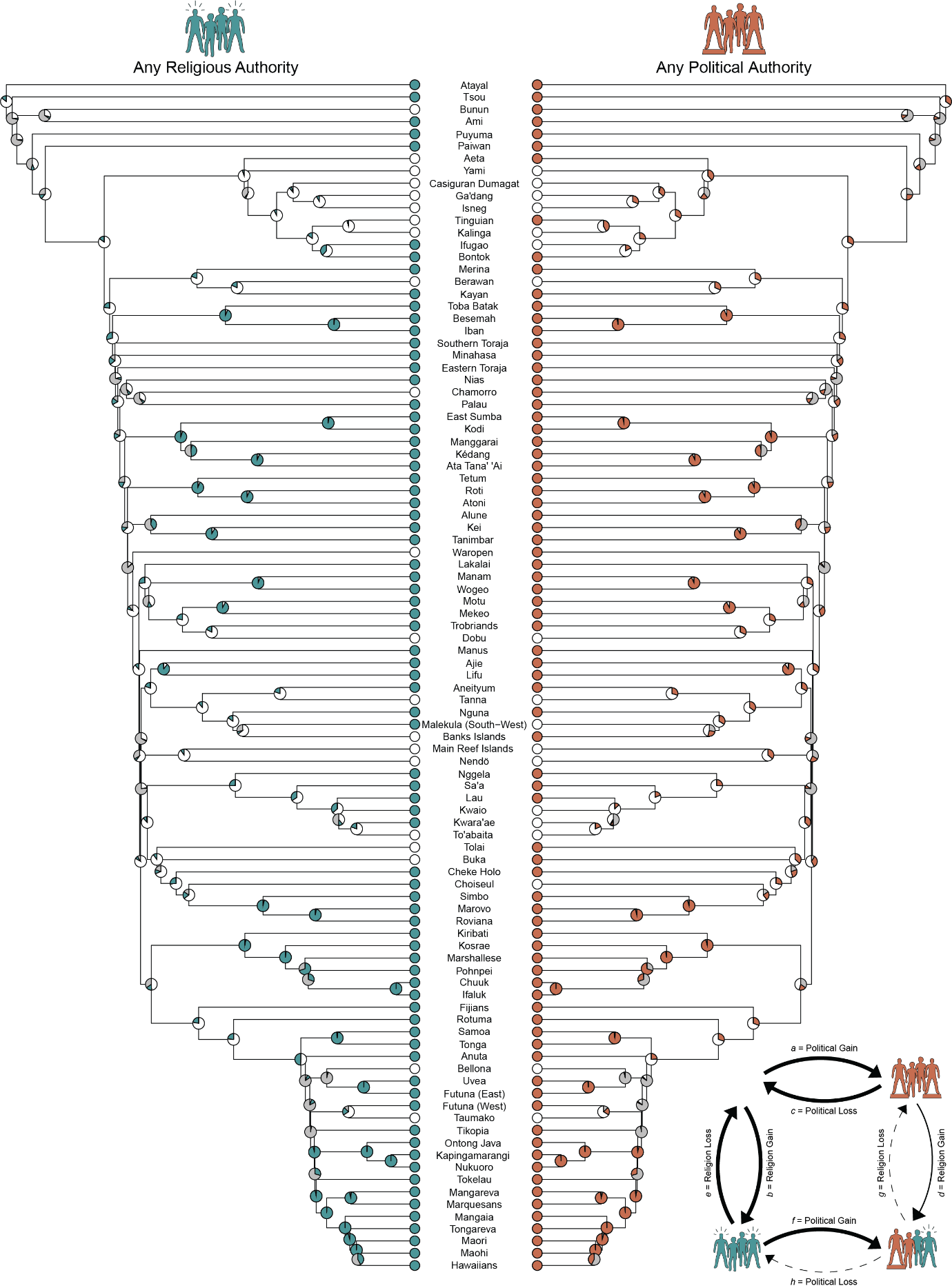
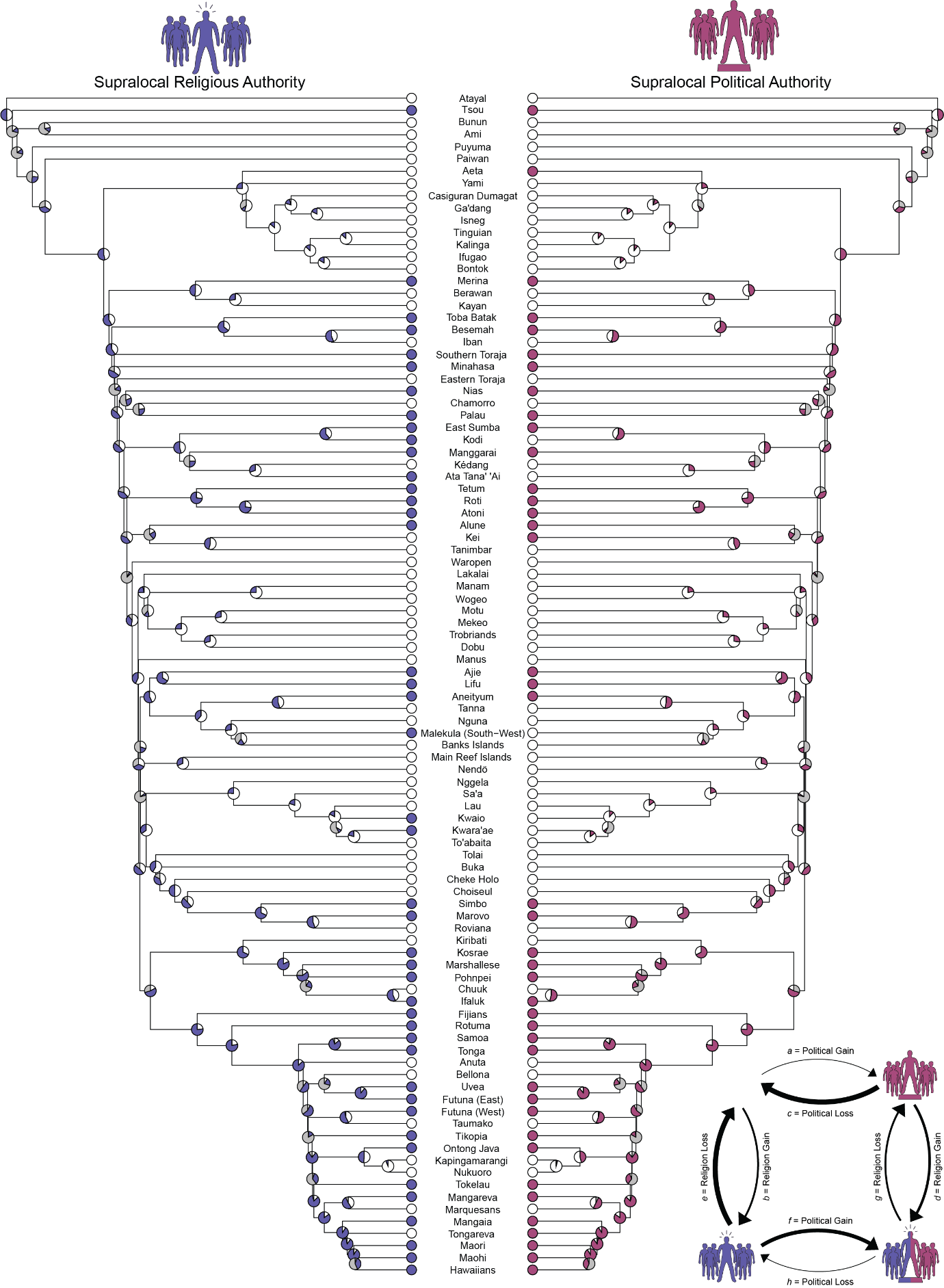
**Supplementary Figures**



*Supplementary Figure 1. Coevolution of religious and political authority at the sublocal level or higher.* Ancestral state reconstructions of religious and political authority at the sublocal level or higher are plotted on a maximum clade credibility tree. Pie charts at the internal nodes of the tree represent the proportion of models in which the trait was inferred to be present at that node, with grey representing the proportion of trees in the sample from which that particular node was absent. In the transition matrix at the bottom right, thickness of the arrows is proportional to rates of change from one state to another.



*Supplementary Figure 2. Coevolution of religious and political authority at the supralocal level or higher.* Ancestral state reconstructions of religious and political authority at the supralocal level or higher are plotted on a maximum clade credibility tree. Pie charts at the internal nodes of the tree represent the proportion of models in which the trait was inferred to be present at that node, with grey representing the proportion of trees in the sample from which that particular node was absent. In the transition matrix at the bottom right, thickness of the arrows is proportional to rates of change from one state to another.

**Supplementary Tables**

**Supplementary Table 1: Coding Decisions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Society** | **ABVD (Austronesian Basic Vocabulary Database) Code** | **Religious Authority** | **Political Authority** | **Structure of Religious and Political Authority** | **Source (s)** |
| Aeta | 444 | 0 | 3 | 0 | Brosius1; Lebar2; Reed3 |
| Ajie | 1188 | 3 | 3 | 1 | Clifford4; Leenhardt5 |
| Alune | 80 | 3 | 3 | 2 | Boulan-Smit6 |
| Ami | 350 | 2 | 2 | 2 | Lebar2; Mabuchi7 |
| Aneityum | 149 | 3 | 3 | 1 | Spriggs8 |
| Anuta | 253 | 2 | 2 | 1 | Feinberg9,10 |
| Ata Tana' 'Ai | 124 | 3 | 2 | 2 | Lewis11,12 |
| Atayal | 255 | 2 | 2 | 1 | Lebar2; Mabuchi7 |
| Atoni | 42 | 3 | 3 | 1 | Schulte Nordholt13 |
| Banks Islands | 376 | 0 | 2 | 0 | Codrington14,15 |
| Bellona | 206 | 0 | 0 | 0 | Monberg16 |
| Berawan | 45 | 0 | 0 | 0 | Huntington & Metcalf17 |
| Besemah | 107 | 3 | 3 | 1 | Collins18 |
| Bontok | 36 | 2 | 1 | 2 | Jenks19 |
| Buka | 187 | 0 | 2 | 0 | Blackwood20; Ogan21 |
| Bunun | 202 | 0 | 2 | 0 | Huang22 |
| Casiguran Dumagat | 417 | 0 | 0 | 0 | Headland23,24 |
| Chamorro | 18 | 0 | 2 | 0 | Cordy25; Thompson26 |
| Cheke Holo | 209 | 1 | 1 | 1 | White27 |
| Choiseul | 44 | 2 | 0 | 0 | Scheffler28 |
| Chuuk | 349 | 2 | 2 | 3 | Dobbin & Hezel29; Goodenough30 |
| Dobu | 218 | 0 | 0 | 0 | Fortune31 |
| East Sumba | 32 | 3 | 3 | 2 | Forth32 |
| Eastern Toraja | 208 | 2 | 2 | 1 | Adriani & Kruyt33; Downs34 |
| Fijians | 11 | 3 | 3 | 2 | Thomson35 |
| Florida | 102 | 2 | 2 | 1 | Codrington15 |
| Futuna (East) | 210 | 3 | 3 | 1 | Burrows36  Kirch37 |
| Futuna (West) | 156 | 3 | 3 | 3 | Capell38 |
| Hawaiians | 52 | 3 | 3 | 1 | Kirch39; Valeri40 |
| Iban | 28 | 2 | 2 | 3 | Freeman41; Jensen42; Pringle43 |
| Ifaluk | 347 | 3 | 3 | 3 | Burrows & Spiro44 |
| Ifugao | 419 | 2 | 0 | 0 | Barton45; Conklin46; Lebar2 |
| Isneg | 424 | 0 | 0 | 0 | Keesing47; Vanoverbergh48,49 |
| Kalinga | 429 | 0 | 0 | 0 | Barton50; Dozier51 |
| Kapingamarangi | 217 | 2 | 2 | 3 | Emory52 |
| Kayan | 237 | 2 | 2 | 1 | Rousseau53,54 |
| Kédang | 236 | 2 | 2 | 2 | Barnes55 |
| Kei | 59 | 2 | 3 | 2 | Hooe56 |
| Kiribati | 346 | 2 | 2 | 2 | Grimble & Maude57; Macdonald58 |
| Kodi | 318 | 3 | 2 | 2 | Hoskins59 |
| Kosrae | 65 | 3 | 3 | 1 | Athens60; Dobbin & Hezel29 |
| Kwaio | 66 | 3 | 0 | 0 | Keesing61,62 |
| Kwara'ae | 213 | 3 | 0 | 0 | Burt63 |
| Lakalai | 281 | 2 | 2 | 3 | Chowning64;  Chowning & Goodenough65 |
| Lau | 68 | 2 | 2 | 2 | Ivens66 |
| Lifu | 196 | 3 | 3 | 2 | Leenhardt5; Ray67 |
| Main Reef Islands | 501 | 0 | 0 | 0 | Davenport68 |
| Malekula (South-West) | 453 | 3 | 0 | 0 | Deacon & Wedgwood69 |
| Manam | 168 | 2 | 2 | 1 | Lutkehaus70,71 |
| Mangaia | 58 | 3 | 3 | 3 | Buck72 |
| Mangareva | 239 | 3 | 3 | 3 | Buck73 |
| Manggarai | 84 | 3 | 3 | 2 | Erb74 |
| Manus | 71 | 2 | 2 | 2 | Gustafsson75, Schwartz76 |
| Maohi | 173 | 3 | 3 | 3 | Oliver77 |
| Maori | 85 | 3 | 3 | 3 | Bowden78 |
| Marovo | 87 | 3 | 3 | 2 | Hviding79 |
| Marquesans | 38 | 2 | 2 | 3 | Thomas80,81 |
| Marshallese | 344 | 3 | 3 | 2 | Carucci82; Dobbin & Hezel29 |
| Mekeo | 89 | 1 | 1 | 2 | Hau’ofa83 |
| Merina | 92 | 3 | 3 | 1 | Campbell84; Larson85; Sibree86 |
| Minahasa | 137 | 3 | 3 | 3 | Schouten87 |
| Motu | 26 | 1 | 1 | 1 | Groves88,89 |
| Nendö | 502 | 0 | 0 | 0 | Davenport90 |
| Nguna | 103 | 2 | 2 | 2 | Facey91 |
| Nias (South) | 104 | 3 | 3 | 2 | Hummel & Telaumbanua92; Viaro & Ziegler93 |
| Nukuoro | 238 | 2 | 2 | 2 | Carroll94; Eilers95 |
| Ontong Java | 418 | 3 | 3 | 3 | Hogbin96 |
| Pagan Gaddang | 177 | 0 | 0 | 0 | Lebar2; Wallace97 |
| Paiwan | 109 | 2 | 2 | 1 | Matsuzawa98 |
| Palau | 179 | 3 | 3 | 3 | Dobbin & Hezel29; Parmentier99 |
| Pohnpei | 271 | 3 | 3 | 2 | Dobbin & Hezel29; Hanlon100 |
| Puyuma | 264 | 2 | 2 | 1 | Lebar2 |
| Roti | 116 | 3 | 3 | 3 | Fox101,102 |
| Rotuma | 117 | 3 | 3 | 2 | Howard103 |
| Roviana | 221 | 2 | 2 | 2 | Aswani104; Nagaoka105 |
| Sa'a | 118 | 2 | 2 | 2 | Ivens106 |
| Samoa | 473 | 3 | 3 | 1 | Meleisea107 |
| Simbo | 226 | 3 | 3 | 2 | Dureau108; Scheffler109 |
| Southern Toraja | 447 | 3 | 3 | 1 | Nooy-Palm110 |
| Tanimbar | 78 | 2 | 2 | 2 | Koentjaraningrat111 |
| Tanna | 162 | 0 | 0 | 0 | Lindstrom112,113 |
| Taumako | 375 | 0 | 0 | 0 | Davenport114 |
| Tetum | 134 | 3 | 3 | 2 | Hicks115 |
| Tikopia | 155 | 3 | 3 | 1 | Firth116 |
| Tinguian | 426 | 0 | 2 | 0 | Cole & Gale117 |
| To'abaita | 223 | 0 | 0 | 0 | Hogbin118 |
| Toba Batak | 188 | 3 | 3 | 2 | Sibeth119; Vergouwen120 |
| Tokelau | 245 | 3 | 3 | 1 | Huntsman & Hooper121; MacGregor122 |
| Tolai | 382 | 0 | 1 | 0 | Epstein123,124; Simet125 |
| Tonga | 136 | 3 | 3 | 2 | Cummins126 |
| Tongareva | 235 | 2 | 3 | 2 | Campbell127; Roscoe128 |
| Trobriands | 159 | 2 | 2 | 1 | Malinowski129,130; Powell131; Weiner132 |
| Tsou (Northern) | 138 | 3 | 3 | 1 | Lebar2 |
| Uvea | 258 | 3 | 3 | 2 | Burrows133 |
| Waropen | 142 | 0 | 1 | 0 | Held134 |
| Wogeo | 146 | 2 | 2 | 1 | Hogbin135,136 |
| Yami | 254 | 0 | 0 | 0 | Lebar2; Yu137 |

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**Supplementary Table 2: Summary of Discrete Analyses (Dependent Unconstrained)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Religious and Political Authority (Sublocal or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -85.67 | 1.34 | 1.32 | 1.35 | 0.30 | 1.34 | 1.26 | 0.003 | 0.002 |
| **2** | -85.61 | 1.32 | 1.30 | 1.32 | 0.31 | 1.32 | 1.25 | 0.004 | 0.002 |
| **3** | -85.58 | 1.32 | 1.31 | 1.33 | 0.30 | 1.32 | 1.24 | 0.003 | 0.002 |
| **Mean** | -85.62 | 1.32 | 1.31 | 1.33 | 0.30 | 1.33 | 1.25 | 0.003 | 0.002 |
| **Religious and Political Authority (Local or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -89.30 | 0.85 | 0.84 | 0.92 | 0.55 | 0.94 | 0.69 | 0.002 | 0.003 |
| **2** | -89.27 | 0.84 | 0.83 | 0.92 | 0.55 | 0.93 | 0.69 | 0.001 | 0.002 |
| **3** | -89.22 | 0.85 | 0.83 | 0.93 | 0.57 | 0.94 | 0.68 | 0.002 | 0.002 |
| **Mean** | -89.26 | 0.85 | 0.84 | 0.92 | 0.56 | 0.94 | 0.69 | 0.002 | 0.002 |
| **Religious and Political Authority (Supralocal)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -103.01 | 0.22 | 0.72 | 5.14 | 5.35 | 6.64 | 3.30 | 0.70 | 0.27 |
| **2** | -103.08 | 0.22 | 0.76 | 5.21 | 5.61 | 6.88 | 3.39 | 0.74 | 0.28 |
| **3** | -103.13 | 0.22 | 0.73 | 5.08 | 5.36 | 6.67 | 3.26 | 0.71 | 0.27 |
| **Mean** | -103.07 | 0.22 | 0.74 | 5.14 | 5.44 | 6.73 | 3.32 | 0.72 | 0.27 |

**Supplementary Table 3: Summary of Discrete Analyses (Independent)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Religious and Political Authority (Sublocal or Higher)** | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | |
| **α1** | **β1** | **α2** | **β2** |
| **1** | -96.30 | 0.09 | 0.09 | 0.09 | 0.09 |
| **2** | -96.33 | 0.09 | 0.09 | 0.010 | 0.09 |
| **3** | -96.38 | 0.09 | 0.09 | 0.10 | 0.09 |
| **Mean** | -96.34 | 0.09 | 0.09 | 0.10 | 0.09 |
| **Religious and Political Authority (Local or Higher)** | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | |
| **α1** | **β1** | **α2** | **β2** |
| **1** | -103.02 | 0.11 | 0.11 | 0.11 | 0.11 |
| **2** | -102.97 | 0.11 | 0.11 | 0.11 | 0.11 |
| **3** | -103.002 | 0.11 | 0.11 | 0.11 | 0.11 |
| **Mean** | -103.00 | 0.11 | 0.11 | 0.11 | 0.11 |
| **Religious and Political Authority (Supralocal)** | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | |
| **α1** | **β1** | **α2** | **β2** |
| **1** | -133.80 | 2.24 | 2.25 | 2.23 | 2.24 |
| **2** | -133.82 | 2.34 | 2.35 | 2.32 | 2.33 |
| **3** | -133.87 | 2.32 | 2.32 | 2.30 | 2.31 |
| **Mean** | -133.83 | 2.30 | 2.31 | 2.29 | 2.29 |

**Supplementary Table 4: Summary of Discrete Analyses (Dependent, Loss of Political Authority Constrained to be Equal With or Without Religious Authority)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Religious and Political Authority (Sublocal or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -89.98 | 0.73 | 0.34 | 0.53 | 0.74 | 1.06 | 4.59 | 0.03 | 0.53 |
| **2** | -90.34 | 0.75 | 0.33 | 0.53 | 0.73 | 1.07 | 4.67 | 0.03 | 0.53 |
| **3** | -89.92 | 0.75 | 0.35 | 0.53 | 0.77 | 1.06 | 4.67 | 0.03 | 0.53 |
| **Mean** | -90.08 | 0.74 | 0.34 | 0.53 | 0.75 | 1.06 | 4.64 | 0.03 | 0.53 |
| **Religious and Political Authority (Local or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -92.94 | 0.24 | 0.30 | 0.17 | 0.46 | 1.51 | 0.99 | 0.01 | 0.17 |
| **2** | -92.92 | 0.25 | 0.29 | 0.17 | 0.48 | 1.51 | 0.95 | 0.01 | 0.17 |
| **3** | -92.95 | 0.24 | 0.29 | 0.17 | 0.46 | 1.52 | 0.95 | 0.01 | 0.17 |
| **Mean** | -92.93 | 0.24 | 0.29 | 0.17 | 0.47 | 1.51 | 0.97 | 0.01 | 0.17 |
| **Religious and Political Authority (Supralocal)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -104.30 | 0.47 | 0.52 | 0.82 | 9.76 | 9.36 | 2.92 | 0.53 | 0.82 |
| **2** | -104.23 | 0.46 | 0.57 | 0.81 | 9.58 | 9.49 | 2.99 | 0.53 | 0.81 |
| **3** | -104.64 | 0.46 | 0.55 | 0.79 | 9.59 | 9.54 | 2.87 | 0.51 | 0.79 |
| **Mean** | -104.39 | 0.46 | 0.55 | 0.81 | 9.64 | 9.46 | 2.93 | 0.52 | 0.81 |

**Supplementary Table 5: Summary of Discrete Analyses (Dependent, Loss of Religious Authority Constrained to be Equal With or Without Political Authority)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Religious and Political Authority (Sublocal or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -89.89 | 0.89 | 0.78 | 1.29 | 3.05 | 0.43 | 1.31 | 0.43 | 0.04 |
| **2** | -89.71 | 0.88 | 0.80 | 1.29 | 2.99 | 0.43 | 1.35 | 0.43 | 0.04 |
| **3** | -90.01 | 0.93 | 0.80 | 1.35 | 2.95 | 0.43 | 1.32 | 0.43 | 0.04 |
| **Mean** | -89.87 | 0.90 | 0.80 | 1.31 | 3.00 | 0.43 | 1.33 | 0.43 | 0.04 |
| **Religious and Political Authority (Local or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -94.08 | 0.32 | 0.49 | 1.29 | 3.72 | 0.44 | 0.89 | 0.44 | 0.01 |
| **2** | -94.17 | 0.34 | 0.49 | 1.31 | 3.70 | 0.43 | 0.92 | 0.43 | 0.01 |
| **3** | -94.06 | 0.35 | 0.50 | 1.32 | 3.79 | 0.44 | 0.90 | 0.44 | 0.01 |
| **Mean** | -94.11 | 0.34 | 0.49 | 1.31 | 3.74 | 0.44 | 0.90 | 0.44 | 0.01 |
| **Religious and Political Authority (Supralocal)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -104.15 | 0.22 | 0.54 | 8.59 | 1.90 | 0.72 | 8.22 | 0.72 | 0.41 |
| **2** | -104.15 | 0.22 | 0.54 | 8.60 | 1.43 | 0.68 | 7.87 | 0.68 | 0.37 |
| **3** | -104.05 | 0.23 | 0.53 | 8.66 | 1.88 | 0.72 | 8.13 | 0.72 | 0.40 |
| **Mean** | -104.12 | 0.23 | 0.54 | 8.61 | 1.74 | 0.71 | 8.07 | 0.71 | 0.39 |

**Supplementary Table 6: Summary of Discrete Analyses (Dependent, Gain of Political Authority Constrained to be Equal With or Without Religious Authority)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Religious and Political Authority (Any Level)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -84.82 | 1.30 | 1.28 | 1.30 | 0.24 | 1.29 | 1.30 | 0.002 | 0.003 |
| **2** | -84.93 | 1.31 | 1.29 | 1.32 | 0.23 | 1.31 | 1.31 | 0.001 | 0.003 |
| **3** | -84.74 | 1.29 | 1.28 | 1.30 | 0.24 | 1.29 | 1.29 | 0.001 | 0.002 |
| **Mean** | -84.83 | 1.30 | 1.28 | 1.31 | 0.24 | 1.30 | 1.30 | 0.001 | 0.003 |
| **Religious and Political Authority (Local or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -88.52 | 0.76 | 0.76 | 0.86 | 0.42 | 0.87 | 0.76 | 0.001 | 0.002 |
| **2** | -88.62 | 0.77 | 0.77 | 0.87 | 0.41 | 0.88 | 0.77 | 0.001 | 0.001 |
| **3** | -88.57 | 0.77 | 0.77 | 0.85 | 0.41 | 0.86 | 0.77 | 0.001 | 0.001 |
| **Mean** | -88.57 | 0.77 | 0.77 | 0.86 | 0.41 | 0.87 | 0.77 | 0.001 | 0.001 |
| **Religious and Political Authority (Supralocal)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -103.88 | 0.50 | 0.31 | 6.37 | 4.26 | 6.10 | 0.50 | 0.25 | 0.35 |
| **2** | -103.66 | 0.50 | 0.31 | 6.50 | 4.14 | 5.94 | 0.50 | 0.25 | 0.35 |
| **3** | -103.66 | 0.49 | 0.32 | 6.43 | 4.11 | 5.83 | 0.49 | 0.25 | 0.34 |
| **Mean** | -103.74 | 0.50 | 0.31 | 6.43 | 4.17 | 5.96 | 0.50 | 0.25 | 0.35 |

**Supplementary Table 7: Summary of Discrete Analyses (Dependent, Gain of Religious Authority Constrained to be Equal With or Without Political Authority)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Religious and Political Authority (Sublocal or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -85.77 | 0.75 | 0.73 | 0.76 | 0.73 | 0.77 | 0.59 | 0.01 | 0.002 |
| **2** | -85.76 | 0.75 | 0.72 | 0.75 | 0.72 | 0.76 | 0.58 | 0.004 | 0.002 |
| **3** | -85.63 | 0.74 | 0.72 | 0.75 | 0.72 | 0.76 | 0.59 | 0.01 | 0.002 |
| **Mean** | -85.72 | 0.75 | 0.72 | 0.75 | 0.72 | 0.76 | 0.59 | 0.01 | 0.002 |
| **Religious and Political Authority (Local or Higher)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -88.72 | 0.74 | 0.73 | 0.83 | 0.73 | 0.84 | 0.49 | 0.001 | 0.001 |
| **2** | -88.65 | 0.74 | 0.73 | 0.84 | 0.73 | 0.85 | 0.49 | 0.001 | 0.002 |
| **3** | -88.78 | 0.75 | 0.74 | 0.85 | 0.74 | 0.86 | 0.48 | 0.001 | 0.002 |
| **Mean** | -88.72 | 0.74 | 0.74 | 0.84 | 0.74 | 0.85 | 0.49 | 0.001 | 0.002 |
| **Religious and Political Authority (Supralocal)** | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | |
| **q12** | **q13** | **q21** | **q24** | **q31** | **q34** | **q42** | **q43** |
| **1** | -103.04 | 0.15 | 0.52 | 6.33 | 0.52 | 4.24 | 4.15 | 0.48 | 0.15 |
| **2** | -103.01 | 0.16 | 0.53 | 6.39 | 0.53 | 4.23 | 4.18 | 0.49 | 0.15 |
| **3** | -103.13 | 0.15 | 0.53 | 6.36 | 0.53 | 4.15 | 4.21 | 0.49 | 0.15 |
| **Mean** | -103.06 | 0.15 | 0.53 | 6.36 | 0.53 | 4.21 | 4.18 | 0.49 | 0.15 |

**Supplementary Table S8: Summary of Multistate Analyses**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Full Model** | | | | | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | | | | | |
| **q01** | **q02** | **q03** | **q10** | **q12** | **q13** | **q20** | **q21** | **q23** | **q30** | **q31** | **q32** |
| **1** | -129.86 | 0.51 | 1.05 | 0.30 | 0.57 | 1.21 | 0.89 | 0.83 | 1.28 | 0.93 | 0.56 | 1.26 | 1.23 |
| **2** | -129.86 | 0.51 | 1.04 | 0.30 | 0.56 | 1.18 | 0.87 | 0.81 | 1.25 | 0.92 | 0.55 | 1.25 | 1.23 |
| **3** | -129.82 | 0.51 | 1.05 | 0.30 | 0.56 | 1.17 | 0.86 | 0.81 | 1.24 | 0.93 | 0.57 | 1.25 | 1.24 |
| **Mean** | -129.85 | 0.51 | 1.04 | 0.30 | 0.57 | 1.19 | 0.87 | 0.82 | 1.26 | 0.92 | 0.56 | 1.25 | 1.23 |
| **Differentiation Model (Strong Version) (q02 q03 q13=0)** | | | | | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | | | | | |
| **q01** | **q02** | **q03** | **q10** | **q12** | **q13** | **q20** | **q21** | **q23** | **q30** | **q31** | **q32** |
| **1** | -129.95 | 1.87 | 0 | 0 | 1.82 | 1.93 | 0 | 0.06 | 1.79 | 1.89 | 0.32 | 1.42 | 1.69 |
| **2** | -129.99 | 1.87 | 0 | 0 | 1.82 | 1.93 | 0 | 0.06 | 1.80 | 1.90 | 0.32 | 1.42 | 1.71 |
| **3** | -129.97 | 1.86 | 0 | 0 | 1.82 | 1.95 | 0 | 0.06 | 1.82 | 1.91 | 0.31 | 1.42 | 1.70 |
| **Mean** | -129.97 | 1.87 | 0 | 0 | 1.82 | 1.93 | 0 | 0.06 | 1.80 | 1.90 | 0.32 | 1.42 | 1.70 |
| **Differentiation Model (Weak Version)** **(q02 q03=0)** | | | | | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | | | | | |
| **q01** | **q02** | **q03** | **q10** | **q12** | **q13** | **q20** | **q21** | **q23** | **q30** | **q31** | **q32** |
| **1** | -130.13 | 1.72 | 0 | 0 | 1.35 | 1.76 | 1.08 | 0.20 | 1.61 | 1.17 | 0.45 | 1.43 | 1.53 |
| **2** | -130.08 | 1.72 | 0 | 0 | 1.33 | 1.73 | 1.11 | 0.22 | 1.58 | 1.16 | 0.47 | 1.44 | 1.52 |
| **3** | -130.12 | 1.72 | 0 | 0 | 1.34 | 1.76 | 1.10 | 0.21 | 1.62 | 1.17 | 0.47 | 1.44 | 1.52 |
| **Mean** | -130.11 | 1.72 | 0 | 0 | 1.34 | 1.75 | 1.09 | 0.21 | 1.61 | 1.17 | 0.46 | 1.44 | 1.53 |
| **Unification Model (Strong Version)** **(q01 q02 q31=0)** | | | | | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | | | | | |
| **q01** | **q02** | **q03** | **q10** | **q12** | **q13** | **q20** | **q21** | **q23** | **q30** | **q31** | **q32** |
| **1** | -133.06 | 0 | 0 | 3.96 | 0.05 | 4.52 | 0.48 | 0.03 | 4.62 | 4.44 | 3.98 | 0 | 4.66 |
| **2** | -133.06 | 0 | 0 | 3.97 | 0.05 | 4.57 | 0.49 | 0.04 | 4.67 | 4.48 | 3.98 | 0 | 4.72 |
| **3** | -133.08 | 0 | 0 | 3.99 | 0.04 | 4.55 | 0.50 | 0.04 | 4.66 | 4.47 | 4.00 | 0 | 4.70 |
| **Mean** | -133.07 | 0 | 0 | 3.97 | 0.05 | 4.55 | 0.49 | 0.04 | 4.65 | 4.46 | 3.99 | 0 | 4.70 |
| **Unification Model (Weak Version)** **(q01 q02=0)** | | | | | | | | | | | | | |
| **Run** | **Log Marginal Likelihood** | **Transition Rates** | | | | | | | | | | | |
| **q01** | **q02** | **q03** | **q10** | **q12** | **q13** | **q20** | **q21** | **q23** | **q30** | **q31** | **q32** |
| **1** | -131.42 | 0 | 0 | 1.98 | 0.65 | 1.84 | 1.25 | 0.32 | 1.89 | 1.44 | 1.05 | 1.83 | 2.00 |
| **2** | -131.39 | 0 | 0 | 1.97 | 0.64 | 1.85 | 1.26 | 0.33 | 1.89 | 1.43 | 1.04 | 1.83 | 2.00 |
| **3** | -131.45 | 0 | 0 | 1.94 | 0.63 | 1.83 | 1.25 | 0.34 | 1.89 | 1.40 | 1.01 | 1.80 | 1.97 |
| **Mean** | -131.42 | 0 | 0 | 1.96 | 0.64 | 1.84 | 1.25 | 0.33 | 1.89 | 1.42 | 1.04 | 1.82 | 1.99 |