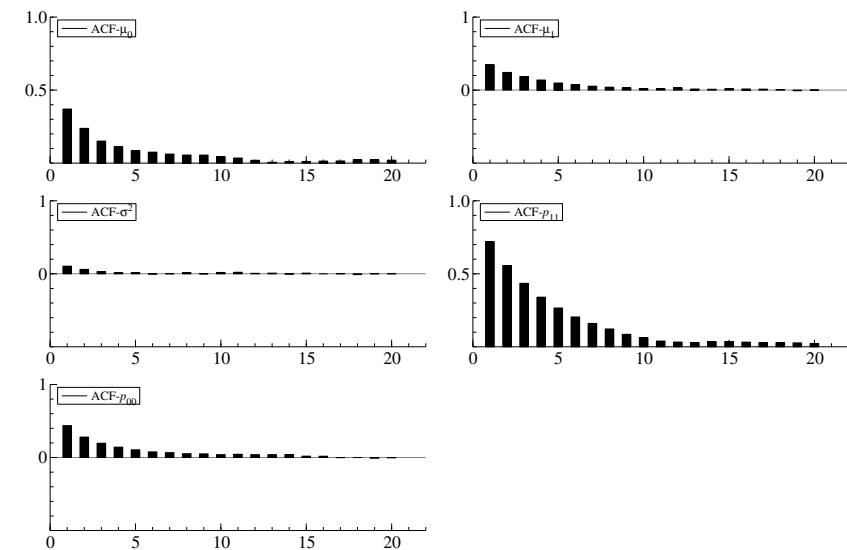


(16) Michoacan

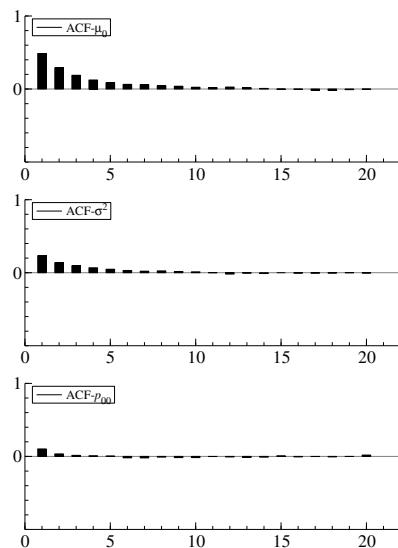
Figure OA.B. 3: Autocorrelation Function (Continued)



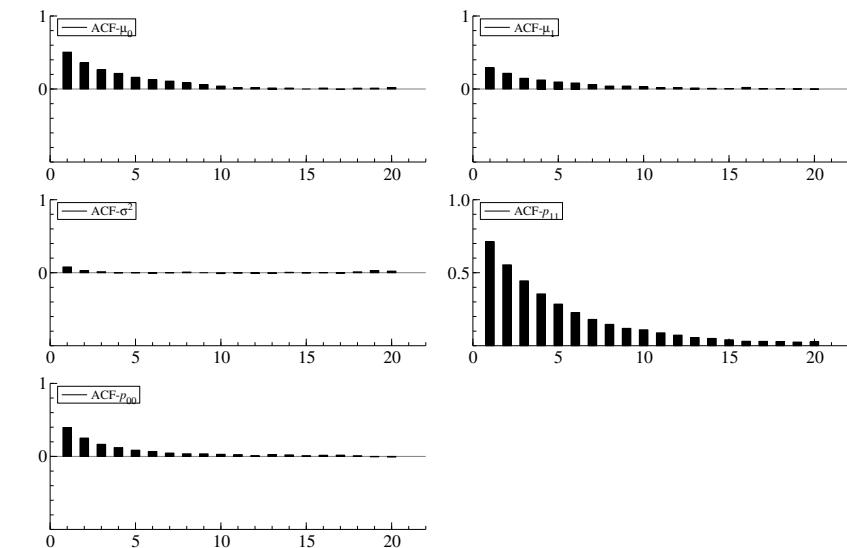
(17) Morelos



(18) Nayarit

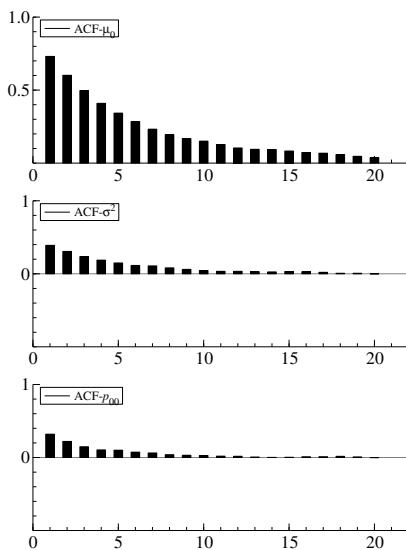


(19) Nuevo Leon

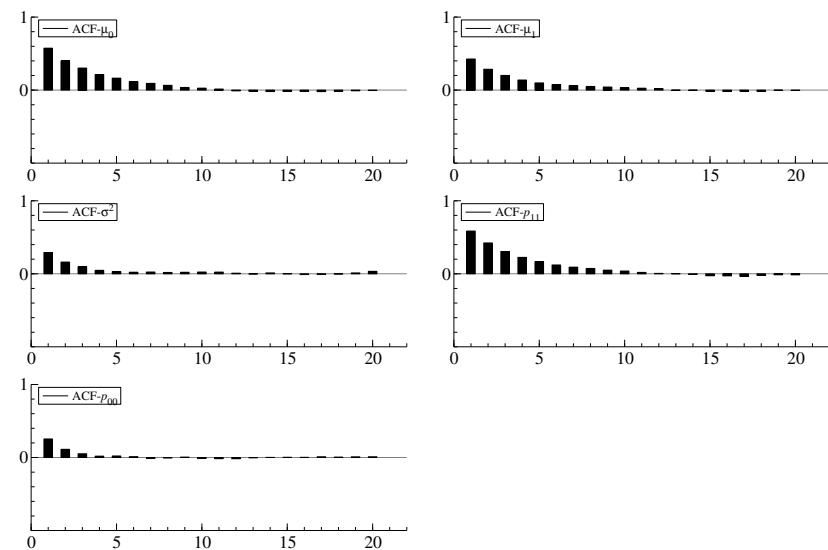


(20) Oaxaca

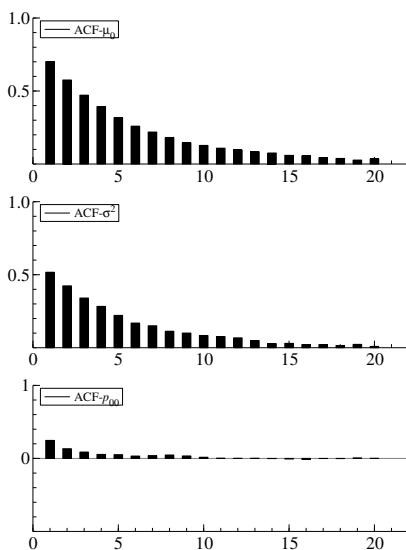
Figure OA.B. 3: Autocorrelation Function from Markov Swithcing Model (Continued)



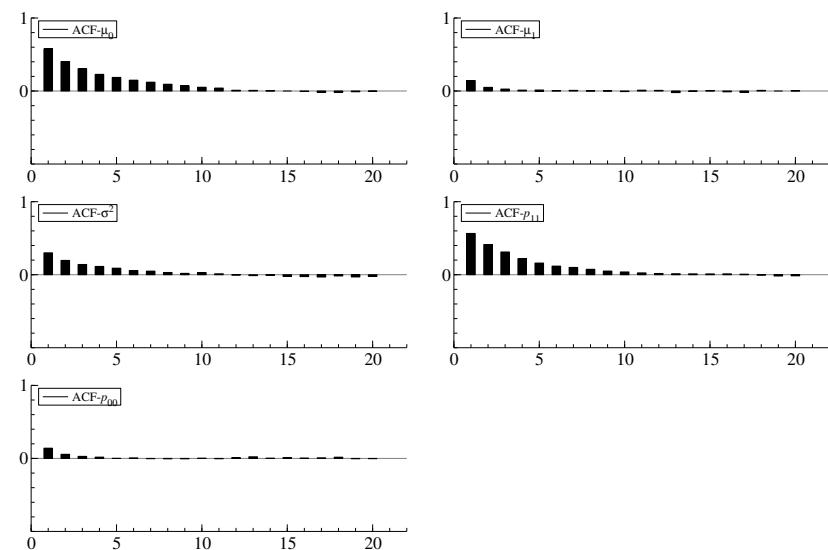
(21) Puebla



(22) Queretaro

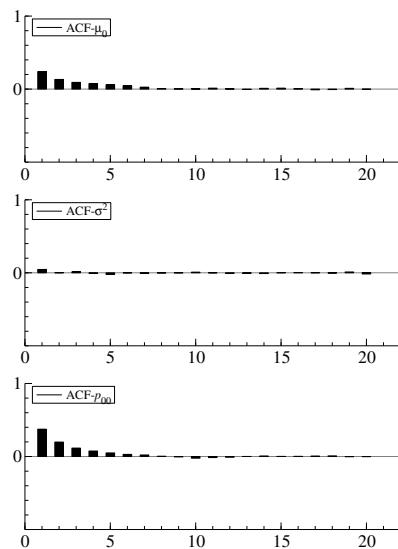


(23) Quintana Roo

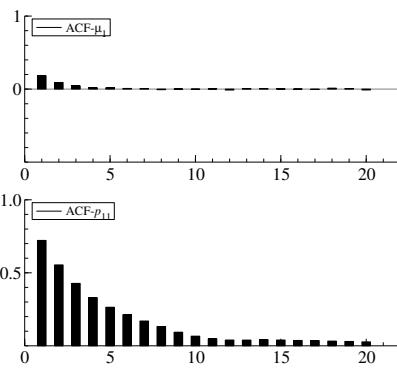


(24) San Luis Potosi

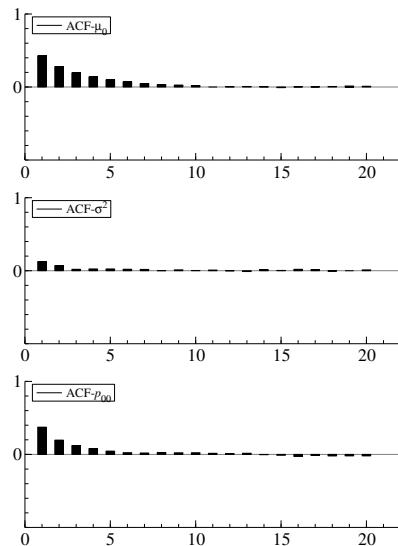
Figure OA.B. 3: Autocorrelation Function from Markov Swithcing Model (Continued)



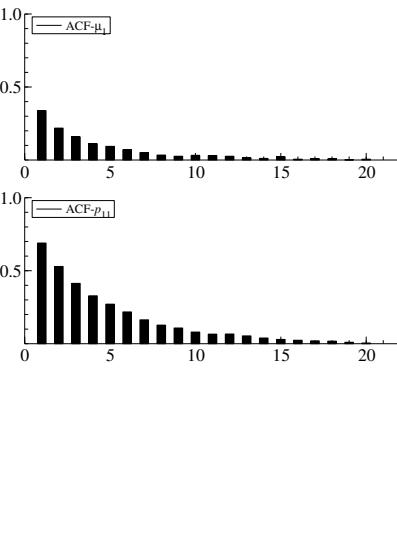
(25) Sinaloa



(26) Sonora

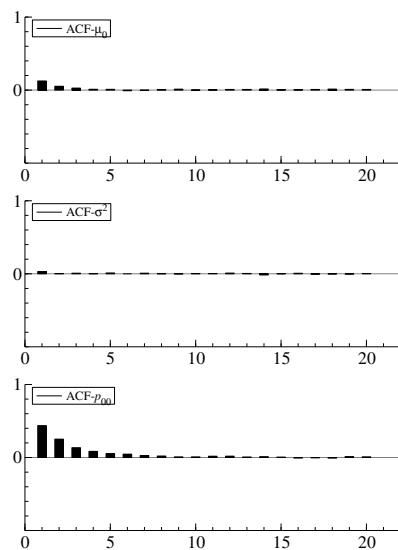


(27) Tabasco

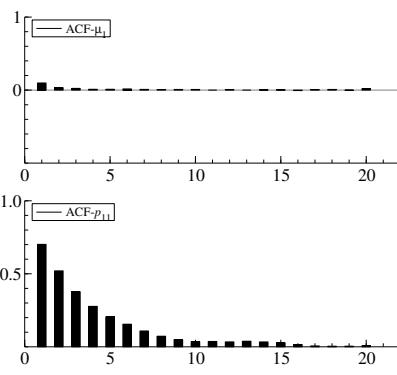


(28) Tamaulipas

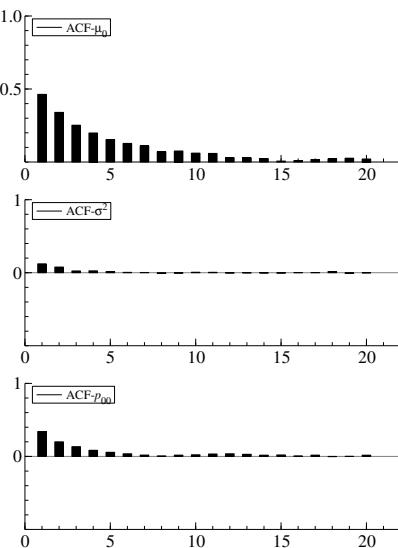
Figure OA.B. 3: Autocorrelation Function from Markov Switching Model (Continued)



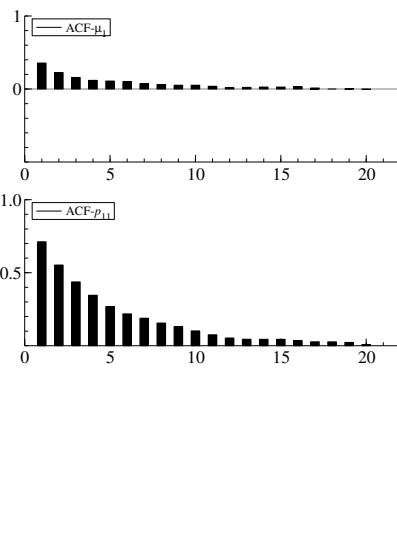
(29) Tlaxcala



(30) Veracruz



(31) Yucatan



(32) Zacatecas

Figure OA.B. 3: Autocorrelation Function from Markov Swithcing Model (Continued)

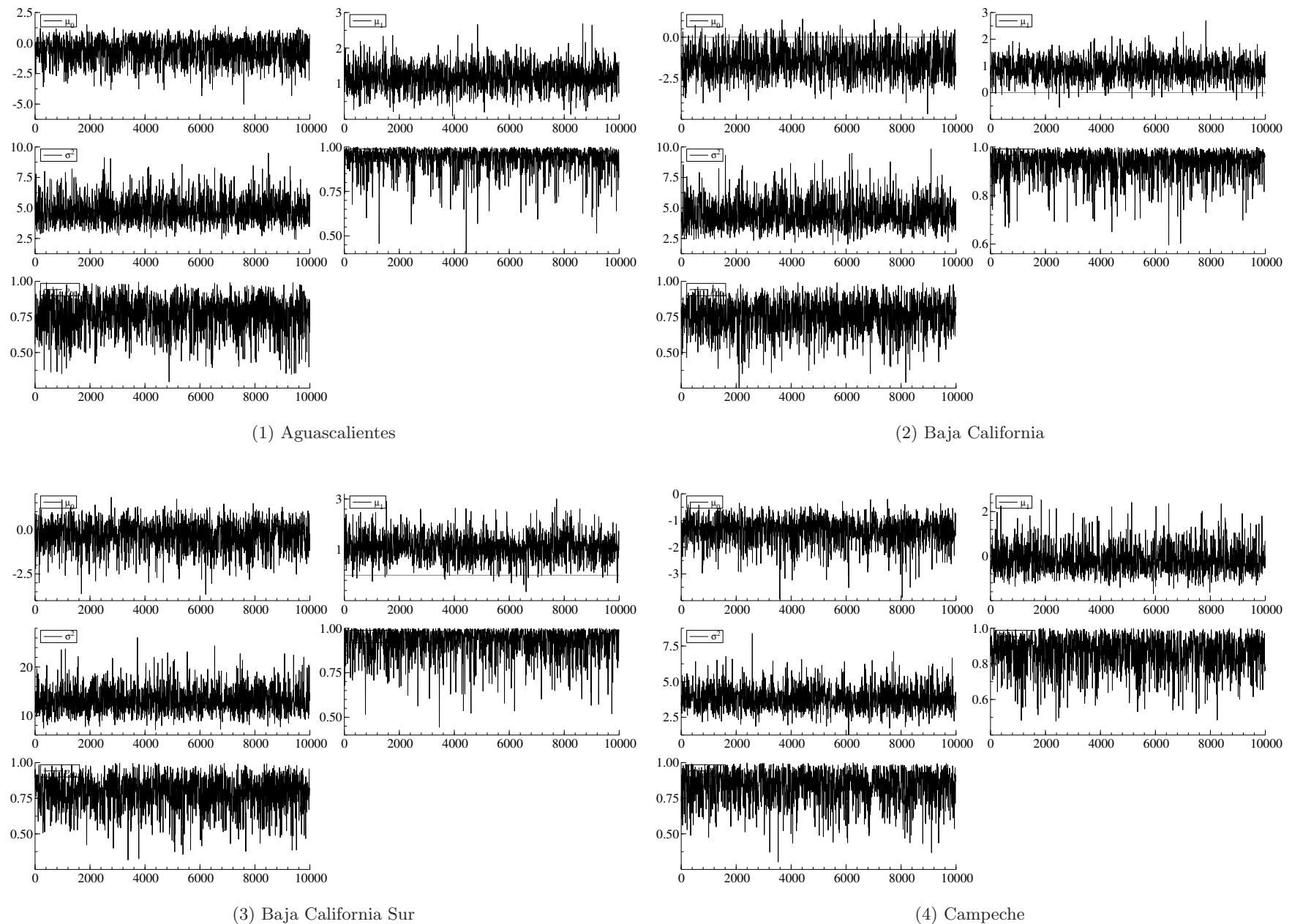


Figure OA.B. 4: Trace Plots from Markov Swithcing Model

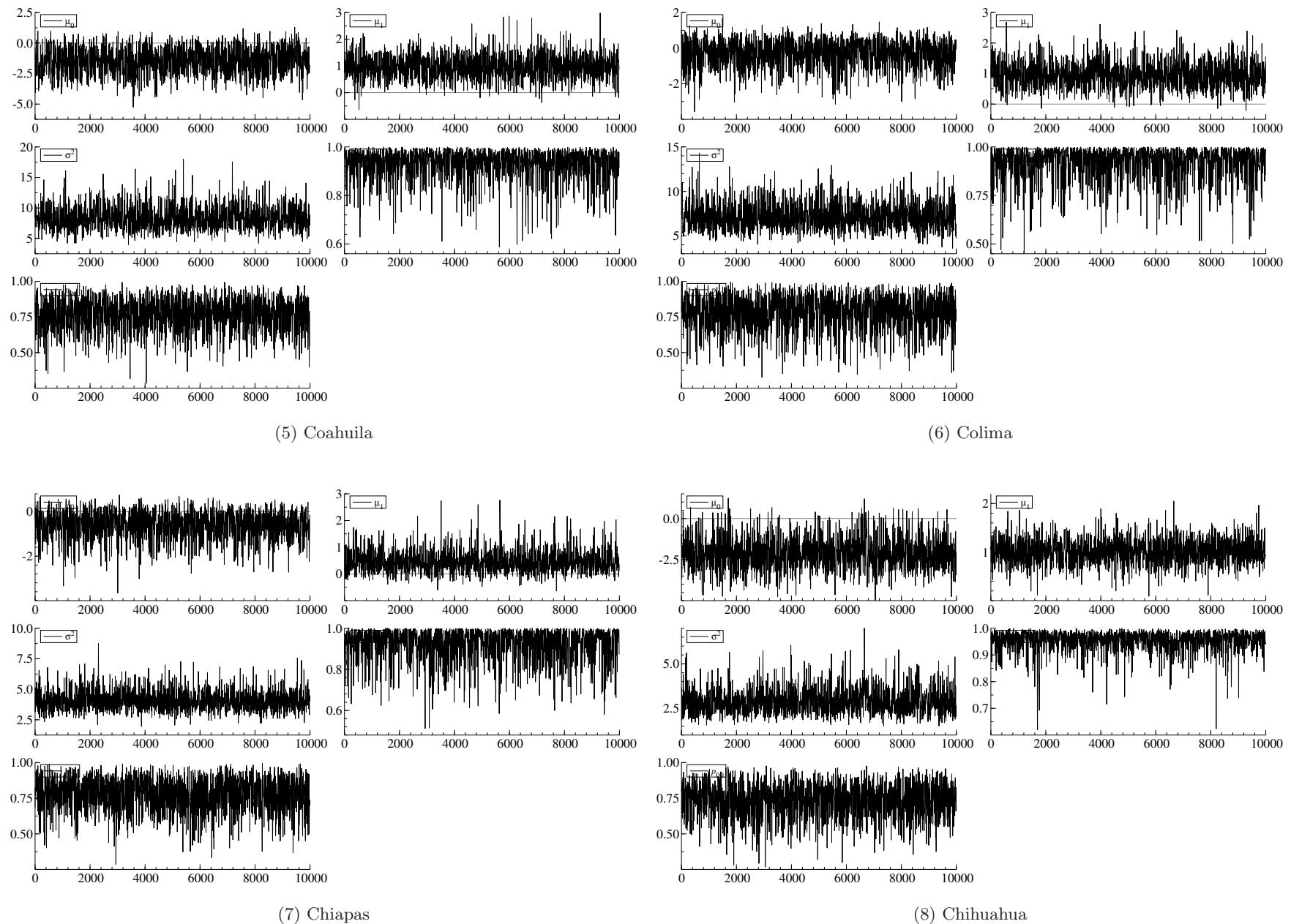
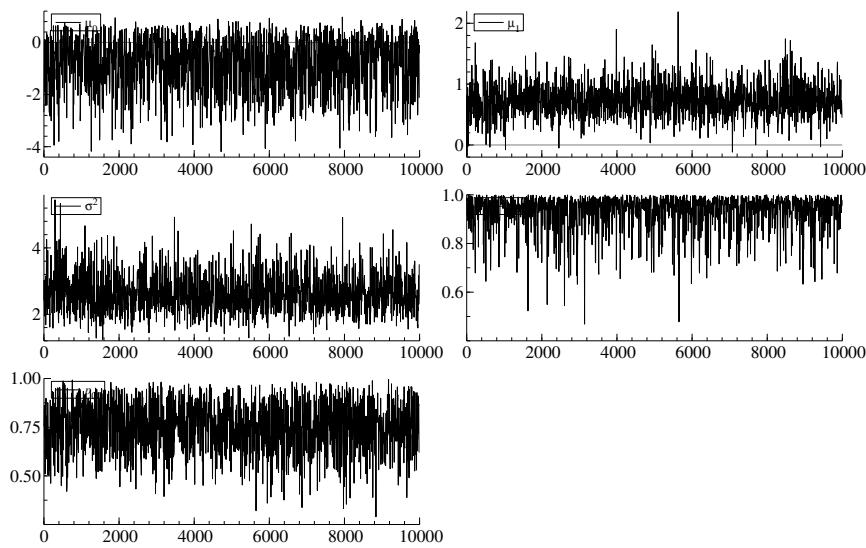
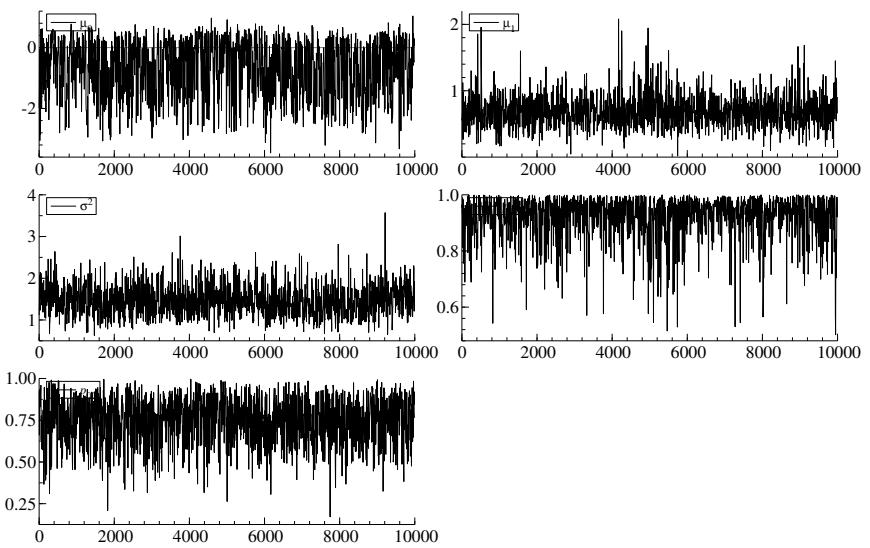


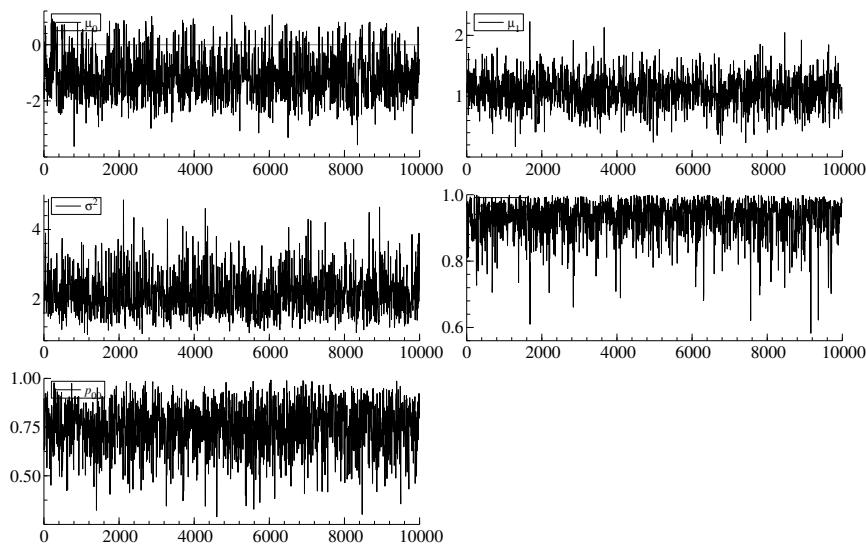
Figure OA.B. 4: Trace Plots from Markov Swithcing Model (Continued)



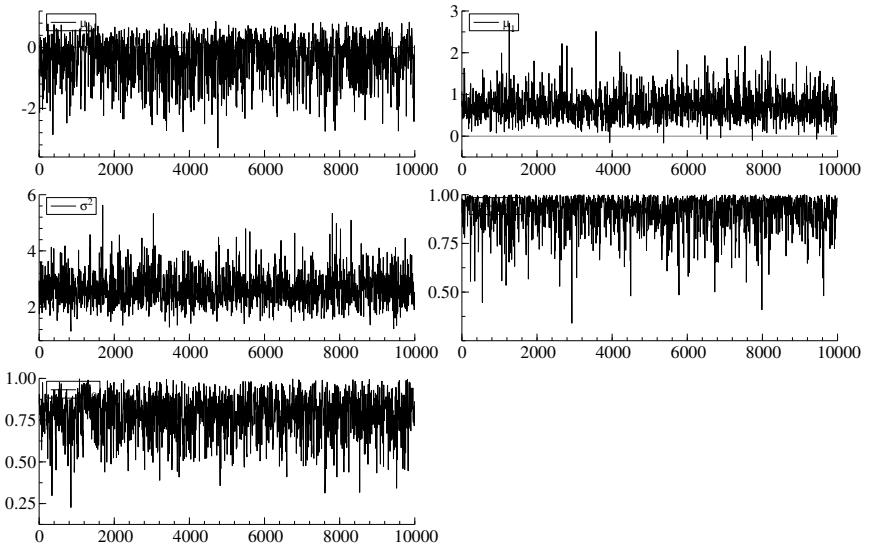
(9) Federal District



(10) Durango



(11) Guanajuato



(12) Guerrero

Figure OA.B. 4: Trace Plots from Markov Switching Model (Continued)

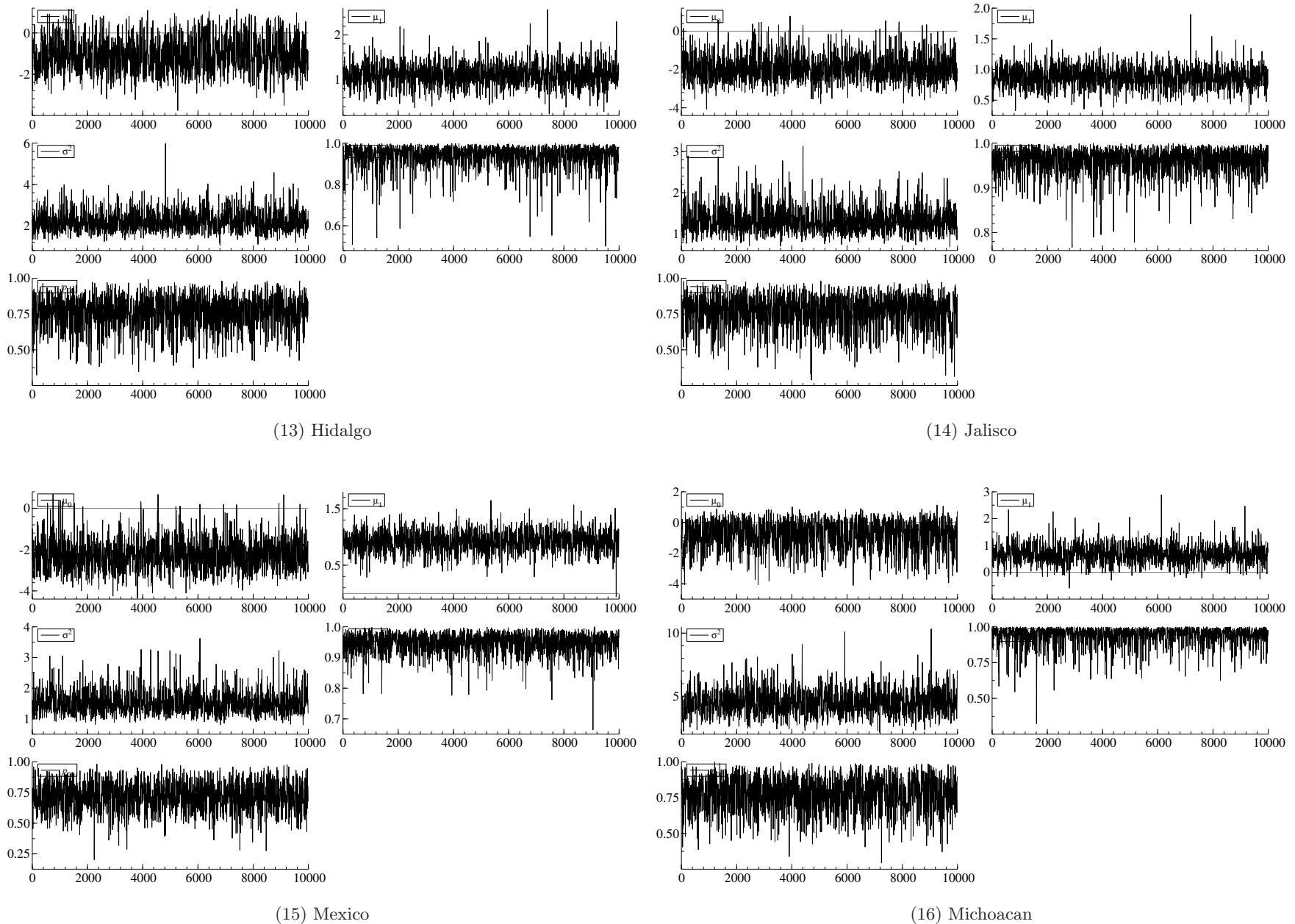
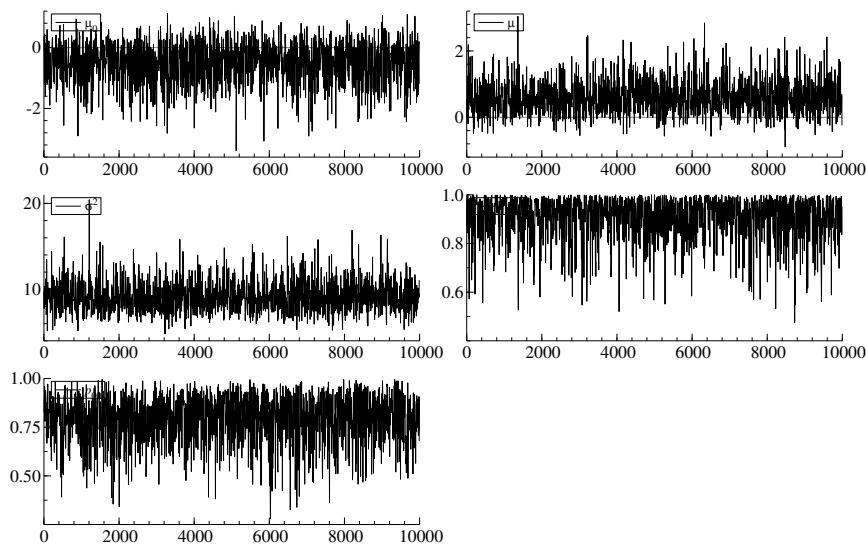
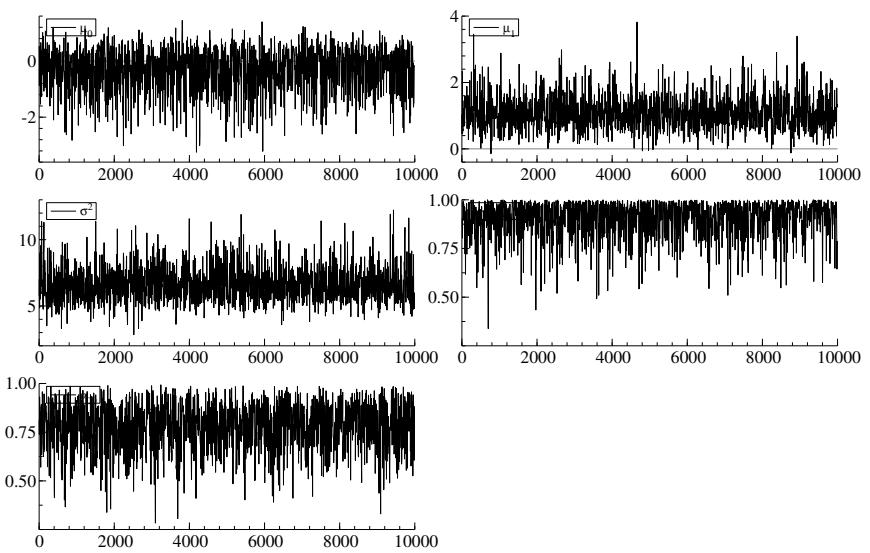


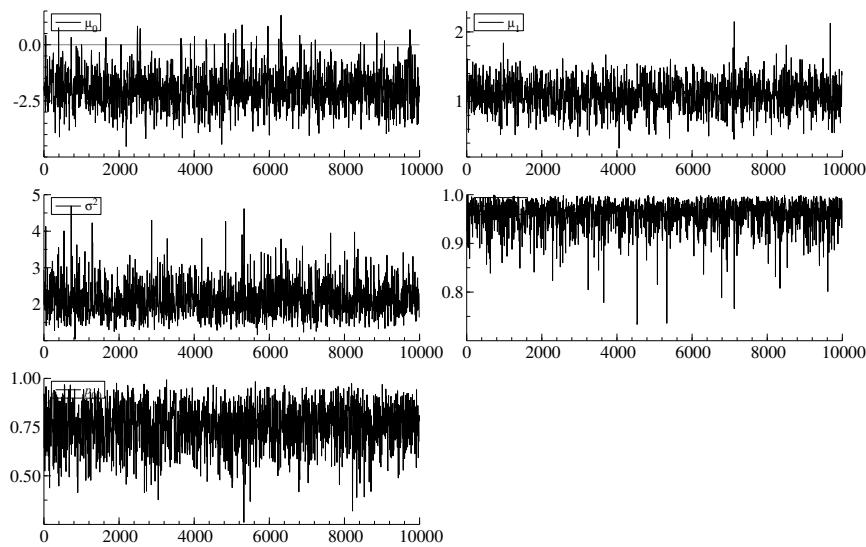
Figure OA.B. 4: Trace Plots from Markov Swithcing Model (Continued)



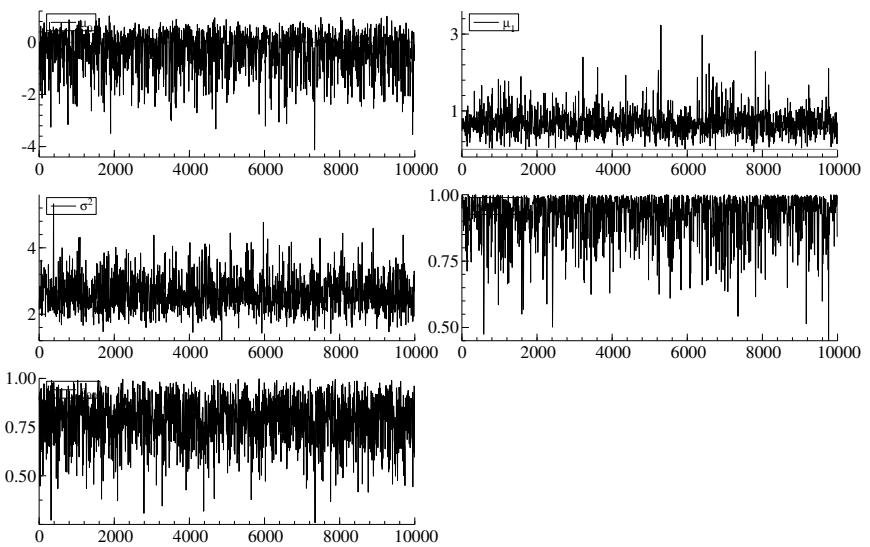
(17) Morelos



(18) Nayarit



(19) Nuevo Leon



(20) Oaxaca

Figure OA.B. 4: Trace Plots from Markov Swithcing Model (Continued)

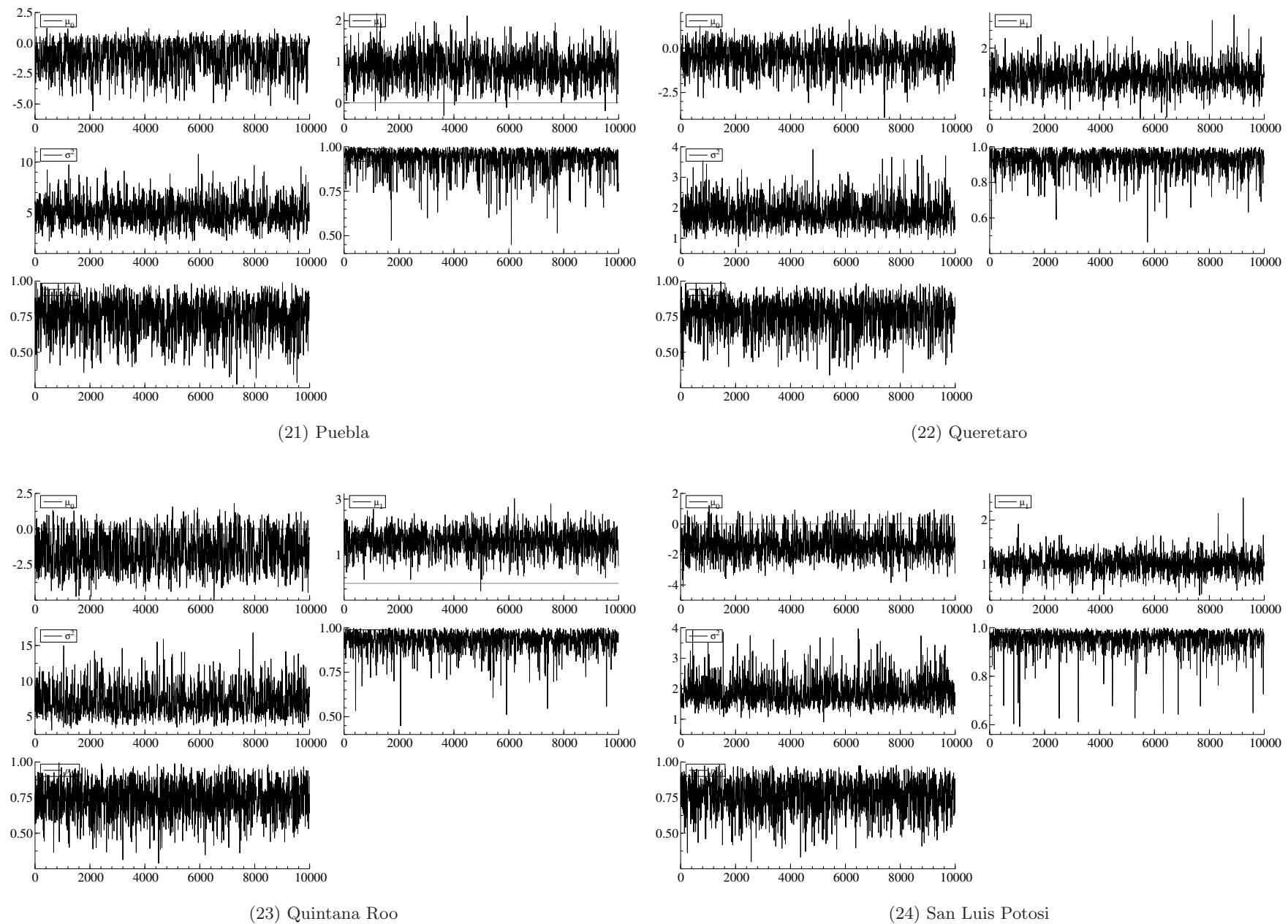


Figure OA.B. 4: Trace Plots from Markov Swithcing Model (Continued)

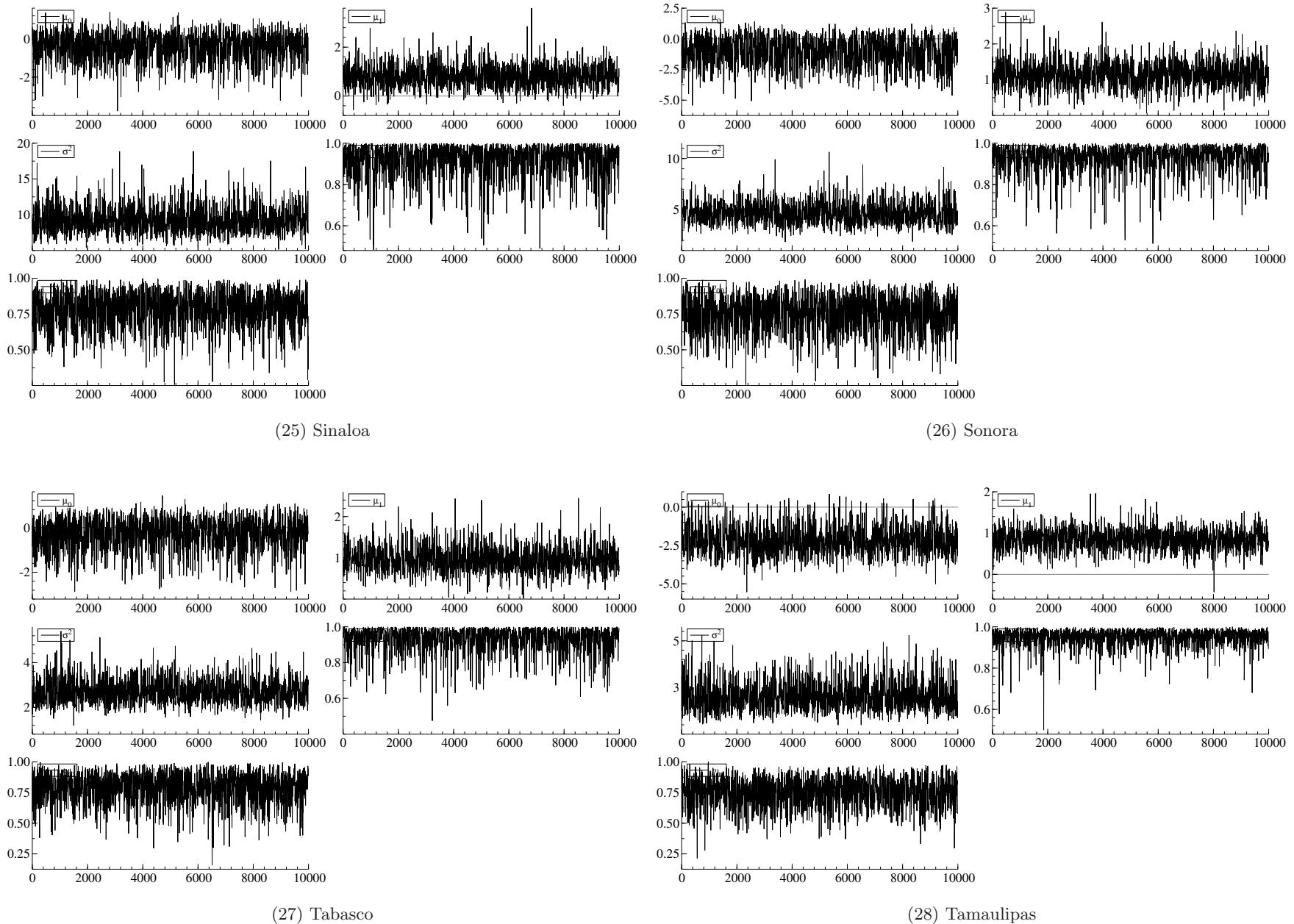


Figure OA.B. 4: Trace Plots from Markov Switching Model (Continued)

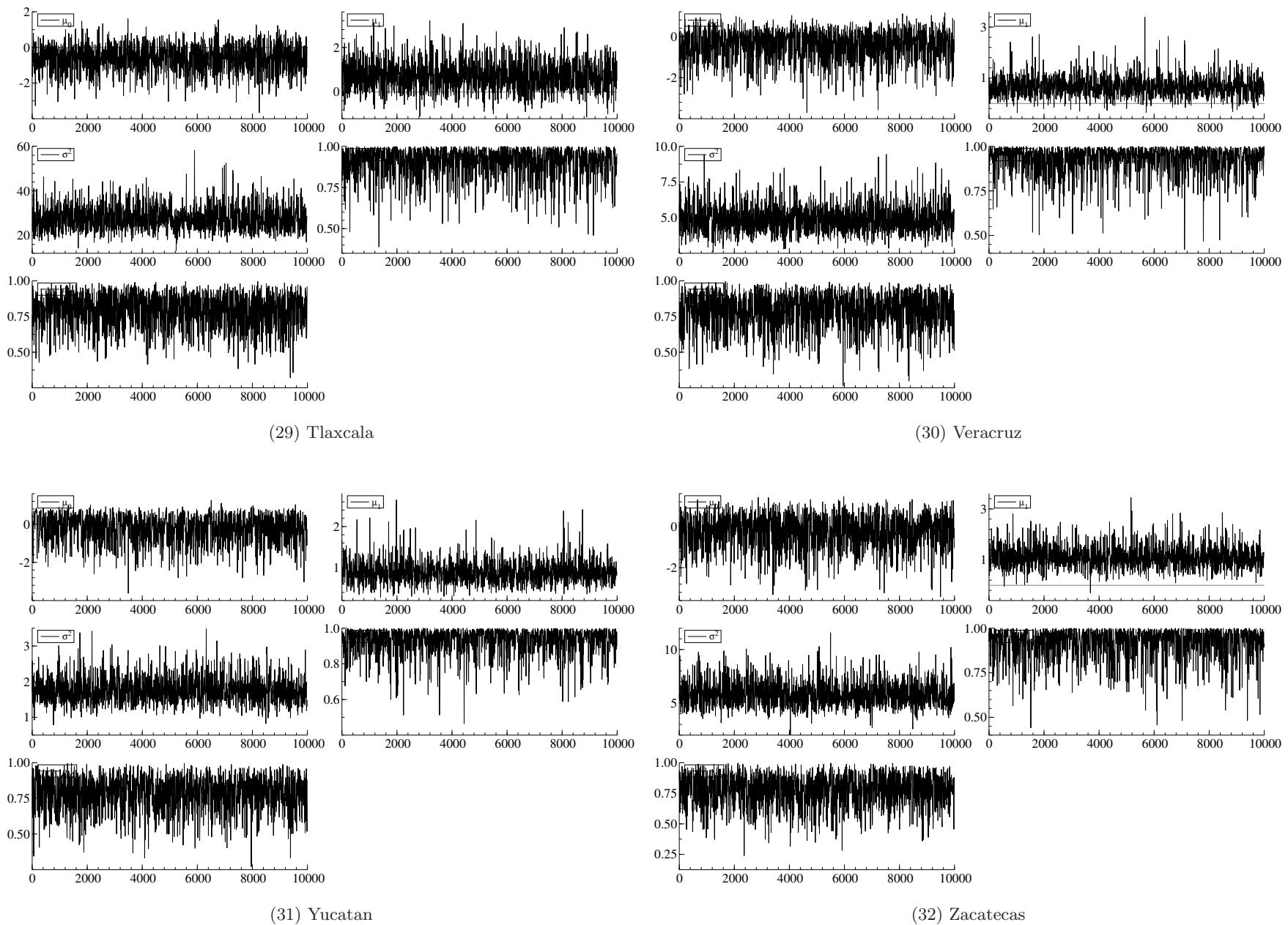


Figure OA.B. 4: Trace Plots from Markov Swithcing Model (Continued)

## Online Appendix C. Estimation Results of Markov Switching Model with First-Order Autoregressive Process

The estimation results here are obtained by estimating the Markov switching model with first-order autoregressive process:

$$\mathbf{y}_t = \boldsymbol{\Phi} \mathbf{y}_{t-1} + \boldsymbol{\mu}_0 \odot (\boldsymbol{\iota}_N - \mathbf{s}_t) + \boldsymbol{\mu}_1 \odot \mathbf{s}_t + \boldsymbol{\varepsilon}_t,$$

where  $\boldsymbol{\Phi} = \text{diag}(\phi_1, \dots, \phi_N)$ ,  $\boldsymbol{\varepsilon}_t \sim \text{i.i.d. } N(\mathbf{0}, \boldsymbol{\Omega})$ , and  $\boldsymbol{\Omega} = \text{diag}(\sigma_1^2, \dots, \sigma_N^2)$ .

### Table OA.C. 1

Table OA.C. 1 shows the point estimates and interval estimates of parameters.

### Figure OA.C. 1

Figure OA.C. 1 shows the probabilities of recession, which are calculated by  $1 - G^{-1} \sum_{g=1}^G s_{t,n}^{(g)}$ , where  $G$  is the number of iterations and the superscript  $(g)$  is the  $g$ th iteration.

### Figure OA.C. 2

Figure OA.C. 2 shows the histogram and density plots of parameters by state. The solid line indicates density estimates obtained by kernel density estimation.

### Figure OA.C. 3

Figure OA.C. 3 shows the autocorrelation plots of parameters by state.

### Figure OA.C. 4

Figure OA.C. 4 shows the trace plots of parameters by state.

Table OA.C. 1: Estimated Parameters

| Code | State               | $\mu_0$ |        |                | $\mu_1$ |        |               | $\phi$ |        |                |
|------|---------------------|---------|--------|----------------|---------|--------|---------------|--------|--------|----------------|
|      |                     | Mean    | Median | 95% CI         | Mean    | Median | 95% CI        | Mean   | Median | 95% CI         |
| 1    | Aguascalientes      | -1.29   | -1.33  | [-3.27, 0.62]  | 1.16    | 1.17   | [0.29, 1.99]  | 0.20   | 0.20   | [-0.11, 0.53]  |
| 2    | Baja California     | -2.14   | -2.25  | [-3.67, 0.11]  | 1.11    | 1.13   | [0.40, 1.72]  | -0.04  | -0.05  | [-0.32, 0.32]  |
| 3    | Baja California Sur | -0.02   | 0.10   | [-2.07, 1.44]  | 1.69    | 1.66   | [0.84, 2.75]  | -0.40  | -0.40  | [-0.69, -0.09] |
| 4    | Campeche            | -1.43   | -1.38  | [-2.63, -0.50] | -0.16   | -0.28  | [-1.28, 1.59] | -0.22  | -0.22  | [-0.53, 0.09]  |
| 5    | Coahuila            | -0.69   | -0.61  | [-2.57, 0.76]  | 0.89    | 0.87   | [-0.30, 2.20] | 0.13   | 0.14   | [-0.18, 0.45]  |
| 6    | Colima              | -0.56   | -0.48  | [-2.34, 0.78]  | 1.04    | 0.99   | [0.02, 2.37]  | 0.16   | 0.16   | [-0.15, 0.48]  |
| 7    | Chiapas             | -0.64   | -0.57  | [-2.33, 0.63]  | 0.75    | 0.69   | [-0.27, 2.10] | -0.10  | -0.10  | [-0.42, 0.21]  |
| 8    | Chihuahua           | -1.53   | -1.45  | [-4.04, 0.48]  | 1.02    | 1.04   | [0.04, 1.93]  | -0.05  | -0.06  | [-0.37, 0.29]  |
| 9    | Federal District    | -1.89   | -1.95  | [-3.73, 0.25]  | 0.88    | 0.89   | [0.28, 1.43]  | -0.05  | -0.05  | [-0.45, 0.37]  |
| 10   | Durango             | -0.65   | -0.55  | [-2.20, 0.36]  | 0.51    | 0.46   | [-0.10, 1.38] | 0.32   | 0.32   | [-0.05, 0.67]  |
| 11   | Guanajuato          | -0.82   | -0.73  | [-2.78, 0.72]  | 1.07    | 1.06   | [0.12, 2.11]  | -0.02  | -0.02  | [-0.36, 0.34]  |
| 12   | Guerrero            | -1.06   | -1.09  | [-2.44, 0.31]  | 0.76    | 0.77   | [0.08, 1.42]  | -0.02  | -0.02  | [-0.38, 0.39]  |
| 13   | Hidalgo             | -1.89   | -1.99  | [-3.99, 0.49]  | 1.32    | 1.34   | [0.37, 2.14]  | -0.18  | -0.19  | [-0.49, 0.18]  |
| 14   | Jalisco             | -1.42   | -1.36  | [-3.84, 0.51]  | 0.88    | 0.88   | [0.11, 1.68]  | 0.03   | 0.03   | [-0.32, 0.35]  |
| 15   | México              | -1.61   | -1.75  | [-3.31, 0.41]  | 1.02    | 1.02   | [0.31, 1.67]  | 0.20   | 0.21   | [-0.16, 0.56]  |
| 16   | Michoacán           | -1.39   | -1.44  | [-3.43, 0.53]  | 0.93    | 0.93   | [0.19, 1.66]  | -0.04  | -0.04  | [-0.36, 0.29]  |
| 17   | Morelos             | -0.77   | -0.79  | [-2.08, 0.53]  | 1.03    | 1.05   | [0.27, 1.77]  | -0.21  | -0.22  | [-0.58, 0.19]  |
| 18   | Nayarit             | -0.45   | -0.38  | [-2.20, 0.91]  | 1.03    | 0.99   | [-0.08, 2.41] | -0.05  | -0.05  | [-0.37, 0.27]  |
| 19   | Nuevo León          | -1.88   | -1.96  | [-3.93, 0.43]  | 1.27    | 1.28   | [0.40, 2.05]  | 0.10   | 0.10   | [-0.25, 0.41]  |
| 20   | Oaxaca              | -0.53   | -0.36  | [-2.40, 0.67]  | 0.79    | 0.76   | [0.11, 1.68]  | -0.21  | -0.21  | [-0.53, 0.11]  |
| 21   | Puebla              | -0.85   | -0.78  | [-2.92, 0.76]  | 1.13    | 1.12   | [0.12, 2.18]  | 0.06   | 0.05   | [-0.29, 0.40]  |
| 22   | Querétaro           | -1.89   | -1.98  | [-3.65, 0.32]  | 1.44    | 1.44   | [0.53, 2.29]  | 0.13   | 0.14   | [-0.27, 0.49]  |
| 23   | Quintana Roo        | -0.98   | -0.83  | [-3.40, 0.88]  | 1.40    | 1.36   | [0.10, 2.84]  | -0.06  | -0.06  | [-0.37, 0.27]  |
| 24   | San Luis Potosí     | -1.37   | -1.43  | [-3.26, 0.62]  | 1.24    | 1.26   | [0.27, 2.09]  | -0.02  | -0.02  | [-0.37, 0.35]  |
| 25   | Sinaloa             | -0.47   | -0.36  | [-2.33, 0.84]  | 0.97    | 0.93   | [0.05, 2.16]  | -0.03  | -0.03  | [-0.36, 0.30]  |
| 26   | Sonora              | -0.65   | -0.58  | [-2.67, 0.98]  | 1.33    | 1.31   | [0.29, 2.42]  | -0.24  | -0.24  | [-0.56, 0.08]  |
| 27   | Tabasco             | -0.25   | -0.24  | [-2.22, 1.47]  | 1.85    | 1.84   | [1.13, 2.65]  | -0.55  | -0.55  | [-0.82, -0.28] |
| 28   | Tamaulipas          | -1.25   | -1.27  | [-2.97, 0.42]  | 1.01    | 1.02   | [0.09, 1.90]  | -0.01  | -0.02  | [-0.37, 0.36]  |
| 29   | Tlaxcala            | -0.99   | -1.00  | [-2.60, 0.46]  | 0.99    | 1.00   | [0.11, 1.83]  | 0.11   | 0.11   | [-0.27, 0.50]  |
| 30   | Veracruz            | -0.27   | -0.14  | [-2.04, 0.86]  | 0.98    | 0.92   | [0.20, 2.13]  | -0.10  | -0.10  | [-0.44, 0.23]  |
| 31   | Yucatán             | -0.41   | -0.40  | [-1.88, 0.90]  | 1.38    | 1.38   | [0.55, 2.27]  | -0.14  | -0.15  | [-0.50, 0.22]  |
| 32   | Zacatecas           | -0.15   | -0.05  | [-2.12, 1.32]  | 1.52    | 1.48   | [0.65, 2.61]  | -0.40  | -0.40  | [-0.70, -0.10] |

Notes: 95% CI indicates 95% credible interval.

Table OA.C. 1: Estimated Parameters (Continued)

| Code | State               | $\sigma^2$ |        |                | $p_{11}$ |        |              | $p_{00}$ |        |              |
|------|---------------------|------------|--------|----------------|----------|--------|--------------|----------|--------|--------------|
|      |                     | Mean       | Median | 95% CI         | Mean     | Median | 95% CI       | Mean     | Median | 95% CI       |
| 1    | Aguascalientes      | 3.69       | 3.50   | [1.95, 6.52]   | 0.92     | 0.94   | [0.73, 1.00] | 0.75     | 0.77   | [0.48, 0.95] |
| 2    | Baja California     | 2.37       | 2.20   | [1.34, 4.40]   | 0.94     | 0.95   | [0.81, 0.99] | 0.77     | 0.79   | [0.52, 0.95] |
| 3    | Baja California Sur | 3.97       | 3.83   | [2.38, 6.35]   | 0.93     | 0.95   | [0.73, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 4    | Campeche            | 4.52       | 4.37   | [2.72, 7.20]   | 0.87     | 0.89   | [0.62, 0.99] | 0.84     | 0.87   | [0.57, 0.98] |
| 5    | Coahuila            | 16.15      | 15.56  | [10.04, 25.45] | 0.90     | 0.93   | [0.68, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 6    | Colima              | 7.21       | 6.99   | [4.28, 11.40]  | 0.91     | 0.93   | [0.69, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 7    | Chiapas             | 9.28       | 9.01   | [5.53, 14.67]  | 0.90     | 0.93   | [0.67, 1.00] | 0.78     | 0.79   | [0.50, 0.97] |
| 8    | Chihuahua           | 5.33       | 5.16   | [2.32, 9.30]   | 0.91     | 0.93   | [0.73, 0.99] | 0.76     | 0.77   | [0.48, 0.96] |
| 9    | Federal District    | 1.60       | 1.50   | [0.93, 2.81]   | 0.94     | 0.95   | [0.82, 0.99] | 0.76     | 0.78   | [0.49, 0.95] |
| 10   | Durango             | 1.68       | 1.63   | [0.93, 2.74]   | 0.91     | 0.93   | [0.69, 1.00] | 0.78     | 0.79   | [0.50, 0.97] |
| 11   | Guanajuato          | 5.03       | 4.84   | [2.84, 8.40]   | 0.91     | 0.93   | [0.71, 1.00] | 0.78     | 0.79   | [0.51, 0.96] |
| 12   | Guerrero            | 1.74       | 1.65   | [0.98, 2.98]   | 0.92     | 0.93   | [0.73, 0.99] | 0.78     | 0.80   | [0.53, 0.96] |
| 13   | Hidalgo             | 4.62       | 4.33   | [2.52, 8.25]   | 0.94     | 0.95   | [0.80, 0.99] | 0.77     | 0.78   | [0.50, 0.95] |
| 14   | Jalisco             | 3.65       | 3.50   | [1.94, 6.31]   | 0.93     | 0.94   | [0.75, 1.00] | 0.75     | 0.77   | [0.47, 0.95] |
| 15   | México              | 1.96       | 1.84   | [1.02, 3.57]   | 0.93     | 0.94   | [0.78, 0.99] | 0.74     | 0.75   | [0.46, 0.94] |
| 16   | Michoacán           | 3.13       | 2.99   | [1.66, 5.37]   | 0.92     | 0.94   | [0.73, 1.00] | 0.75     | 0.76   | [0.47, 0.95] |
| 17   | Morelos             | 2.25       | 2.16   | [1.31, 3.78]   | 0.92     | 0.94   | [0.75, 1.00] | 0.79     | 0.81   | [0.54, 0.96] |
| 18   | Nayarit             | 12.62      | 12.17  | [7.88, 19.93]  | 0.91     | 0.93   | [0.68, 1.00] | 0.79     | 0.81   | [0.51, 0.97] |
| 19   | Nuevo León          | 4.23       | 3.99   | [2.39, 7.51]   | 0.94     | 0.95   | [0.81, 0.99] | 0.76     | 0.77   | [0.49, 0.95] |
| 20   | Oaxaca              | 2.48       | 2.40   | [1.44, 4.03]   | 0.91     | 0.93   | [0.67, 1.00] | 0.78     | 0.79   | [0.49, 0.97] |
| 21   | Puebla              | 7.34       | 7.06   | [4.33, 11.92]  | 0.92     | 0.94   | [0.73, 1.00] | 0.77     | 0.79   | [0.49, 0.96] |
| 22   | Querétaro           | 3.34       | 3.12   | [1.92, 5.93]   | 0.94     | 0.95   | [0.83, 0.99] | 0.77     | 0.79   | [0.51, 0.95] |
| 23   | Quintana Roo        | 10.46      | 10.32  | [4.18, 17.97]  | 0.91     | 0.92   | [0.71, 1.00] | 0.76     | 0.78   | [0.48, 0.96] |
| 24   | San Luis Potosí     | 4.14       | 3.94   | [2.07, 7.30]   | 0.92     | 0.94   | [0.75, 0.99] | 0.75     | 0.76   | [0.48, 0.95] |
| 25   | Sinaloa             | 6.92       | 6.69   | [4.18, 10.94]  | 0.90     | 0.93   | [0.68, 1.00] | 0.78     | 0.80   | [0.49, 0.96] |
| 26   | Sonora              | 7.17       | 6.90   | [4.22, 11.68]  | 0.92     | 0.94   | [0.72, 1.00] | 0.77     | 0.79   | [0.50, 0.96] |
| 27   | Tabasco             | 2.99       | 2.90   | [1.61, 4.88]   | 0.94     | 0.96   | [0.77, 1.00] | 0.75     | 0.77   | [0.45, 0.96] |
| 28   | Tamaulipas          | 3.92       | 3.73   | [2.18, 6.72]   | 0.91     | 0.93   | [0.72, 0.99] | 0.78     | 0.80   | [0.52, 0.96] |
| 29   | Tlaxcala            | 2.61       | 2.48   | [1.29, 4.70]   | 0.89     | 0.90   | [0.68, 0.99] | 0.76     | 0.77   | [0.50, 0.96] |
| 30   | Veracruz            | 3.56       | 3.43   | [2.21, 5.67]   | 0.91     | 0.94   | [0.69, 1.00] | 0.79     | 0.82   | [0.50, 0.97] |
| 31   | Yucatán             | 2.44       | 2.33   | [1.41, 4.07]   | 0.92     | 0.94   | [0.73, 1.00] | 0.79     | 0.81   | [0.54, 0.96] |
| 32   | Zacatecas           | 5.00       | 4.83   | [3.01, 7.97]   | 0.92     | 0.95   | [0.69, 1.00] | 0.77     | 0.79   | [0.47, 0.96] |

Notes: 95% CI indicates 95% credible interval.

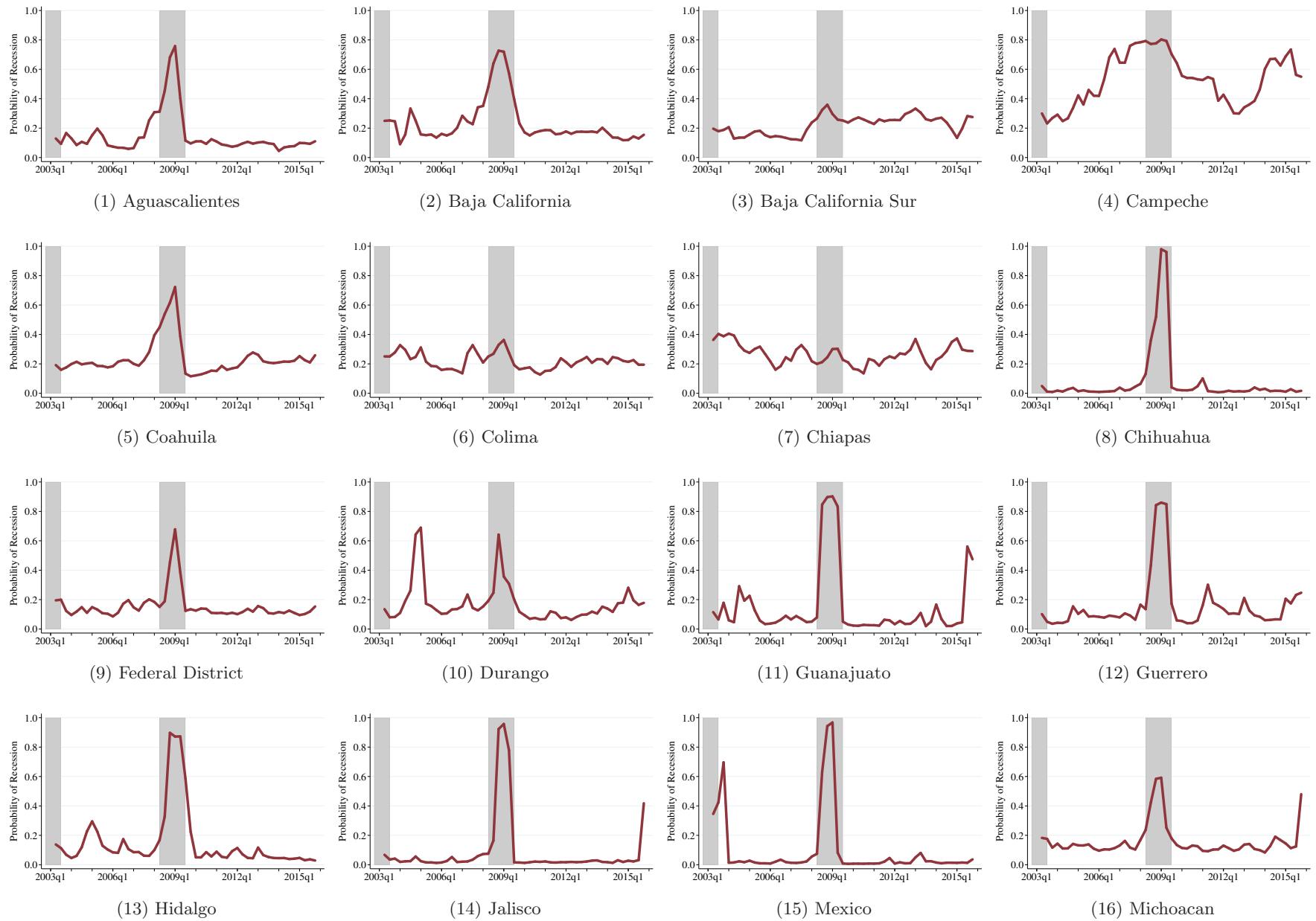


Figure OA.C. 1: Recessions Probabilities from Markov Switching Model with AR(1)

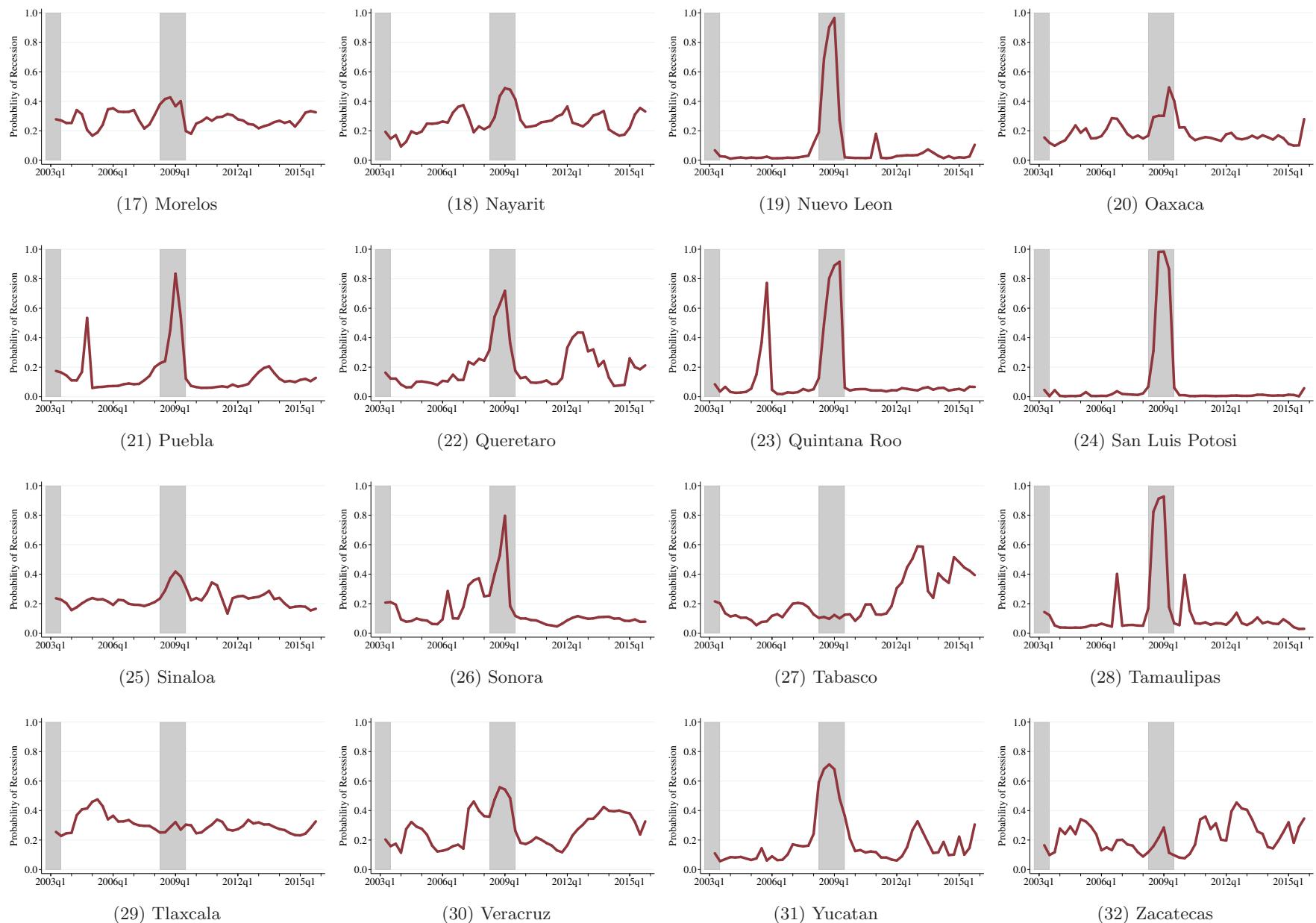


Figure OA.C. 1: Recession Probabilities (Continued)

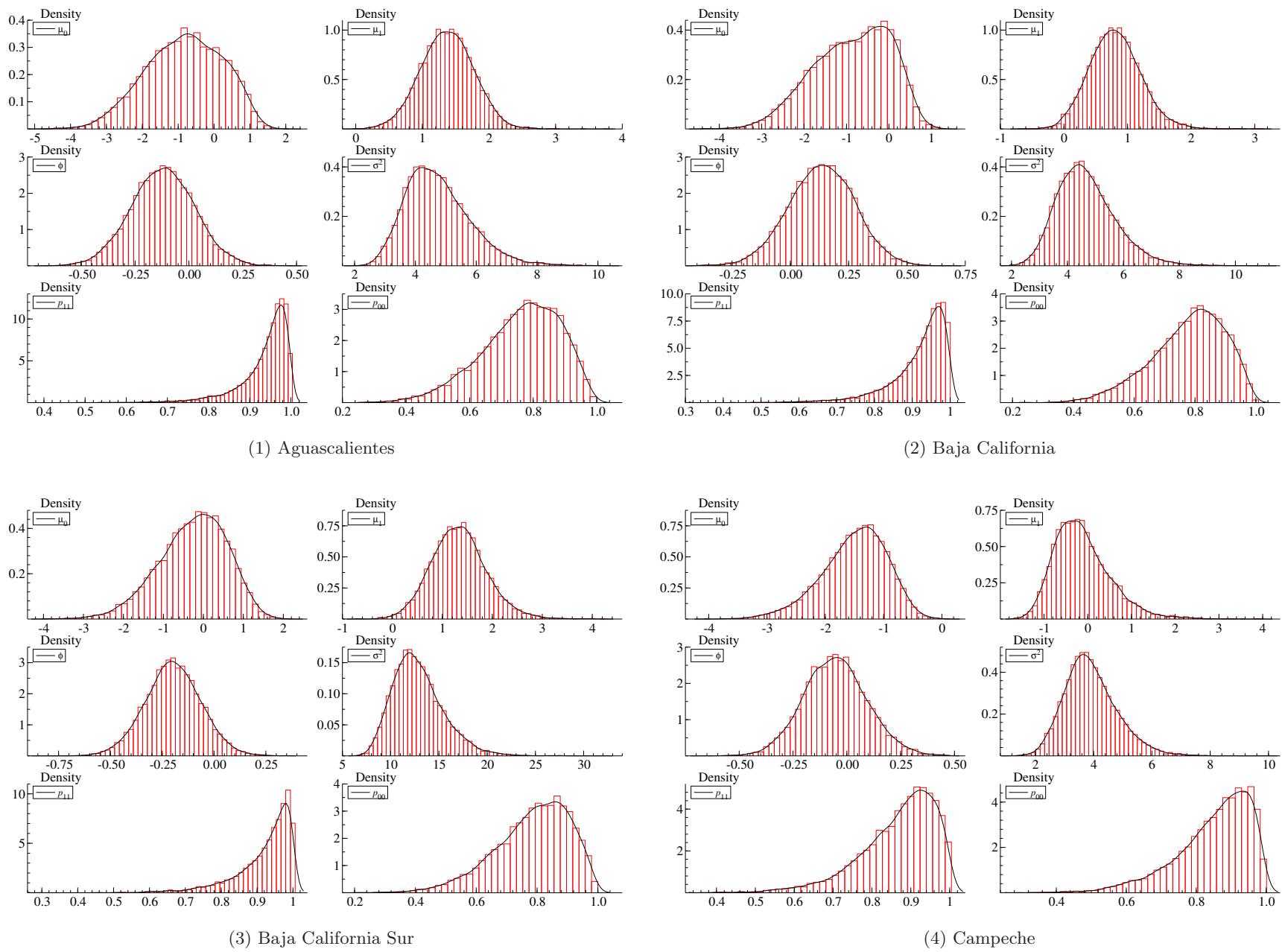


Figure OA.C. 2: Posterior Distributions

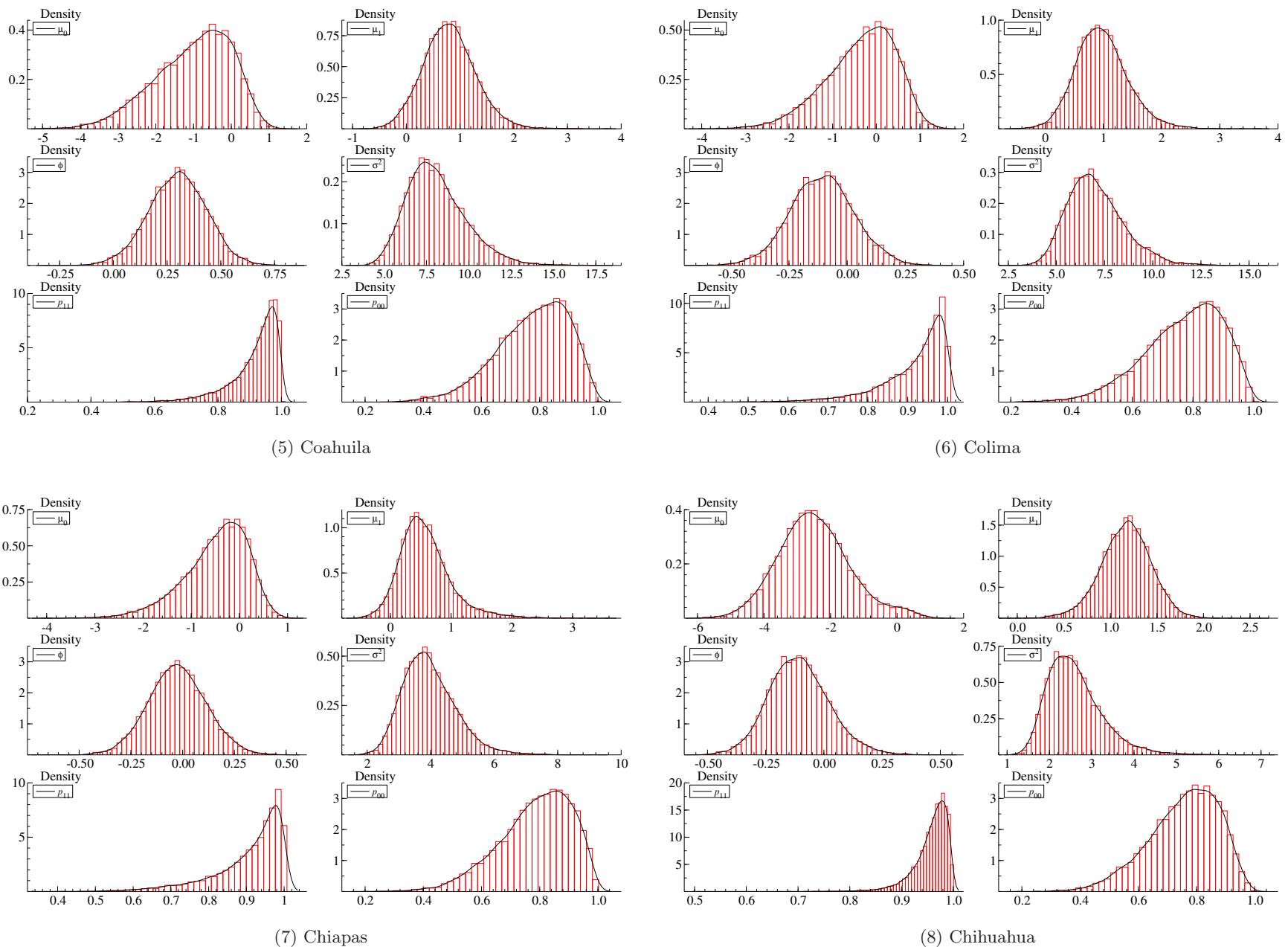


Figure O.A.C. 2: Posterior Distributions (Continued)

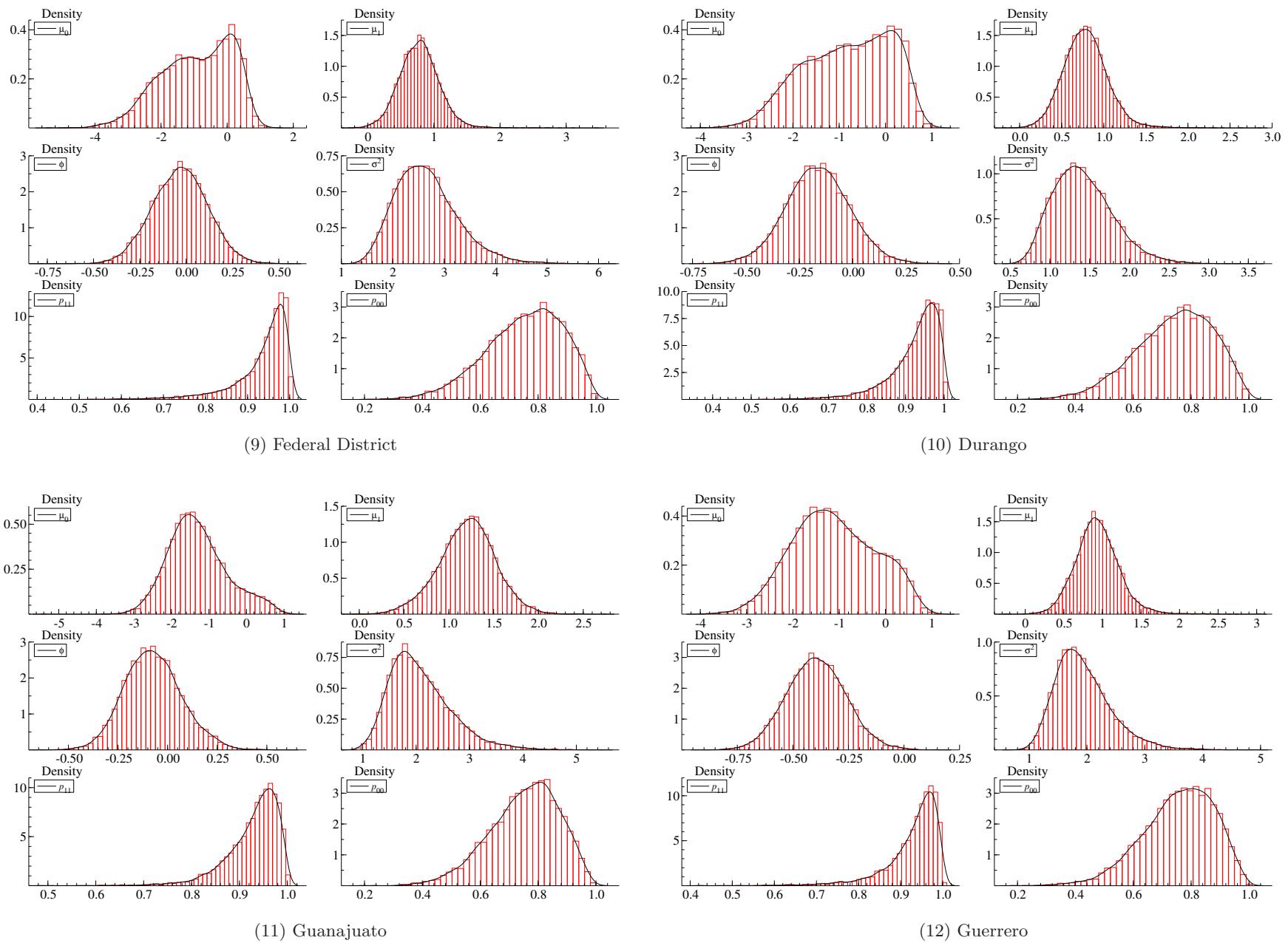
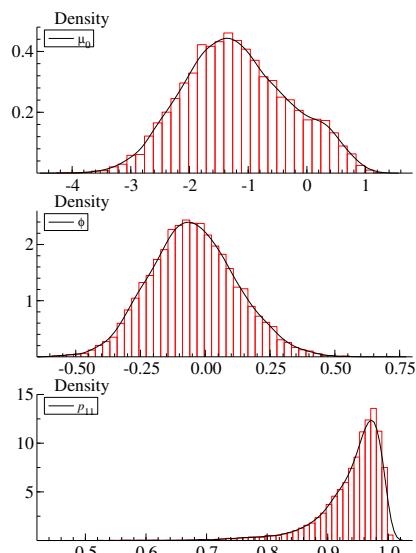
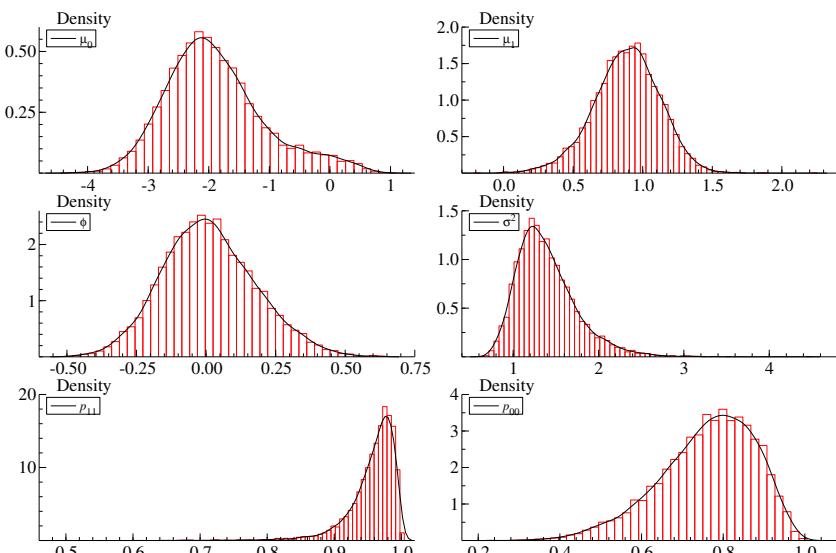


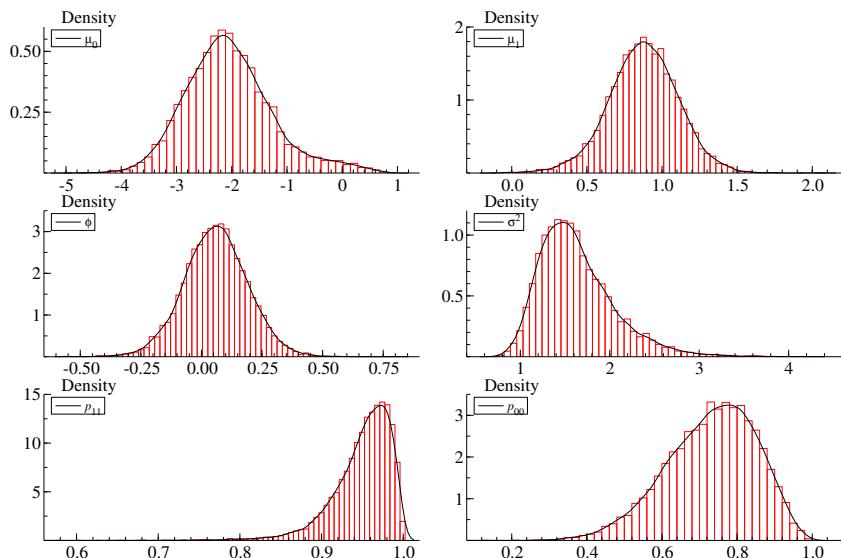
Figure OA.C. 2: Posterior Distributions (Continued)



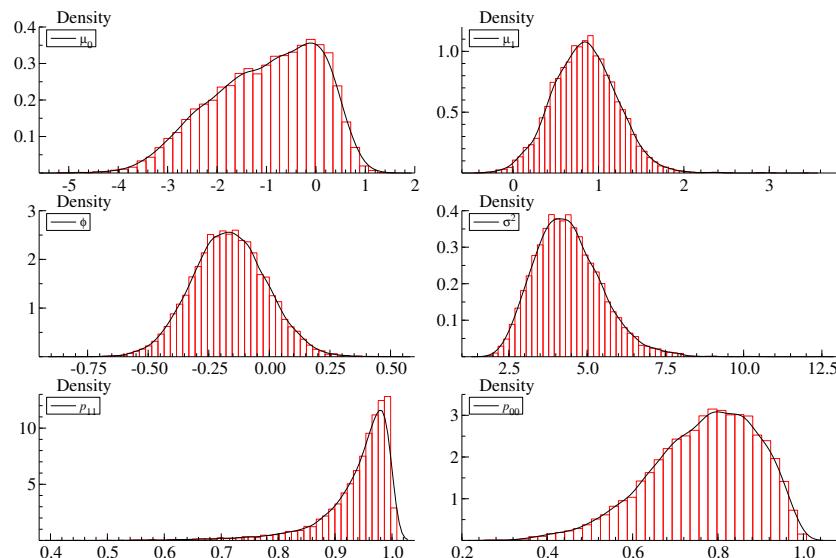
(13) Hidalgo



(14) Jalisco

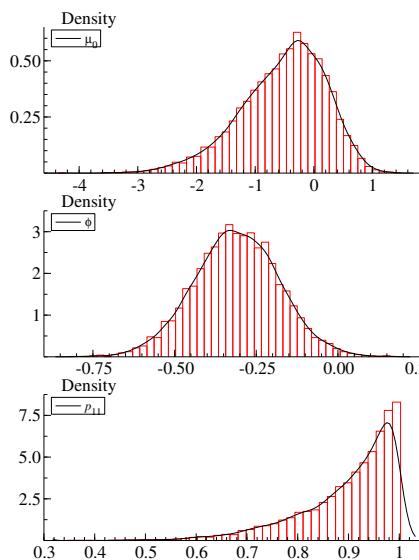


(15) Mexico

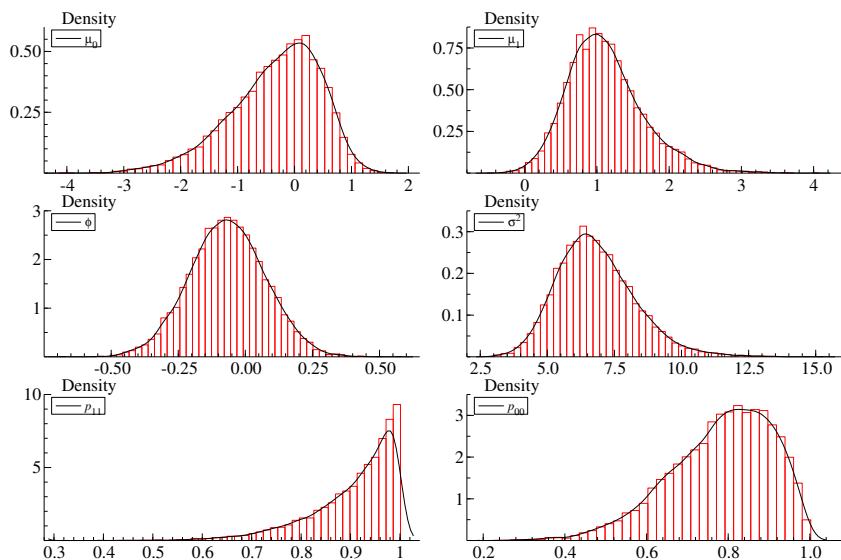


(16) Michoacan

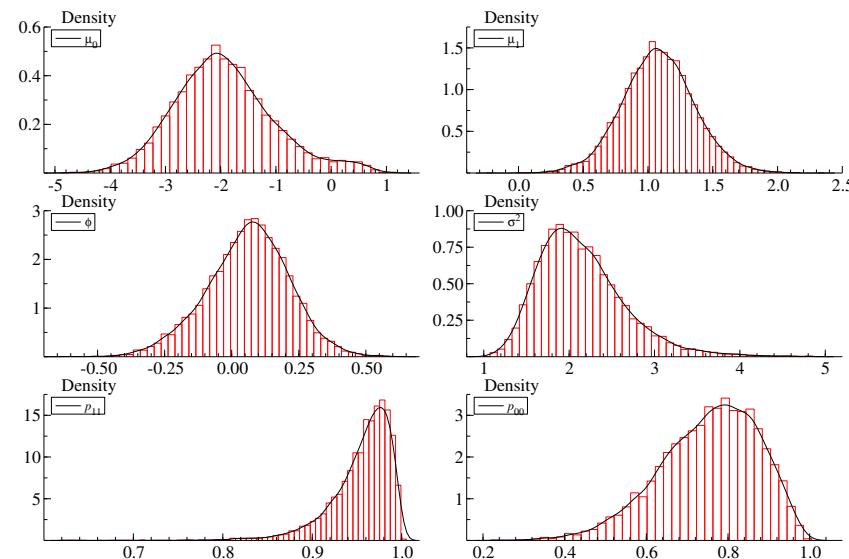
Figure O.A.C. 2: Posterior Distributions (Continued)



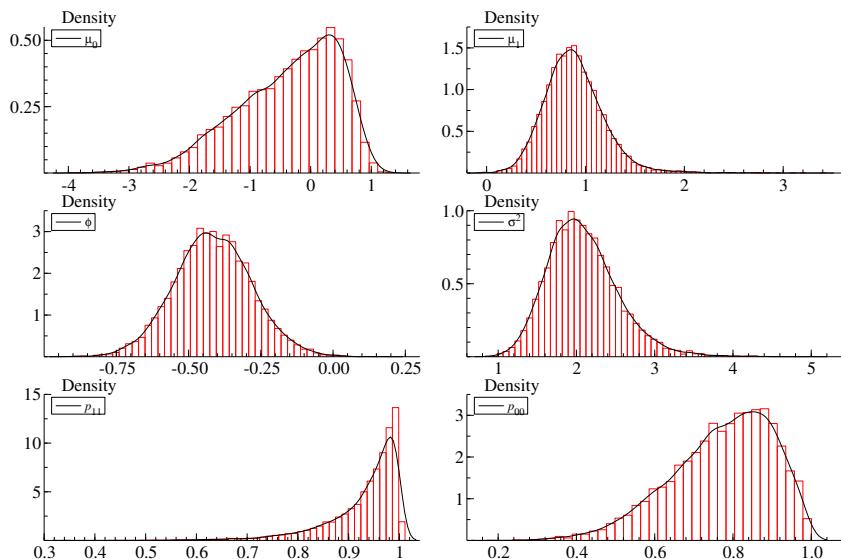
(17) Morelos



(18) Nayarit



(19) Nuevo Leon



(20) Oaxaca

Figure O.A.C. 2: Posterior Distributions (Continued)

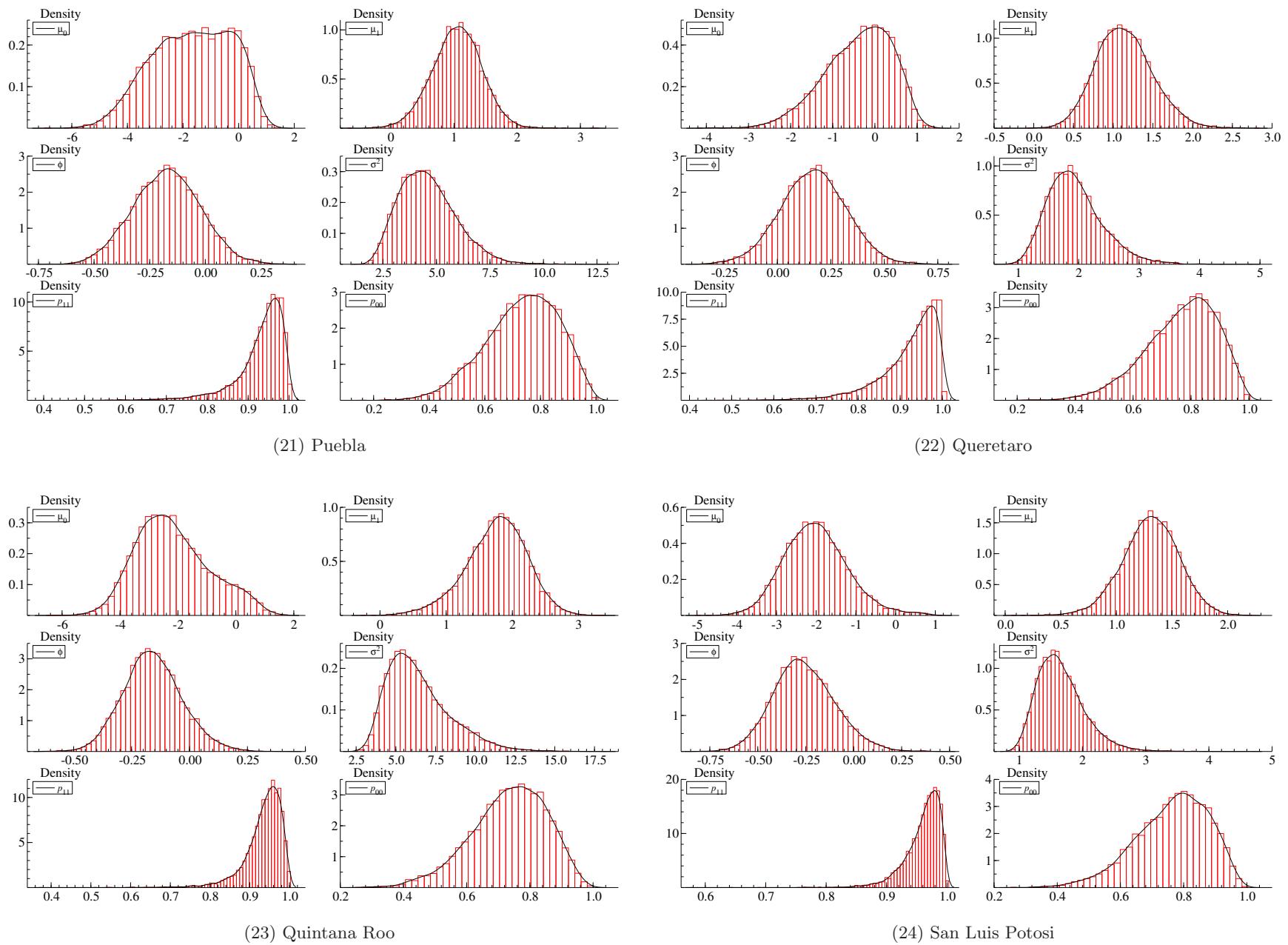
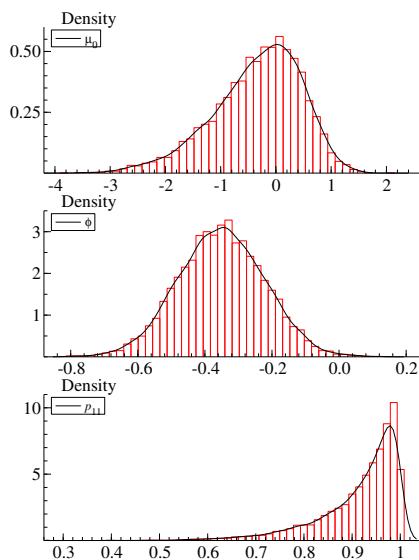
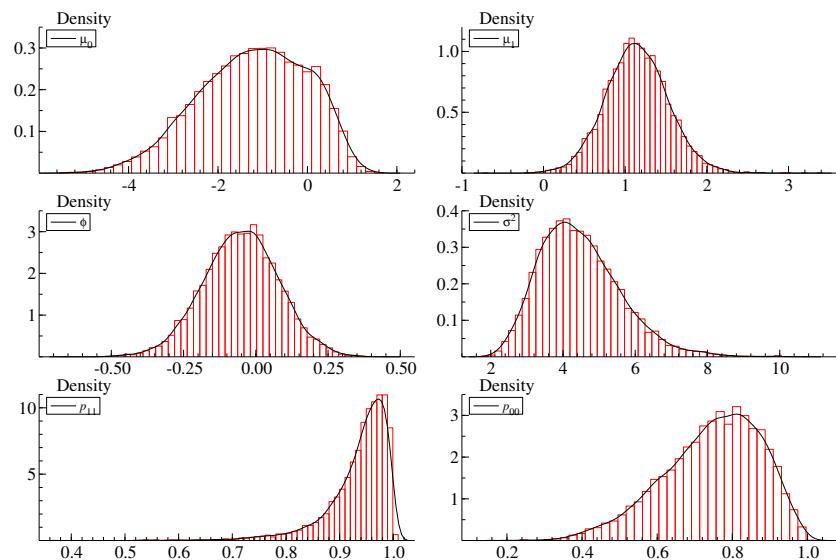


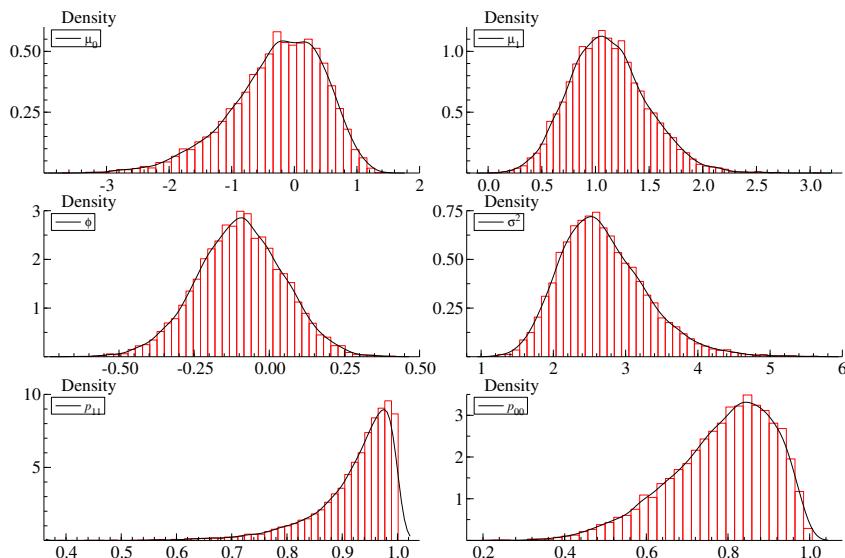
Figure O.A.C. 2: Posterior Distributions (Continued)



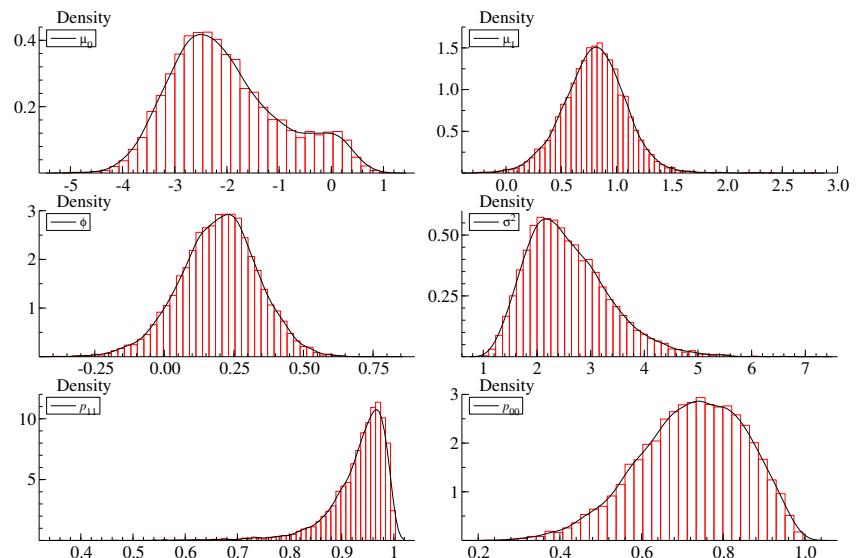
(25) Sinaloa



(26) Sonora



(27) Tabasco



(28) Tamaulipas

Figure O.A.C. 2: Posterior Distributions (Continued)

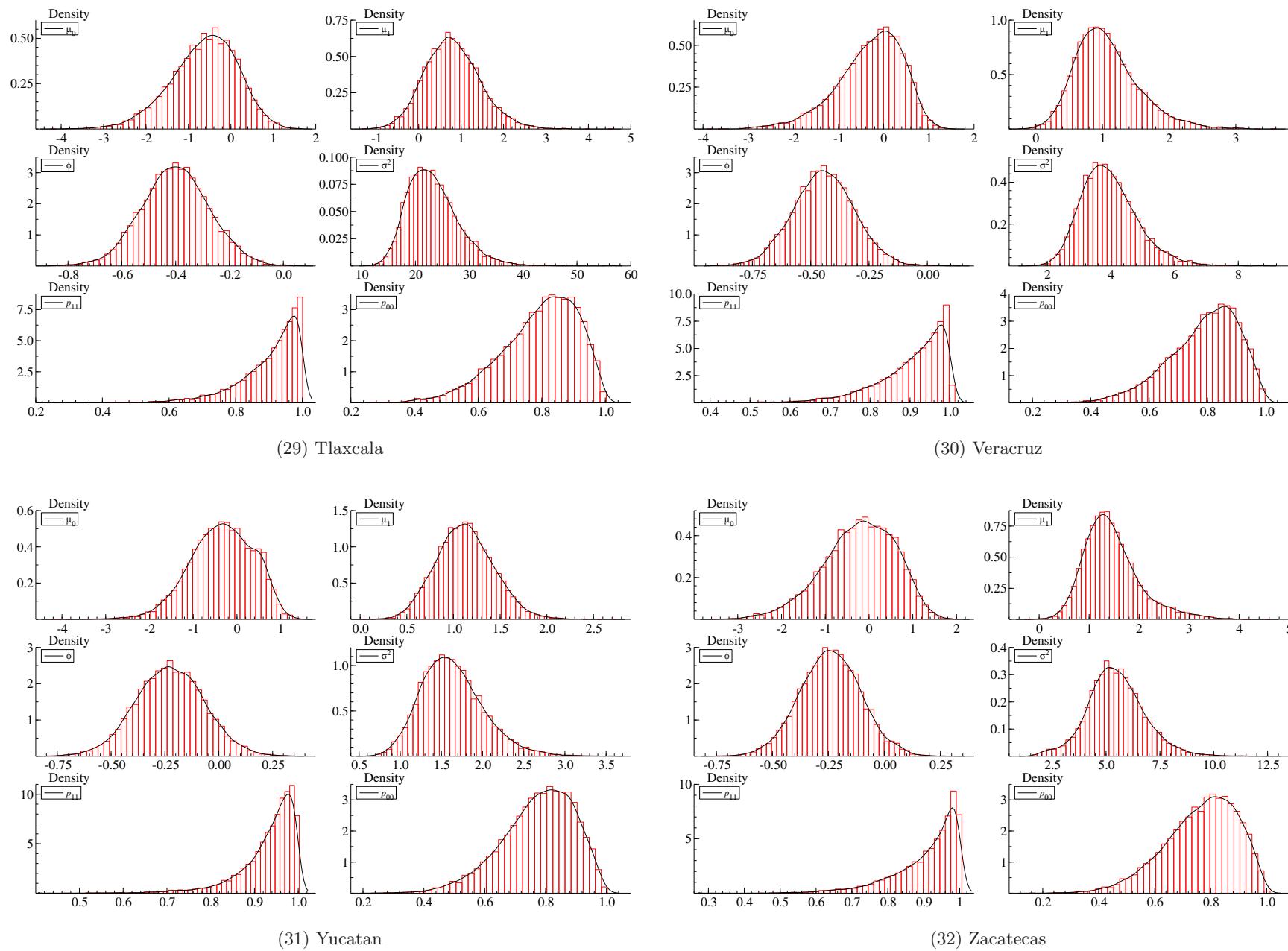


Figure O.A.C. 2: Posterior Distributions (Continued)

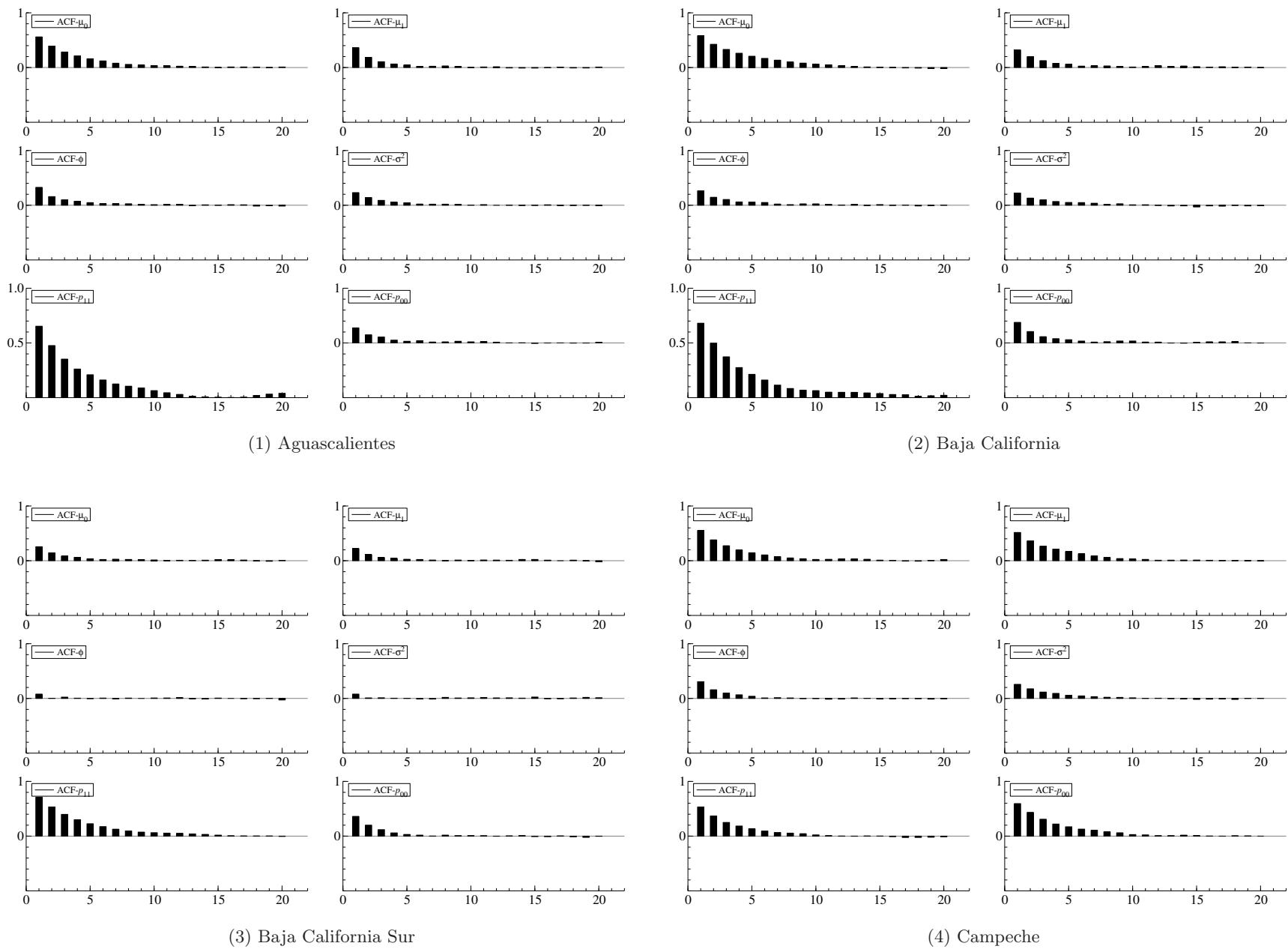
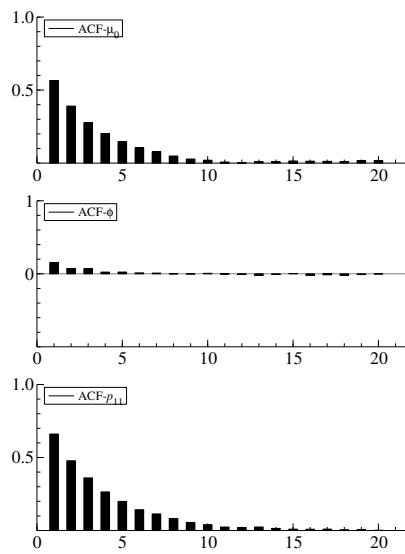
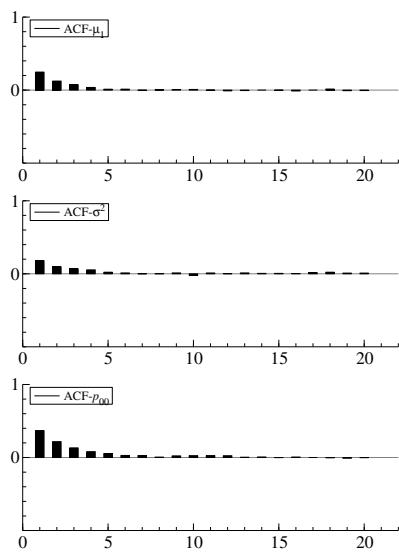


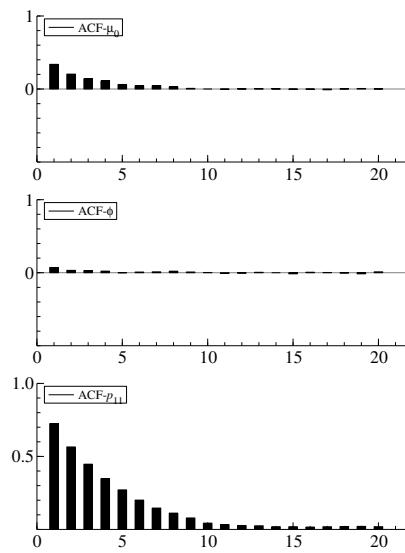
Figure OA.C. 3: Autocorrelation Function



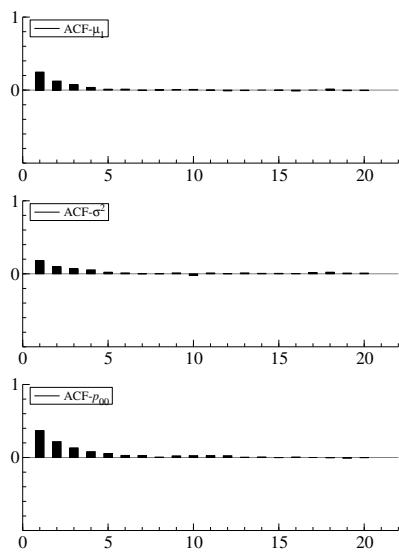
(5) Coahuila



(6) Colima



(7) Chiapas



(8) Chihuahua

Figure O.A.C. 3: Autocorrelation Function (Continued)

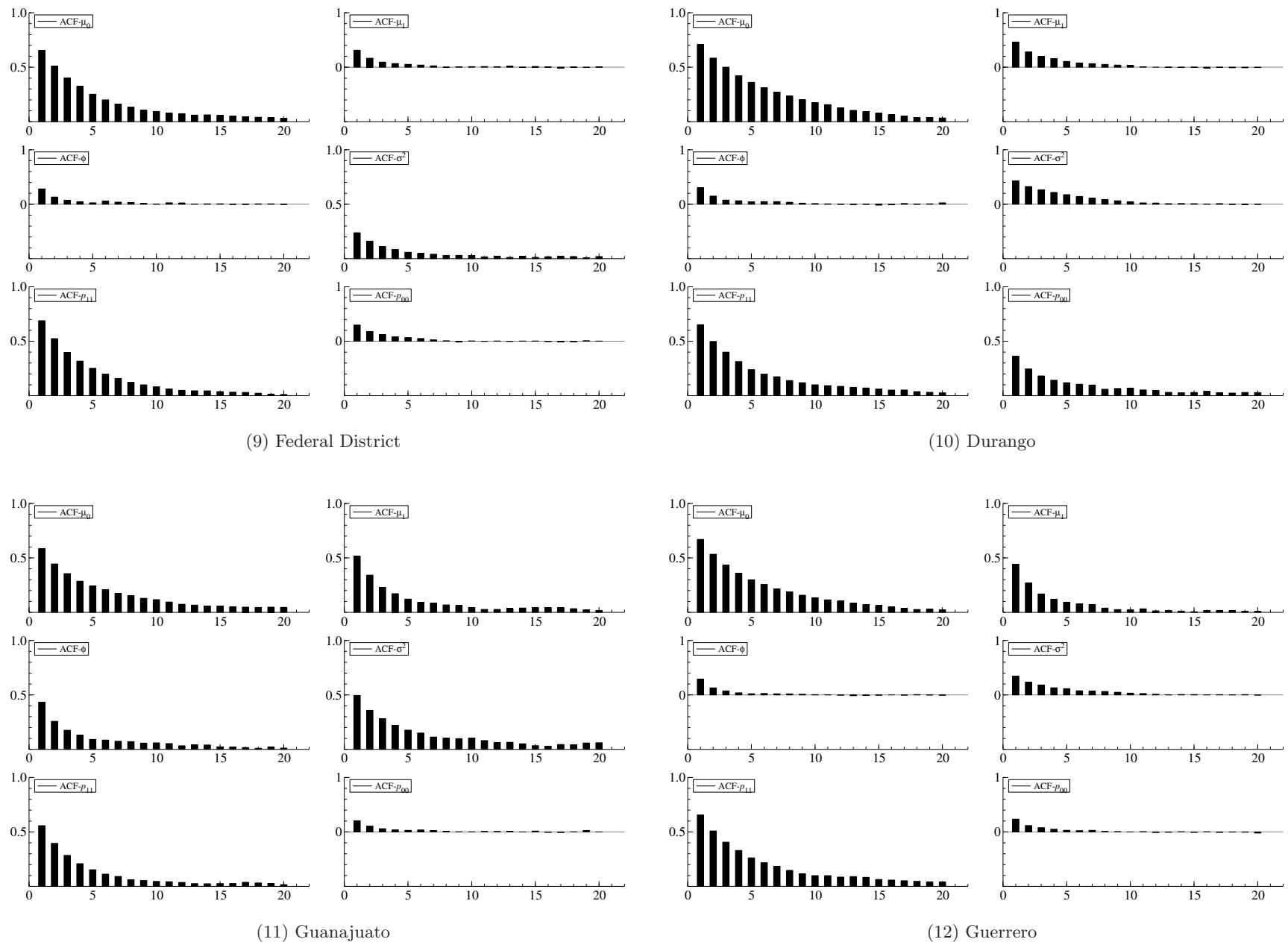


Figure O.A.C. 3: Autocorrelation Function (Continued)

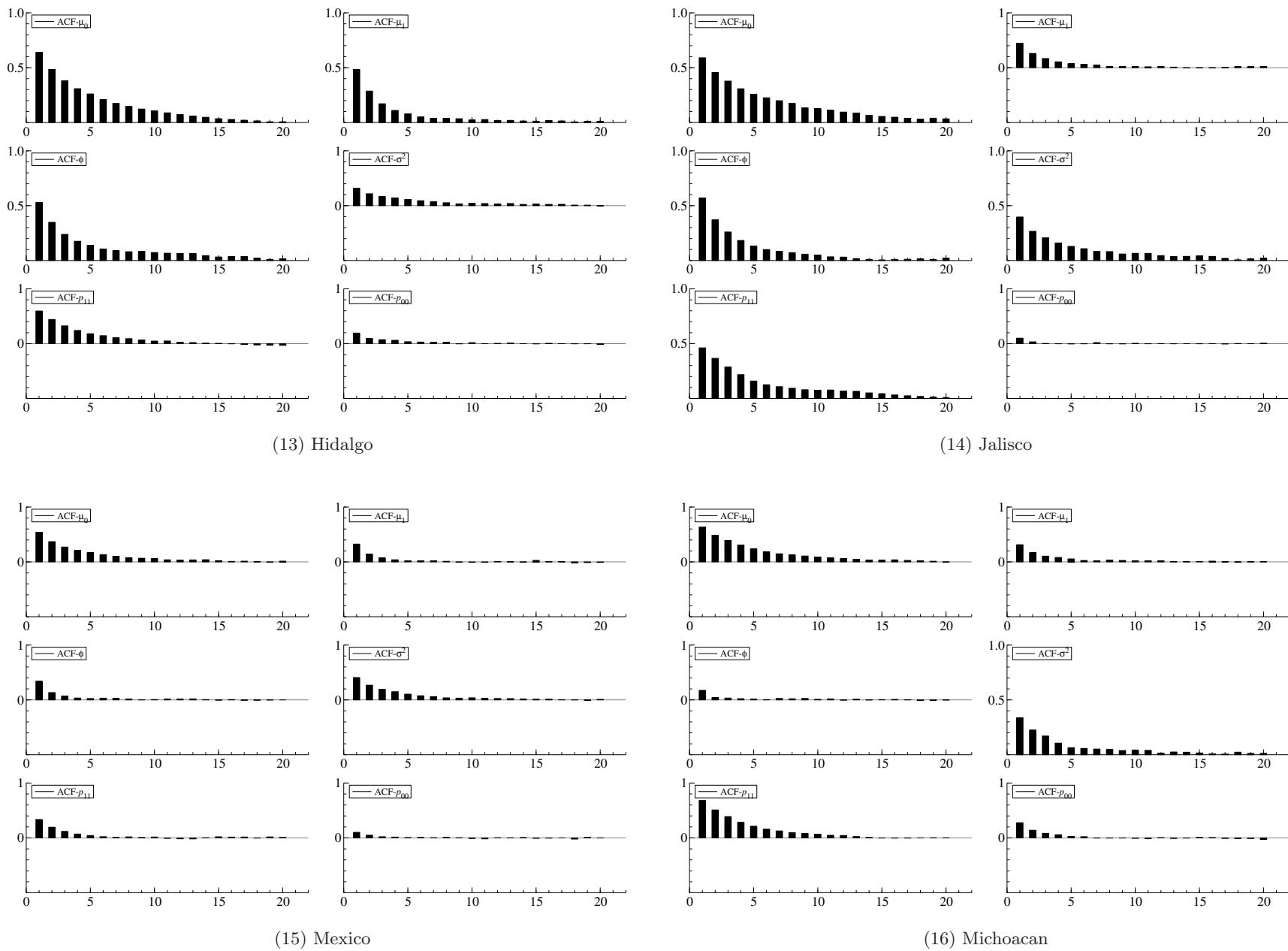


Figure O.A.C. 3: Autocorrelation Function (Continued)

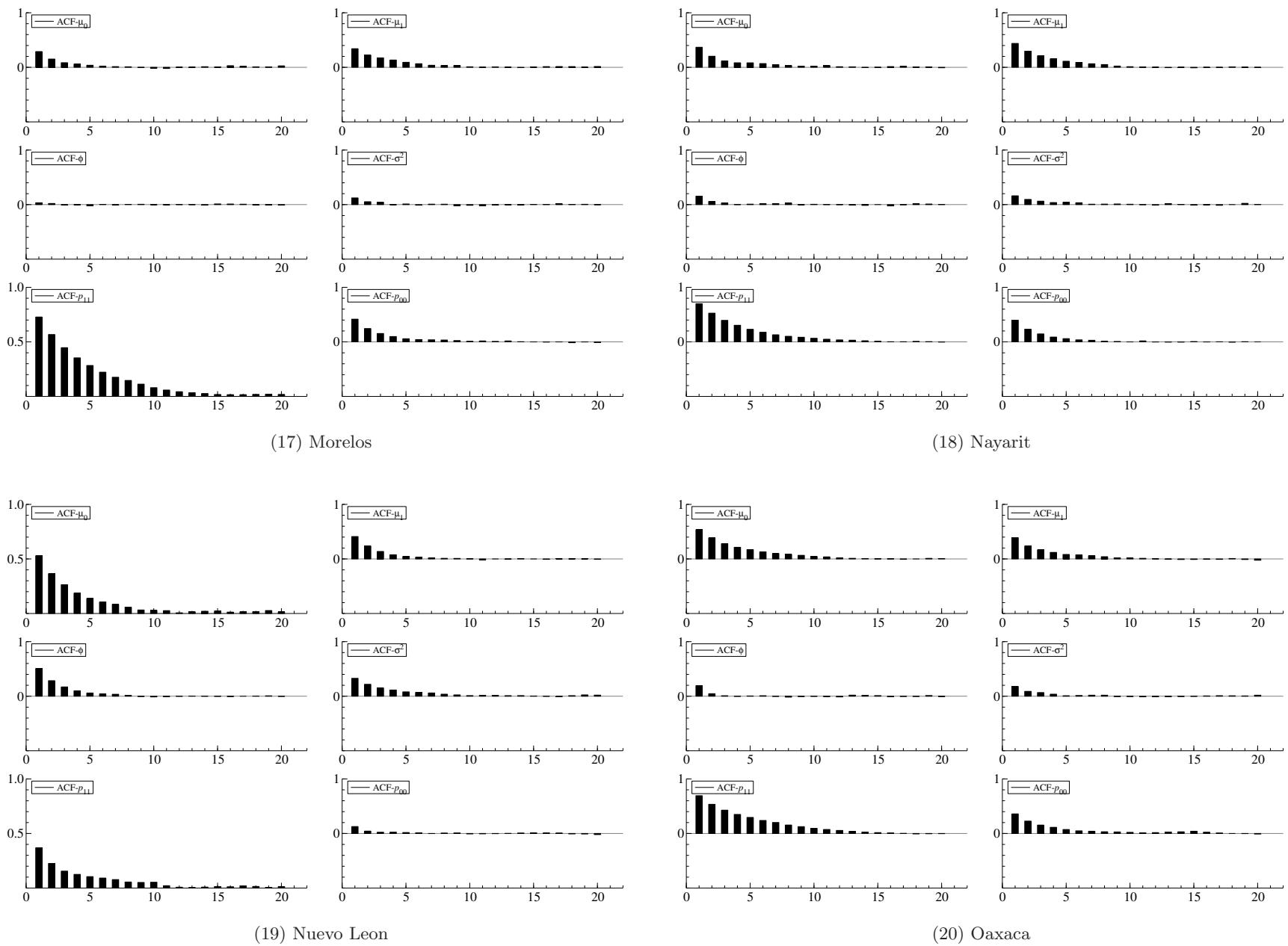


Figure OA.C. 3: Autocorrelation Function (Continued)

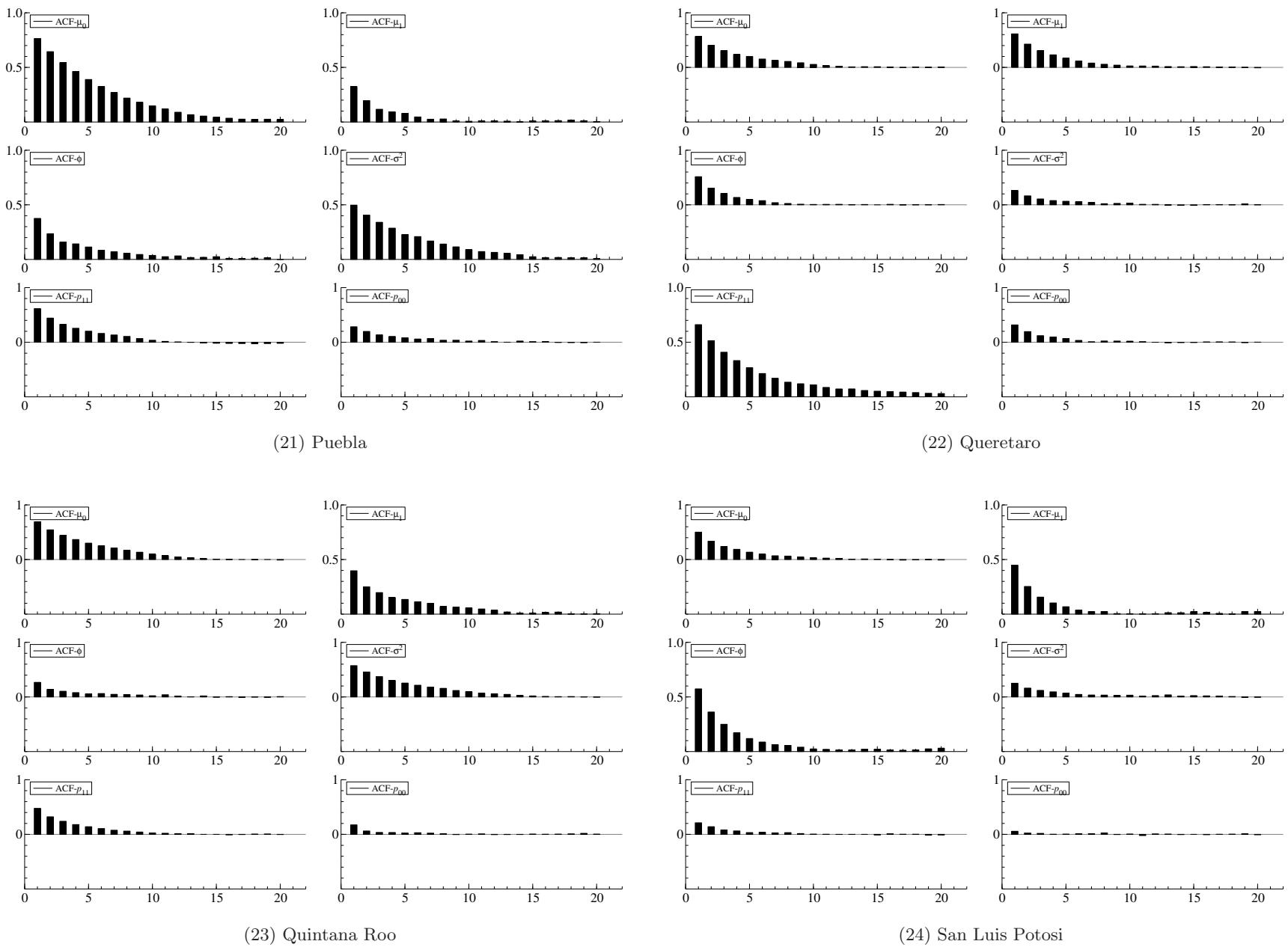
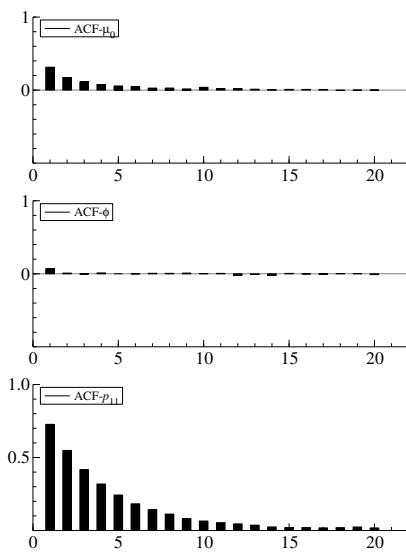
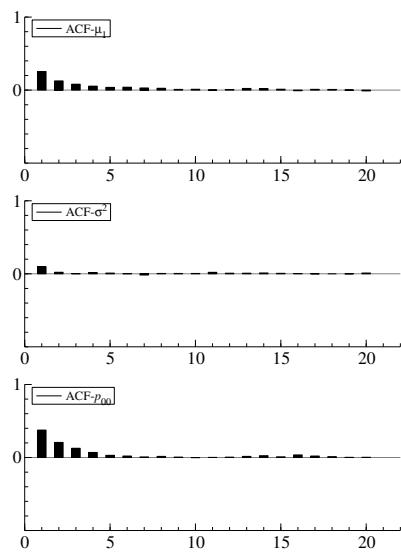


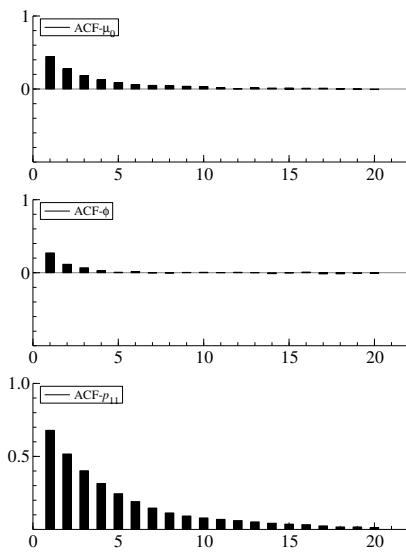
Figure OA.C. 3: Autocorrelation Function (Continued)



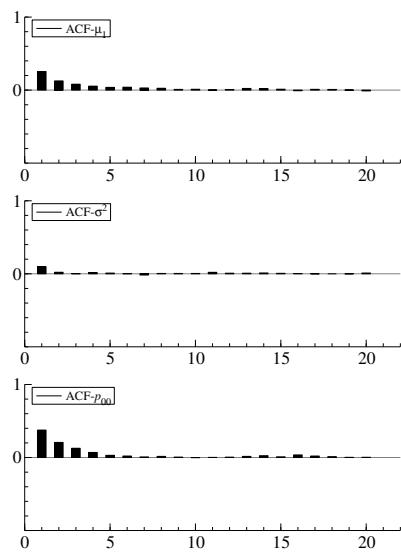
(25) Sinaloa



(26) Sonora



(27) Tabasco



(28) Tamaulipas

Figure O.A.C. 3: Autocorrelation Function (Continued)

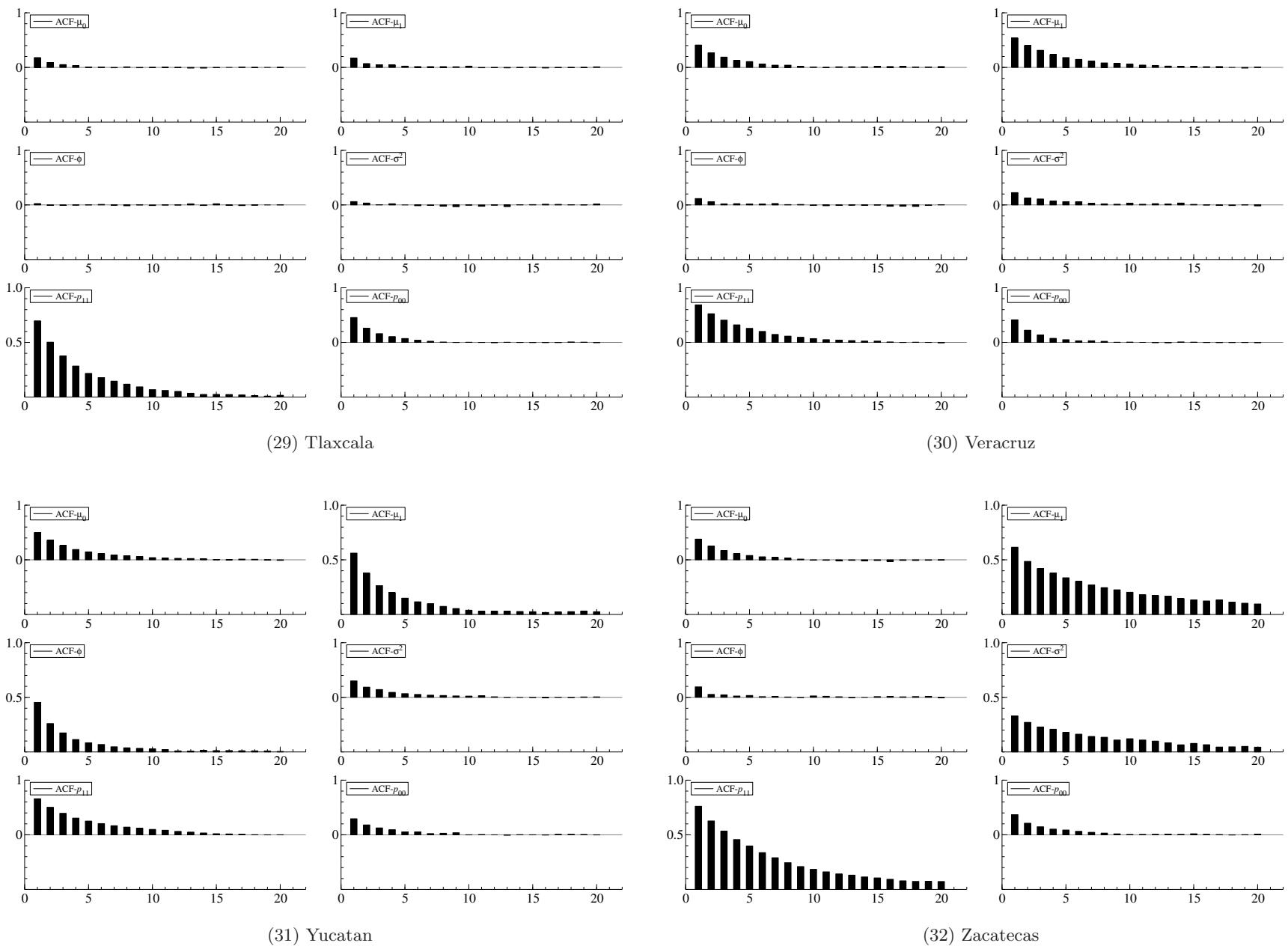


Figure OA.C. 3: Autocorrelation Function (Continued)

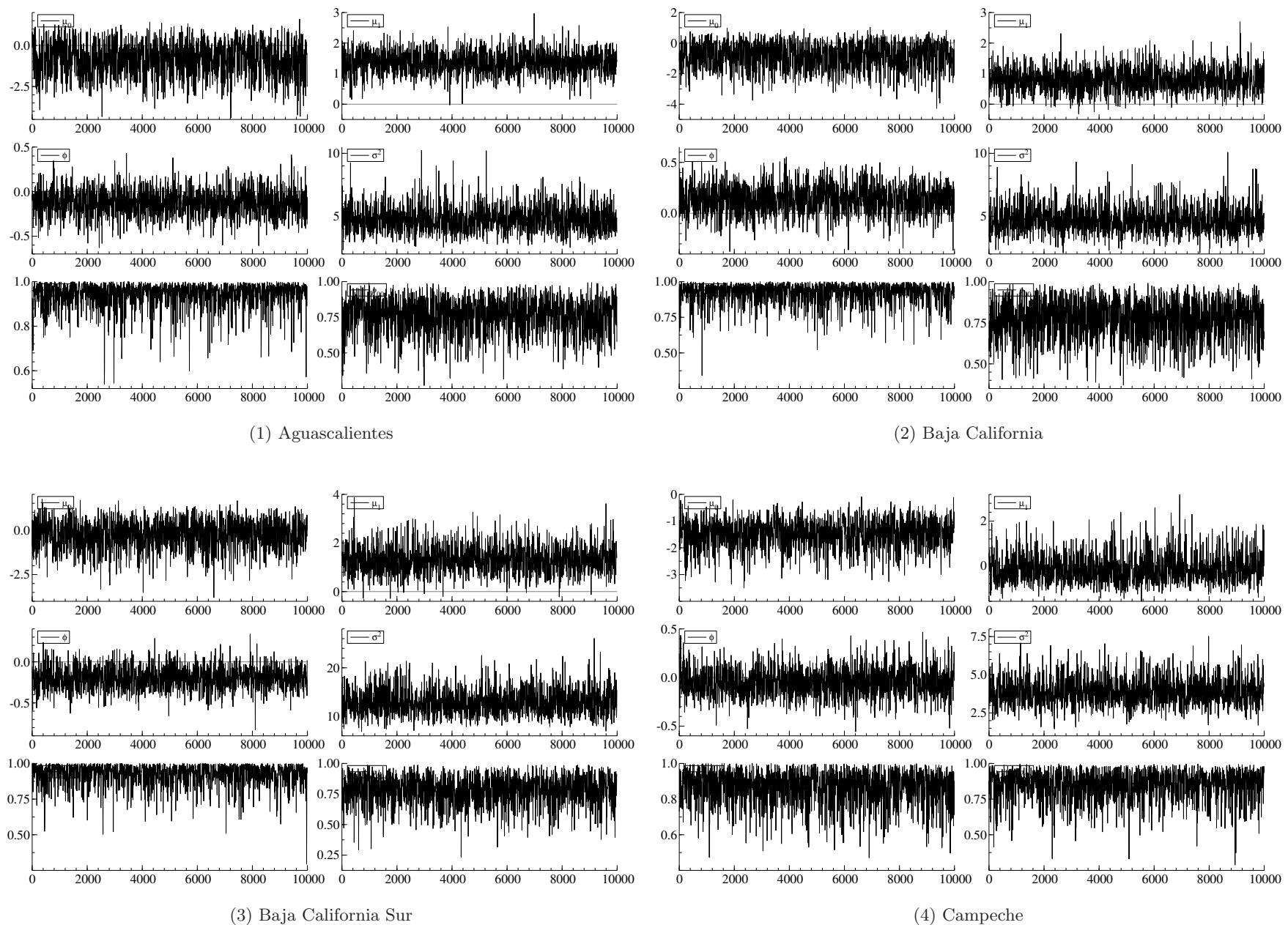


Figure OA.C. 4: Trace Plots

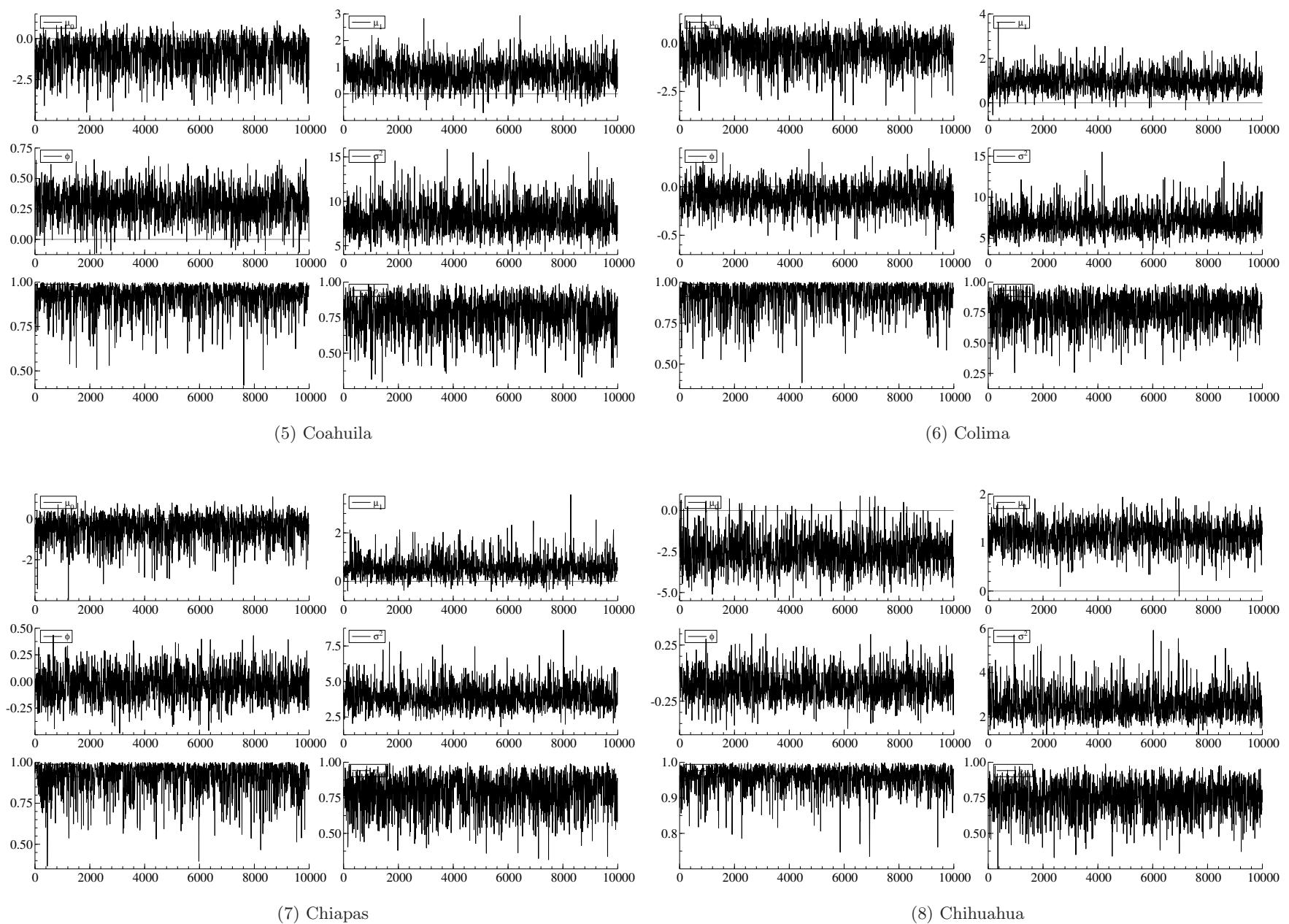


Figure O.A.C. 4: Trace Plots (Continued)

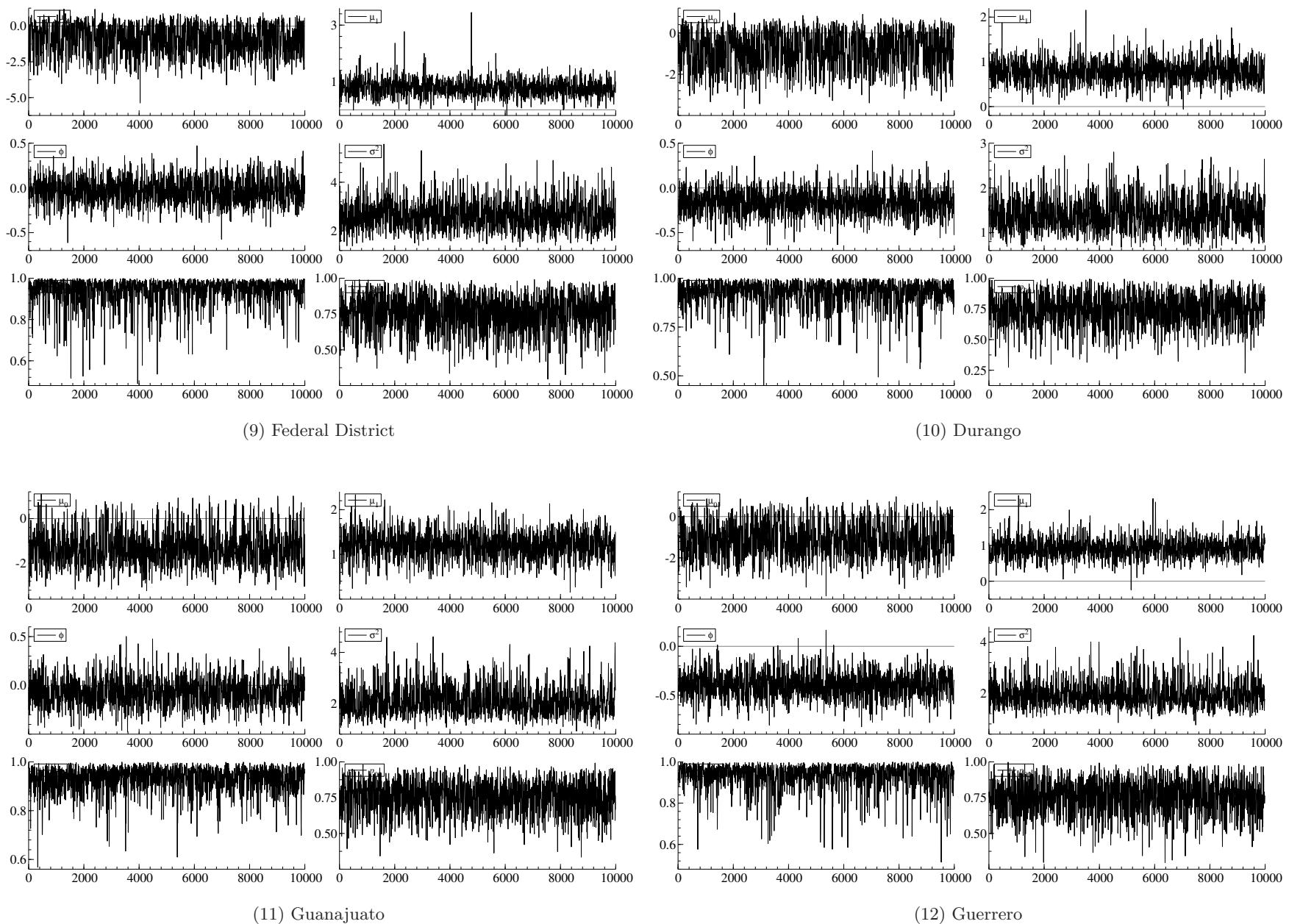


Figure O.A.C. 4: Trace Plots (Continued)

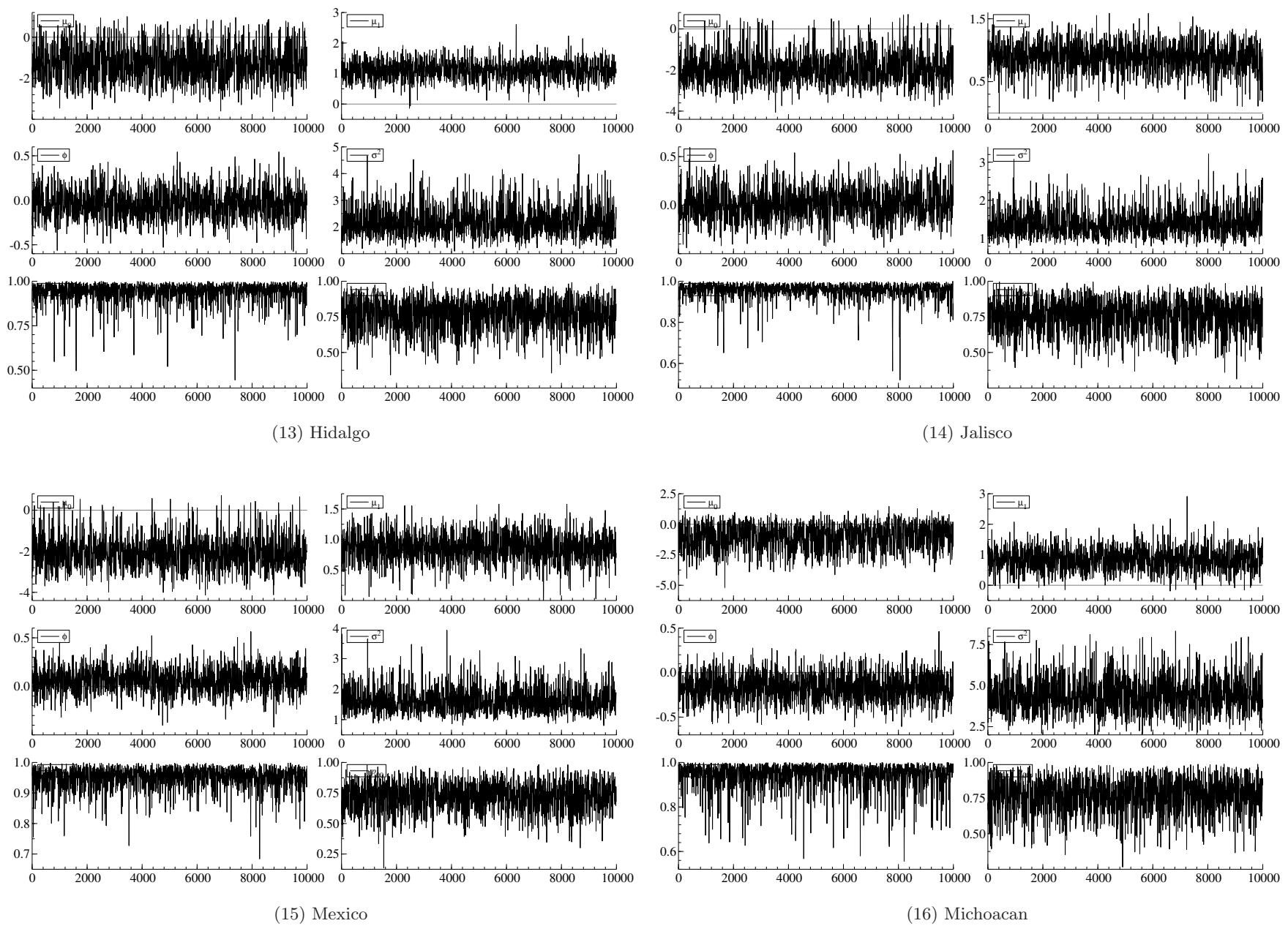


Figure O.A.C. 4: Trace Plots (Continued)

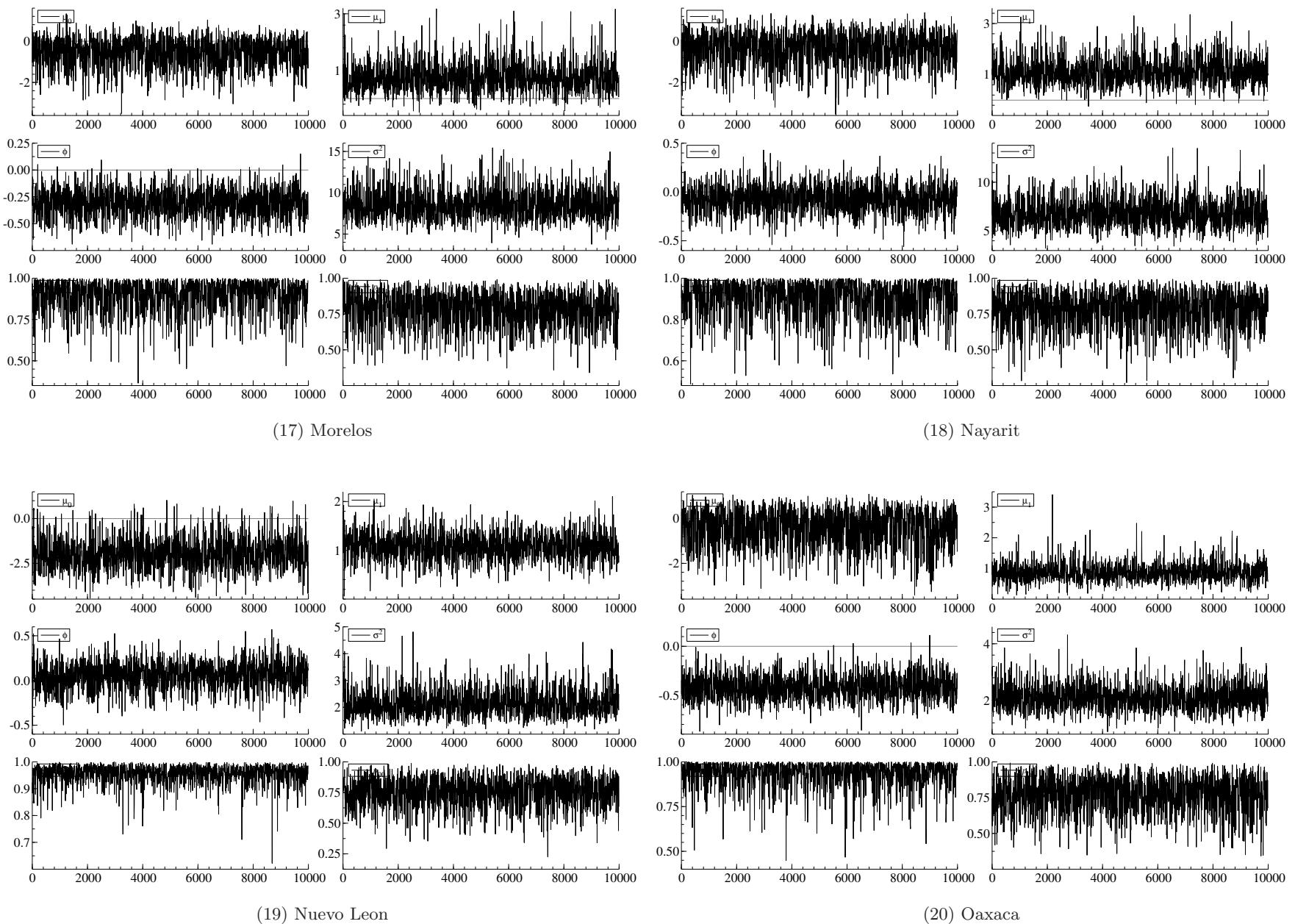
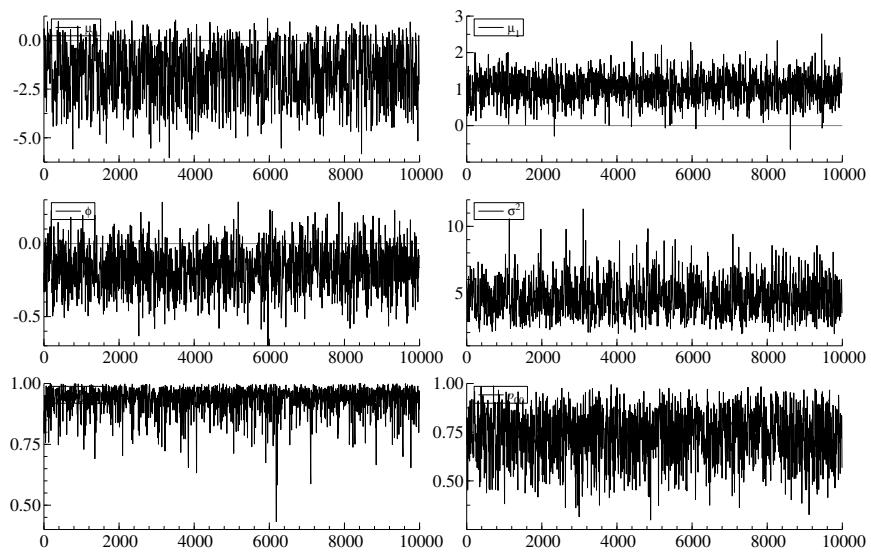
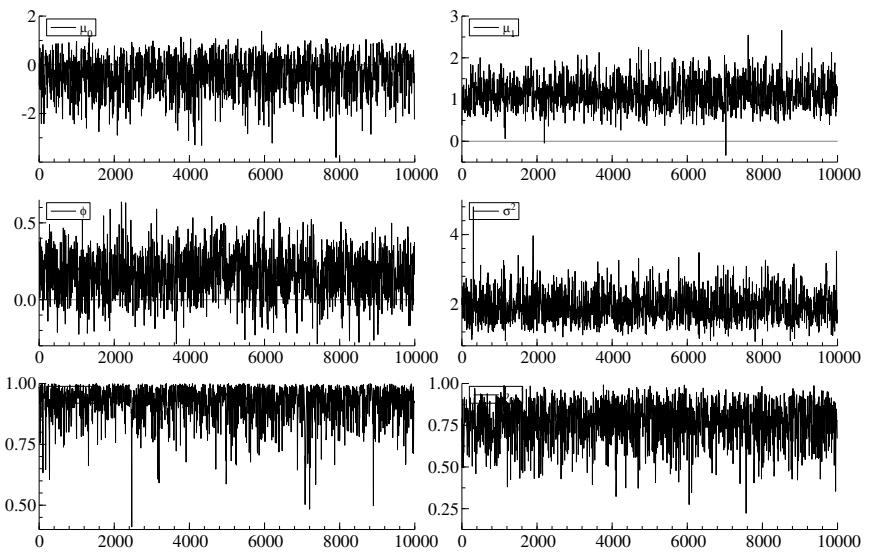


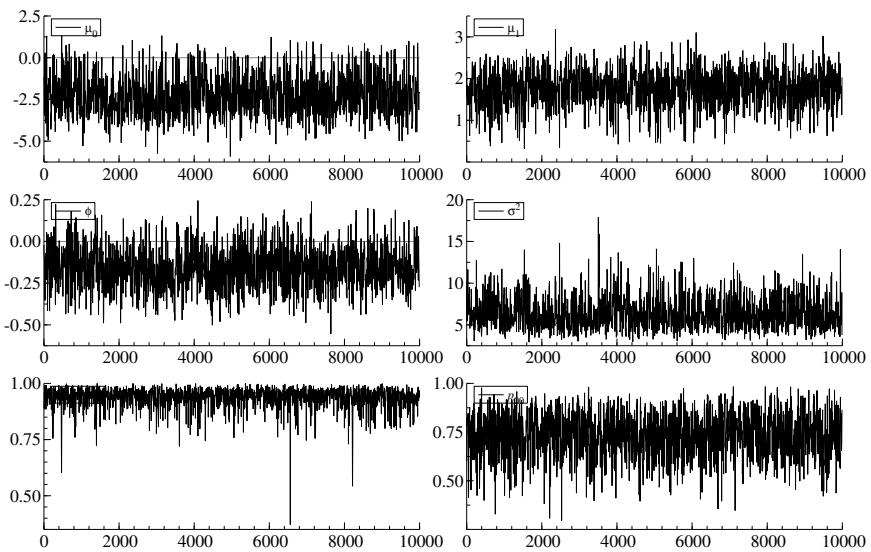
Figure O.A.C. 4: Trace Plots (Continued)



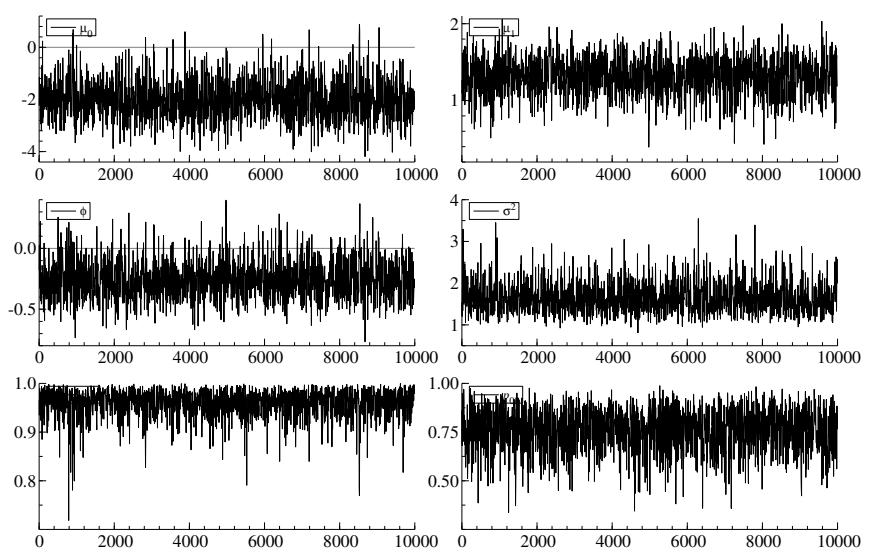
(21) Puebla



(22) Queretaro



(23) Quintana Roo



(24) San Luis Potosi

Figure O.A.C. 4: Trace Plots (Continued)

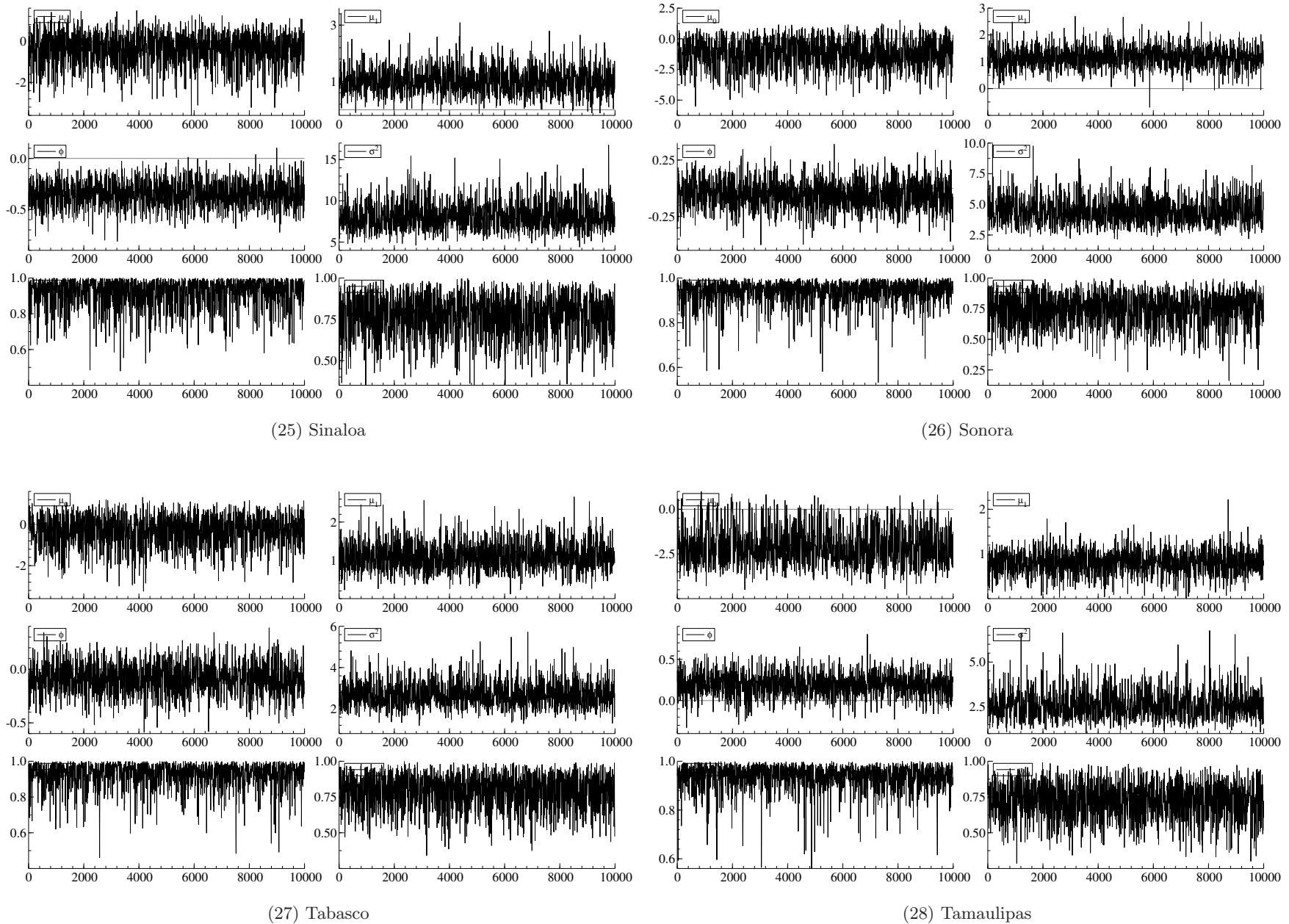


Figure O.A.C. 4: Trace Plots (Continued)

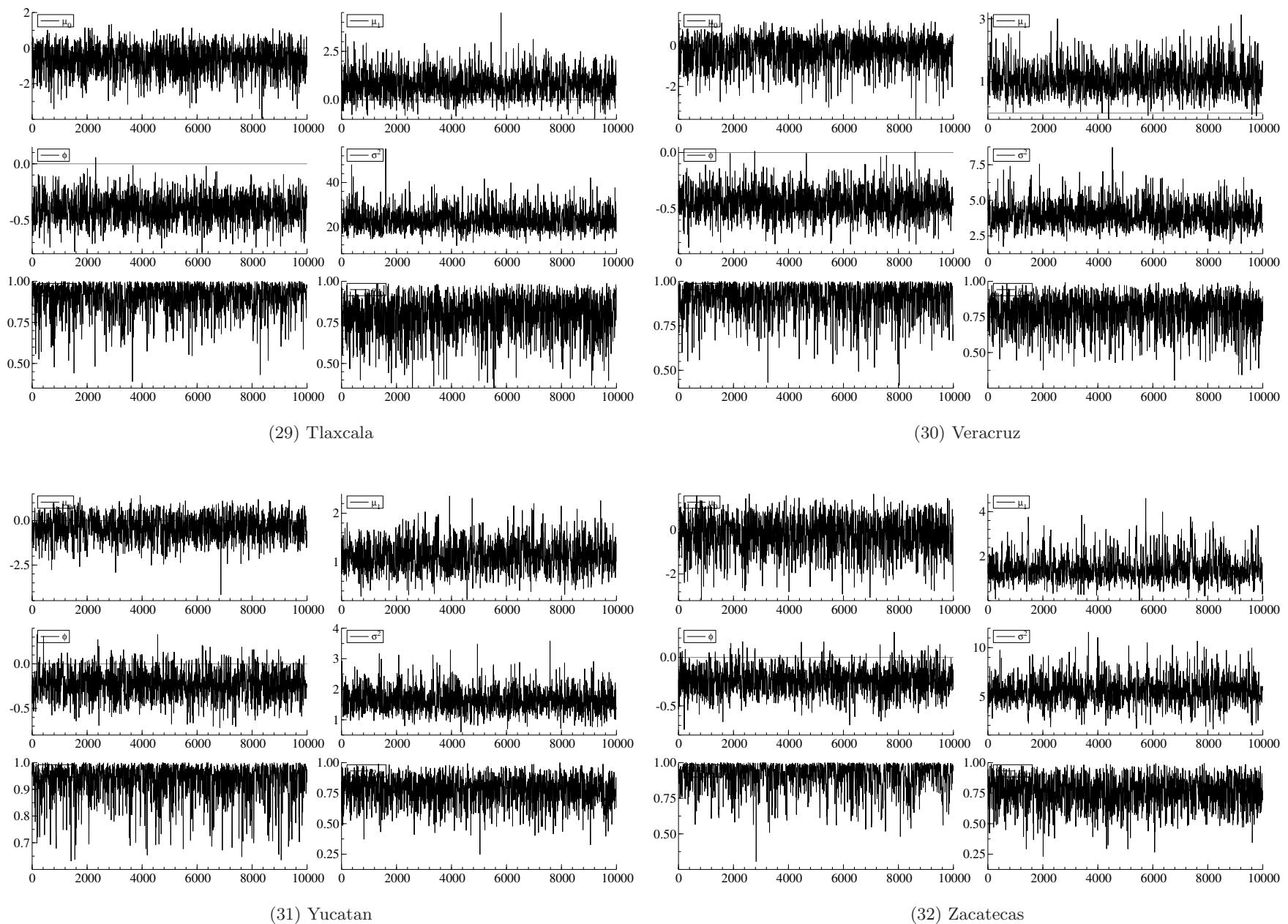


Figure O.A.C. 4: Trace Plots (Continued)

## Online Appendix D. Estimation Results of Markov Switching Model with Spatial Autoregressive Process

The estimation results here are obtained by estimating the Markov switching model with spatial autoregressive (SAR) process:

$$\mathbf{y}_t = \rho \mathbf{W} \mathbf{y}_t + \boldsymbol{\mu}_0 \odot (\boldsymbol{\iota}_N - \mathbf{s}_t) + \boldsymbol{\mu}_1 \odot \mathbf{s}_t + \boldsymbol{\varepsilon}_t,$$

where  $\boldsymbol{\Phi} = \text{diag}(\phi_1, \dots, \phi_N)$ ,  $\boldsymbol{\varepsilon}_t \sim \text{i.i.d. } N(\mathbf{0}, \boldsymbol{\Omega})$ , and  $\boldsymbol{\Omega} = \text{diag}(\sigma_1^2, \dots, \sigma_N^2)$ . (Distance-Based SWM,  $\eta = 4$ )

### Table OA.D. 1

Table OA.D. 1 shows the point estimates and interval estimates of parameters.

### Figure OA.D. 1

Figure OA.D. 1 shows the probabilities of recession, which are calculated by  $1 - G^{-1} \sum_{g=1}^G s_{t,n}^{(g)}$ , where  $G$  is the number of iterations and the superscript  $(g)$  is the  $g$ th iteration.

### Figure OA.D. 2

Figure OA.D. 2 shows convergence diagnostics (kernel density, autocorrelation, and trace plots) for the posterior distribution of  $\rho$ .

### Figure OA.D. 3

Figure OA.D. 3 shows the histogram and density plots of parameters by state. The solid line indicates density estimates obtained by kernel density estimation.

### Figure OA.D. 4

Figure OA.D. 4 shows the autocorrelation plots of parameters by state.

### Figure OA.D. 5

Figure OA.D. 5 shows the trace plots of parameters by state.

Table OA.D. 1: Estimated Parameters

|                    |                     | $\rho$  |        |                |         |        |               |              |  |
|--------------------|---------------------|---------|--------|----------------|---------|--------|---------------|--------------|--|
|                    |                     | Mean    |        |                | Median  |        |               | 95% CI       |  |
| Spatial Dependence |                     | 0.22    |        |                | 0.22    |        |               | [0.18, 0.26] |  |
|                    |                     | $\mu_0$ |        |                | $\mu_1$ |        |               |              |  |
| Code               | State               | Mean    | Median | 95% CI         | Mean    | Median | 95% CI        |              |  |
| 1                  | Aguascalientes      | -0.65   | -0.56  | [-2.63, 0.80]  | 1.01    | 1.00   | [0.37, 1.72]  |              |  |
| 2                  | Baja California     | -1.29   | -1.29  | [-3.01, 0.31]  | 0.67    | 0.66   | [-0.09, 1.46] |              |  |
| 3                  | Baja California Sur | -0.33   | -0.24  | [-2.11, 0.99]  | 1.03    | 1.01   | [0.07, 2.16]  |              |  |
| 4                  | Campeche            | -1.50   | -1.45  | [-2.60, -0.71] | -0.30   | -0.41  | [-1.27, 1.32] |              |  |
| 5                  | Coahuila            | -1.32   | -1.24  | [-3.47, 0.40]  | 0.77    | 0.75   | [-0.06, 1.74] |              |  |
| 6                  | Colima              | -0.34   | -0.21  | [-2.10, 0.81]  | 0.84    | 0.80   | [0.08, 1.86]  |              |  |
| 7                  | Chiapas             | -0.71   | -0.60  | [-2.20, 0.28]  | 0.33    | 0.29   | [-0.32, 1.24] |              |  |
| 8                  | Chihuahua           | -1.76   | -1.85  | [-3.71, 0.37]  | 0.82    | 0.82   | [0.31, 1.35]  |              |  |
| 9                  | Federal District    | -0.69   | -0.48  | [-2.82, 0.55]  | 0.59    | 0.56   | [0.12, 1.19]  |              |  |
| 10                 | Durango             | -0.49   | -0.26  | [-2.33, 0.45]  | 0.50    | 0.47   | [0.08, 1.20]  |              |  |
| 11                 | Guanajuato          | -0.79   | -0.80  | [-2.31, 0.57]  | 0.84    | 0.82   | [0.28, 1.47]  |              |  |
| 12                 | Guerrero            | -0.32   | -0.15  | [-2.04, 0.58]  | 0.62    | 0.57   | [0.09, 1.51]  |              |  |
| 13                 | Hidalgo             | -0.78   | -0.78  | [-2.43, 0.68]  | 0.97    | 0.95   | [0.47, 1.57]  |              |  |
| 14                 | Jalisco             | -1.24   | -1.31  | [-2.67, 0.37]  | 0.66    | 0.66   | [0.28, 1.06]  |              |  |
| 15                 | México              | -2.27   | -2.33  | [-3.32, -0.85] | 0.80    | 0.80   | [0.48, 1.09]  |              |  |
| 16                 | Michoacán           | -0.68   | -0.52  | [-2.59, 0.49]  | 0.51    | 0.48   | [-0.14, 1.34] |              |  |
| 17                 | Morelos             | -0.54   | -0.45  | [-2.09, 0.56]  | 0.52    | 0.48   | [-0.33, 1.63] |              |  |
| 18                 | Nayarit             | -0.30   | -0.19  | [-1.99, 0.82]  | 0.95    | 0.89   | [0.12, 2.10]  |              |  |
| 19                 | Nuevo León          | -1.05   | -1.12  | [-2.71, 0.65]  | 0.93    | 0.93   | [0.50, 1.37]  |              |  |
| 20                 | Oaxaca              | -0.37   | -0.18  | [-2.23, 0.59]  | 0.57    | 0.54   | [0.04, 1.30]  |              |  |
| 21                 | Puebla              | -0.65   | -0.51  | [-2.64, 0.68]  | 0.82    | 0.80   | [0.03, 1.76]  |              |  |
| 22                 | Querétaro           | -0.24   | -0.17  | [-1.83, 0.88]  | 1.22    | 1.20   | [0.69, 1.84]  |              |  |
| 23                 | Quintana Roo        | -1.49   | -1.58  | [-3.87, 0.84]  | 1.48    | 1.49   | [0.56, 2.30]  |              |  |
| 24                 | San Luis Potosí     | -0.81   | -0.80  | [-2.49, 0.63]  | 0.80    | 0.79   | [0.36, 1.30]  |              |  |
| 25                 | Sinaloa             | -0.46   | -0.35  | [-2.15, 0.69]  | 0.65    | 0.62   | [-0.17, 1.67] |              |  |
| 26                 | Sonora              | -0.87   | -0.68  | [-3.45, 0.78]  | 1.02    | 1.01   | [0.35, 1.77]  |              |  |
| 27                 | Tabasco             | -0.24   | -0.09  | [-2.00, 0.82]  | 0.93    | 0.90   | [0.39, 1.62]  |              |  |
| 28                 | Tamaulipas          | -1.41   | -1.47  | [-3.23, 0.35]  | 0.66    | 0.65   | [0.11, 1.29]  |              |  |
| 29                 | Tlaxcala            | -0.66   | -0.62  | [-2.31, 0.67]  | 0.64    | 0.61   | [-0.54, 1.97] |              |  |
| 30                 | Veracruz            | -0.45   | -0.31  | [-2.10, 0.57]  | 0.54    | 0.51   | [-0.09, 1.38] |              |  |
| 31                 | Yucatán             | -0.12   | 0.05   | [-2.08, 1.01]  | 1.04    | 1.02   | [0.61, 1.64]  |              |  |
| 32                 | Zacatecas           | -0.28   | -0.16  | [-2.08, 0.90]  | 0.95    | 0.91   | [0.24, 1.93]  |              |  |

Notes: 95% CI indicates 95% credible interval.

Table OA.D. 1: Estimated Parameters (Continued)

| Code | State               | $\sigma^2$ |        |                | $p_{11}$ |        |              | $p_{00}$ |        |              |
|------|---------------------|------------|--------|----------------|----------|--------|--------------|----------|--------|--------------|
|      |                     | Mean       | Median | 95% CI         | Mean     | Median | 95% CI       | Mean     | Median | 95% CI       |
| 1    | Aguascalientes      | 4.30       | 4.19   | [2.82, 6.43]   | 0.93     | 0.95   | [0.73, 1.00] | 0.77     | 0.78   | [0.48, 0.96] |
| 2    | Baja California     | 4.38       | 4.26   | [2.59, 6.86]   | 0.93     | 0.95   | [0.75, 1.00] | 0.76     | 0.77   | [0.50, 0.95] |
| 3    | Baja California Sur | 13.14      | 12.82  | [8.94, 19.12]  | 0.91     | 0.94   | [0.69, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 4    | Campeche            | 3.88       | 3.79   | [2.47, 5.75]   | 0.86     | 0.88   | [0.61, 0.99] | 0.84     | 0.87   | [0.56, 0.98] |
| 5    | Coahuila            | 7.37       | 7.18   | [4.76, 11.06]  | 0.92     | 0.94   | [0.73, 1.00] | 0.77     | 0.79   | [0.50, 0.95] |
| 6    | Colima              | 7.03       | 6.85   | [4.71, 10.32]  | 0.91     | 0.94   | [0.66, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 7    | Chiapas             | 3.85       | 3.75   | [2.58, 5.60]   | 0.92     | 0.95   | [0.68, 1.00] | 0.78     | 0.80   | [0.49, 0.96] |
| 8    | Chihuahua           | 2.71       | 2.61   | [1.64, 4.35]   | 0.94     | 0.96   | [0.80, 1.00] | 0.73     | 0.75   | [0.45, 0.94] |
| 9    | Federal District    | 2.25       | 2.19   | [1.47, 3.37]   | 0.93     | 0.96   | [0.72, 1.00] | 0.76     | 0.78   | [0.46, 0.97] |
| 10   | Durango             | 1.59       | 1.56   | [1.01, 2.36]   | 0.91     | 0.94   | [0.67, 1.00] | 0.78     | 0.80   | [0.48, 0.97] |
| 11   | Guanajuato          | 2.15       | 2.11   | [1.19, 3.40]   | 0.92     | 0.94   | [0.72, 1.00] | 0.75     | 0.76   | [0.47, 0.95] |
| 12   | Guerrero            | 2.51       | 2.46   | [1.67, 3.70]   | 0.91     | 0.94   | [0.65, 1.00] | 0.79     | 0.81   | [0.49, 0.97] |
| 13   | Hidalgo             | 2.20       | 2.14   | [1.41, 3.35]   | 0.93     | 0.95   | [0.75, 1.00] | 0.77     | 0.78   | [0.51, 0.95] |
| 14   | Jalisco             | 1.38       | 1.33   | [0.87, 2.17]   | 0.95     | 0.96   | [0.82, 1.00] | 0.76     | 0.77   | [0.50, 0.95] |
| 15   | México              | 1.07       | 1.02   | [0.69, 1.75]   | 0.94     | 0.95   | [0.86, 0.99] | 0.71     | 0.72   | [0.46, 0.92] |
| 16   | Michoacán           | 4.47       | 4.38   | [2.94, 6.60]   | 0.93     | 0.95   | [0.72, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 17   | Morelos             | 9.27       | 9.06   | [6.34, 13.39]  | 0.90     | 0.92   | [0.65, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 18   | Nayarit             | 6.50       | 6.35   | [4.39, 9.45]   | 0.90     | 0.93   | [0.65, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 19   | Nuevo León          | 1.59       | 1.54   | [0.96, 2.55]   | 0.94     | 0.95   | [0.78, 1.00] | 0.74     | 0.75   | [0.46, 0.94] |
| 20   | Oaxaca              | 2.82       | 2.75   | [1.91, 4.13]   | 0.92     | 0.95   | [0.68, 1.00] | 0.79     | 0.81   | [0.49, 0.97] |
| 21   | Puebla              | 6.13       | 5.98   | [3.93, 9.21]   | 0.91     | 0.94   | [0.70, 1.00] | 0.77     | 0.78   | [0.48, 0.96] |
| 22   | Querétaro           | 1.64       | 1.60   | [1.01, 2.54]   | 0.91     | 0.93   | [0.73, 1.00] | 0.77     | 0.79   | [0.50, 0.95] |
| 23   | Quintana Roo        | 7.16       | 6.90   | [4.13, 11.70]  | 0.93     | 0.94   | [0.77, 1.00] | 0.74     | 0.75   | [0.48, 0.95] |
| 24   | San Luis Potosí     | 1.81       | 1.76   | [1.17, 2.74]   | 0.94     | 0.96   | [0.78, 1.00] | 0.77     | 0.79   | [0.50, 0.96] |
| 25   | Sinaloa             | 9.03       | 8.81   | [6.19, 13.11]  | 0.92     | 0.94   | [0.68, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 26   | Sonora              | 4.28       | 4.19   | [2.55, 6.56]   | 0.92     | 0.94   | [0.71, 1.00] | 0.75     | 0.77   | [0.46, 0.96] |
| 27   | Tabasco             | 2.60       | 2.54   | [1.74, 3.82]   | 0.92     | 0.95   | [0.70, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 28   | Tamaulipas          | 2.57       | 2.48   | [1.56, 4.01]   | 0.93     | 0.95   | [0.74, 0.99] | 0.75     | 0.76   | [0.48, 0.95] |
| 29   | Tlaxcala            | 27.62      | 26.99  | [18.96, 40.10] | 0.90     | 0.93   | [0.65, 1.00] | 0.80     | 0.82   | [0.51, 0.97] |
| 30   | Veracruz            | 4.52       | 4.40   | [3.09, 6.60]   | 0.92     | 0.95   | [0.70, 1.00] | 0.79     | 0.81   | [0.49, 0.97] |
| 31   | Yucatán             | 1.90       | 1.85   | [1.27, 2.76]   | 0.93     | 0.96   | [0.70, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |
| 32   | Zacatecas           | 5.34       | 5.21   | [3.57, 7.85]   | 0.91     | 0.94   | [0.66, 1.00] | 0.78     | 0.80   | [0.49, 0.97] |

Notes: 95% CI indicates 95% credible interval.

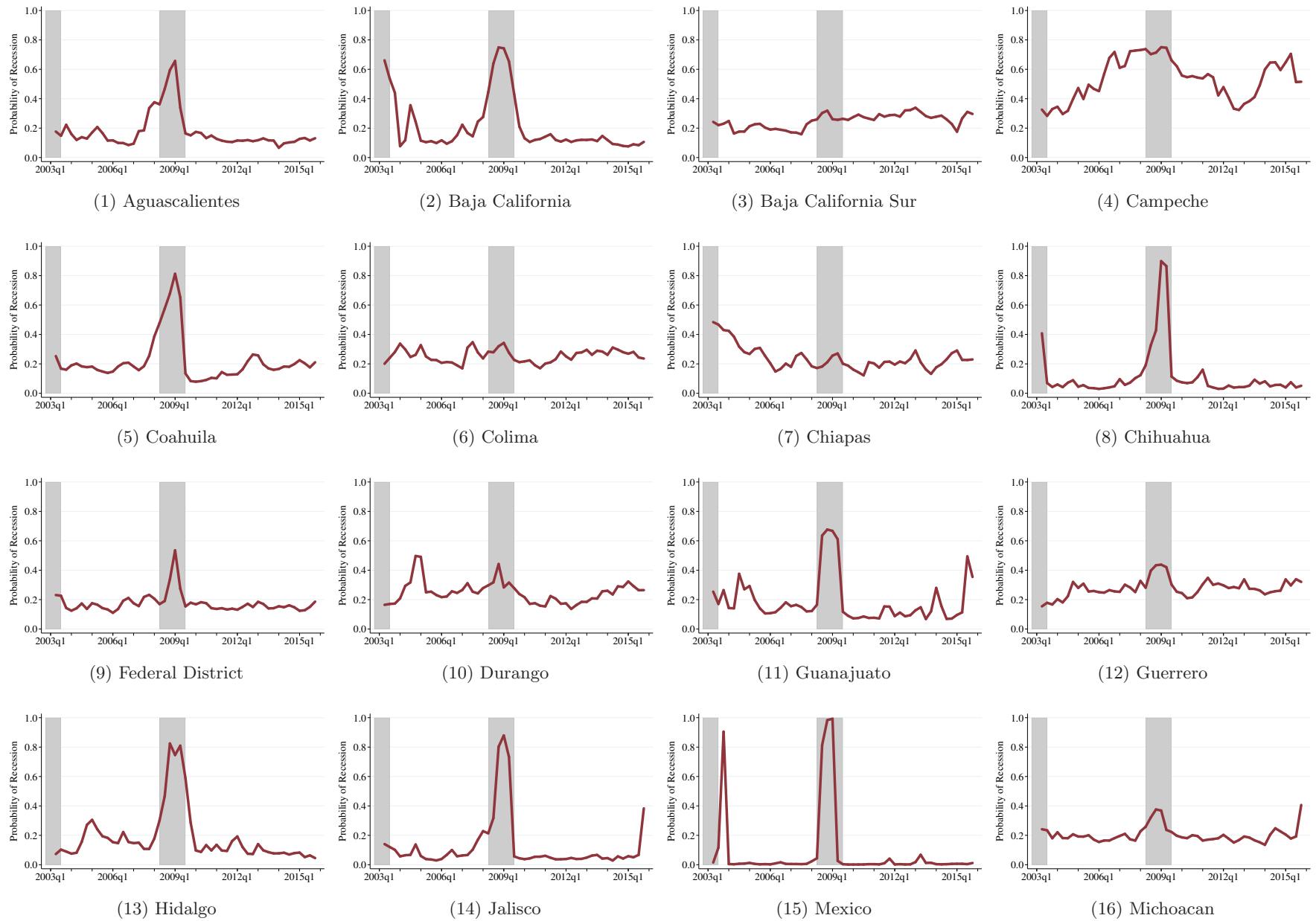


Figure OA.D. 1: Recession Probabilities

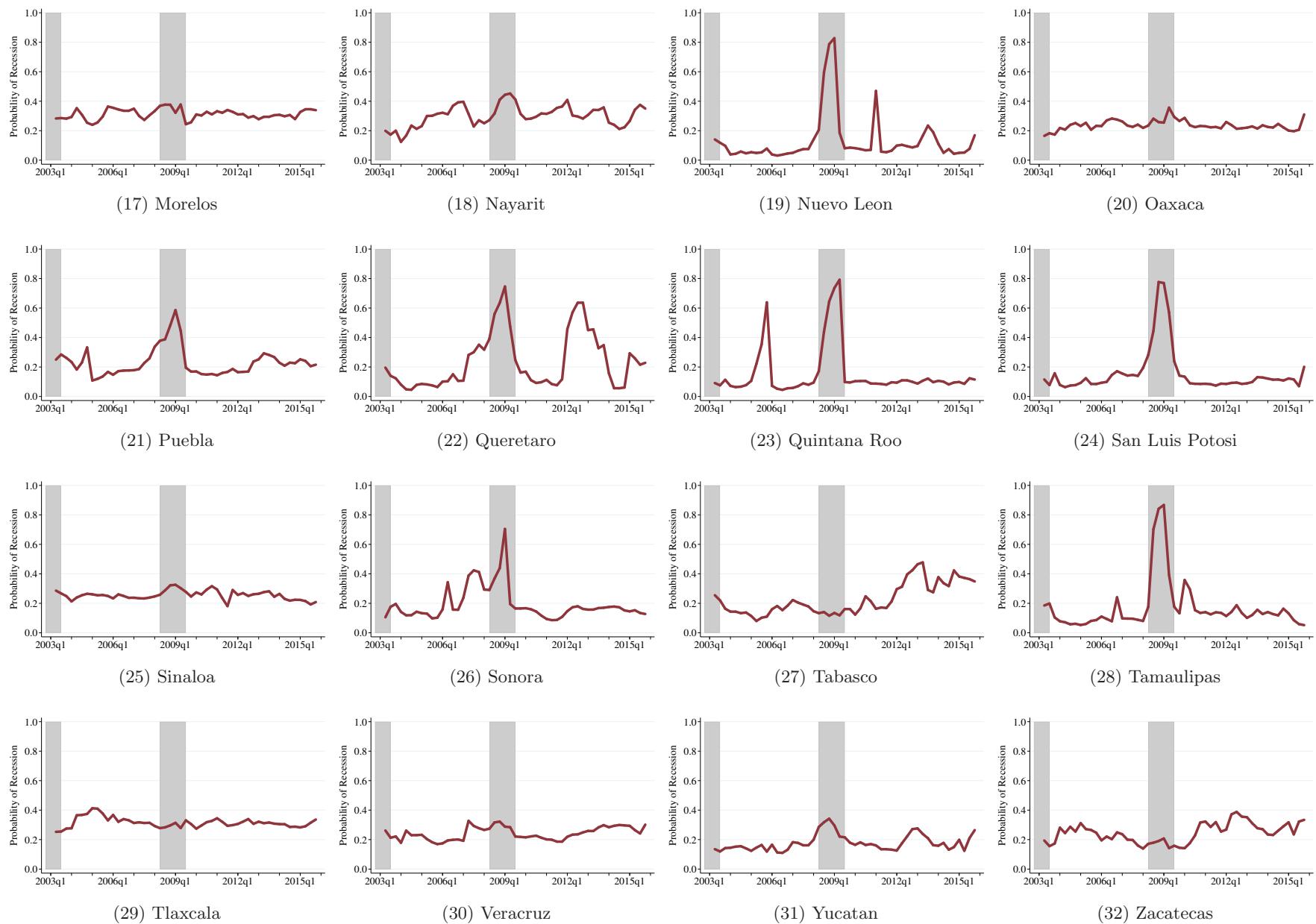
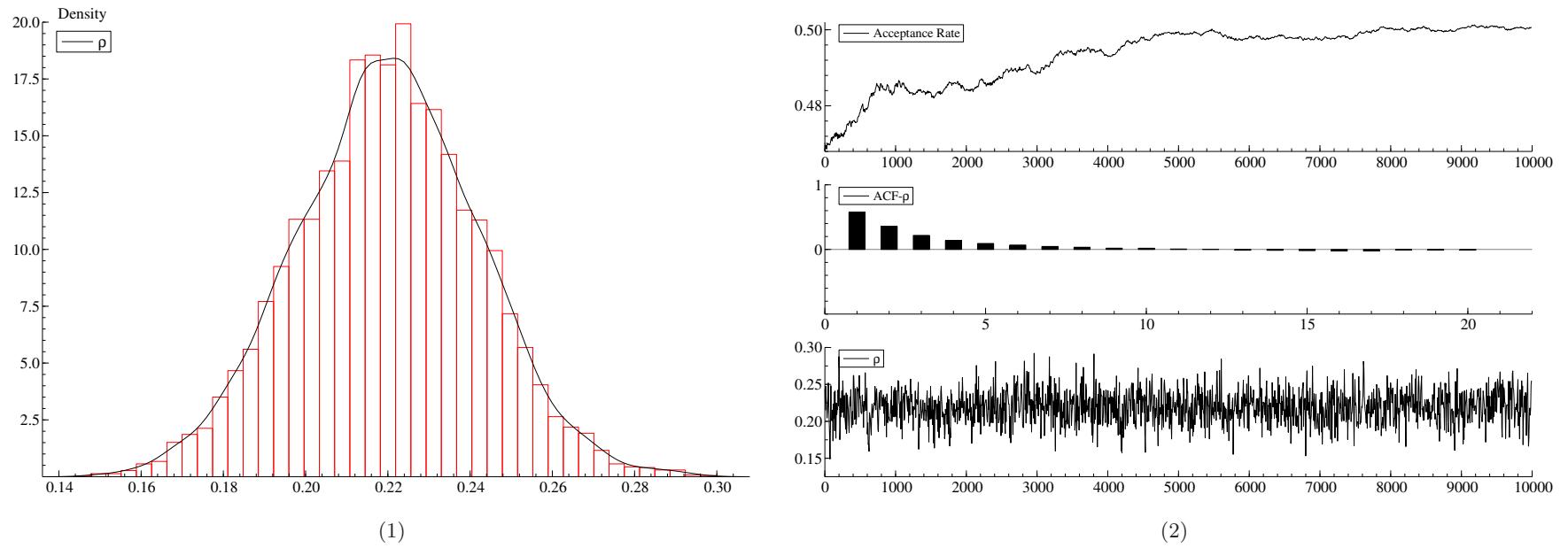


Figure OA.D. 1: Recession Probabilities (Continued)

Figure OA.D. 2: Posterior Distribution of  $\rho$

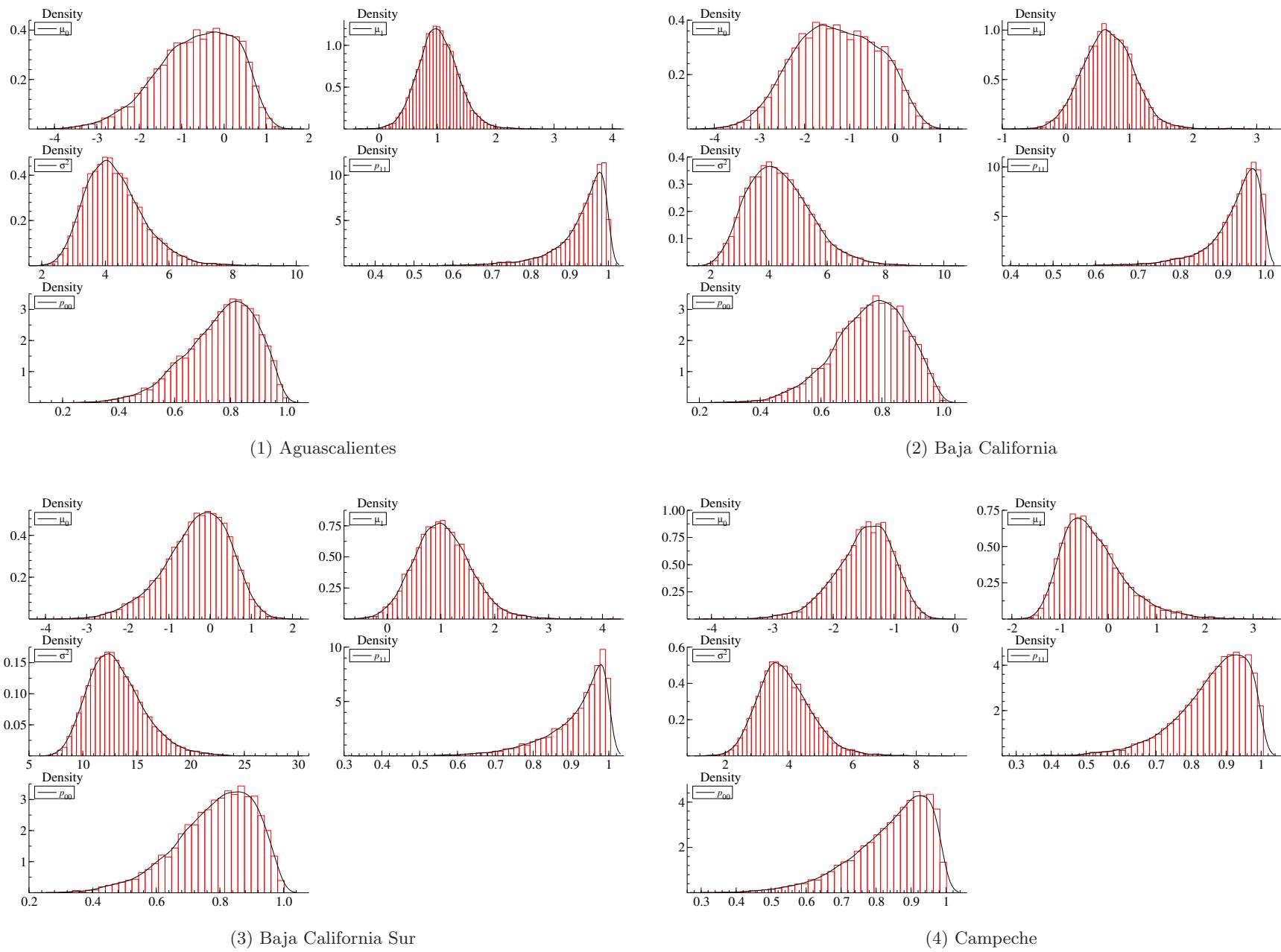
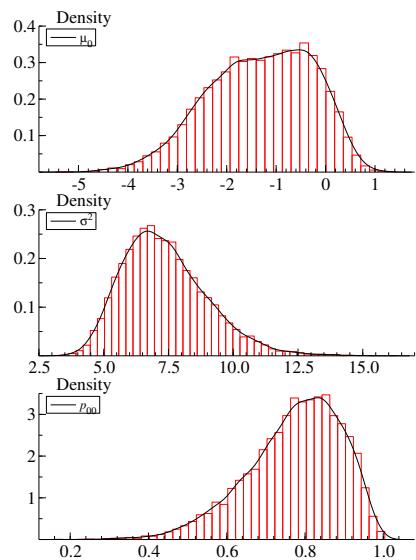
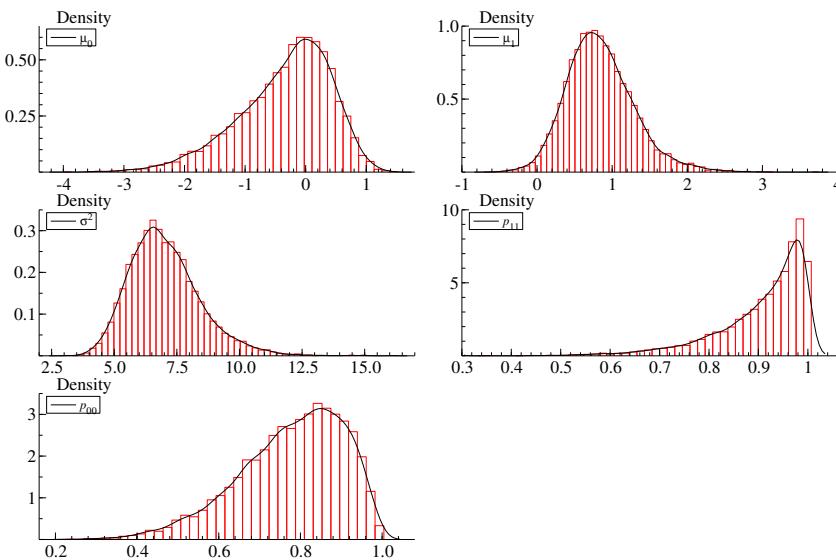


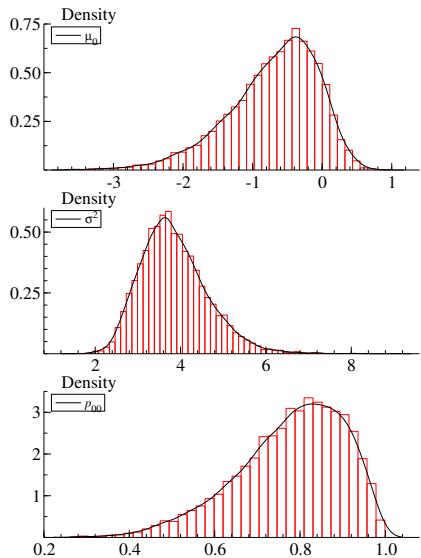
Figure OA.D. 3: Posterior Distributions



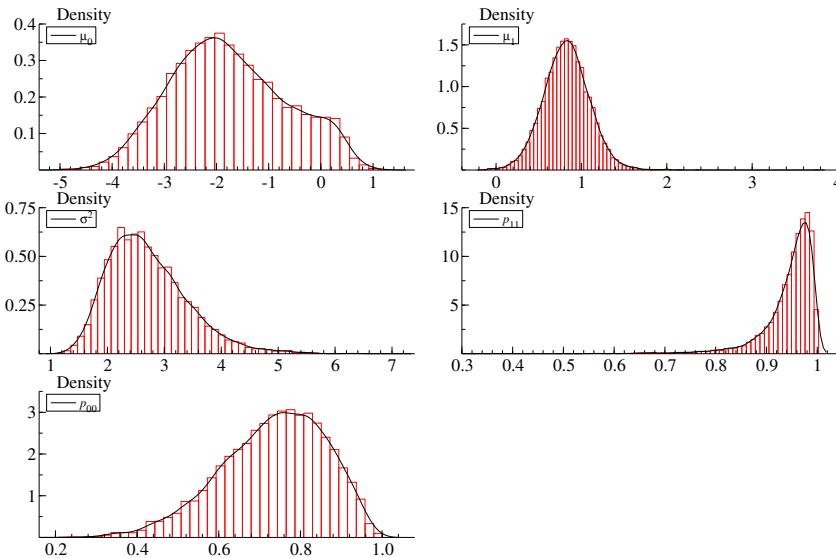
(5) Coahuila



(6) Colima

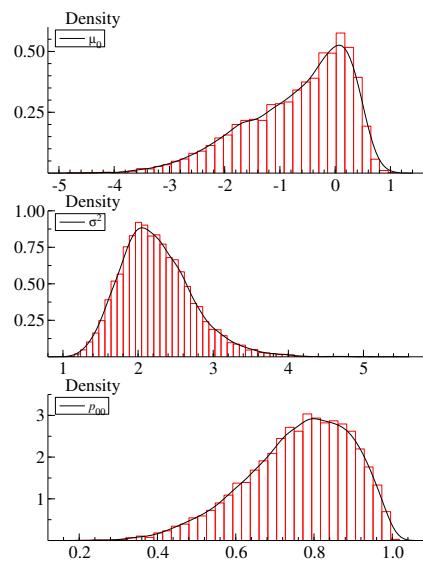


(7) Chiapas

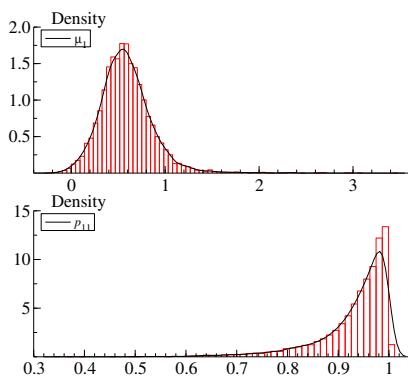


(8) Chihuahua

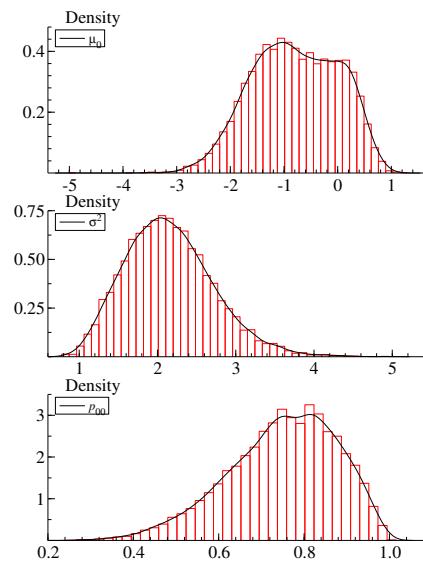
Figure OA.D. 3: Posterior Distributions (Continued)



(9) Federal District

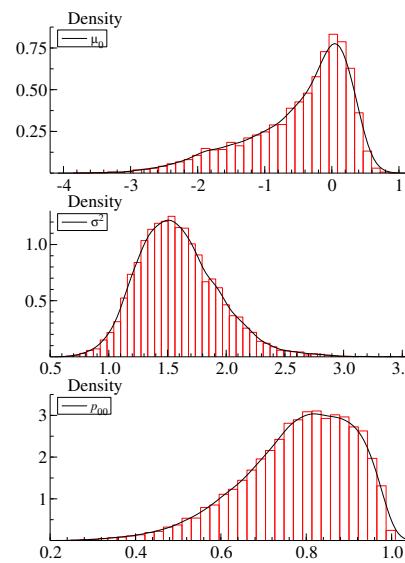


(10) Durango

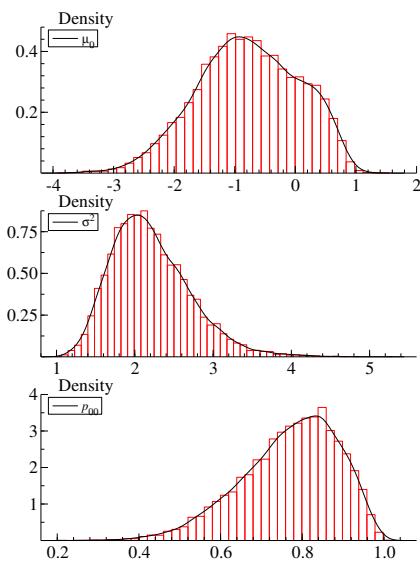


(11) Guanajuato

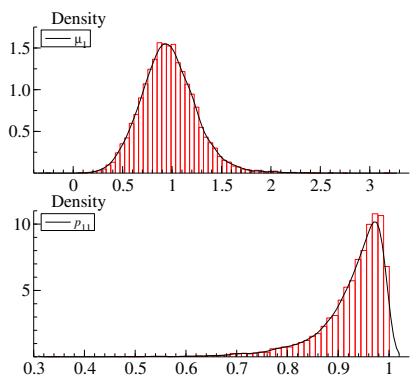
Figure OA.D. 3: Posterior Distributions (Continued)



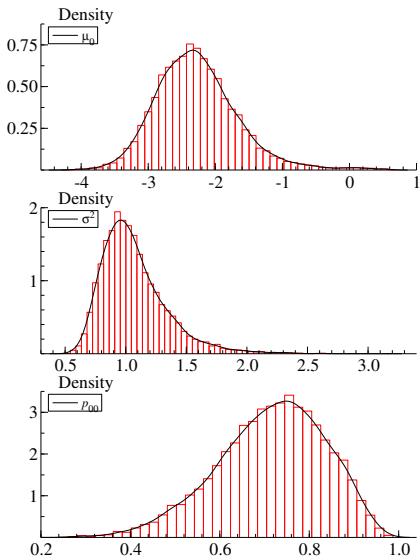
(12) Guerrero



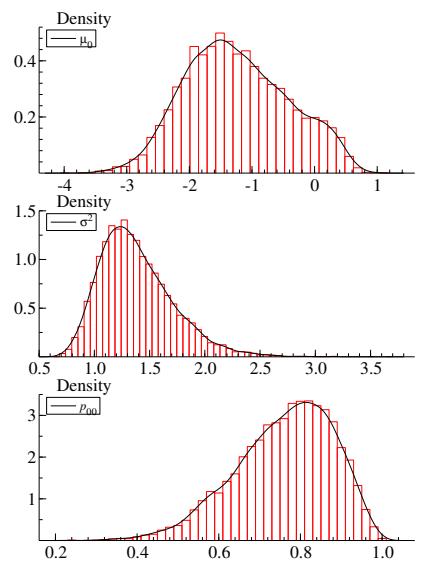
(13) Hidalgo



(14) Jalisco

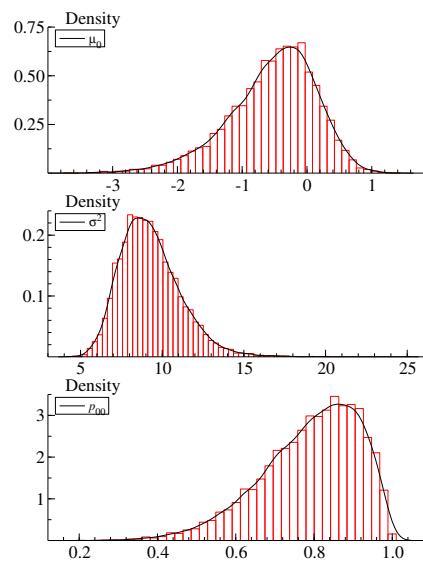


(15) Mexico

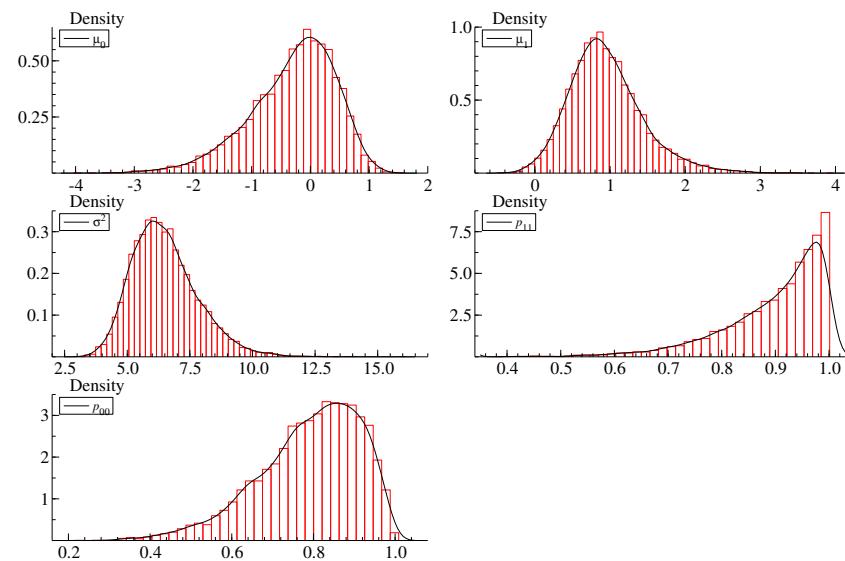


(16) Michoacan

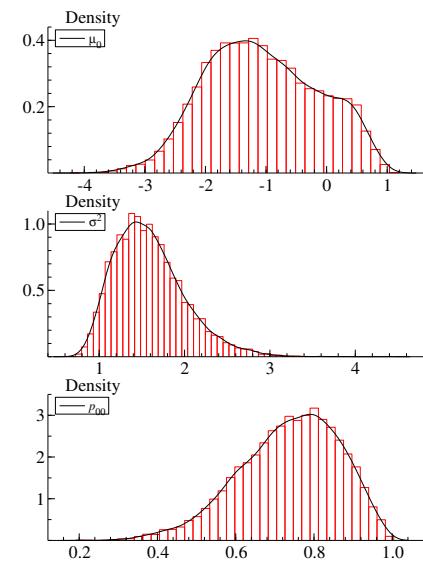
Figure OA.D. 3: Posterior Distributions (Continued)



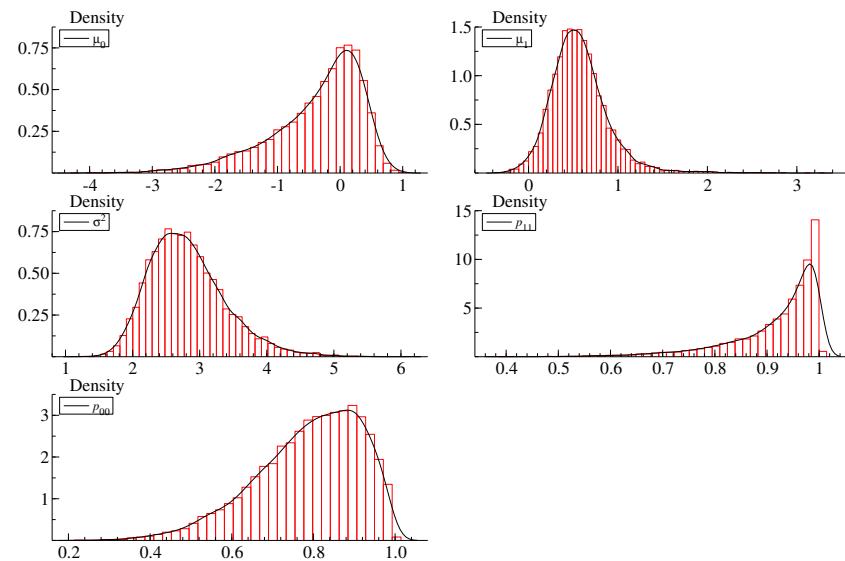
(17) Morelos



(18) Nayarit

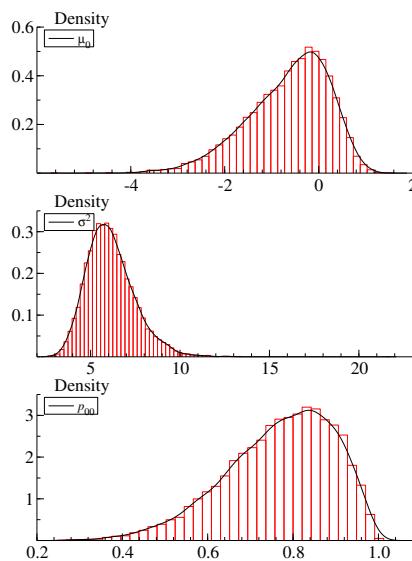


(19) Nuevo Leon

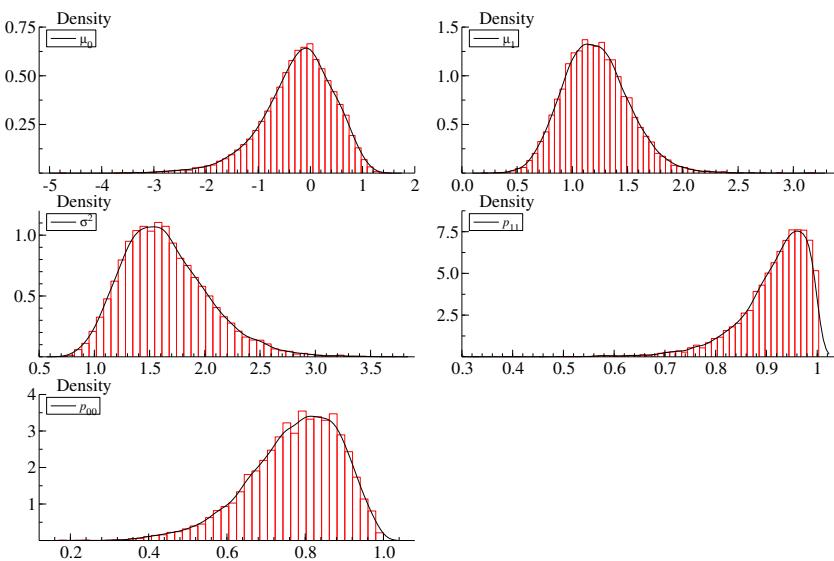


(20) Oaxaca

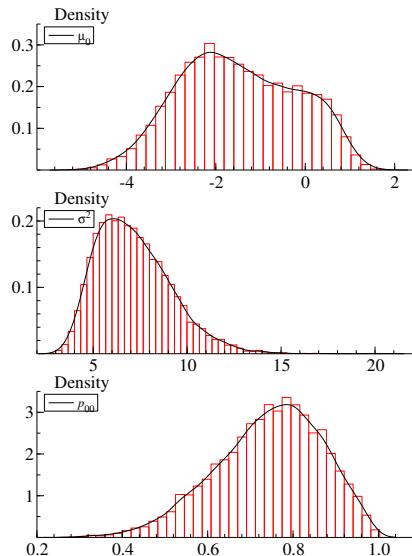
Figure OA.D. 3: Posterior Distributions (Continued)



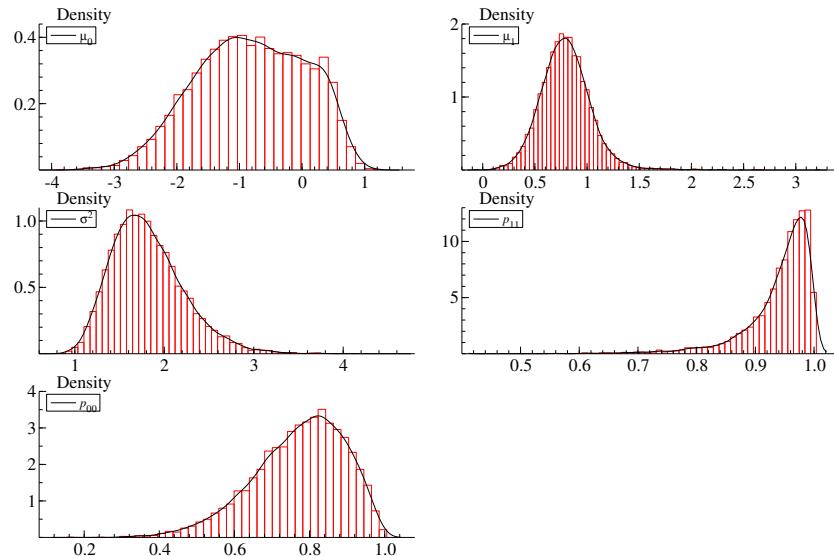
(21) Puebla



(22) Queretaro

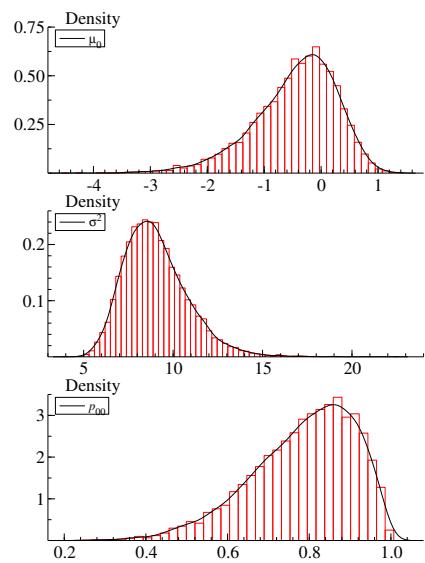


(23) Quintana Roo

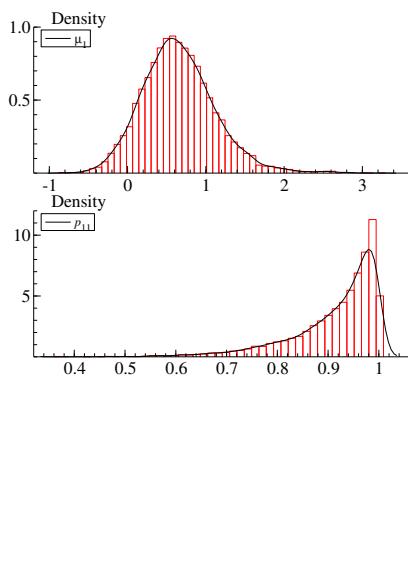


(24) San Luis Potosi

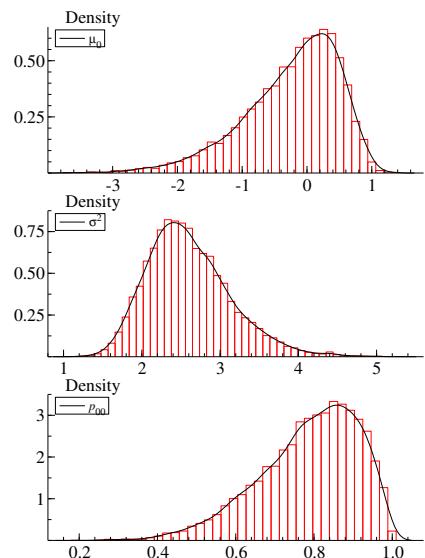
Figure OA.D. 3: Posterior Distributions (Continued)



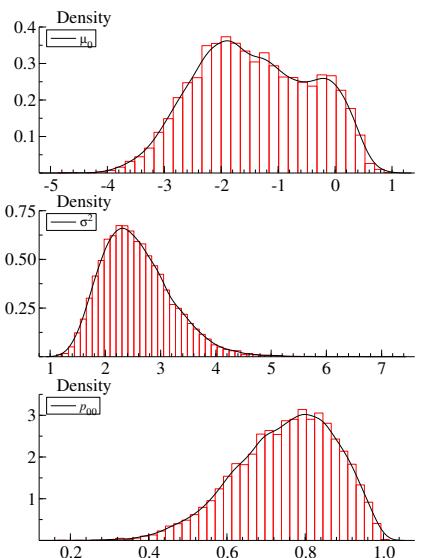
(25) Sinaloa



(26) Sonora



(27) Tabasco



(28) Tamaulipas

Figure OA.D. 3: Posterior Distributions (Continued)

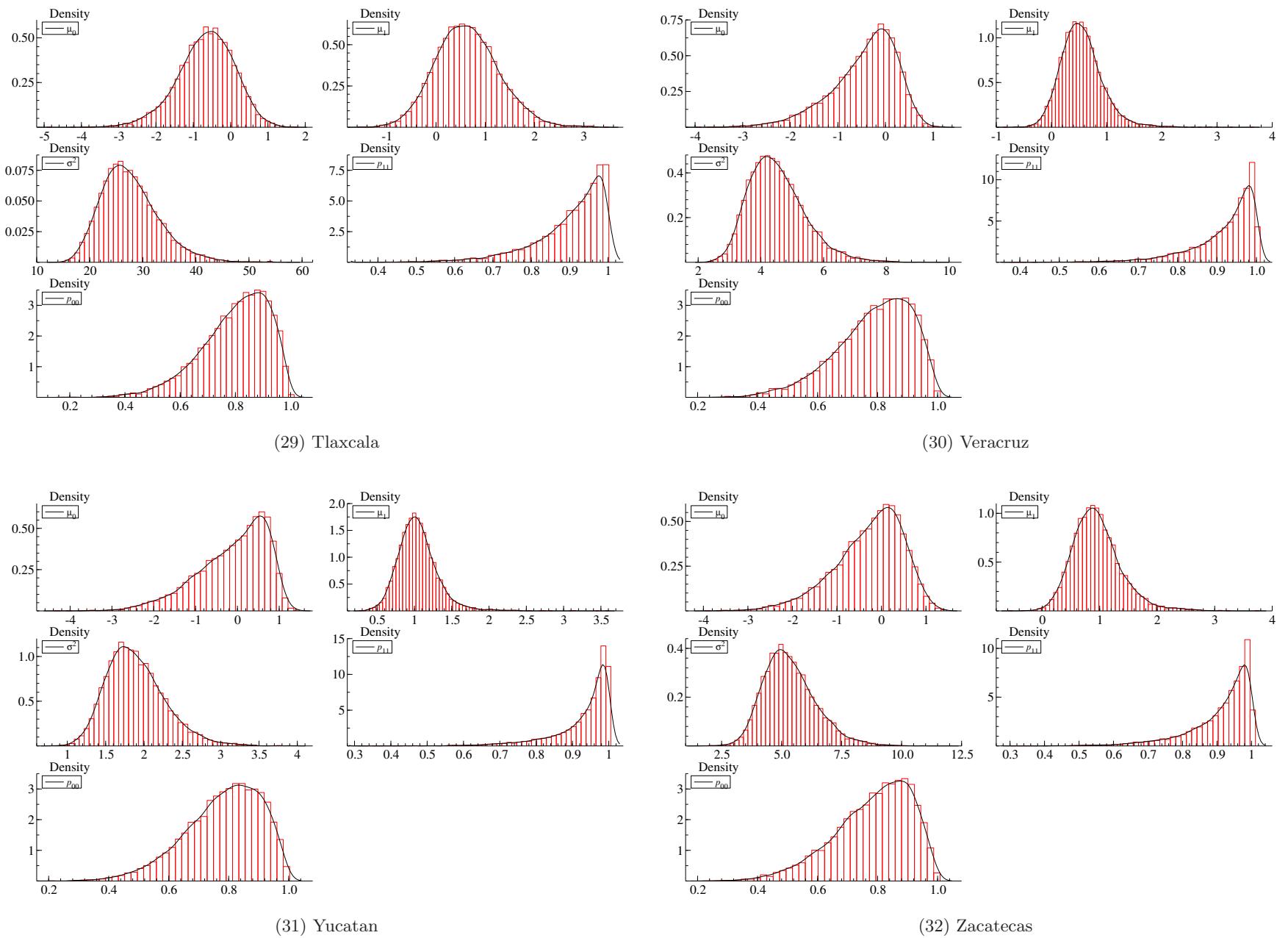


Figure OA.D. 3: Posterior Distributions (Continued)

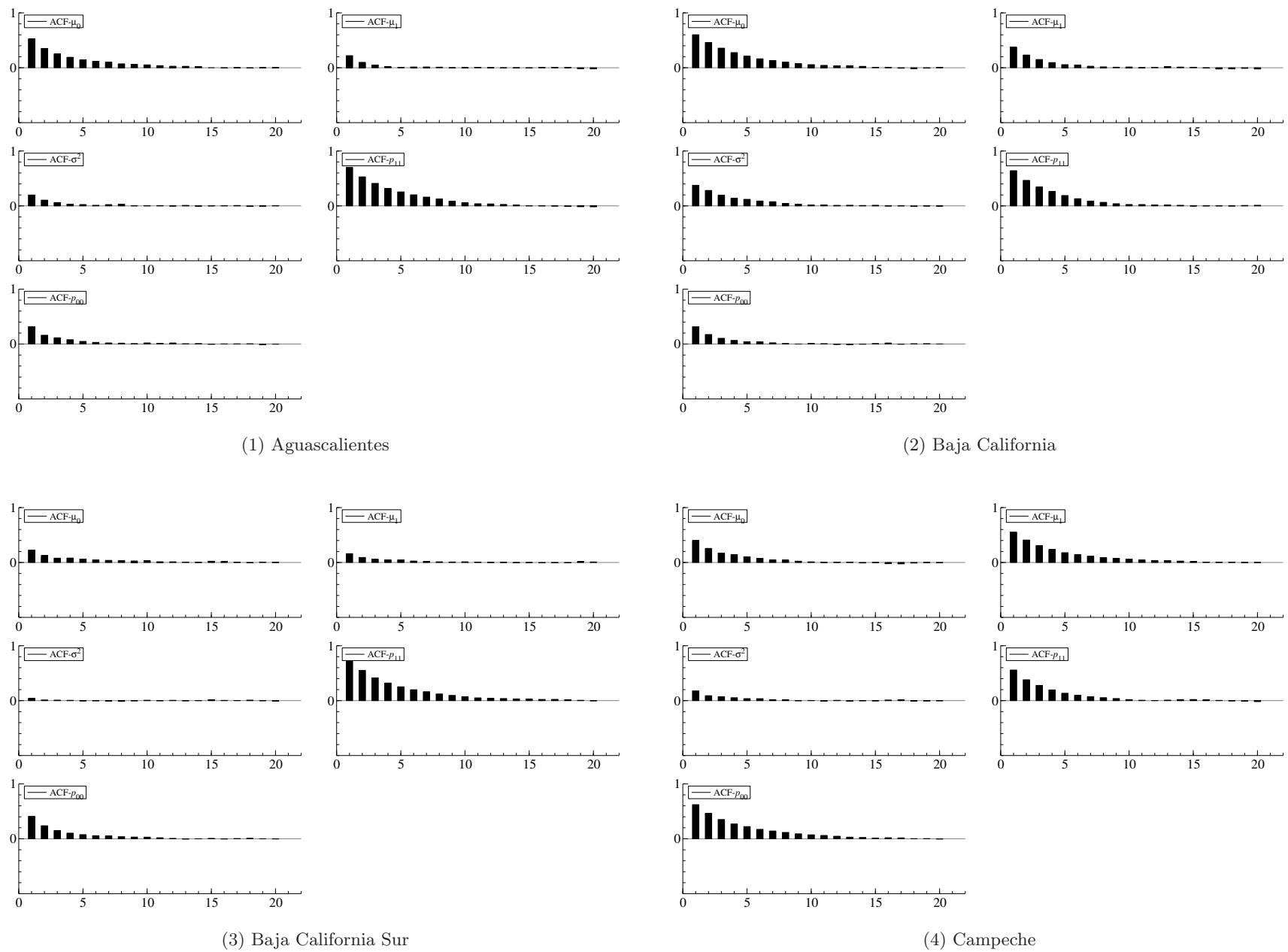
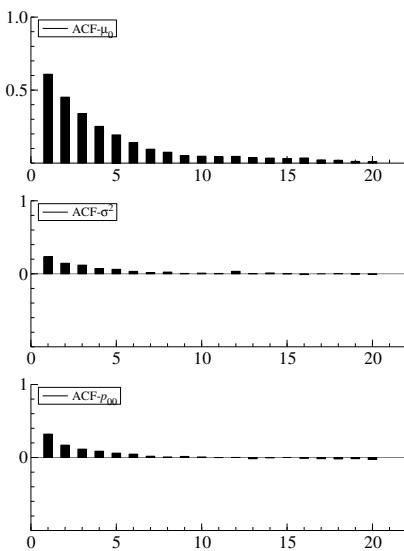
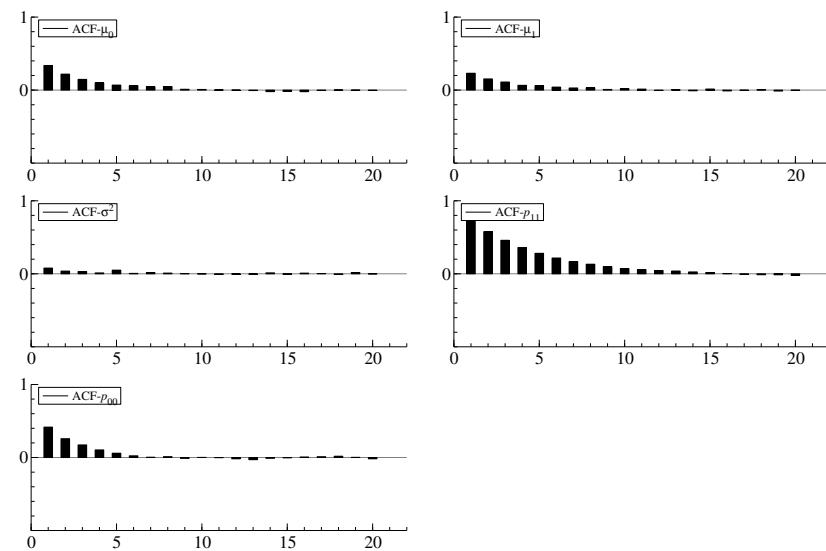


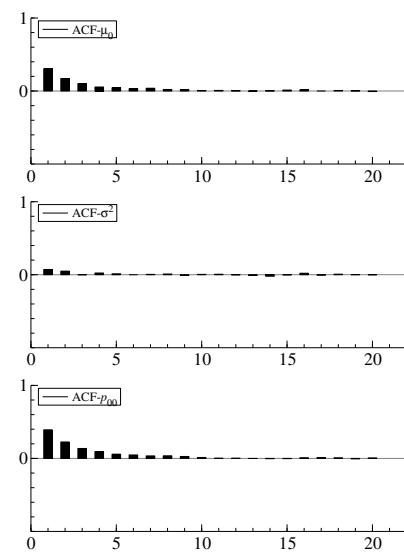
Figure OA.D. 4: Posterior Distributions



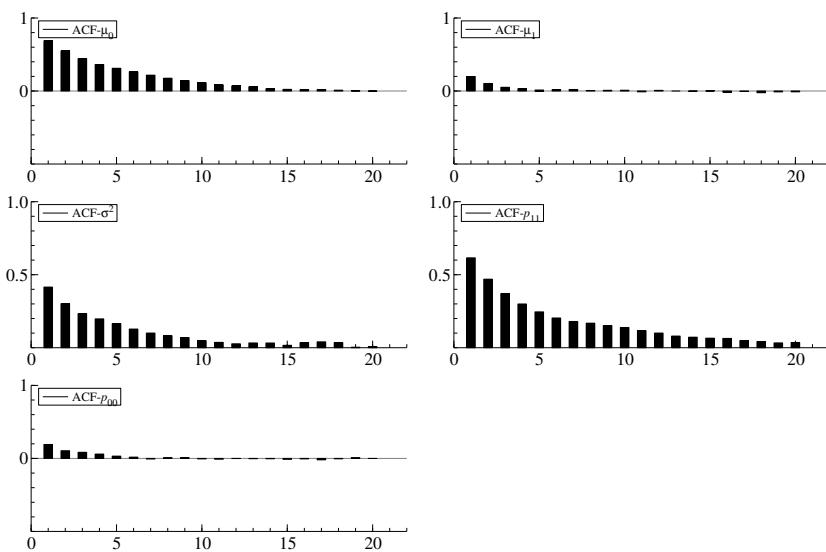
(5) Coahuila



(6) Colima

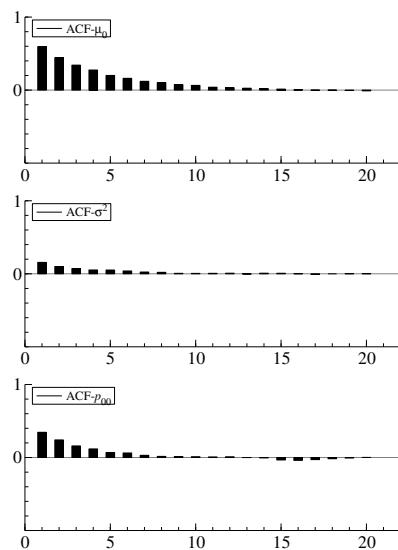


(7) Chiapas

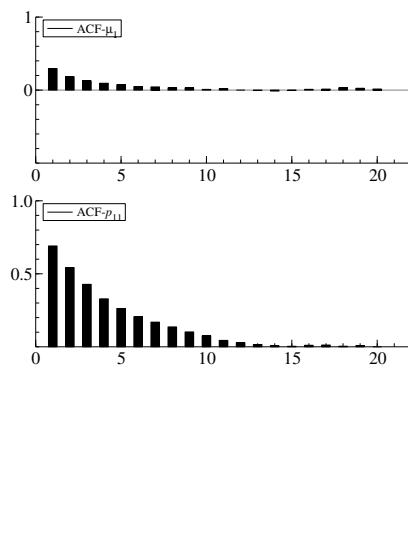


(8) Chihuahua

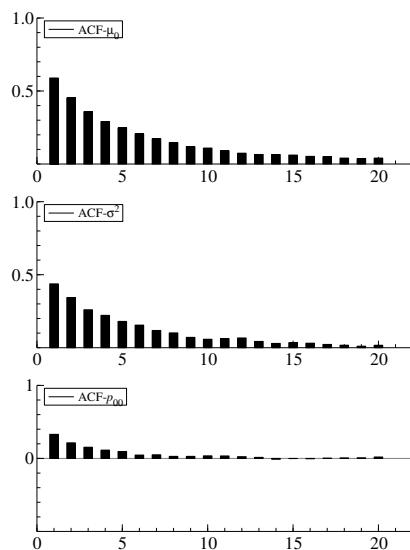
Figure OA.D. 4: Autocorrelation Function (Continued)



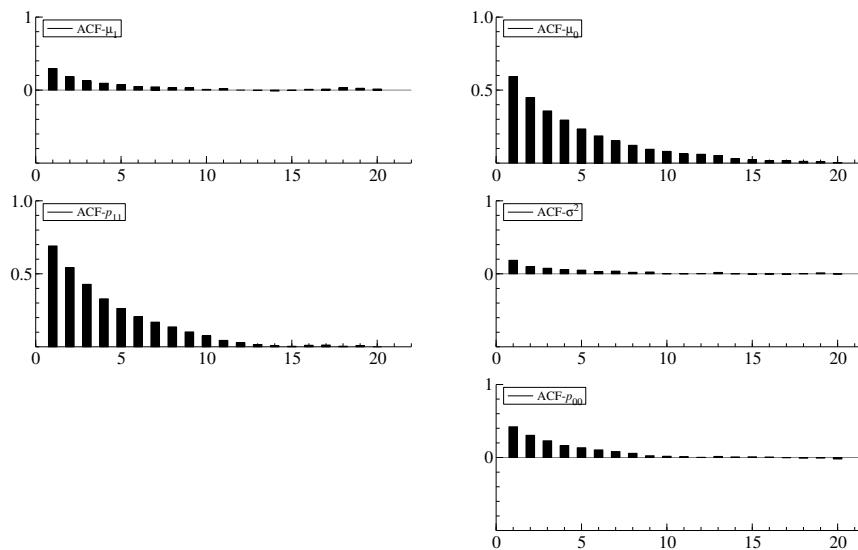
(9) Federal District



(10) Durango

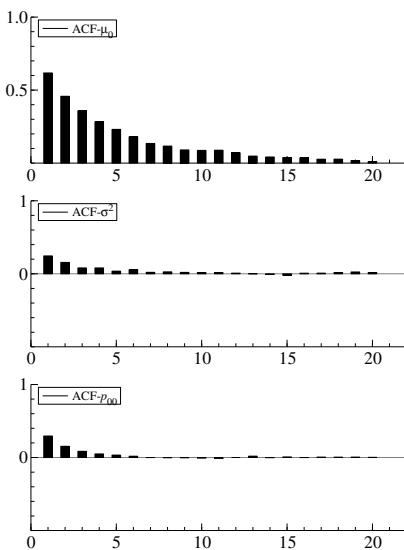


(11) Guanajuato

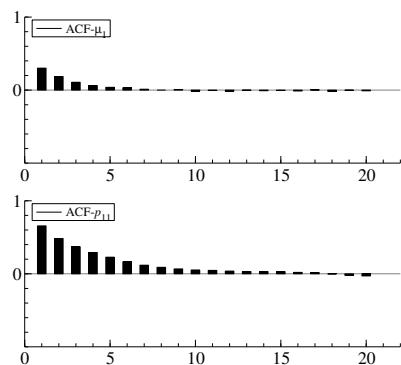


(12) Guerrero

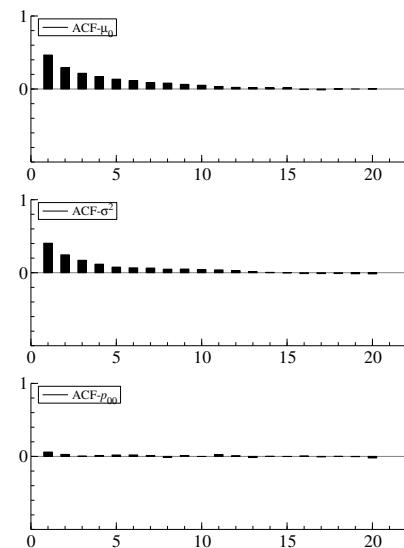
Figure OA.D. 4: Autocorrelation Function (Continued)



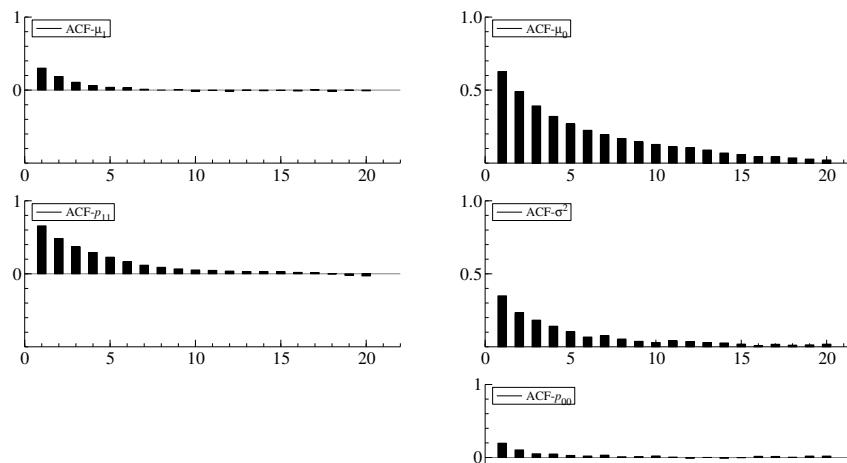
(13) Hidalgo



(14) Jalisco

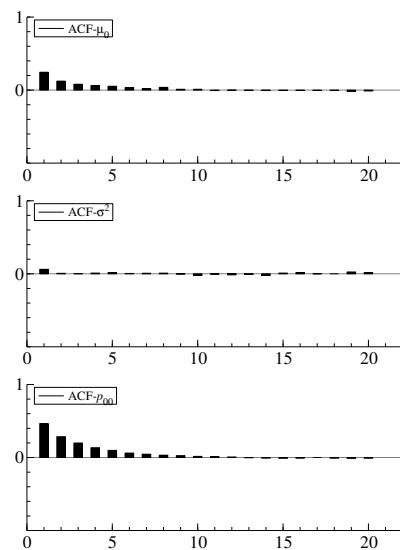


(15) Mexico

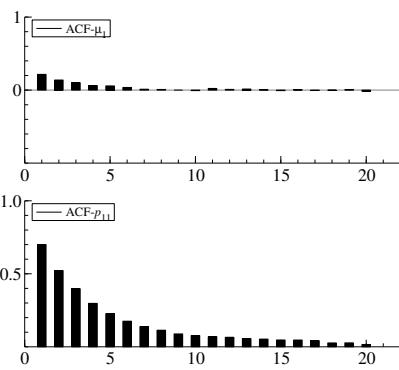


(16) Michoacan

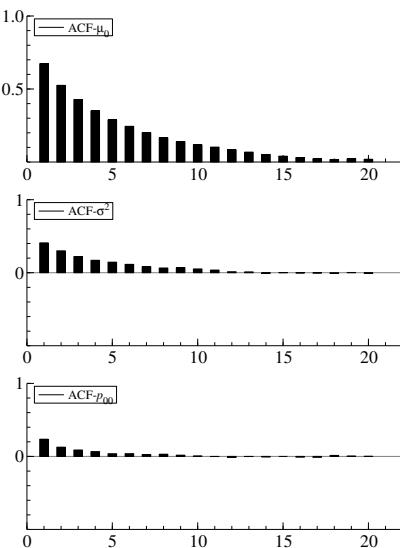
Figure OA.D. 4: Autocorrelation Function (Continued)



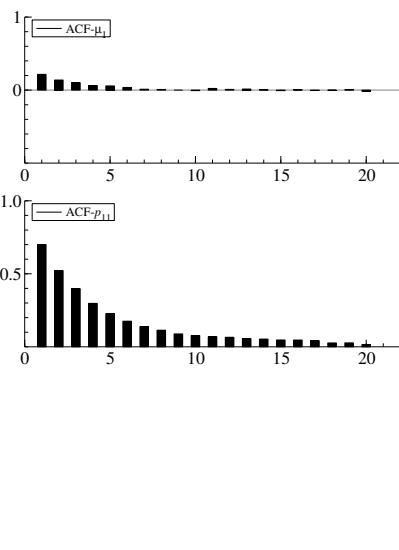
(17) Morelos



(18) Nayarit

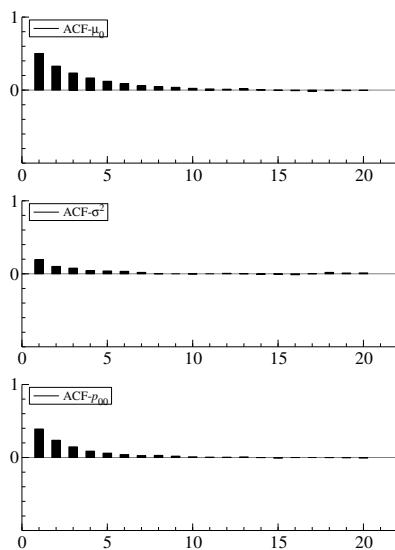


(19) Nuevo Leon

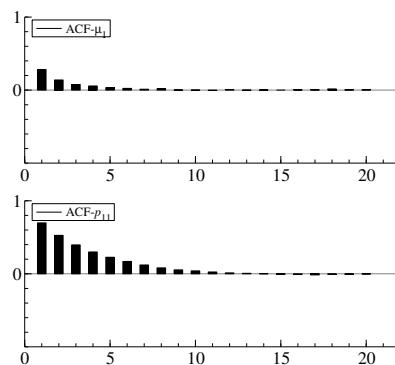


(20) Oaxaca

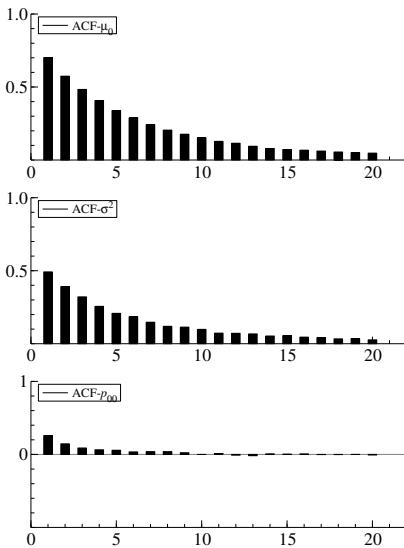
Figure OA.D. 4: Autocorrelation Function (Continued)



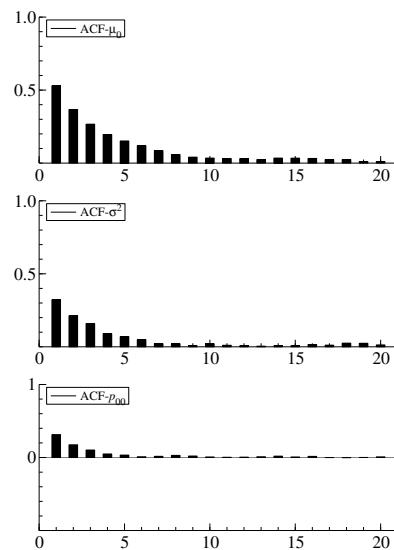
(21) Puebla



(22) Queretaro

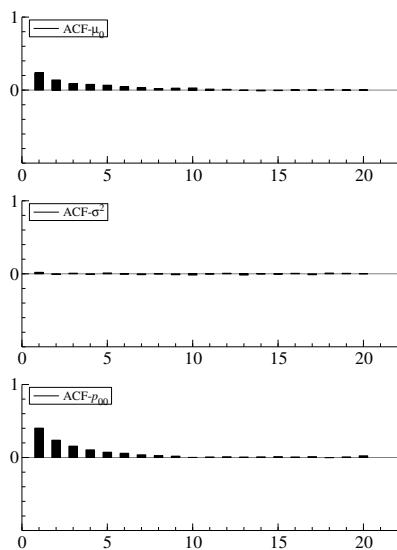


(23) Quintana Roo

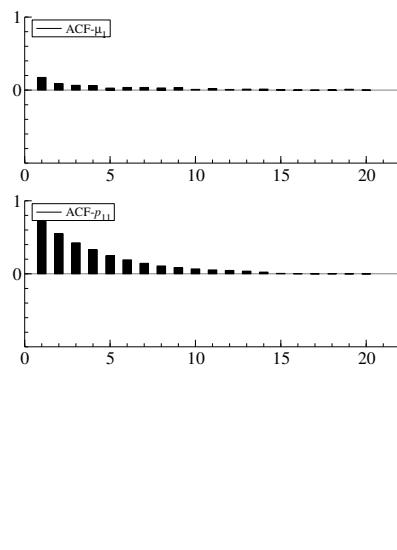


(24) San Luis Potosi

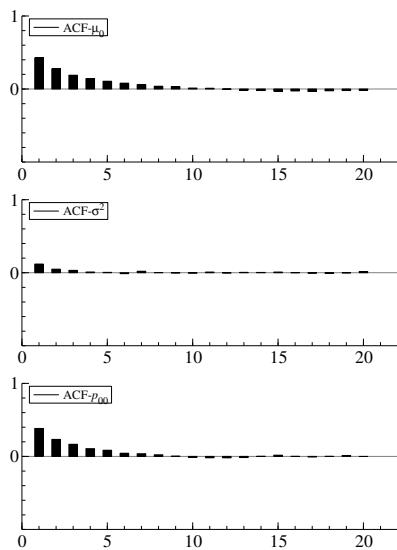
Figure OA.D. 4: Autocorrelation Function (Continued)



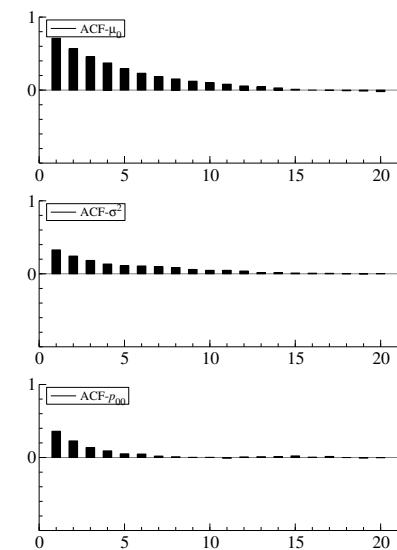
(25) Sinaloa



(26) Sonora

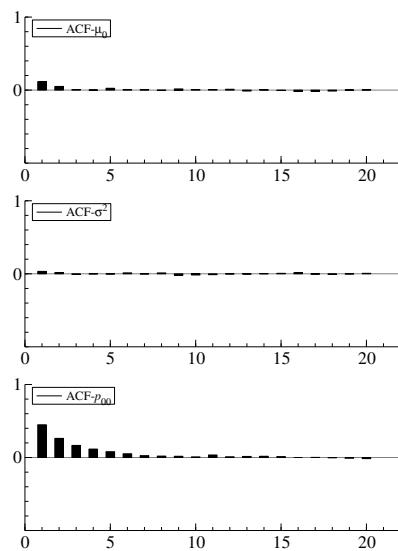


(27) Tabasco

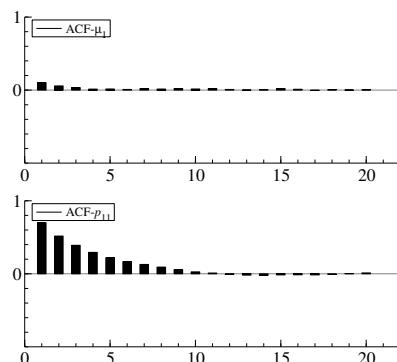


(28) Tamaulipas

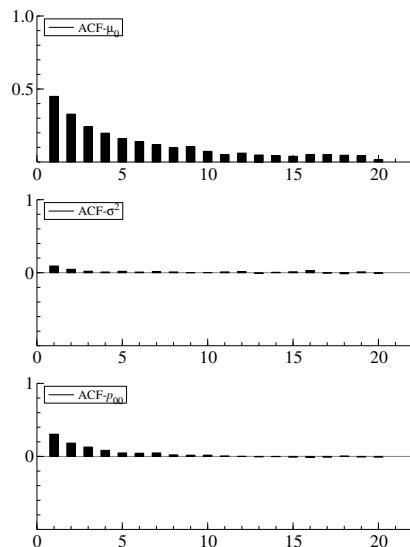
Figure OA.D. 4: Autocorrelation Function (Continued)



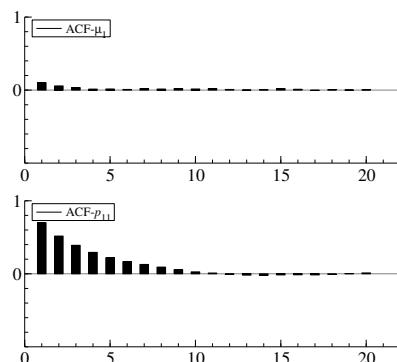
(29) Tlaxcala



(30) Veracruz



(31) Yucatan



(32) Zacatecas

Figure OA.D. 4: Autocorrelation Function (Continued)

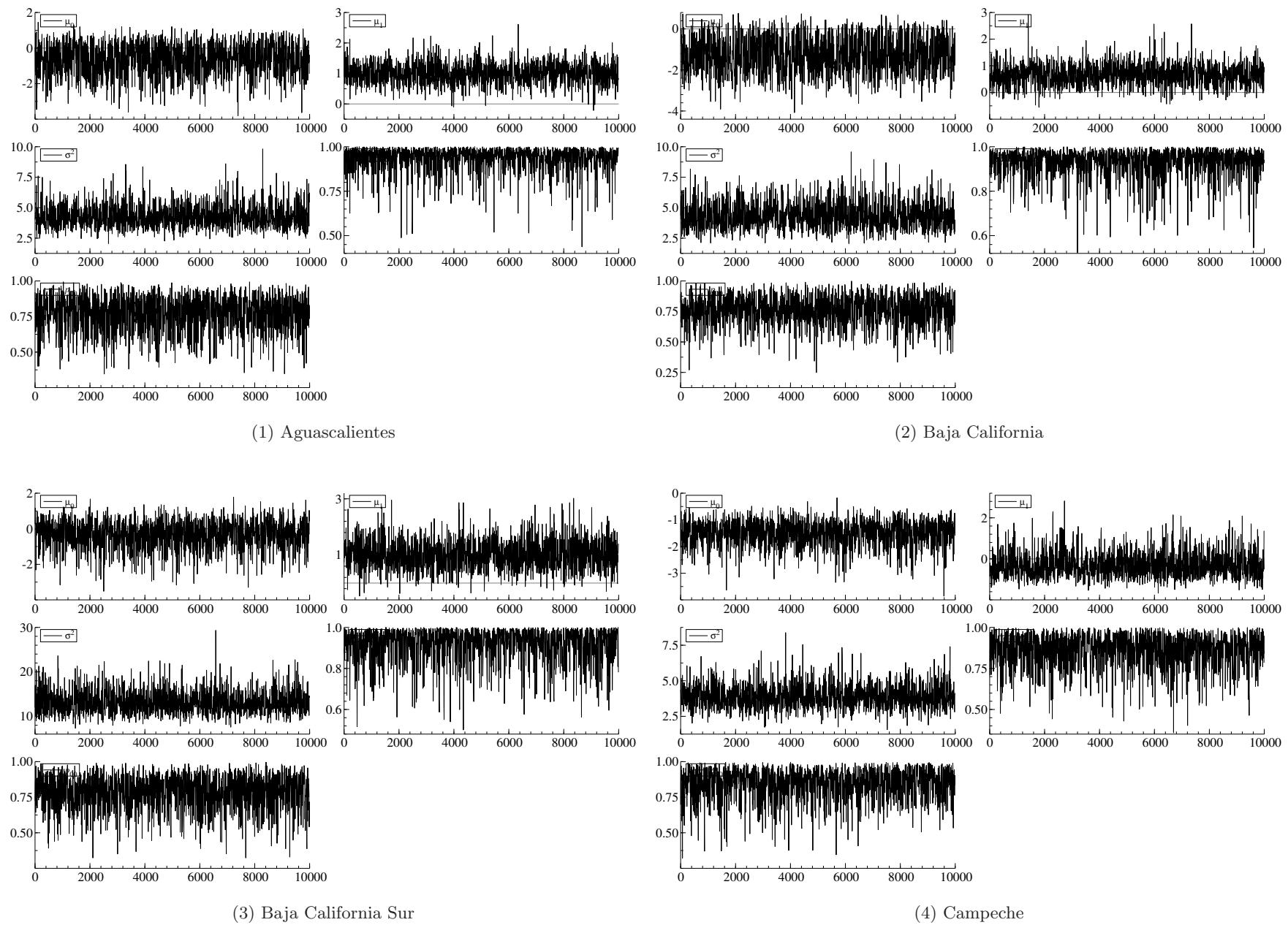


Figure OA.D. 5: Trace Plots

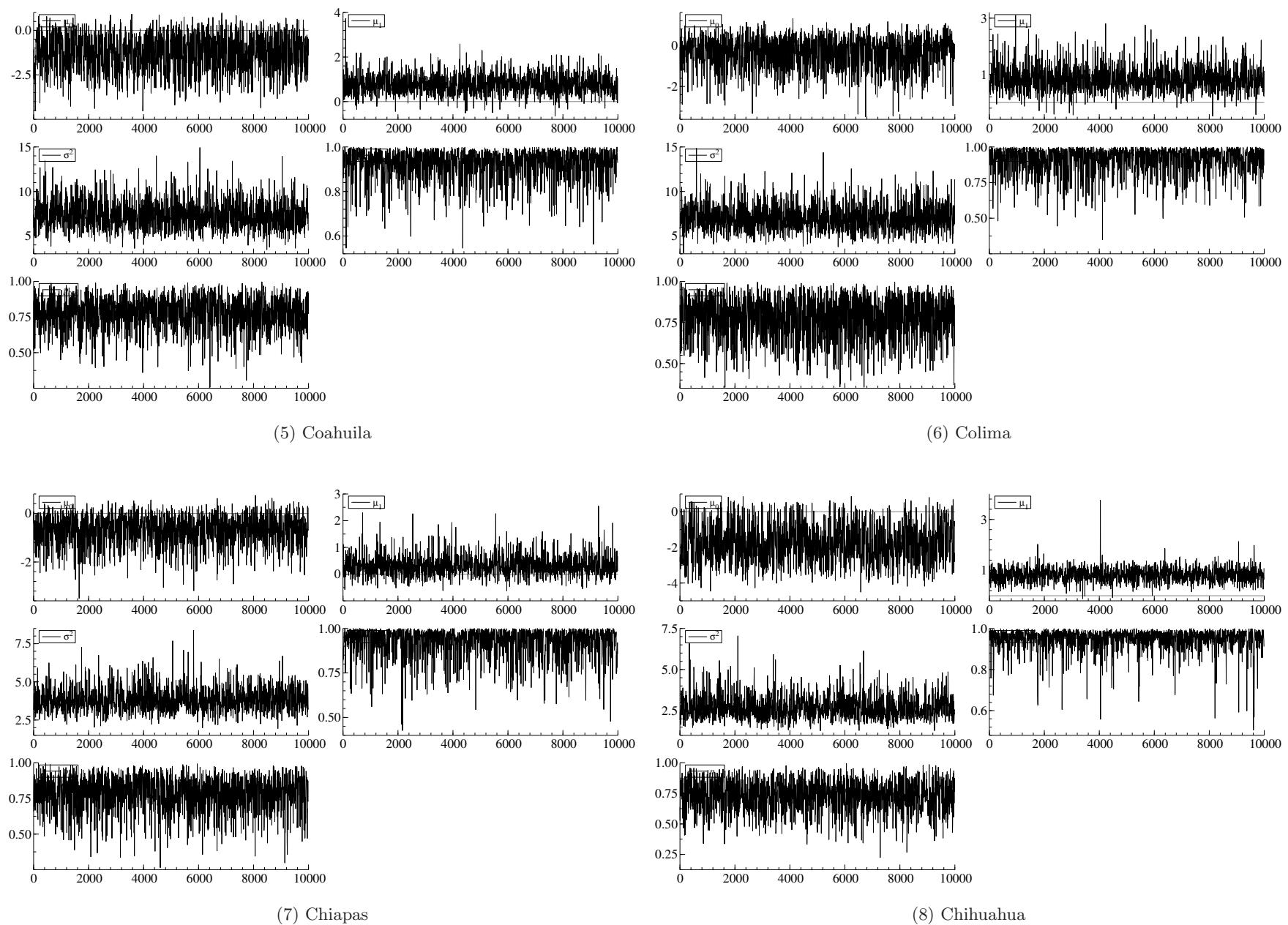
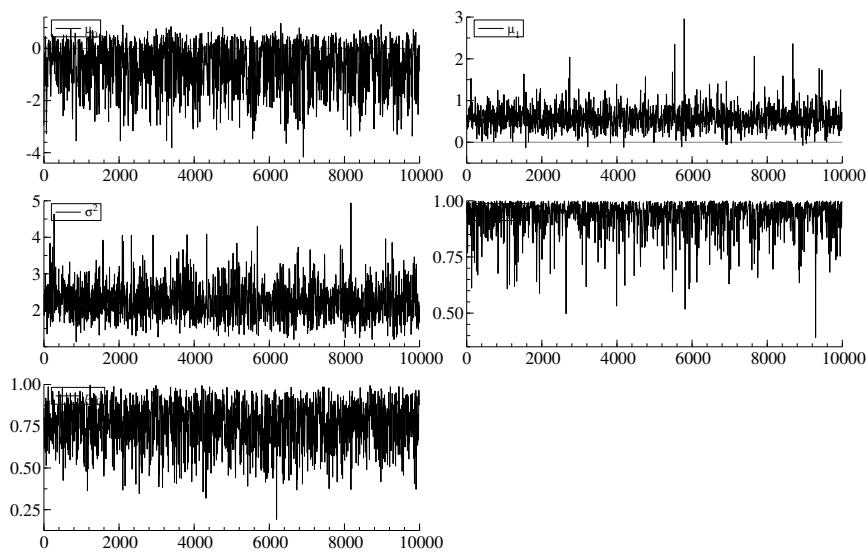
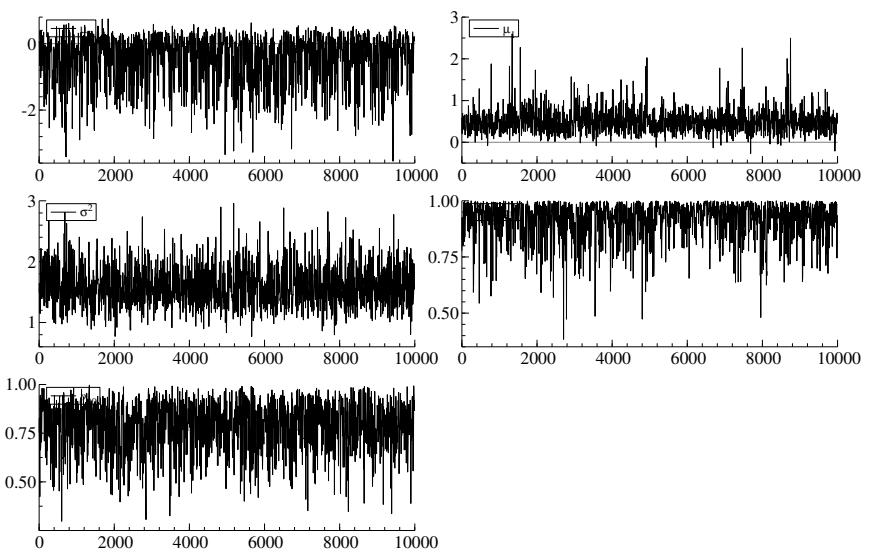


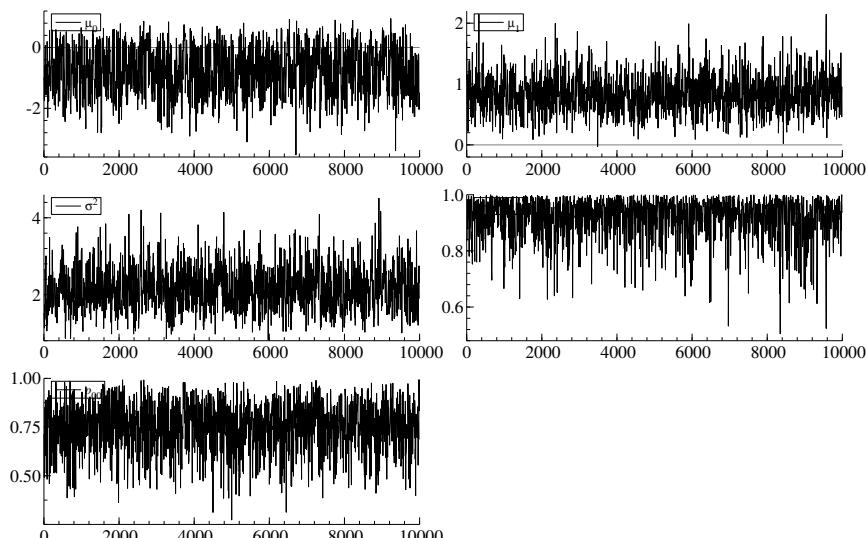
Figure O.A.D. 5: Trace Plots (Continued)



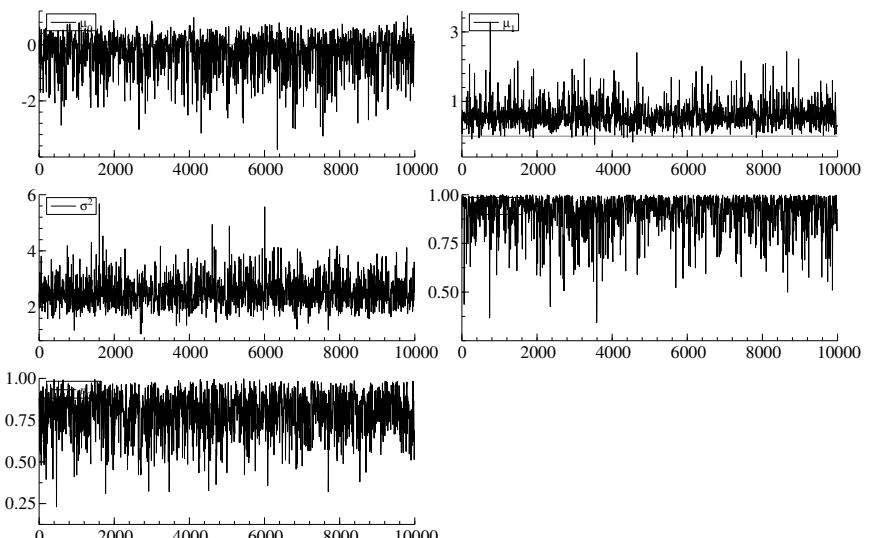
(9) Federal District



(10) Durango

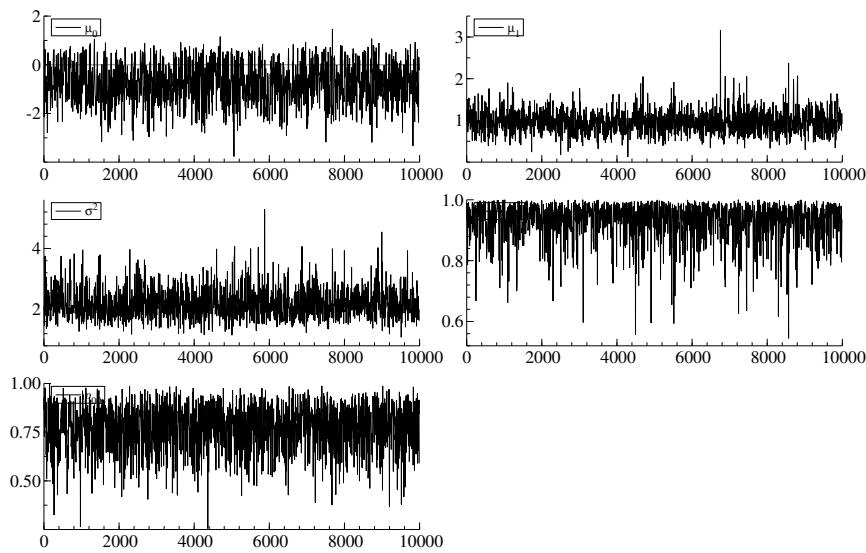


(11) Guanajuato

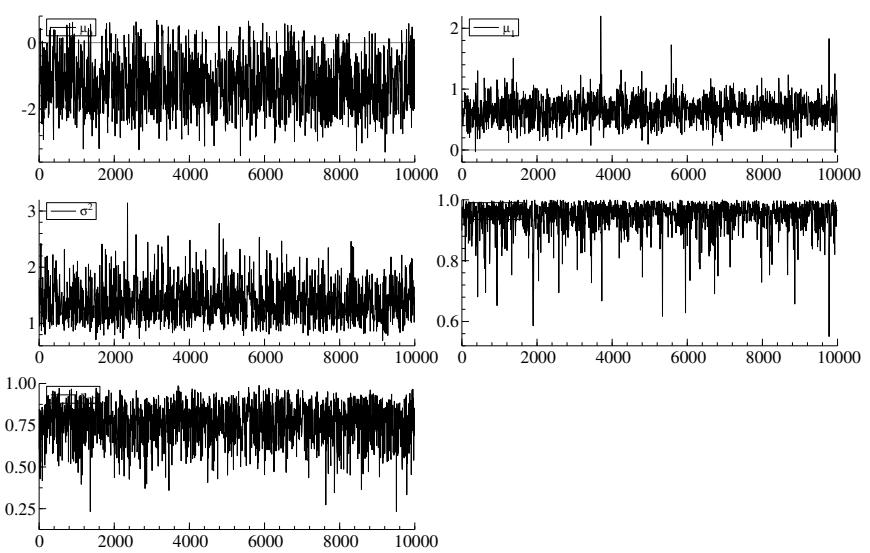


(12) Guerrero

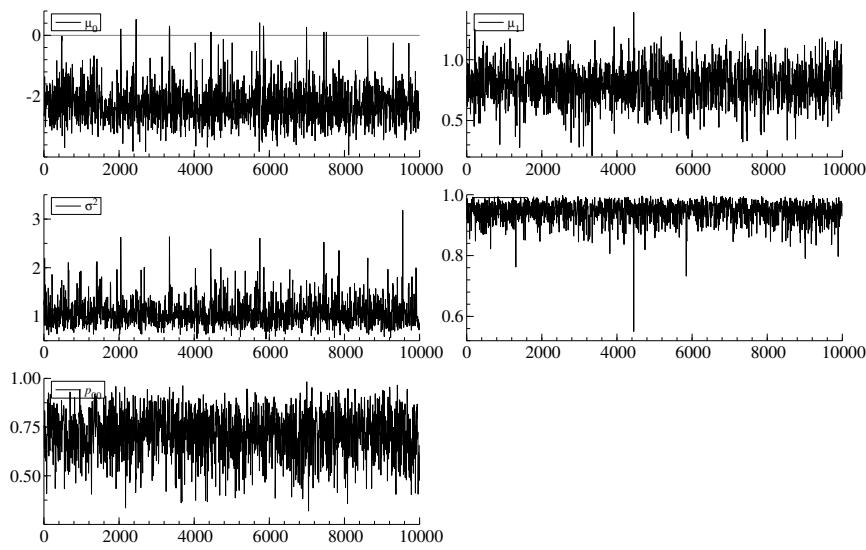
Figure O.A.D. 5: Trace Plots (Continued)



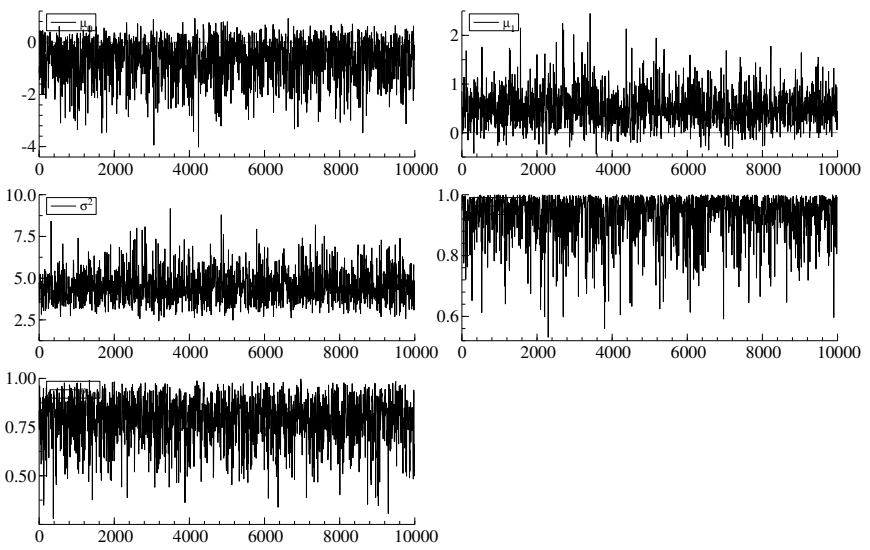
(13) Hidalgo



(14) Jalisco

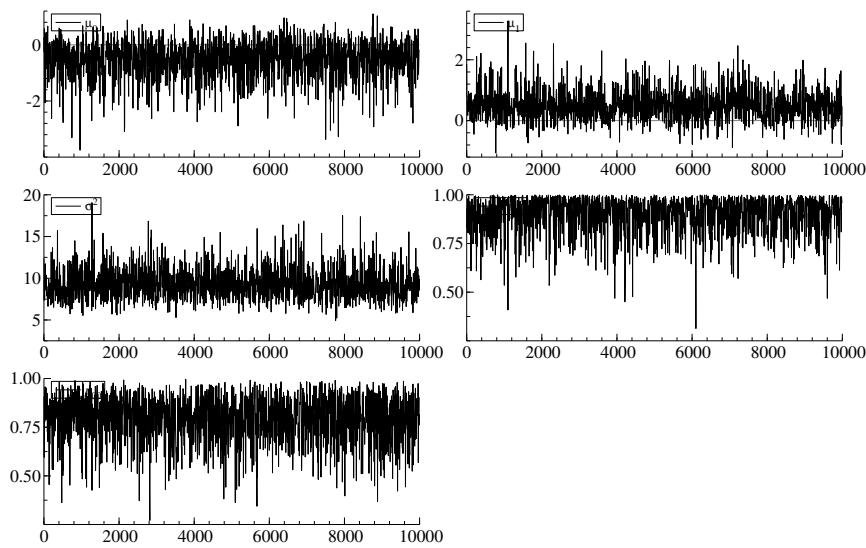


(15) Mexico

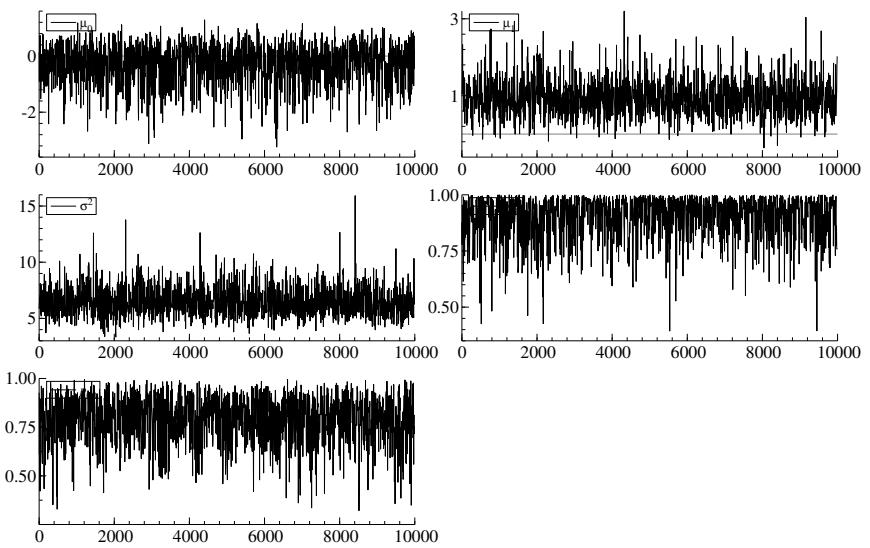


(16) Michoacan

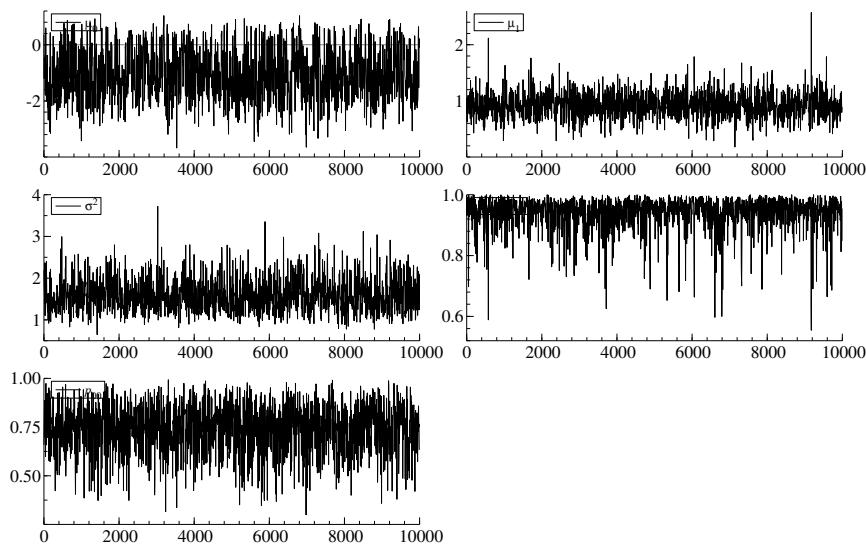
Figure O.A.D. 5: Trace Plots (Continued)



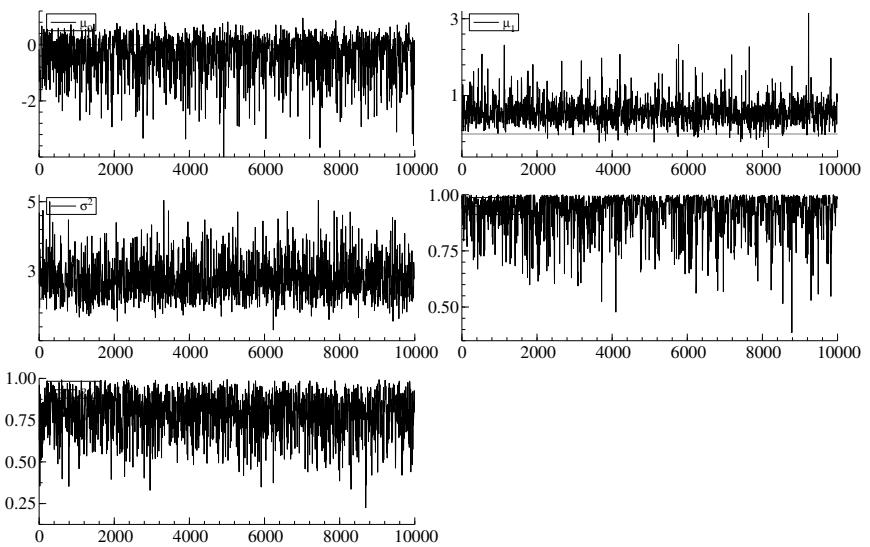
(17) Morelos



(18) Nayarit

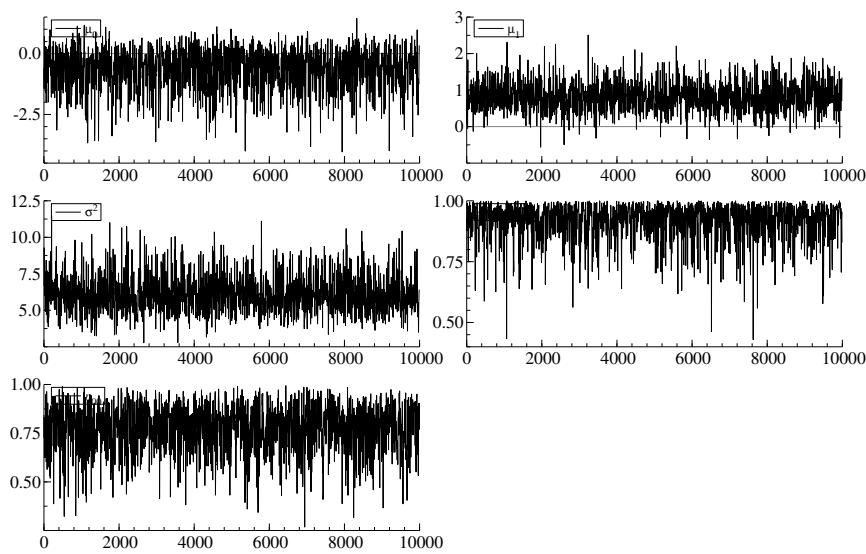


(19) Nuevo Leon

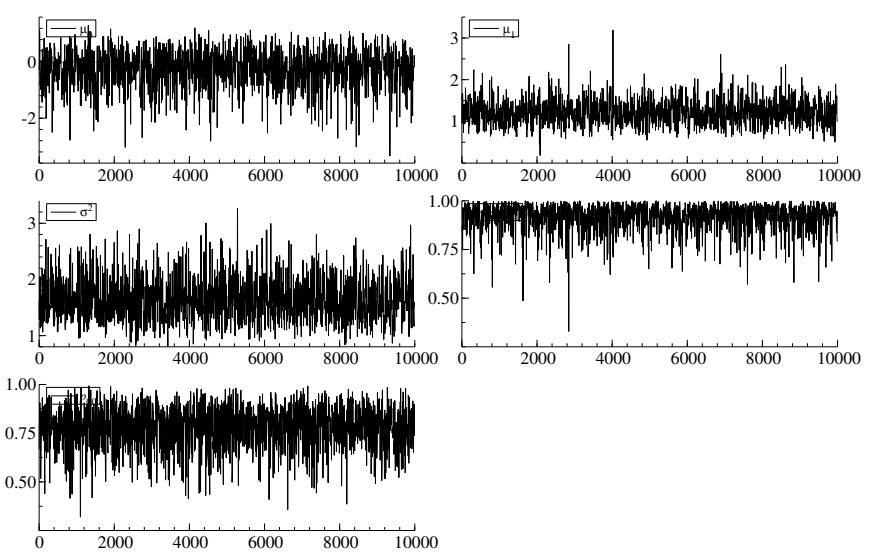


(20) Oaxaca

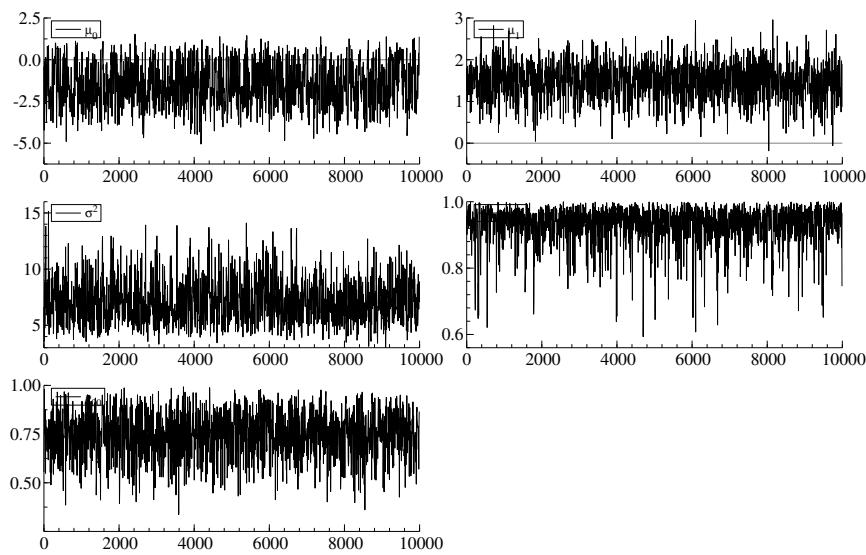
Figure OA.D. 5: Trace Plots (Continued)



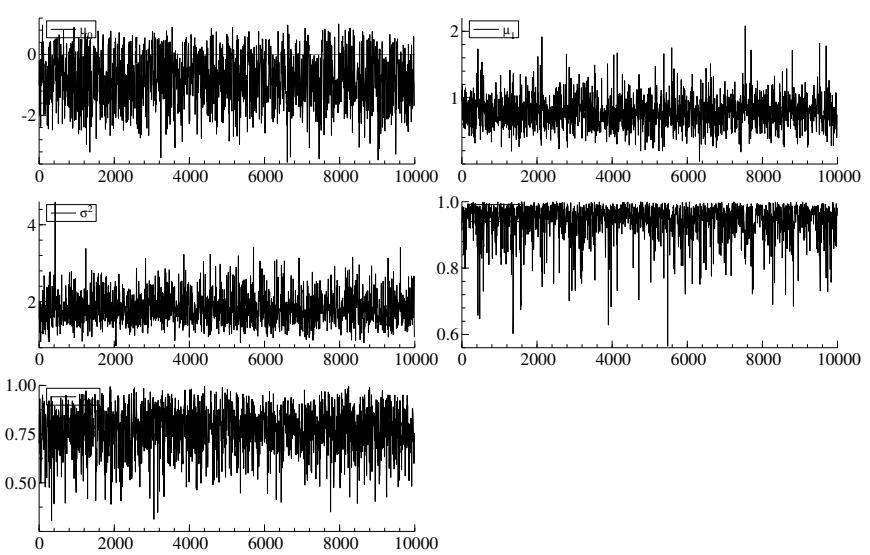
(21) Puebla



(22) Queretaro



(23) Quintana Roo



(24) San Luis Potosi

Figure OA.D. 5: Trace Plots (Continued)

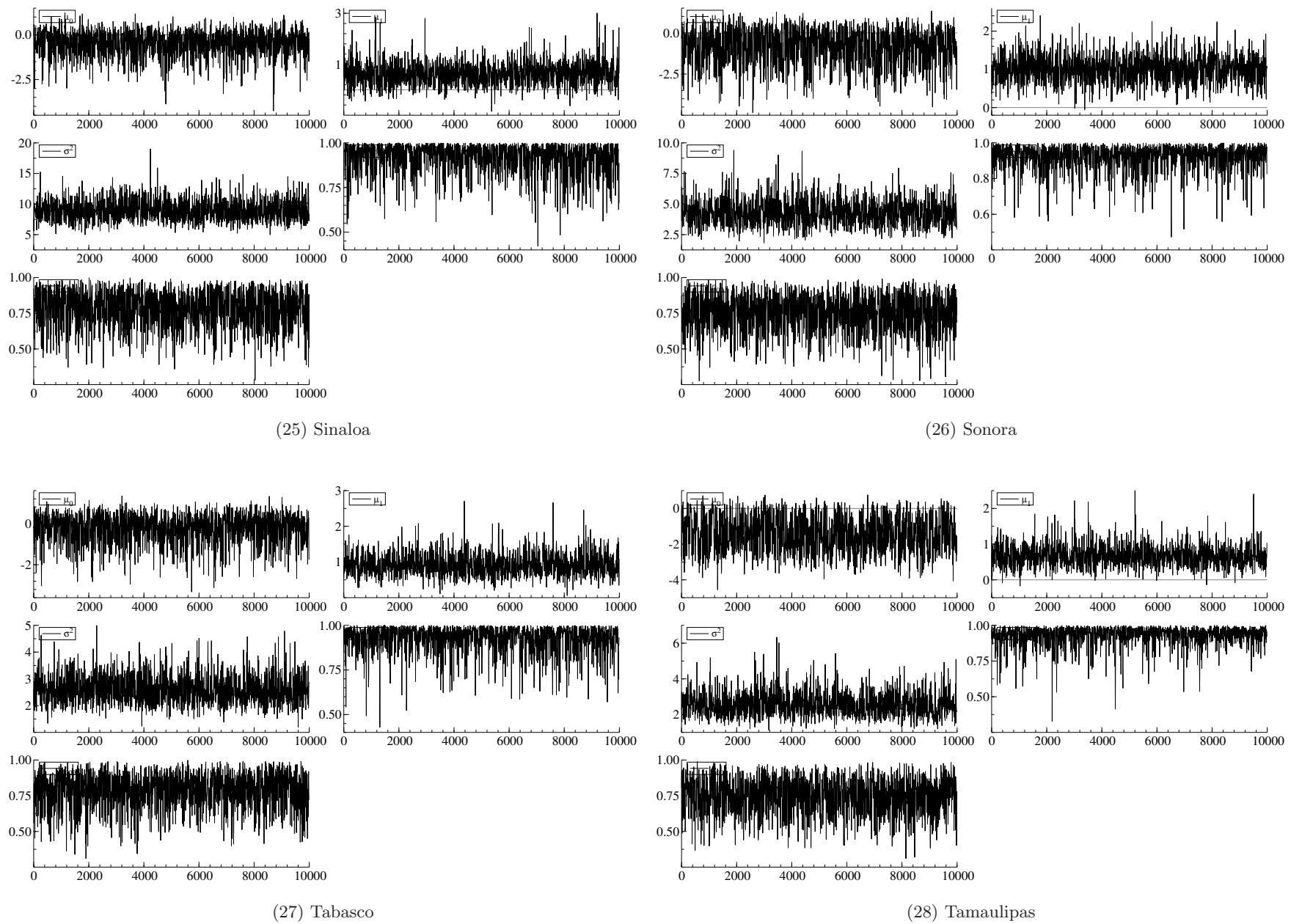


Figure O.A.D. 5: Trace Plots (Continued)

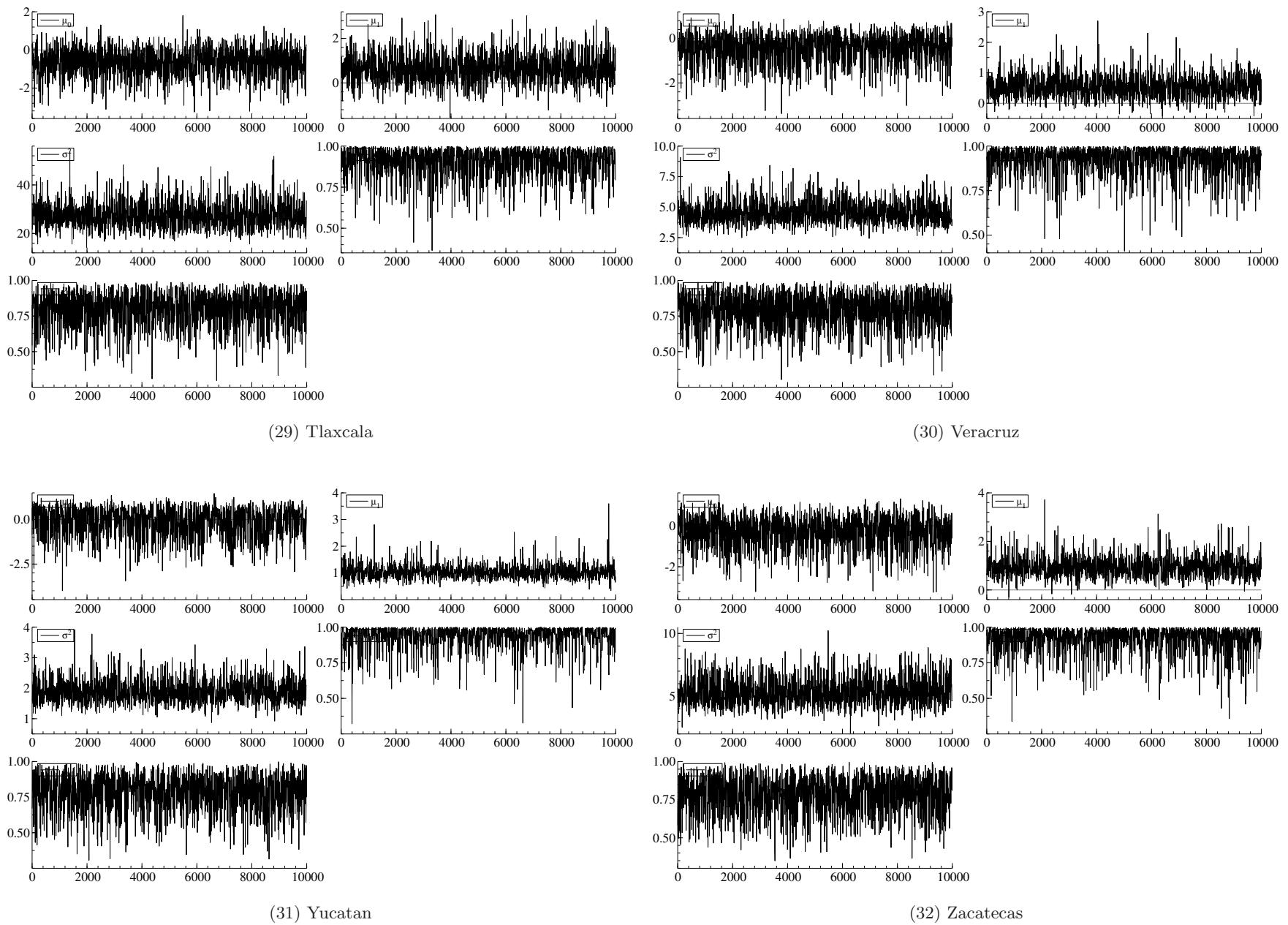


Figure O.A.D. 5: Trace Plots (Continued)

## Online Appendix E. Estimation Results of Markov Switching Model with Spatial Autoregressive and First-Order Autoregressive Processes

The estimation results here are obtained by estimating the Markov switching model with SAR and AR(1) processes:

$$\mathbf{y}_t = \rho \mathbf{W} \mathbf{y}_{t-1} + \boldsymbol{\Phi} \mathbf{y}_{t-1} + \boldsymbol{\mu}_0 \odot (\boldsymbol{\iota}_N - \mathbf{s}_t) + \boldsymbol{\mu}_1 \odot \mathbf{s}_t + \boldsymbol{\varepsilon}_t,$$

where  $\boldsymbol{\Phi} = \text{diag}(\phi_1, \dots, \phi_N)$ ,  $\boldsymbol{\varepsilon}_t \sim \text{i.i.d. } N(\mathbf{0}, \boldsymbol{\Omega})$ , and  $\boldsymbol{\Omega} = \text{diag}(\sigma_1^2, \dots, \sigma_N^2)$ . (Distance-Based SWM,  $\eta = 4$ )

### **Table OA.E. 1**

Table OA.E. 1 shows the point estimates and interval estimates of parameters.

### **Figure OA.E. 1**

Figure OA.E. 1 shows the probabilities of recession, which are calculated by  $1 - G^{-1} \sum_{g=1}^G s_{t,n}^{(g)}$ , where  $G$  is the number of iterations and the superscript  $(g)$  is the  $g$ th iteration.

### **Figure OA.E. 2**

Figure OA.E. 2 shows convergence diagnostics (kernel density, autocorrelation, and trace plots) for the posterior distribution of  $\rho$ .

### **Figure OA.E. 3**

Figure OA.E. 3 shows the histogram and density plots of parameters by state. The solid line indicates density estimates obtained by kernel density estimation.

### **Figure OA.E. 4**

Figure OA.E. 4 shows the autocorrelation plots of parameters by state.

### **Figure OA.E. 5**

Figure OA.E. 5 shows the trace plots of parameters by state.

Table OA.E. 1: Estimated Parameters

| $\rho$                    |                     |         |        |                |         |        |               |              |        |                |
|---------------------------|---------------------|---------|--------|----------------|---------|--------|---------------|--------------|--------|----------------|
|                           |                     |         |        |                |         |        |               |              |        |                |
| Mean                      |                     |         |        |                |         |        |               |              |        |                |
| <b>Spatial Dependence</b> |                     | 0.23    |        |                | 0.23    |        |               | [0.18, 0.27] |        |                |
|                           |                     | $\mu_0$ |        |                | $\mu_1$ |        |               | $\phi$       |        |                |
| Code                      | State               | Mean    | Median | 95% CI         | Mean    | Median | 95% CI        | Mean         | Median | 95% CI         |
| 1                         | Aguascalientes      | -0.83   | -0.81  | [-2.83, 0.84]  | 1.21    | 1.22   | [0.45, 2.00]  | -0.13        | -0.12  | [-0.40, 0.15]  |
| 2                         | Baja California     | -0.84   | -0.72  | [-2.61, 0.44]  | 0.67    | 0.63   | [-0.06, 1.57] | 0.08         | 0.09   | [-0.19, 0.34]  |
| 3                         | Baja California Sur | -0.29   | -0.20  | [-2.14, 1.08]  | 1.23    | 1.20   | [0.22, 2.42]  | -0.19        | -0.20  | [-0.46, 0.07]  |
| 4                         | Campeche            | -1.55   | -1.49  | [-2.72, -0.70] | -0.27   | -0.39  | [-1.28, 1.37] | -0.03        | -0.03  | [-0.31, 0.26]  |
| 5                         | Coahuila            | -0.96   | -0.80  | [-3.08, 0.41]  | 0.61    | 0.58   | [-0.23, 1.64] | 0.29         | 0.29   | [0.04, 0.53]   |
| 6                         | Colima              | -0.39   | -0.28  | [-2.16, 0.81]  | 0.86    | 0.82   | [0.05, 1.86]  | -0.13        | -0.13  | [-0.39, 0.14]  |
| 7                         | Chiapas             | -0.59   | -0.47  | [-2.12, 0.36]  | 0.42    | 0.36   | [-0.23, 1.48] | -0.03        | -0.03  | [-0.29, 0.23]  |
| 8                         | Chihuahua           | -2.28   | -2.38  | [-4.34, 0.20]  | 0.98    | 0.99   | [0.44, 1.48]  | -0.11        | -0.11  | [-0.34, 0.16]  |
| 9                         | Federal District    | -0.72   | -0.52  | [-2.85, 0.57]  | 0.63    | 0.62   | [0.13, 1.22]  | -0.04        | -0.04  | [-0.32, 0.22]  |
| 10                        | Durango             | -0.57   | -0.34  | [-2.45, 0.49]  | 0.63    | 0.60   | [0.13, 1.39]  | -0.22        | -0.22  | [-0.51, 0.07]  |
| 11                        | Guanajuato          | -0.95   | -1.01  | [-2.37, 0.54]  | 1.00    | 1.00   | [0.31, 1.72]  | -0.09        | -0.09  | [-0.36, 0.21]  |
| 12                        | Guerrero            | -0.51   | -0.41  | [-2.15, 0.59]  | 0.80    | 0.76   | [0.23, 1.61]  | -0.35        | -0.35  | [-0.61, -0.09] |
| 13                        | Hidalgo             | -0.98   | -1.02  | [-2.60, 0.56]  | 0.99    | 0.99   | [0.38, 1.61]  | -0.07        | -0.07  | [-0.38, 0.25]  |
| 14                        | Jalisco             | -1.32   | -1.40  | [-2.88, 0.32]  | 0.67    | 0.68   | [0.16, 1.14]  | -0.01        | -0.01  | [-0.32, 0.33]  |
| 15                        | México              | -2.11   | -2.16  | [-3.27, -0.51] | 0.75    | 0.75   | [0.39, 1.10]  | 0.04         | 0.04   | [-0.16, 0.25]  |
| 16                        | Michoacán           | -0.70   | -0.53  | [-2.68, 0.59]  | 0.66    | 0.63   | [-0.03, 1.51] | -0.20        | -0.20  | [-0.50, 0.10]  |
| 17                        | Morelos             | -0.57   | -0.48  | [-2.17, 0.58]  | 0.64    | 0.58   | [-0.25, 1.87] | -0.31        | -0.31  | [-0.57, -0.05] |
| 18                        | Nayarit             | -0.34   | -0.23  | [-2.09, 0.85]  | 0.98    | 0.93   | [0.13, 2.18]  | -0.07        | -0.08  | [-0.35, 0.20]  |
| 19                        | Nuevo León          | -1.09   | -1.15  | [-2.65, 0.58]  | 1.02    | 1.02   | [0.48, 1.58]  | -0.05        | -0.05  | [-0.33, 0.20]  |
| 20                        | Oaxaca              | -0.37   | -0.19  | [-2.34, 0.78]  | 0.82    | 0.79   | [0.28, 1.52]  | -0.48        | -0.48  | [-0.75, -0.20] |
| 21                        | Puebla              | -0.72   | -0.57  | [-2.84, 0.68]  | 0.85    | 0.82   | [0.03, 1.85]  | -0.02        | -0.02  | [-0.33, 0.28]  |
| 22                        | Querétaro           | -0.26   | -0.13  | [-1.99, 0.82]  | 1.00    | 0.96   | [0.37, 1.80]  | 0.16         | 0.16   | [-0.13, 0.43]  |
| 23                        | Quintana Roo        | -2.06   | -2.21  | [-4.30, 0.67]  | 1.74    | 1.77   | [0.71, 2.56]  | -0.16        | -0.17  | [-0.40, 0.11]  |
| 24                        | San Luis Potosí     | -1.55   | -1.66  | [-3.11, 0.46]  | 1.06    | 1.07   | [0.52, 1.56]  | -0.24        | -0.25  | [-0.53, 0.11]  |
| 25                        | Sinaloa             | -0.35   | -0.24  | [-2.11, 0.86]  | 0.91    | 0.87   | [0.08, 1.93]  | -0.38        | -0.37  | [-0.62, -0.12] |
| 26                        | Sonora              | -1.28   | -1.19  | [-3.75, 0.66]  | 1.02    | 1.02   | [0.33, 1.75]  | -0.07        | -0.07  | [-0.30, 0.18]  |
| 27                        | Tabasco             | -0.23   | -0.11  | [-1.91, 0.89]  | 1.08    | 1.04   | [0.45, 1.84]  | -0.10        | -0.10  | [-0.38, 0.17]  |
| 28                        | Tamaulipas          | -1.28   | -1.27  | [-3.20, 0.35]  | 0.60    | 0.59   | [0.01, 1.25]  | 0.16         | 0.16   | [-0.11, 0.41]  |
| 29                        | Tlaxcala            | -0.69   | -0.63  | [-2.39, 0.66]  | 0.72    | 0.69   | [-0.43, 2.10] | -0.41        | -0.41  | [-0.64, -0.16] |
| 30                        | Veracruz            | -0.35   | -0.24  | [-2.03, 0.72]  | 0.93    | 0.87   | [0.22, 2.01]  | -0.44        | -0.44  | [-0.69, -0.20] |
| 31                        | Yucatán             | -0.15   | -0.09  | [-1.92, 1.11]  | 1.32    | 1.30   | [0.76, 1.97]  | -0.28        | -0.28  | [-0.60, 0.03]  |
| 32                        | Zacatecas           | -0.23   | -0.15  | [-1.96, 0.98]  | 1.27    | 1.19   | [0.41, 2.66]  | -0.24        | -0.24  | [-0.49, 0.02]  |

Notes: 95% CI indicates 95% credible interval.

Table OA.E. 1: Estimated Parameters (Continued)

| Code | State               | $\sigma^2$ |        |                | $p_{11}$ |        |              | $p_{00}$ |        |              |
|------|---------------------|------------|--------|----------------|----------|--------|--------------|----------|--------|--------------|
|      |                     | Mean       | Median | 95% CI         | Mean     | Median | 95% CI       | Mean     | Median | 95% CI       |
| 1    | Aguascalientes      | 4.21       | 4.10   | [2.66, 6.38]   | 0.93     | 0.95   | [0.74, 1.00] | 0.77     | 0.78   | [0.50, 0.96] |
| 2    | Baja California     | 4.17       | 4.07   | [2.61, 6.26]   | 0.91     | 0.94   | [0.70, 1.00] | 0.78     | 0.79   | [0.50, 0.96] |
| 3    | Baja California Sur | 12.90      | 12.59  | [8.68, 19.08]  | 0.92     | 0.94   | [0.69, 1.00] | 0.79     | 0.80   | [0.50, 0.97] |
| 4    | Campeche            | 4.00       | 3.91   | [2.51, 6.07]   | 0.86     | 0.88   | [0.62, 0.99] | 0.85     | 0.87   | [0.57, 0.99] |
| 5    | Coahuila            | 7.03       | 6.86   | [4.58, 10.46]  | 0.91     | 0.94   | [0.70, 1.00] | 0.78     | 0.79   | [0.50, 0.97] |
| 6    | Colima              | 6.84       | 6.67   | [4.52, 10.10]  | 0.91     | 0.94   | [0.67, 1.00] | 0.77     | 0.79   | [0.47, 0.96] |
| 7    | Chiapas             | 3.74       | 3.66   | [2.46, 5.50]   | 0.91     | 0.94   | [0.66, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 8    | Chihuahua           | 2.38       | 2.27   | [1.48, 3.87]   | 0.95     | 0.96   | [0.85, 1.00] | 0.75     | 0.76   | [0.47, 0.94] |
| 9    | Federal District    | 2.29       | 2.23   | [1.47, 3.41]   | 0.93     | 0.95   | [0.71, 1.00] | 0.76     | 0.78   | [0.48, 0.96] |
| 10   | Durango             | 1.50       | 1.47   | [0.92, 2.29]   | 0.91     | 0.93   | [0.69, 1.00] | 0.77     | 0.79   | [0.47, 0.97] |
| 11   | Guanajuato          | 2.02       | 1.95   | [1.08, 3.33]   | 0.91     | 0.93   | [0.73, 1.00] | 0.74     | 0.76   | [0.48, 0.95] |
| 12   | Guerrero            | 2.02       | 1.98   | [1.22, 3.07]   | 0.91     | 0.93   | [0.69, 1.00] | 0.77     | 0.78   | [0.49, 0.96] |
| 13   | Hidalgo             | 2.13       | 2.06   | [1.34, 3.28]   | 0.93     | 0.95   | [0.76, 1.00] | 0.77     | 0.78   | [0.52, 0.95] |
| 14   | Jalisco             | 1.41       | 1.36   | [0.87, 2.23]   | 0.95     | 0.96   | [0.81, 1.00] | 0.76     | 0.78   | [0.49, 0.95] |
| 15   | México              | 1.13       | 1.08   | [0.71, 1.85]   | 0.95     | 0.95   | [0.86, 0.99] | 0.72     | 0.73   | [0.46, 0.92] |
| 16   | Michoacán           | 4.41       | 4.32   | [2.76, 6.63]   | 0.93     | 0.95   | [0.71, 1.00] | 0.77     | 0.79   | [0.49, 0.96] |
| 17   | Morelos             | 8.59       | 8.40   | [5.70, 12.58]  | 0.90     | 0.93   | [0.65, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 18   | Nayarit             | 6.65       | 6.51   | [4.37, 9.71]   | 0.90     | 0.93   | [0.66, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 19   | Nuevo León          | 1.58       | 1.53   | [0.94, 2.53]   | 0.93     | 0.95   | [0.79, 1.00] | 0.73     | 0.75   | [0.47, 0.94] |
| 20   | Oaxaca              | 2.21       | 2.16   | [1.44, 3.31]   | 0.92     | 0.95   | [0.70, 1.00] | 0.77     | 0.79   | [0.48, 0.97] |
| 21   | Puebla              | 6.35       | 6.21   | [3.98, 9.52]   | 0.91     | 0.94   | [0.69, 1.00] | 0.77     | 0.79   | [0.49, 0.96] |
| 22   | Querétaro           | 1.72       | 1.67   | [1.06, 2.59]   | 0.91     | 0.94   | [0.69, 1.00] | 0.77     | 0.79   | [0.50, 0.96] |
| 23   | Quintana Roo        | 6.49       | 6.07   | [3.68, 11.26]  | 0.93     | 0.94   | [0.81, 0.99] | 0.73     | 0.74   | [0.46, 0.93] |
| 24   | San Luis Potosí     | 1.60       | 1.54   | [1.02, 2.55]   | 0.95     | 0.96   | [0.83, 1.00] | 0.77     | 0.78   | [0.51, 0.95] |
| 25   | Sinaloa             | 7.85       | 7.66   | [5.32, 11.54]  | 0.91     | 0.94   | [0.68, 1.00] | 0.78     | 0.80   | [0.50, 0.97] |
| 26   | Sonora              | 3.79       | 3.69   | [2.12, 6.07]   | 0.93     | 0.94   | [0.76, 1.00] | 0.73     | 0.75   | [0.44, 0.95] |
| 27   | Tabasco             | 2.60       | 2.53   | [1.67, 3.91]   | 0.92     | 0.94   | [0.72, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 28   | Tamaulipas          | 2.58       | 2.52   | [1.43, 4.15]   | 0.92     | 0.94   | [0.73, 1.00] | 0.74     | 0.76   | [0.46, 0.96] |
| 29   | Tlaxcala            | 22.98      | 22.49  | [15.52, 33.76] | 0.90     | 0.93   | [0.67, 1.00] | 0.79     | 0.81   | [0.51, 0.97] |
| 30   | Veracruz            | 3.52       | 3.44   | [2.24, 5.28]   | 0.91     | 0.93   | [0.68, 1.00] | 0.79     | 0.81   | [0.50, 0.97] |
| 31   | Yucatán             | 1.77       | 1.73   | [1.10, 2.66]   | 0.93     | 0.95   | [0.74, 1.00] | 0.77     | 0.78   | [0.49, 0.96] |
| 32   | Zacatecas           | 5.01       | 4.91   | [2.72, 7.56]   | 0.90     | 0.93   | [0.65, 1.00] | 0.77     | 0.79   | [0.49, 0.96] |

Notes: 95% CI indicates 95% credible interval.

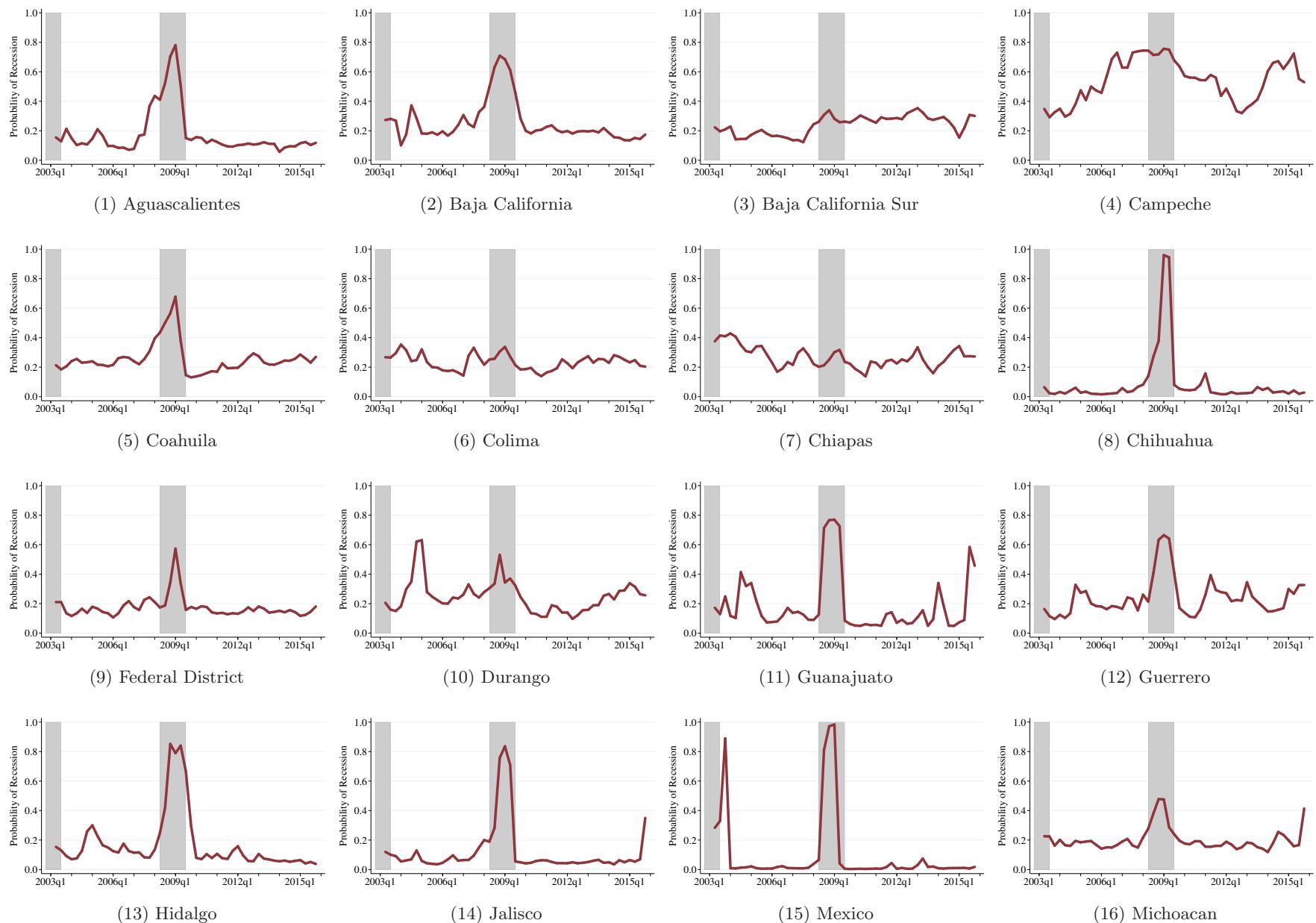


Figure OA.E. 1: Recession Probabilities

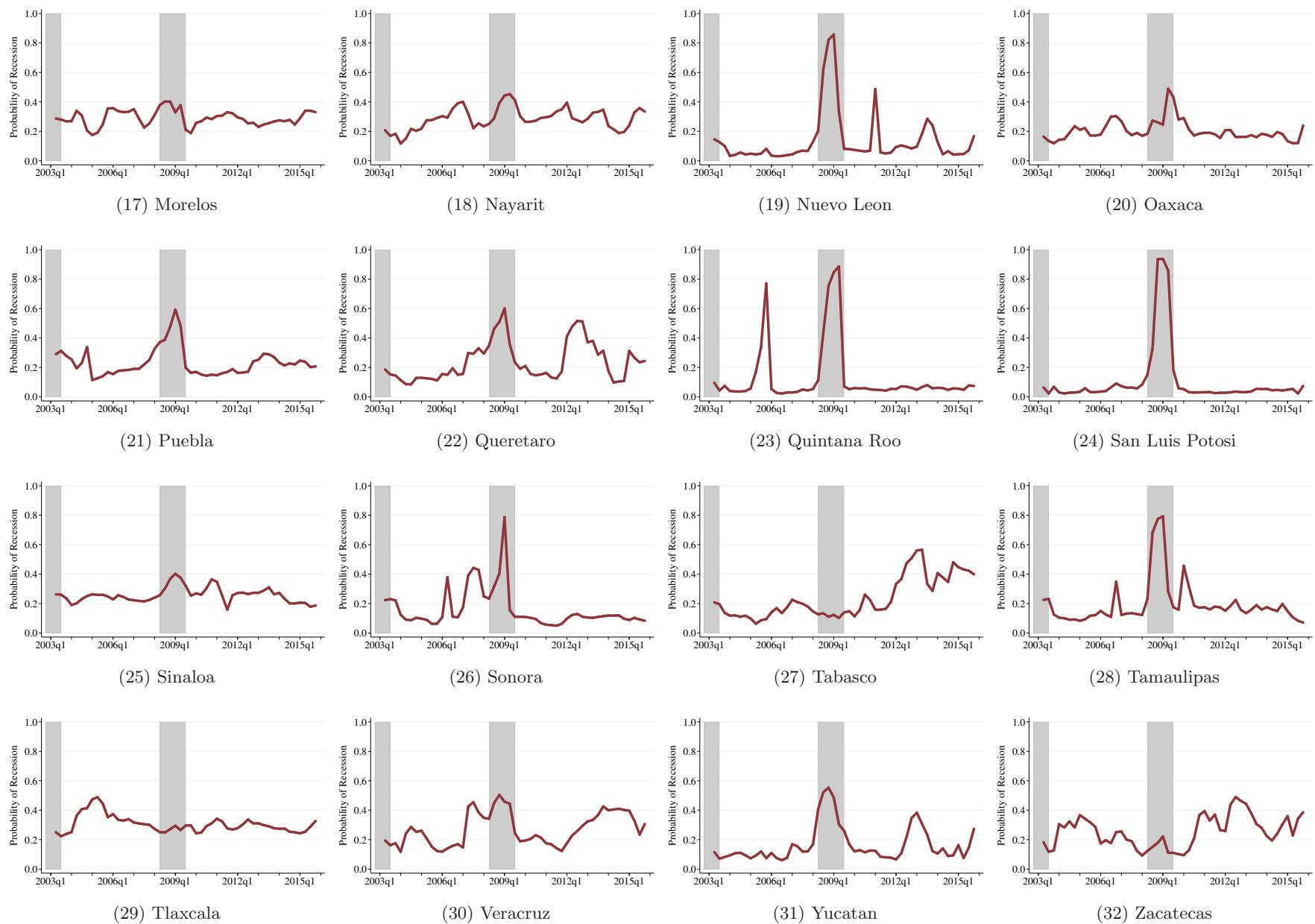
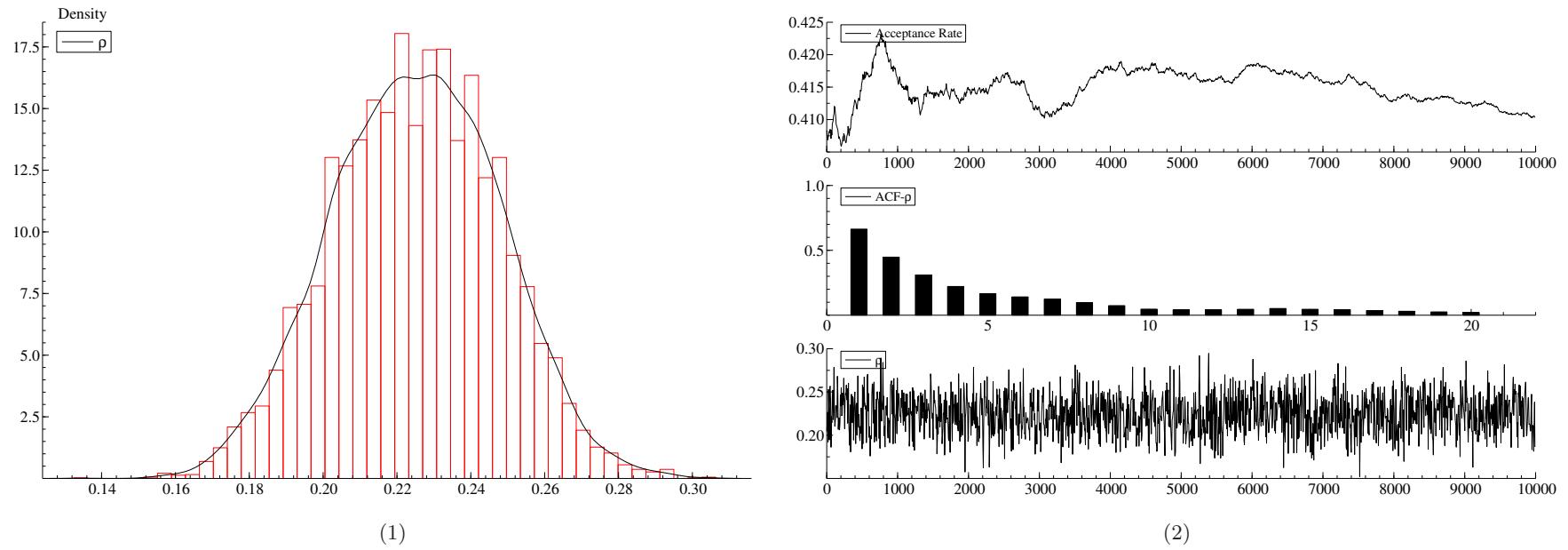


Figure OA.E. 1: Recession Probabilities (Continued)

Figure OA.E. 2: Posterior Distribution of  $\rho$

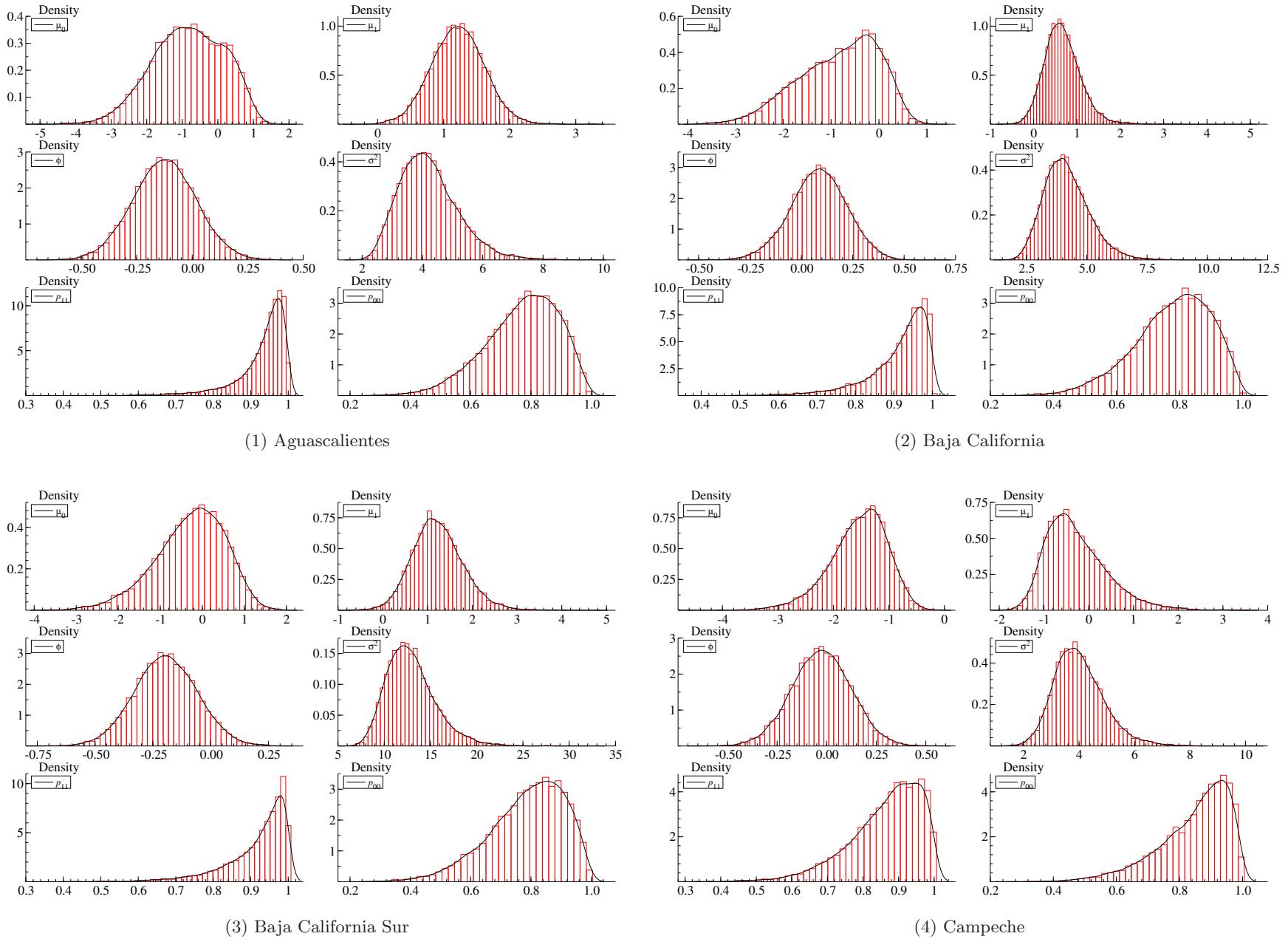
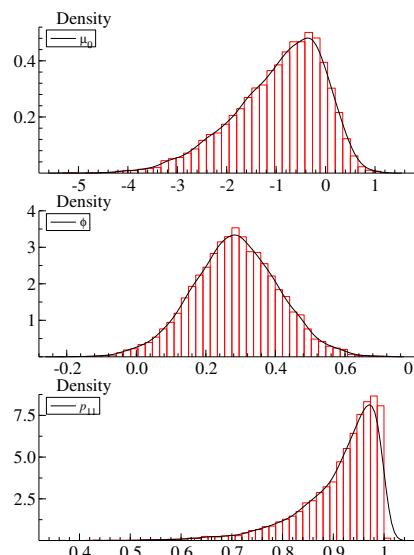
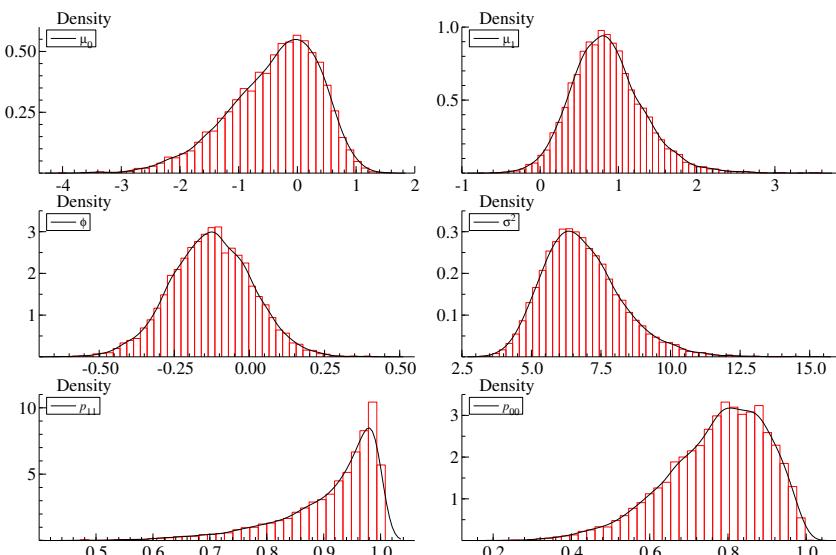


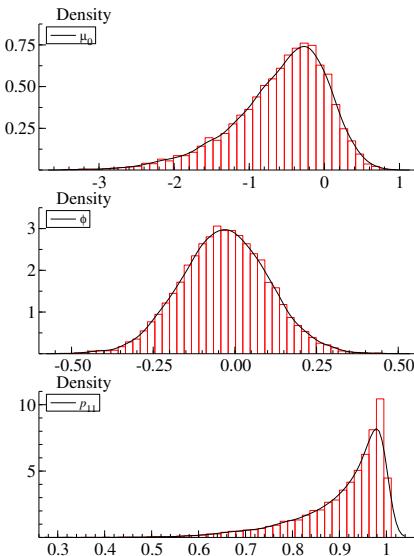
Figure OA.E. 3: Posterior Distributions



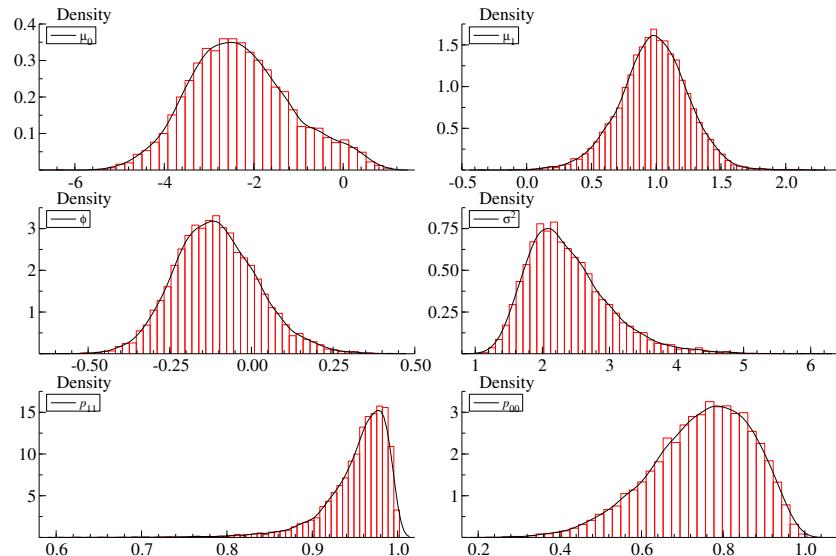
(5) Coahuila



(6) Colima

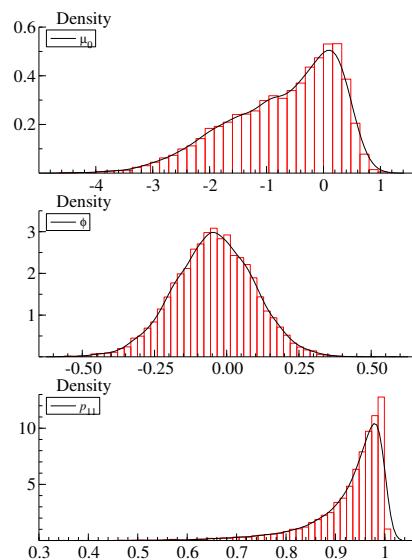


(7) Chiapas

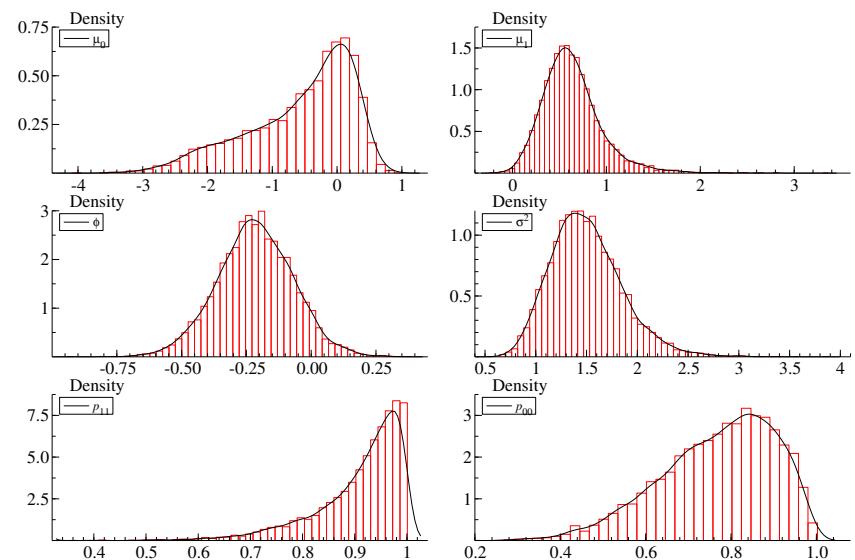


(8) Chihuahua

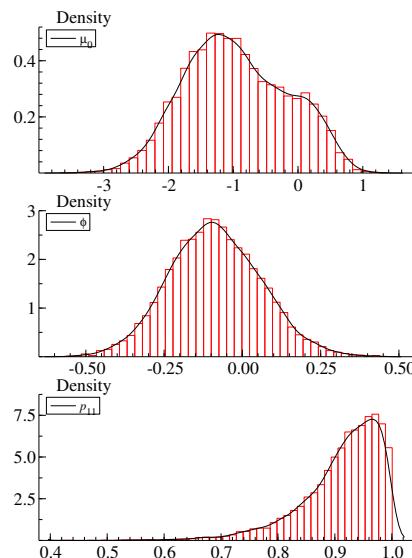
Figure OA.E. 3: Posterior Distributions (Continued)



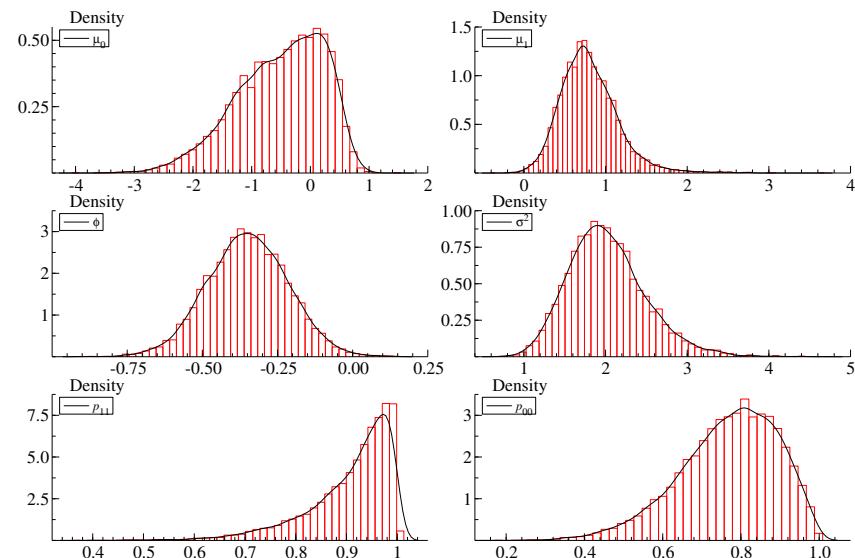
(9) Federal District



(10) Durango

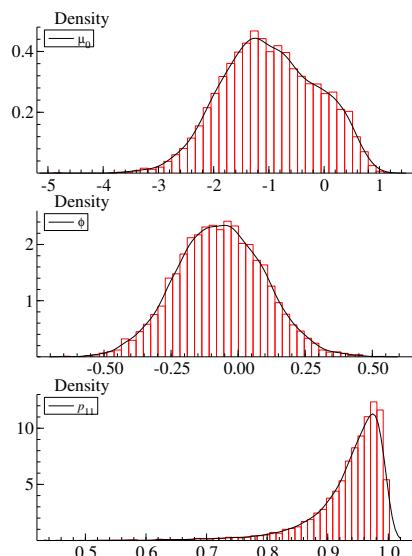


(11) Guanajuato

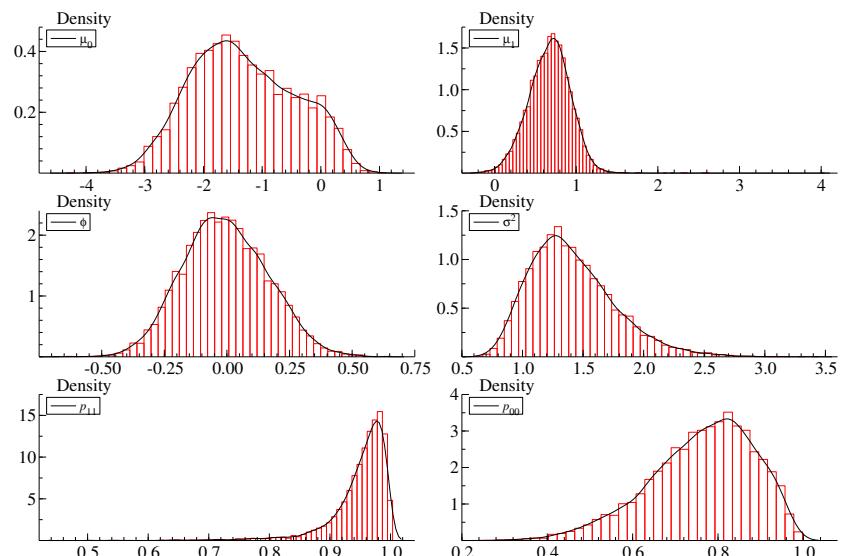


(12) Guerrero

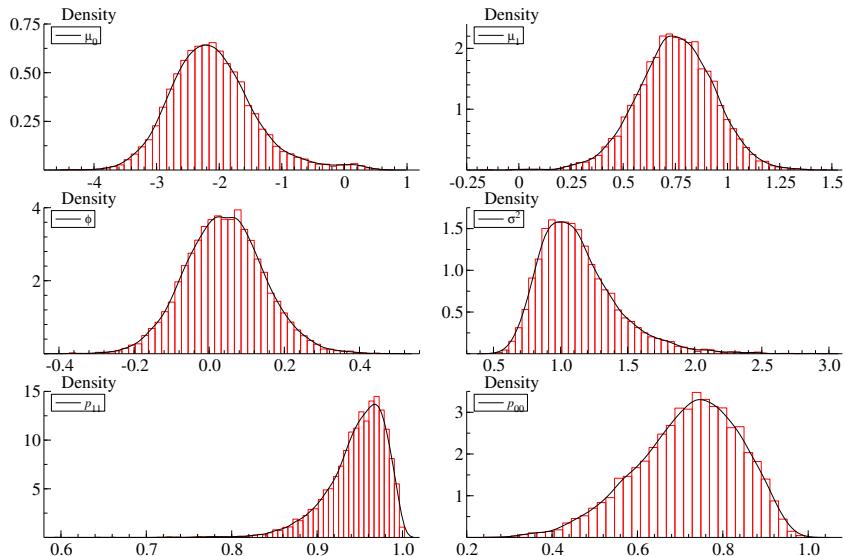
Figure OA.E. 3: Posterior Distributions (Continued)



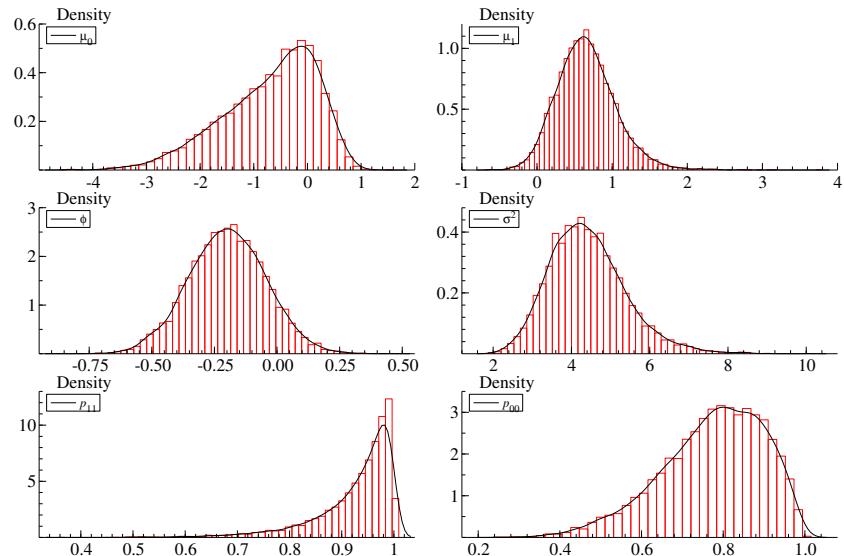
(13) Hidalgo



(14) Jalisco

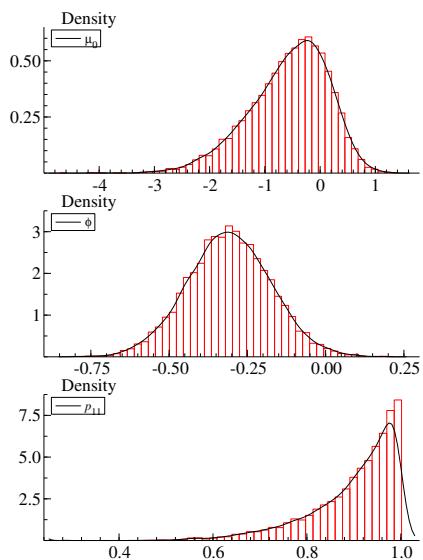


(15) Mexico

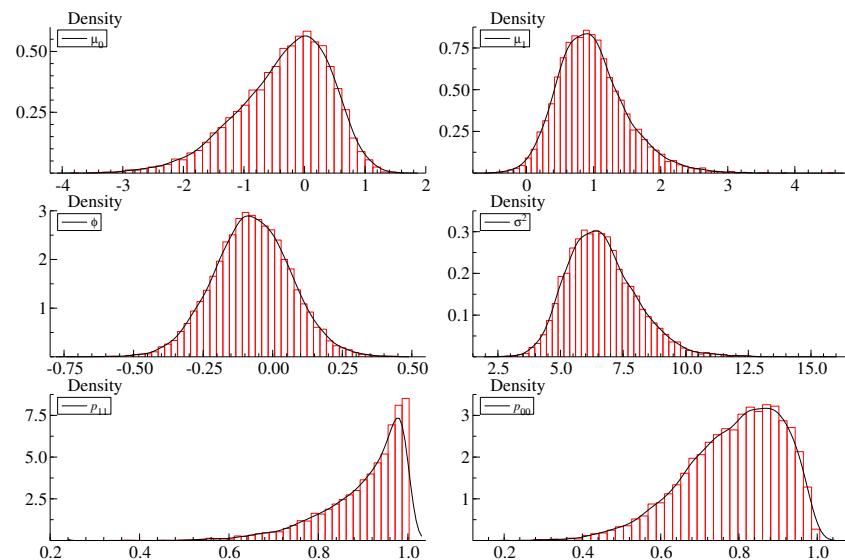


(16) Michoacan

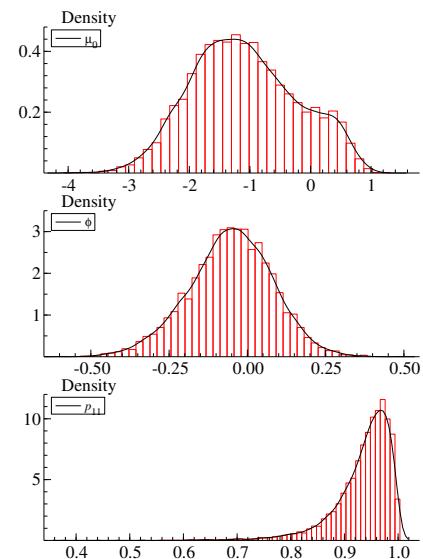
Figure OA.E. 3: Posterior Distributions (Continued)



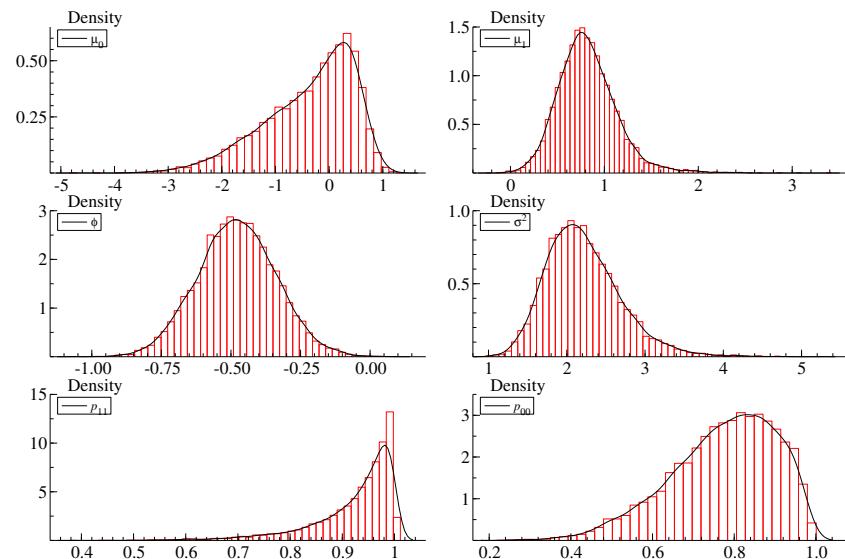
(17) Morelos



(18) Nayarit



(19) Nuevo Leon



(20) Oaxaca

Figure OA.E. 3: Posterior Distributions (Continued)

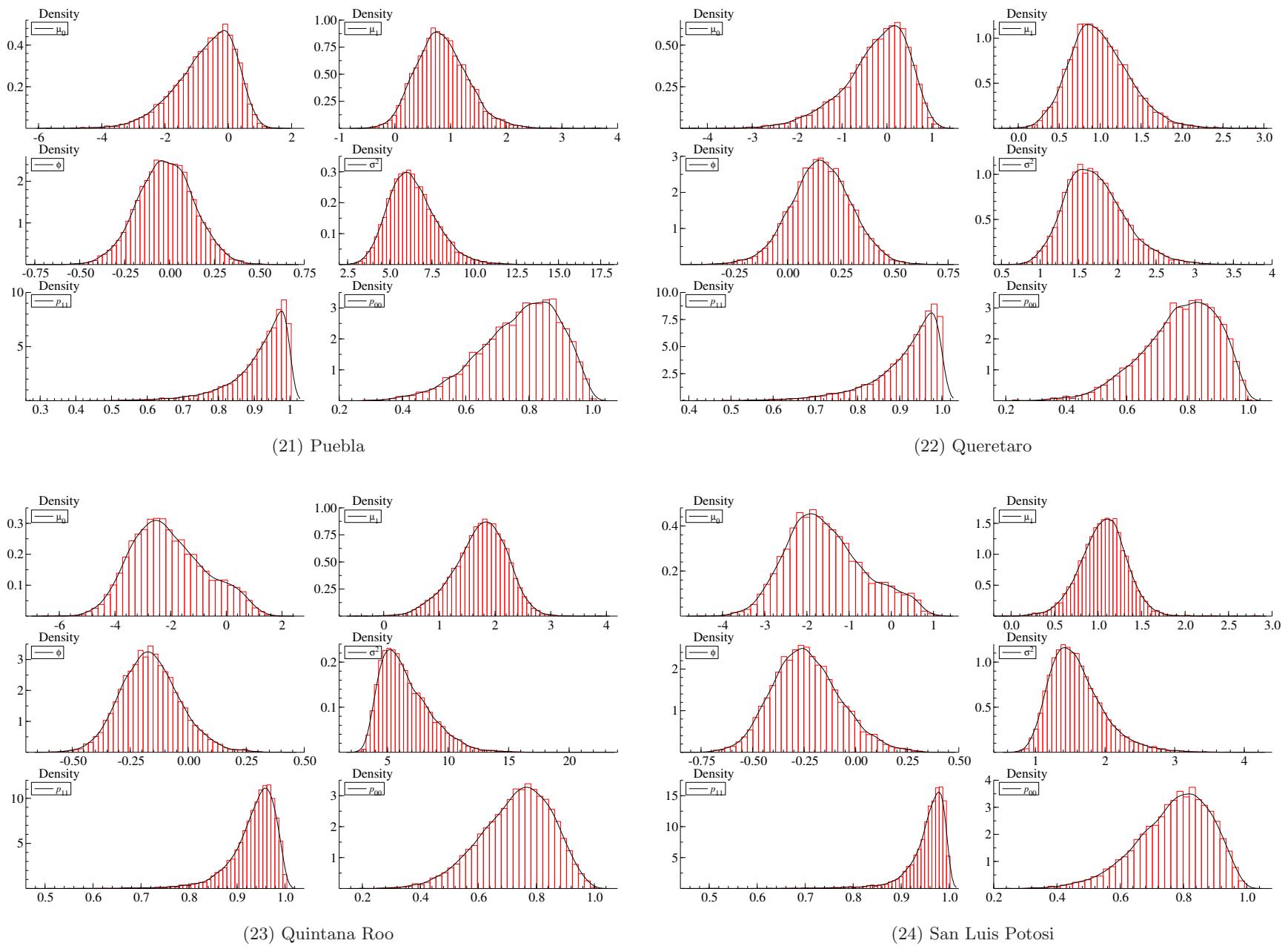
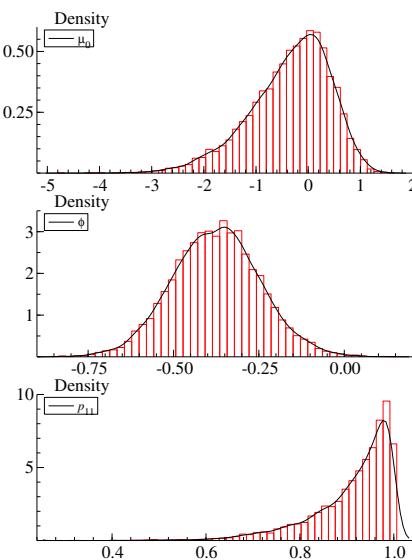
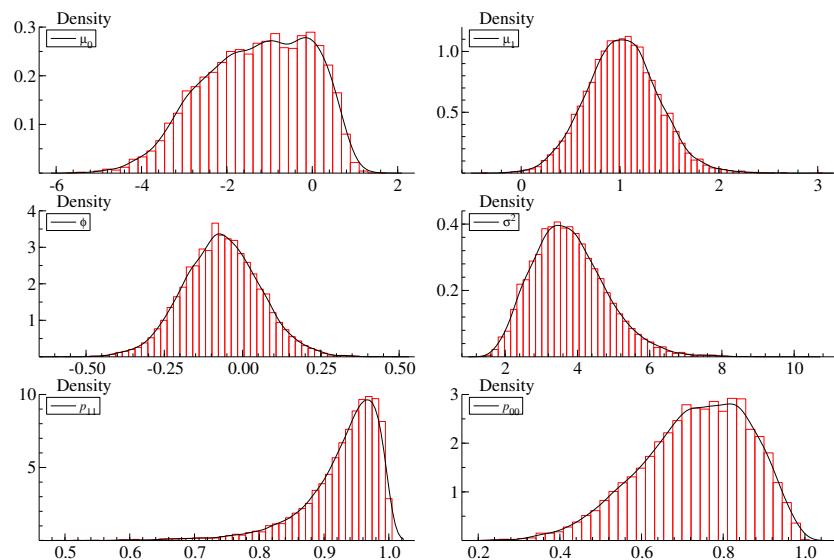


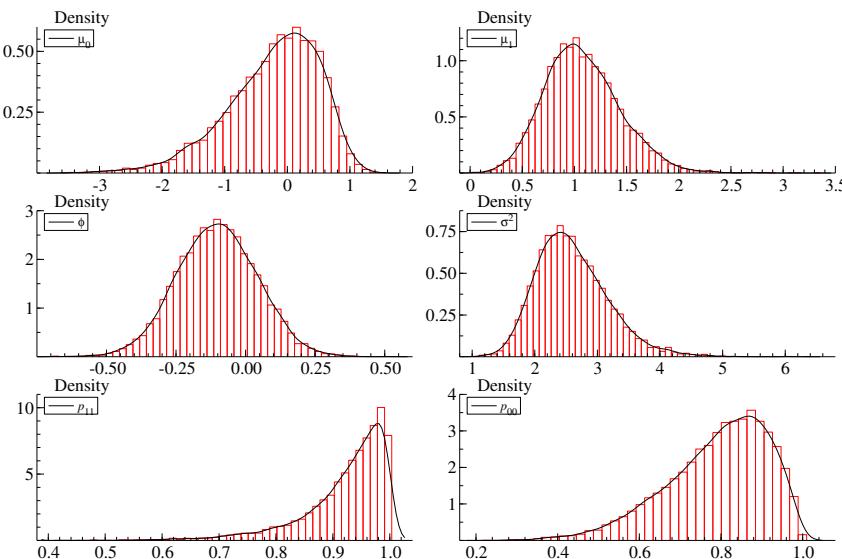
Figure OA.E. 3: Posterior Distributions (Continued)



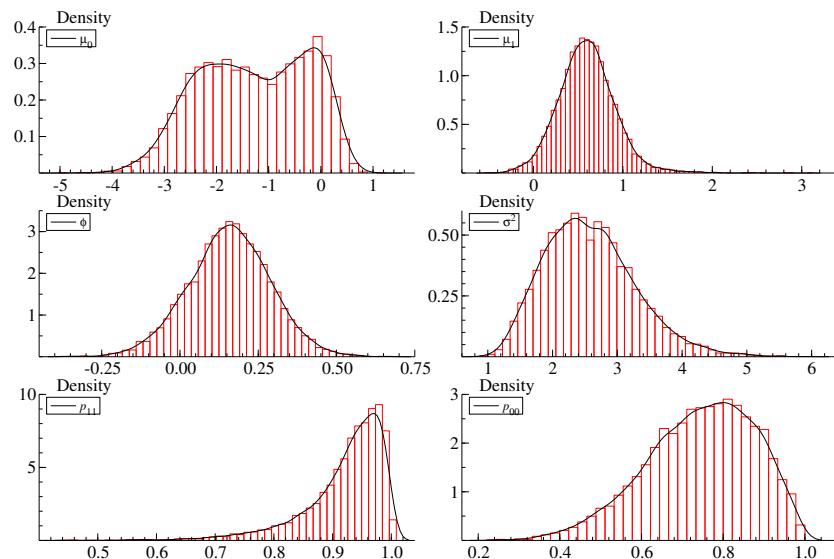
(25) Sinaloa



(26) Sonora

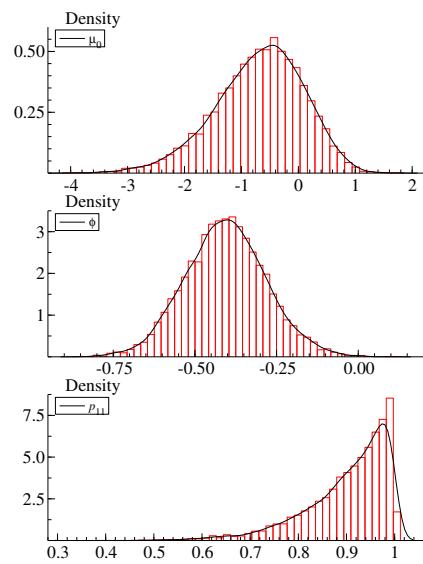


(27) Tabasco

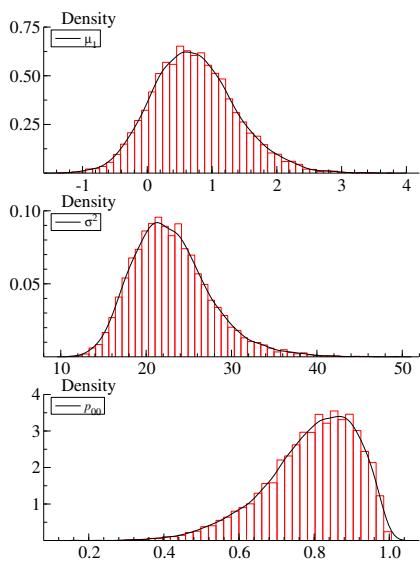


(28) Tamaulipas

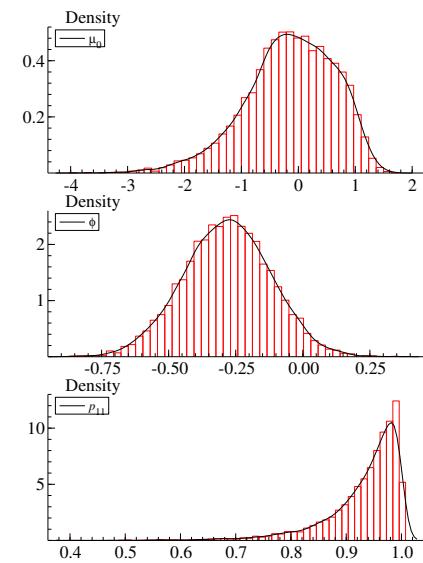
Figure OA.E. 3: Posterior Distributions (Continued)



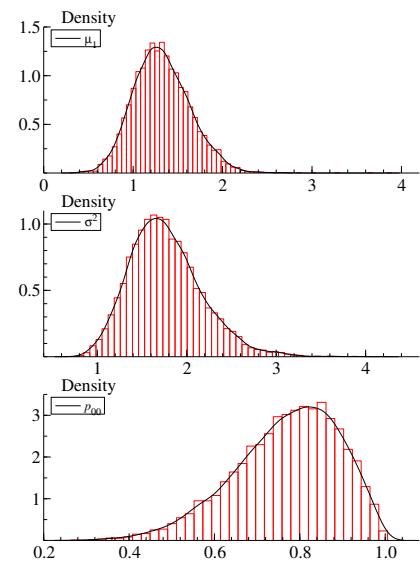
(29) Tlaxcala



(30) Veracruz



(31) Yucatan



(32) Zacatecas

Figure OA.E. 3: Posterior Distributions (Continued)

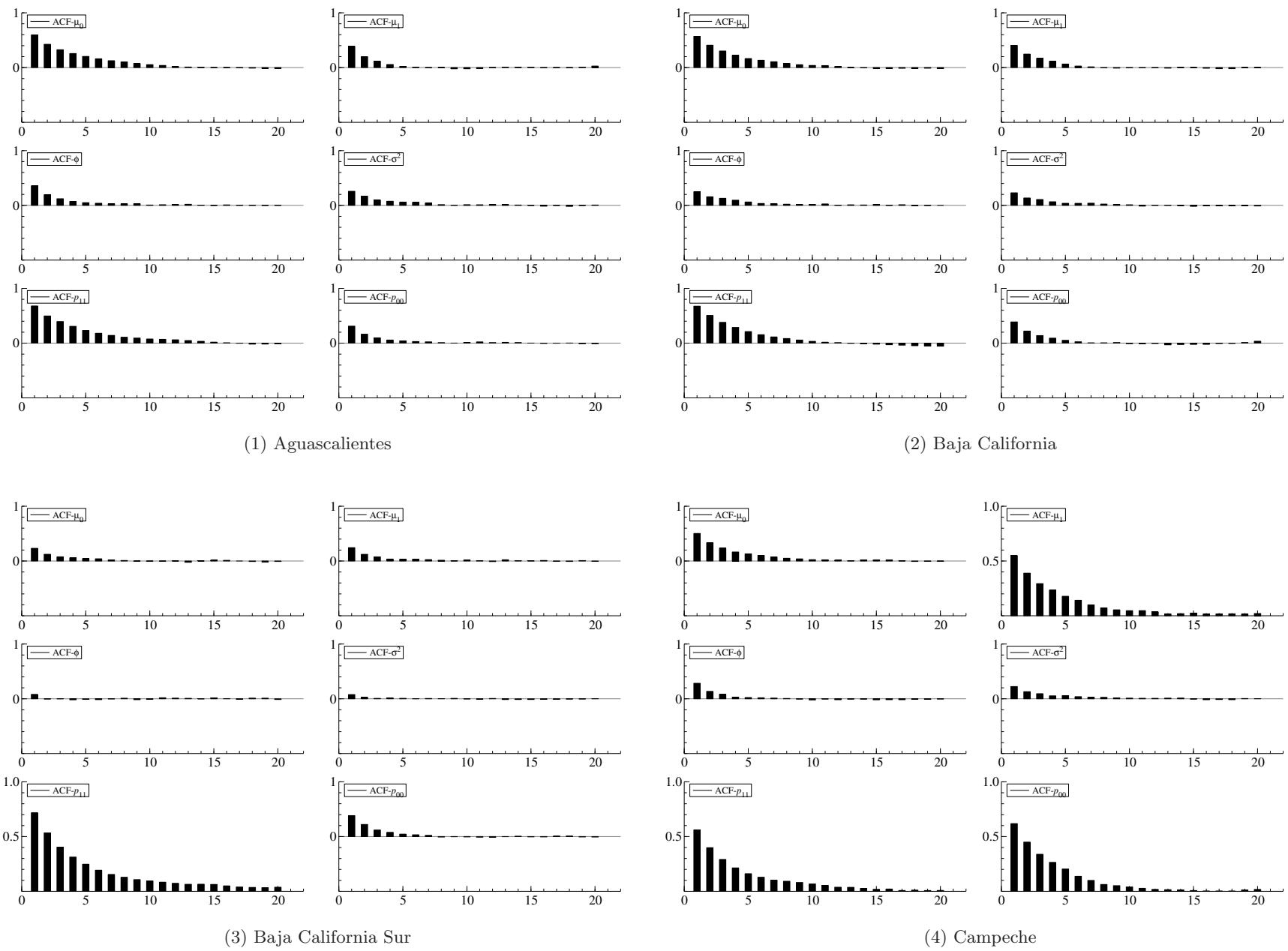


Figure OA.E. 4: Autocorrelation Function

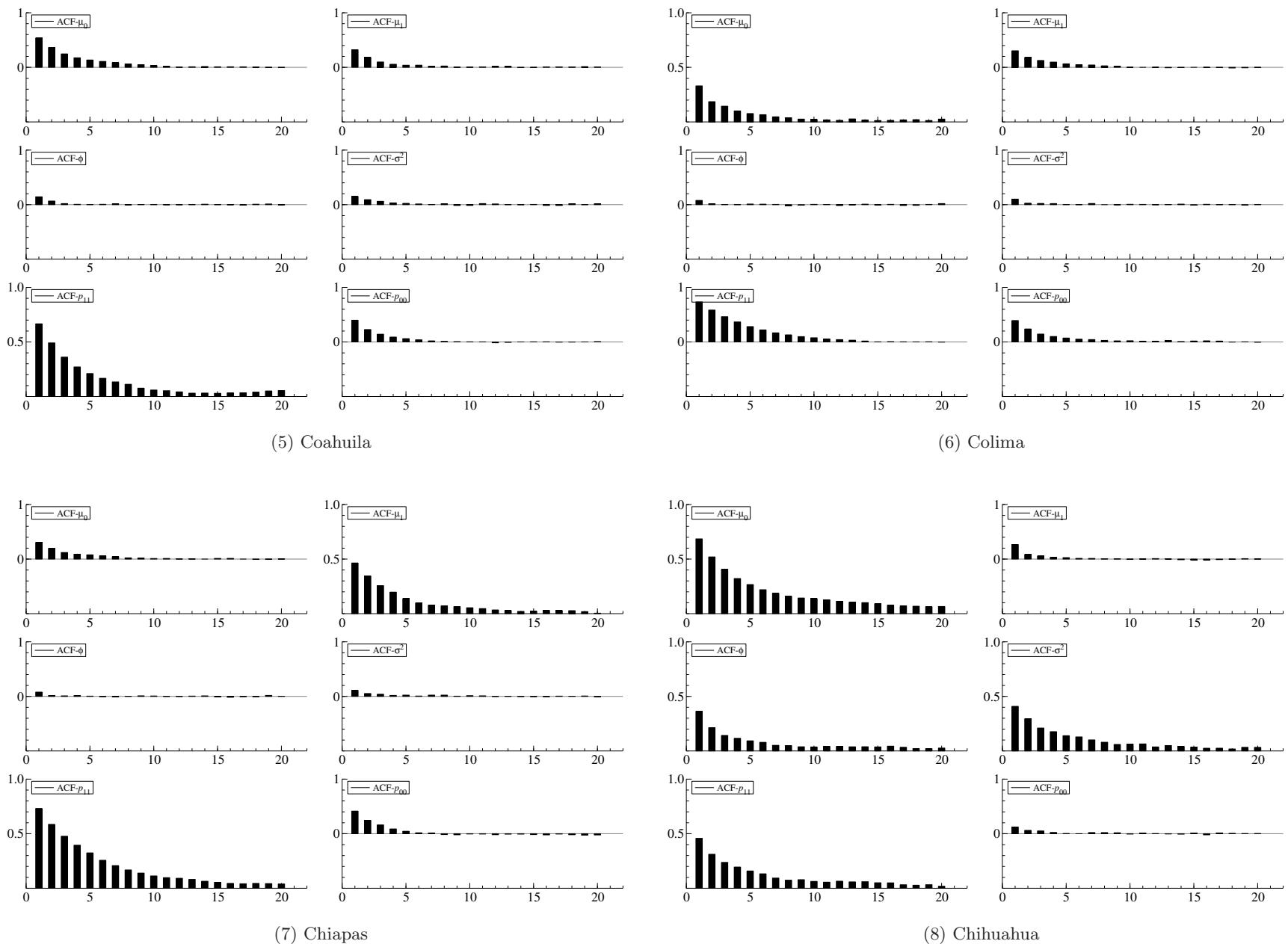


Figure OA.E. 4: Autocorrelation Function (Continued)

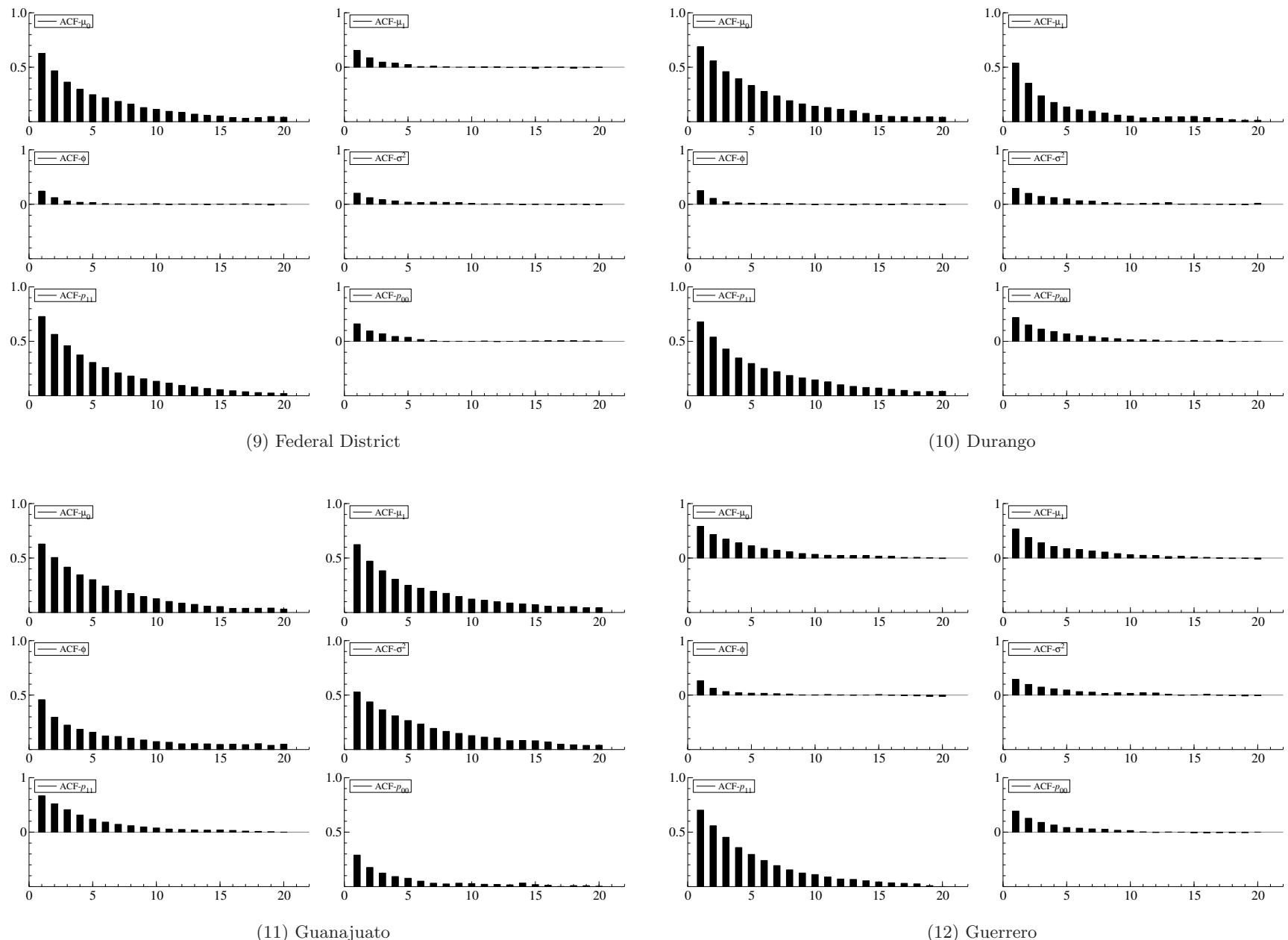
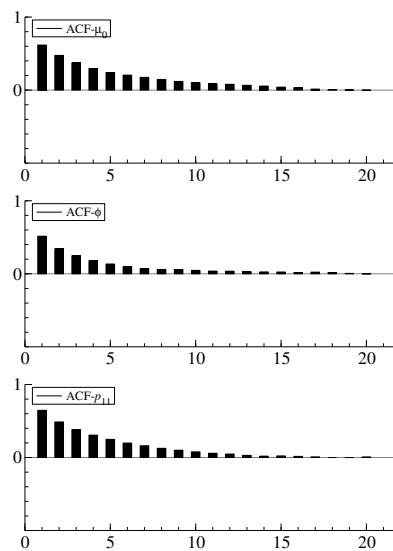
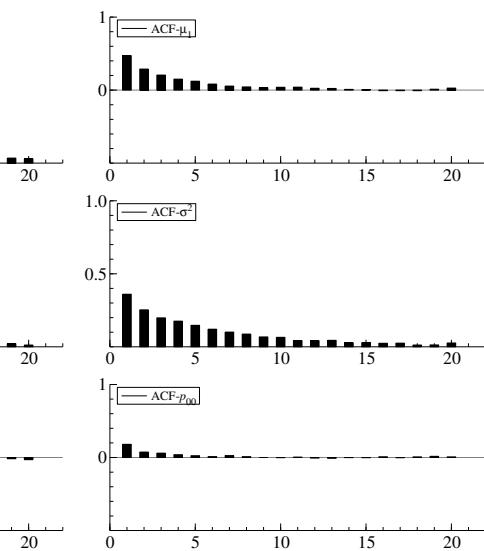
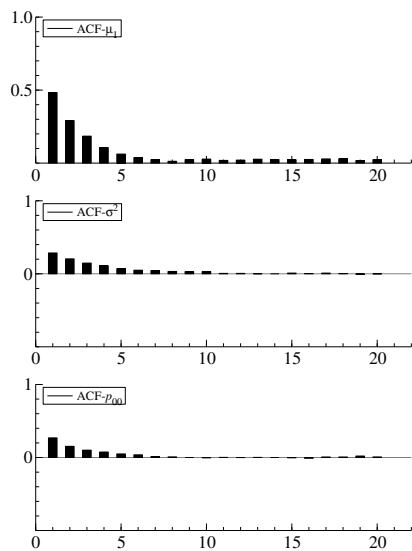


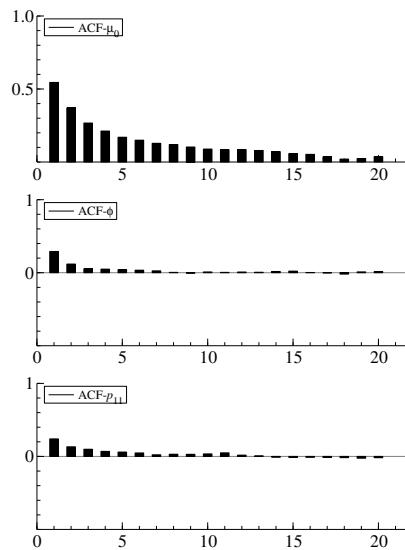
Figure OA.E. 4: Autocorrelation Function (Continued)



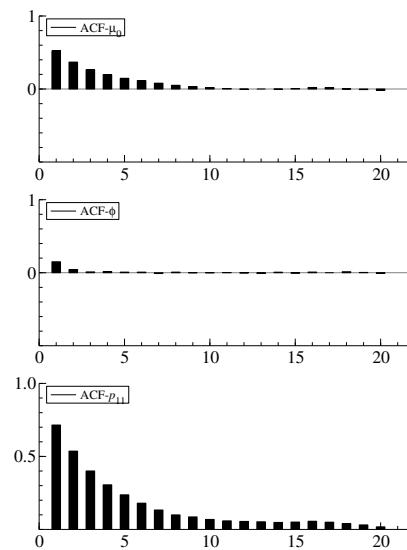
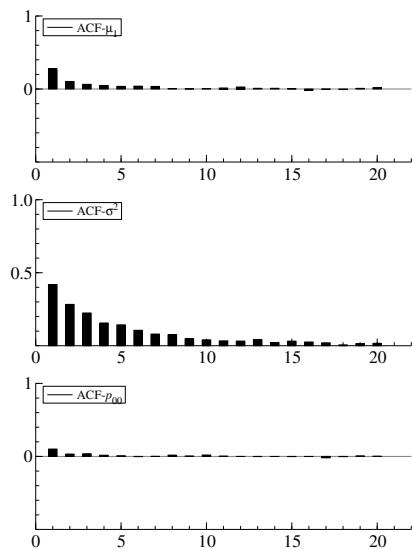
(13) Hidalgo



(14) Jalisco



(15) Mexico



(16) Michoacan

Figure OA.E. 4: Autocorrelation Function (Continued)

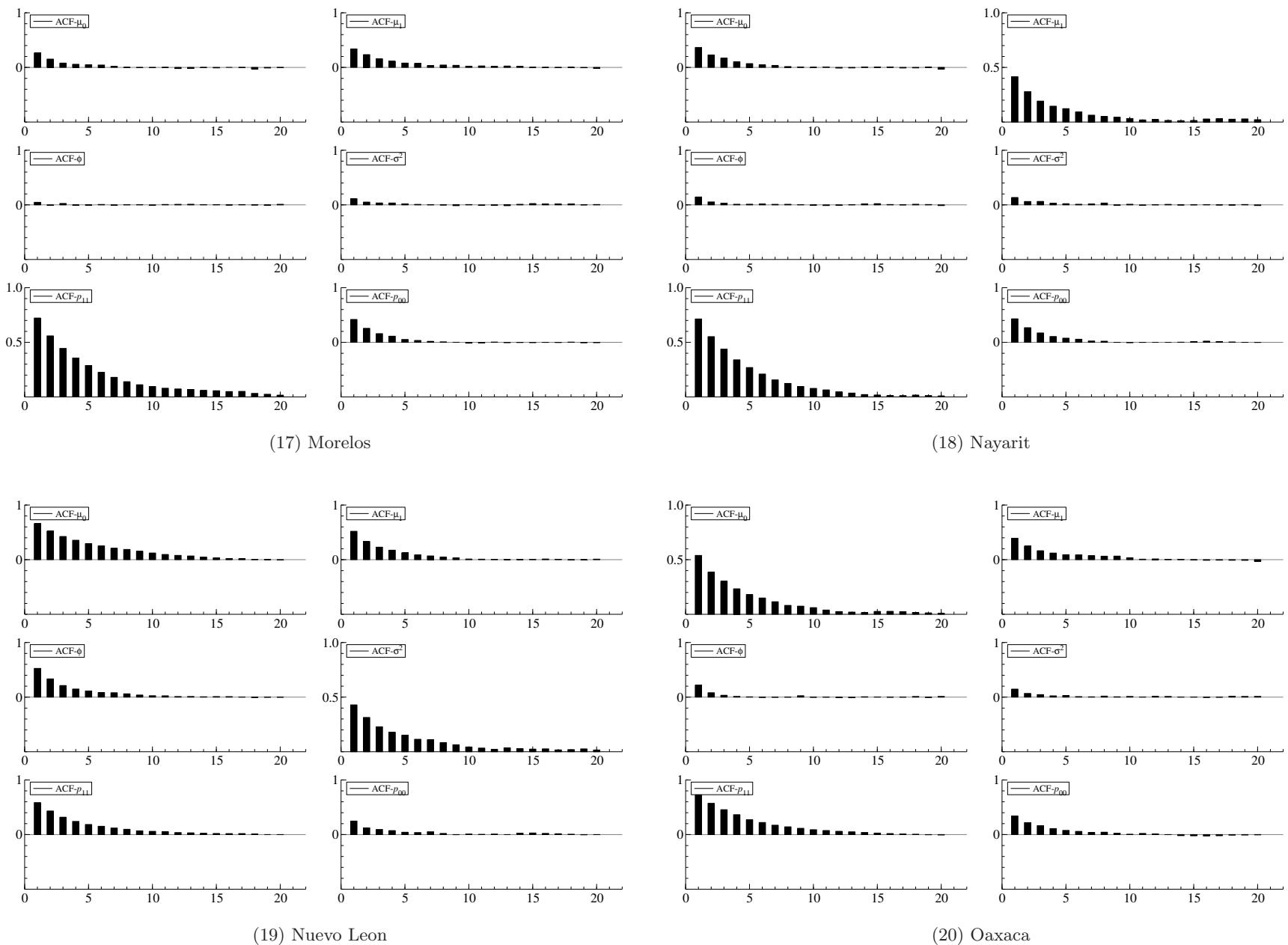
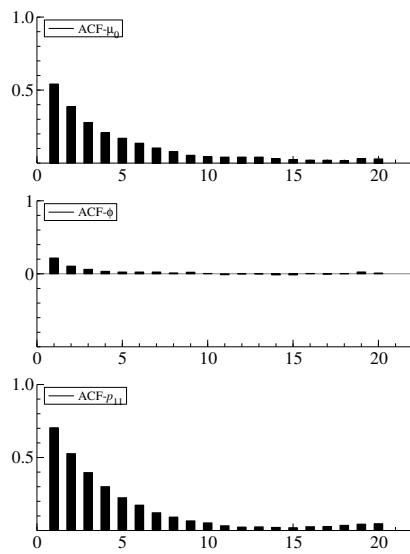
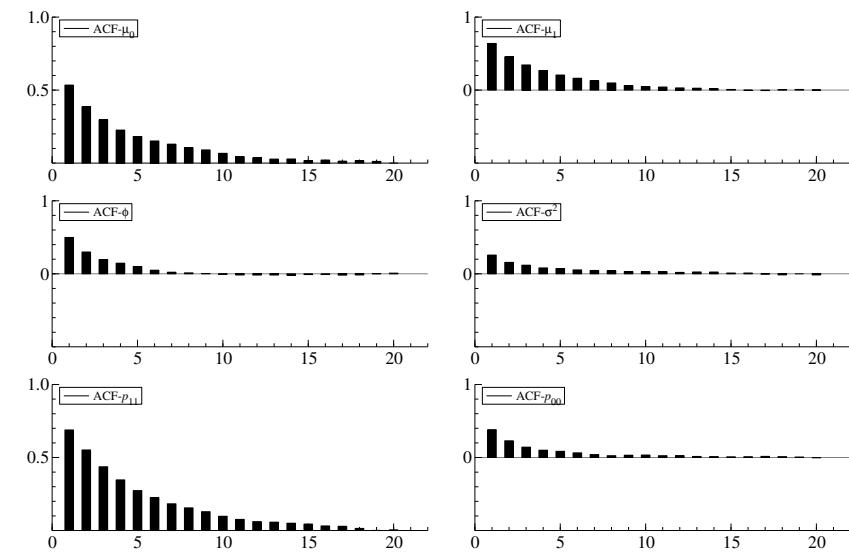


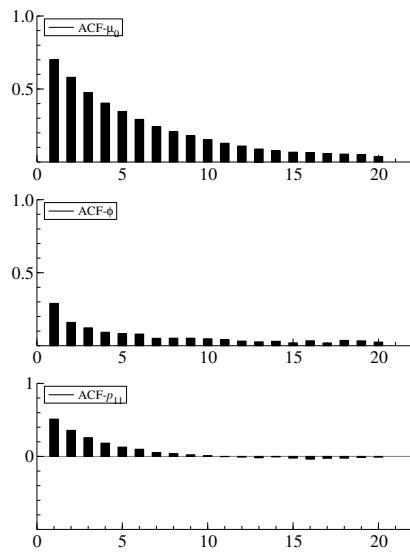
Figure OA.E. 4: Autocorrelation Function (Continued)



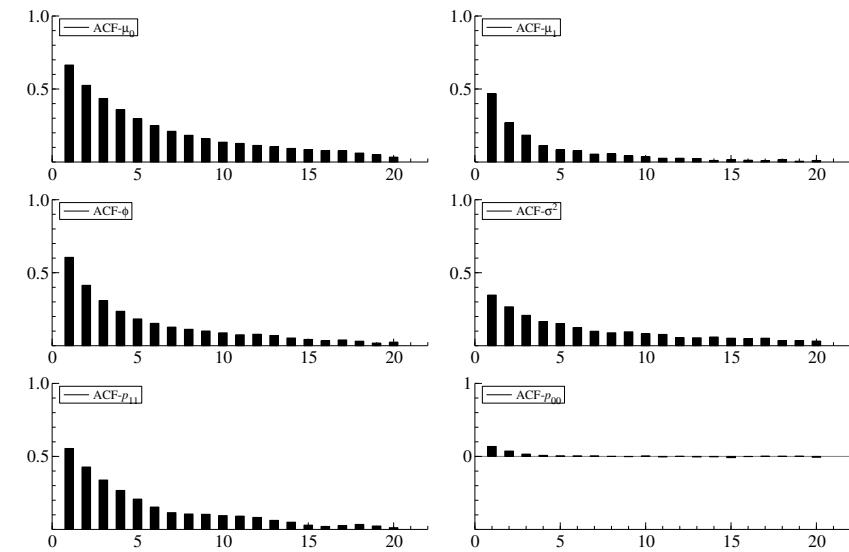
(21) Puebla



(22) Queretaro

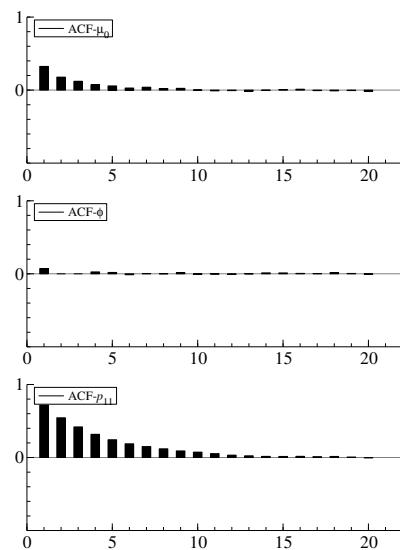


(23) Quintana Roo

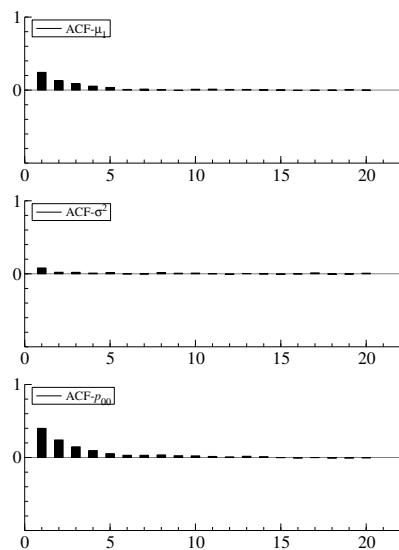


(24) San Luis Potosi

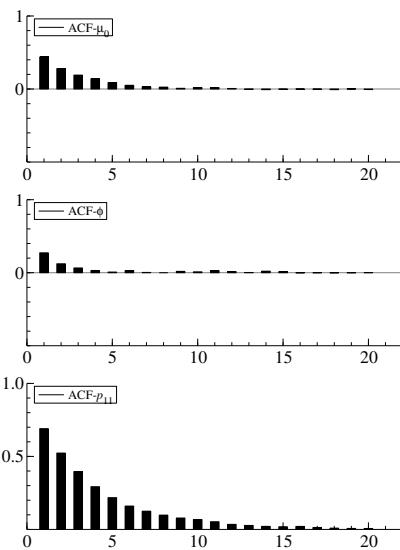
Figure OA.E. 4: Autocorrelation Function (Continued)



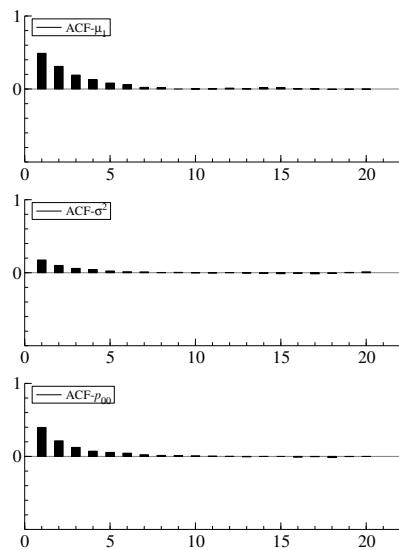
(25) Sinaloa



(26) Sonora



(27) Tabasco



(28) Tamaulipas

Figure OA.E. 4: Autocorrelation Function (Continued)

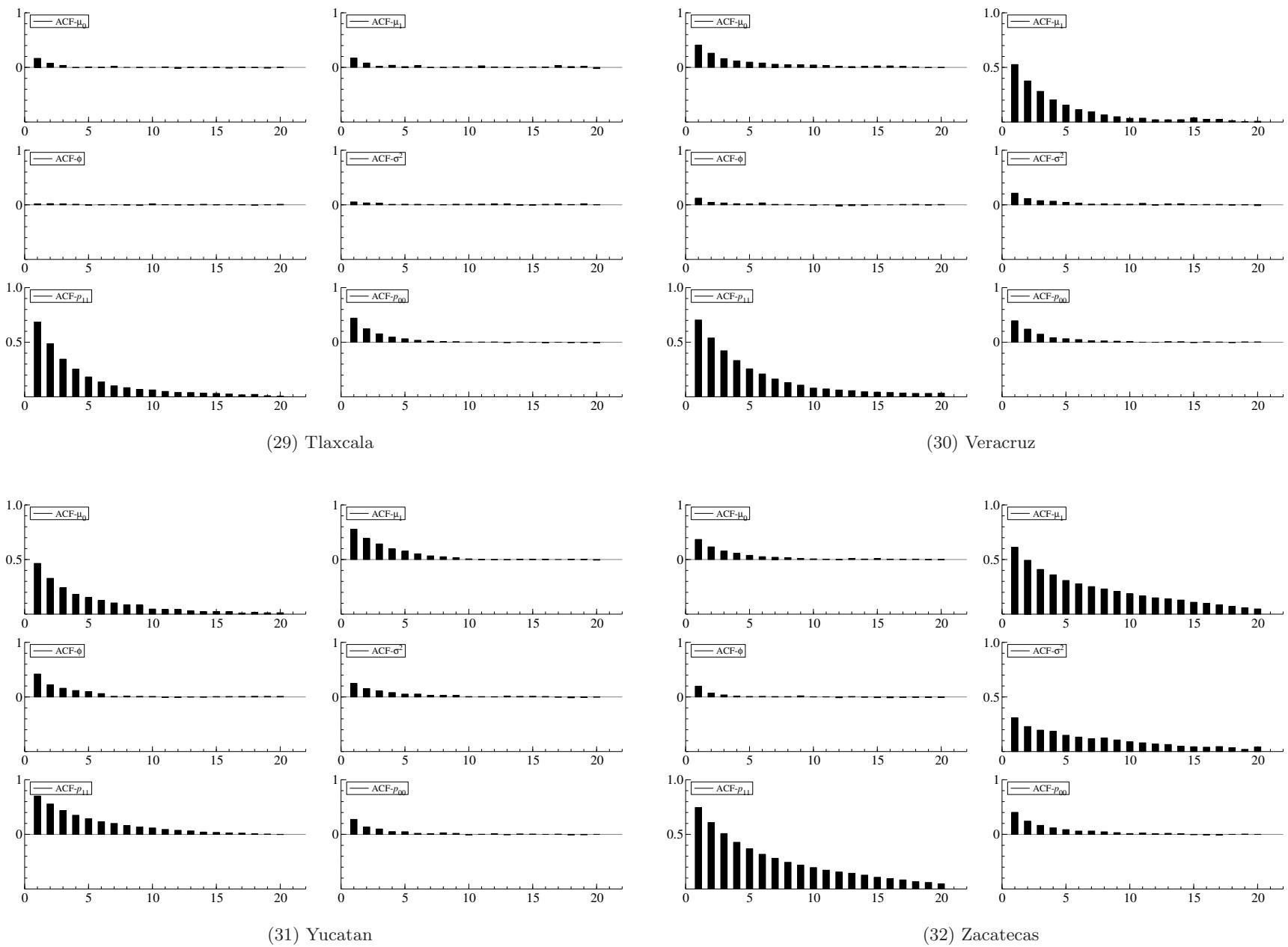


Figure OA.E. 4: Autocorrelation Function (Continued)

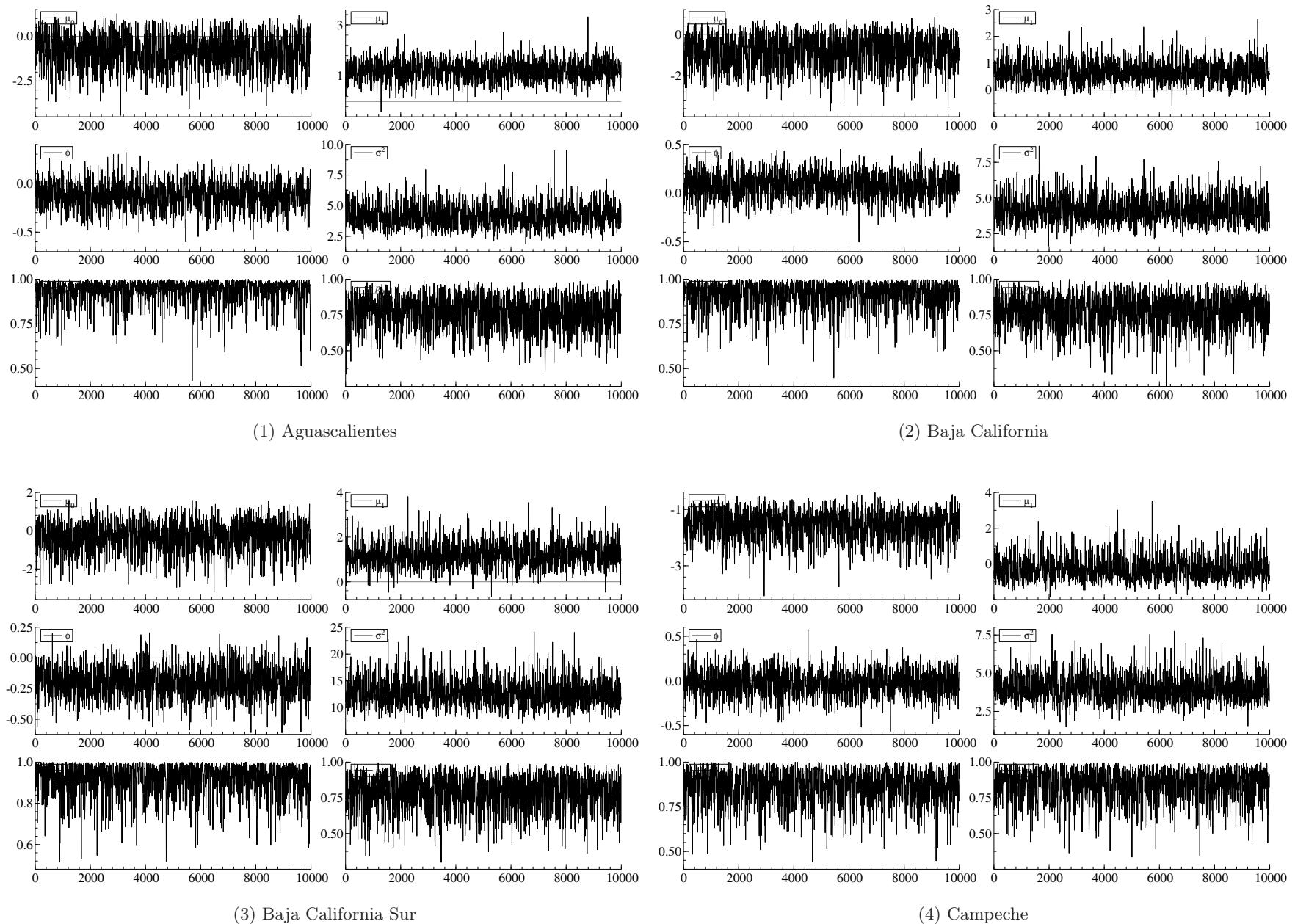


Figure OA.E. 5: Trace Plots

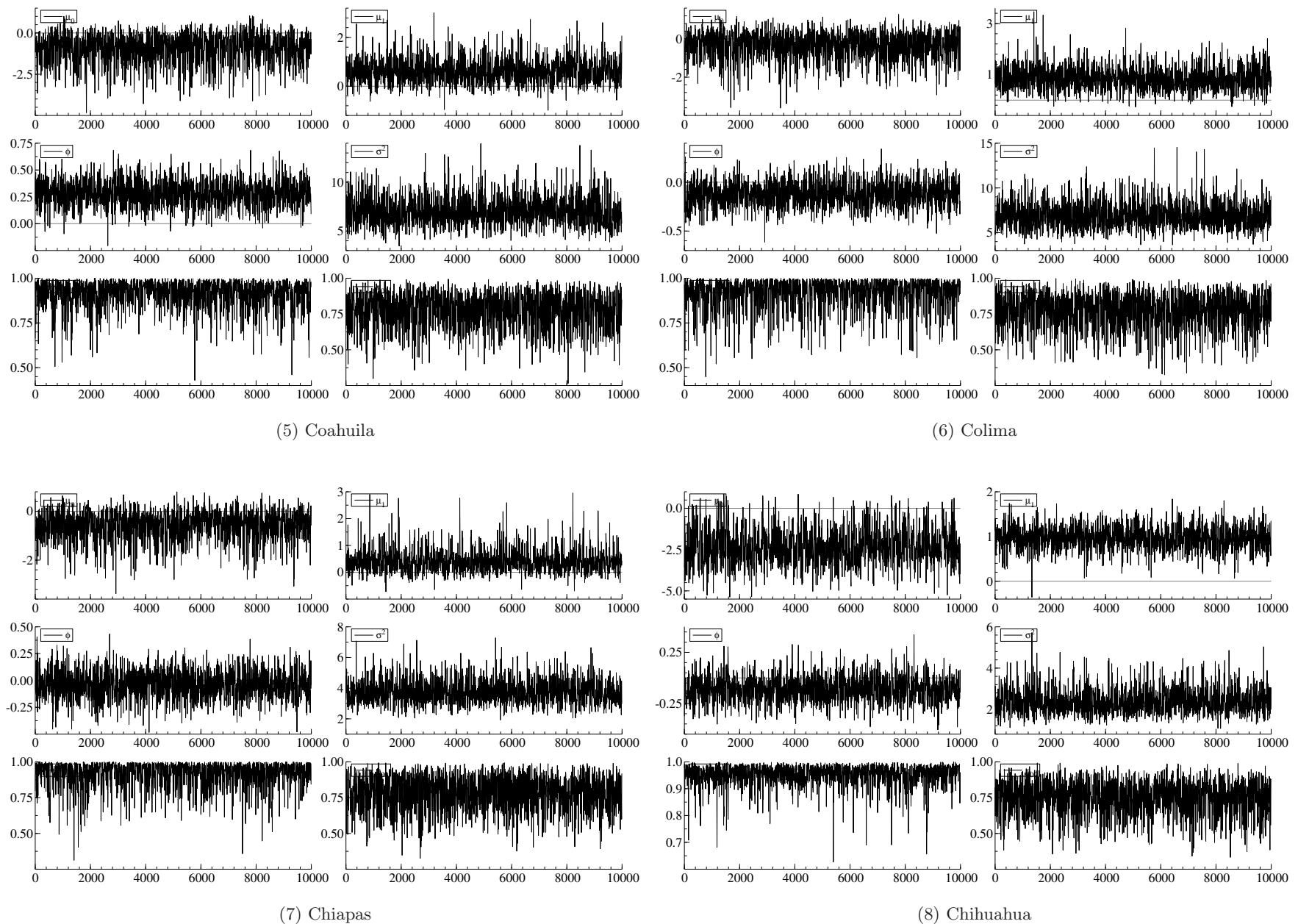


Figure O.A.E. 5: Trace Plots (Continued)

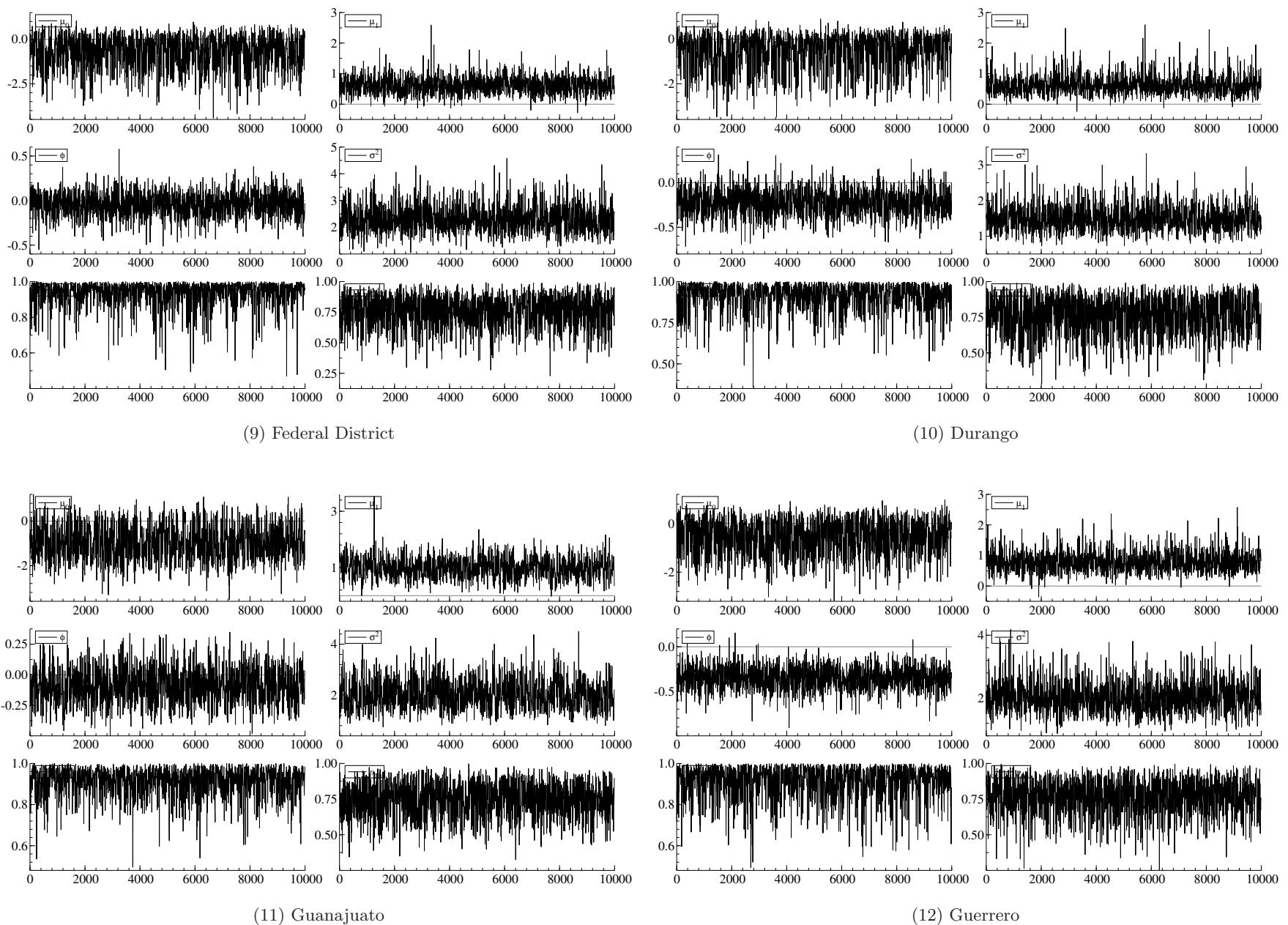


Figure O.A.E. 5: Trace Plots (Continued)

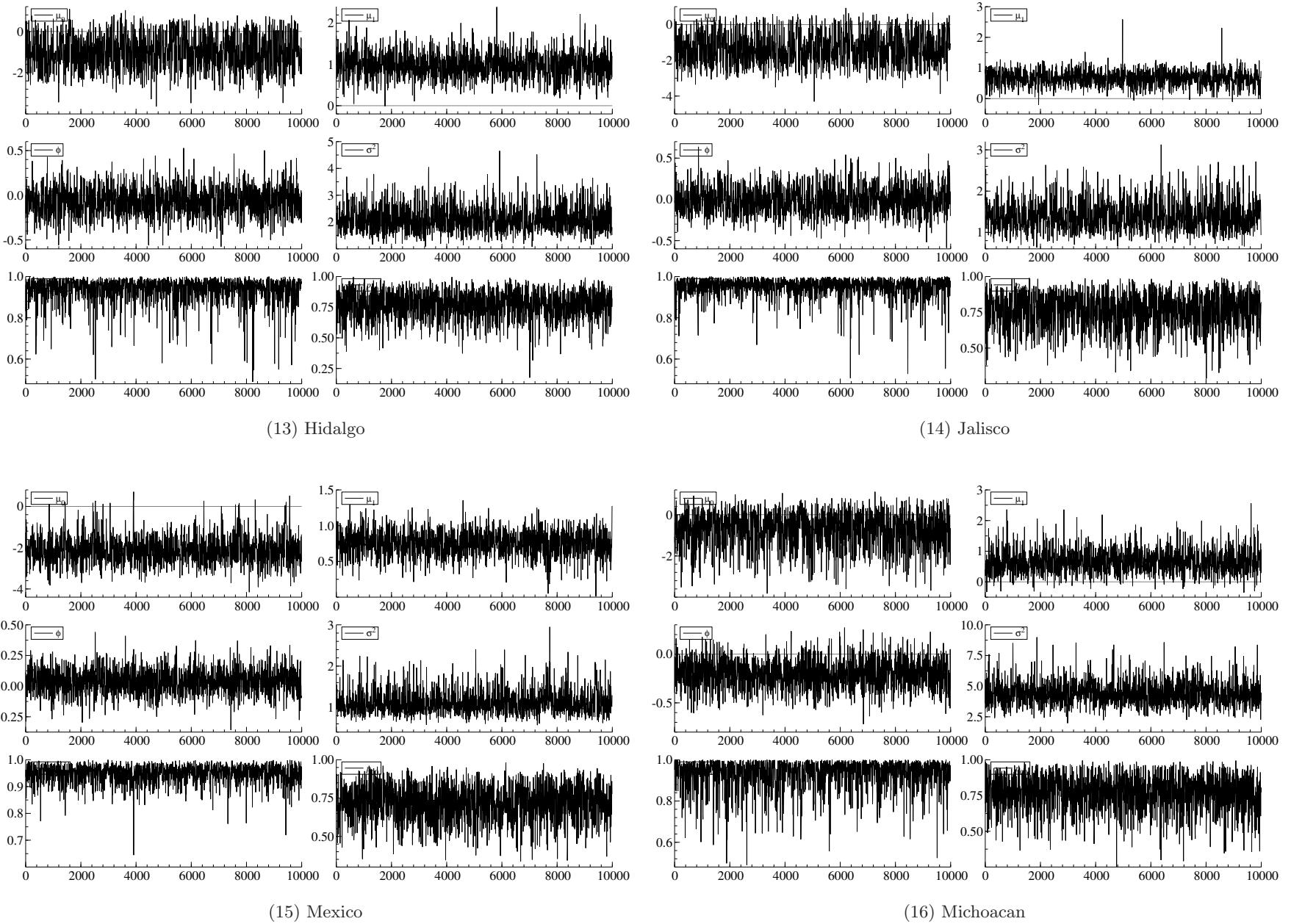


Figure O.A.E. 5: Trace Plots (Continued)

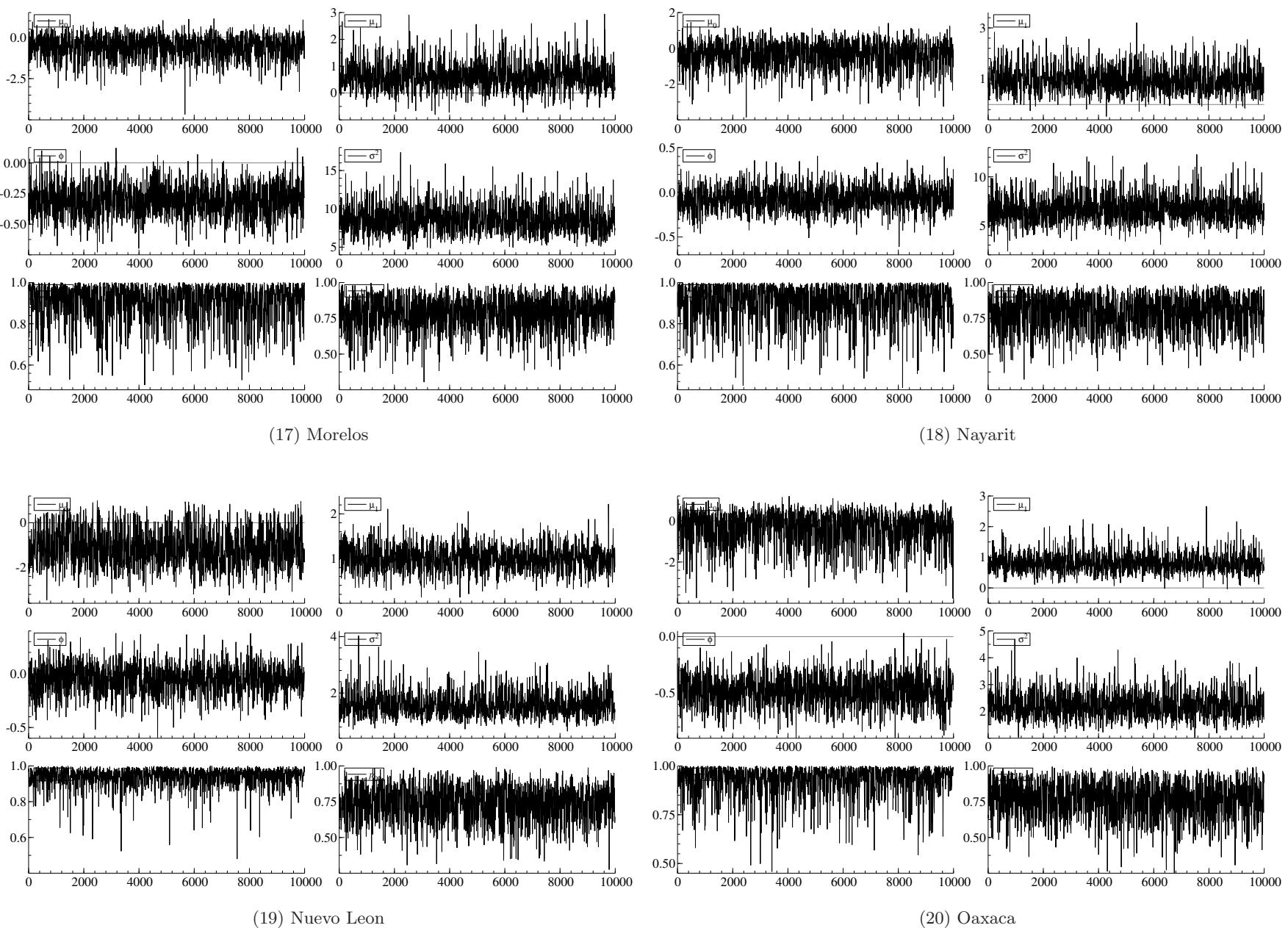


Figure O.A.E. 5: Trace Plots (Continued)

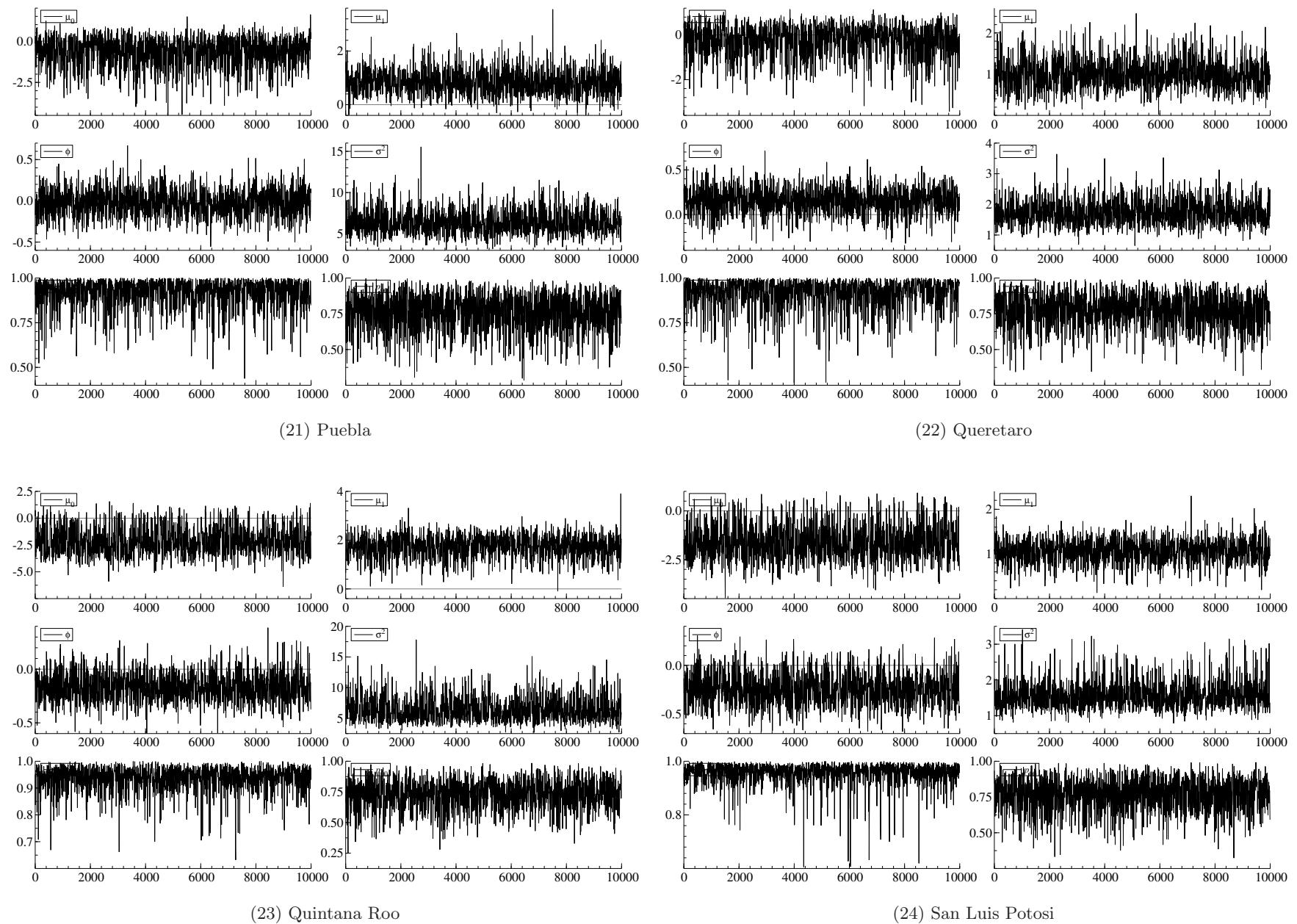


Figure O.A.E. 5: Trace Plots (Continued)

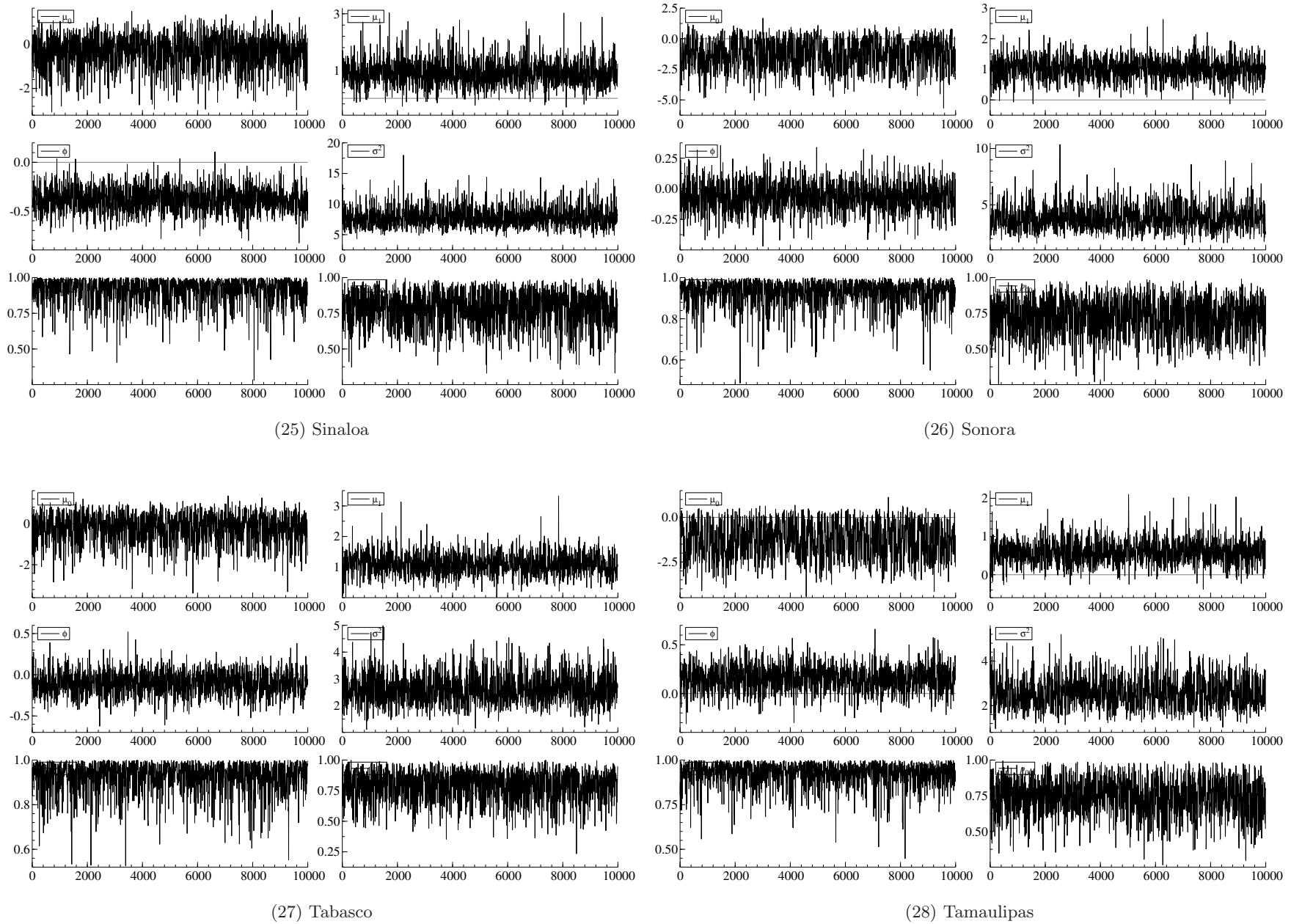


Figure O.A.E. 5: Trace Plots (Continued)

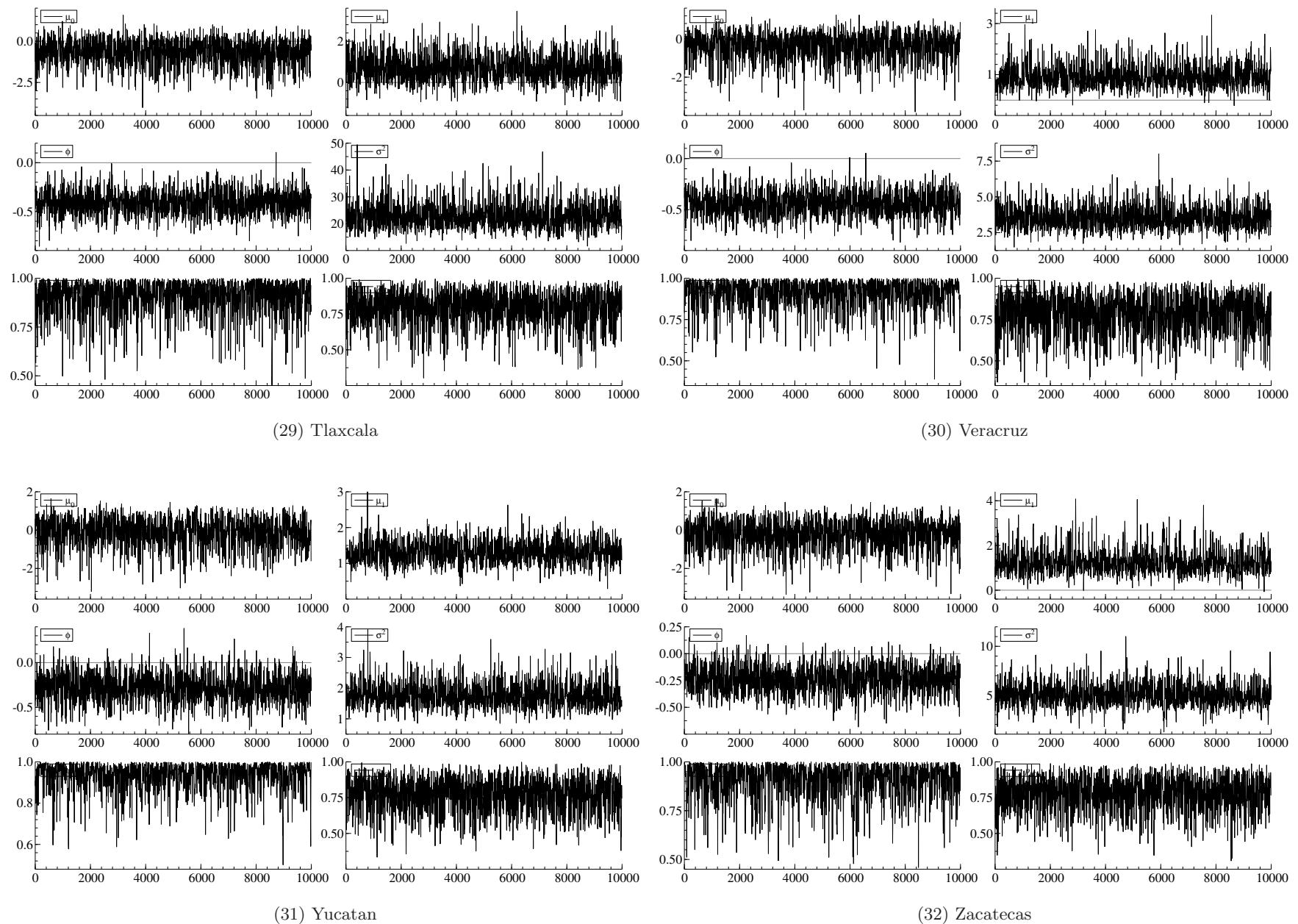


Figure OA.E. 5: Trace Plots (Continued)

## Online Appendix F. Simulation Results of Spatial Spillover Effects

### Figure OA.F. 1

Figure OA.F. 1 visualizes the spatial spillover effects of a transition from expansion to recession for all states.

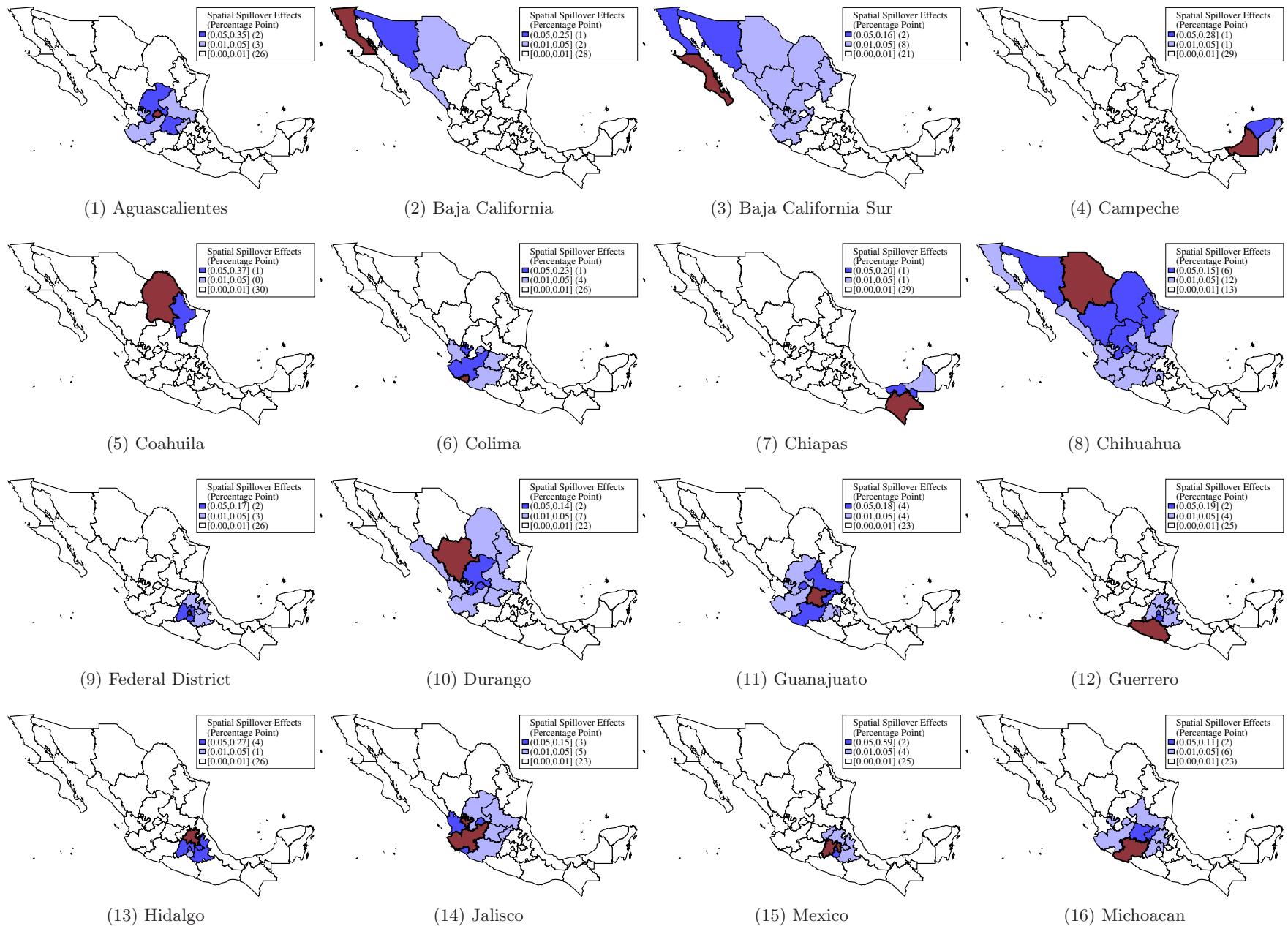


Figure OA.F. 1: Spatial Spillover Effects

Notes: The origin state of regime switch ( $\mu_0 \leftarrow \mu_1$ ) is red-colored.

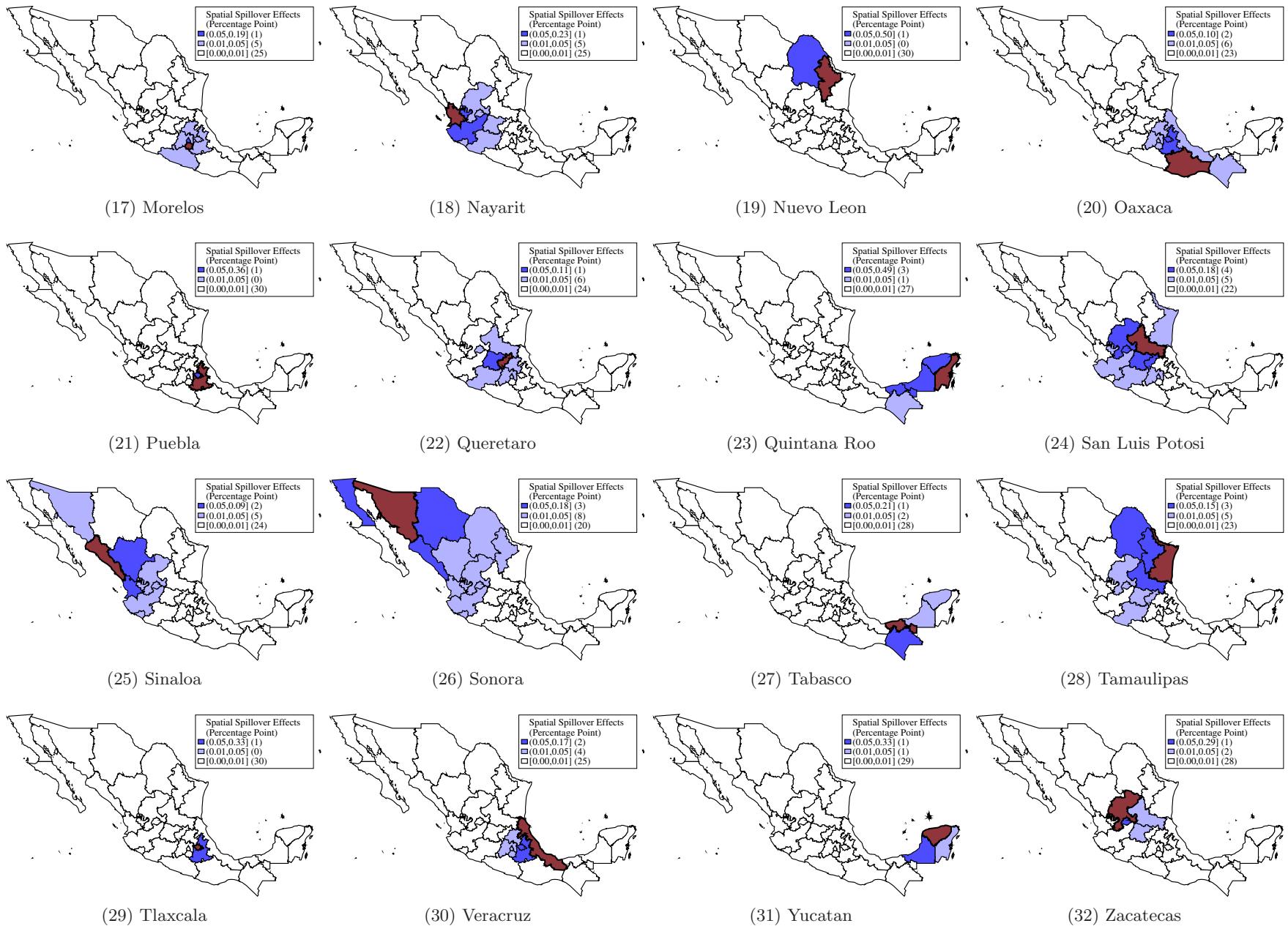


Figure OA.F. 1: Spatial Spillover Effects (Continued)

Notes: The origin state of regime switch ( $\mu_0 \leftarrow \mu_1$ ) is red-colored.