

**Table S9. Empirical false positive rate. Population sub-structure** with two sub-populations, split time  $t = 1$  in the past and sampling scheme  $n_1 = 195$ ,  $n_2 = 5$ . Varying migration rate  $m$  per generation per  $4N$  individuals. Significance levels  $\alpha$  are based on theoretical formulae according to eqs (7) and (8).

| $m$    | $\alpha = 0.01$      |                          |                       | $\alpha = 0.05$      |                          |                       | SKD*   |
|--------|----------------------|--------------------------|-----------------------|----------------------|--------------------------|-----------------------|--------|
|        | $T_2^{(\text{sum})}$ | $T_2^{(\text{product})}$ | $T_0^{(\text{dist})}$ | $T_2^{(\text{sum})}$ | $T_2^{(\text{product})}$ | $T_0^{(\text{dist})}$ |        |
| 0.0010 | 0.0031               | 0.00617                  | 0.04194               | 0.03147              | 0.04385                  | 0.17031               | 0.1179 |
| 0.0020 | 0.00306              | 0.00586                  | 0.04218               | 0.03196              | 0.04541                  | 0.16944               | 0.1198 |
| 0.0030 | 0.00299              | 0.00629                  | 0.0425                | 0.03131              | 0.04457                  | 0.17031               | 0.1208 |
| 0.0040 | 0.00302              | 0.00597                  | 0.04173               | 0.03146              | 0.04311                  | 0.16847               | 0.1225 |
| 0.0050 | 0.00306              | 0.00647                  | 0.04189               | 0.03091              | 0.04394                  | 0.16893               | 0.1141 |
| 0.0060 | 0.00319              | 0.00614                  | 0.04162               | 0.03129              | 0.04364                  | 0.169                 | 0.1141 |
| 0.0070 | 0.00299              | 0.00628                  | 0.04211               | 0.03094              | 0.04421                  | 0.16913               | 0.1182 |
| 0.0080 | 0.00319              | 0.0063                   | 0.0412                | 0.03142              | 0.04373                  | 0.16776               | 0.1177 |
| 0.0090 | 0.00299              | 0.00626                  | 0.04262               | 0.03156              | 0.04414                  | 0.16934               | 0.1207 |
| 0.01   | 0.00294              | 0.00584                  | 0.04159               | 0.03034              | 0.04333                  | 0.16658               | 0.1233 |
| 0.02   | 0.00317              | 0.00616                  | 0.04168               | 0.03163              | 0.04496                  | 0.16444               | 0.1198 |
| 0.03   | 0.00304              | 0.00612                  | 0.04043               | 0.03137              | 0.04376                  | 0.16339               | 0.1178 |
| 0.04   | 0.0032               | 0.00589                  | 0.04024               | 0.02959              | 0.04196                  | 0.15742               | 0.1203 |
| 0.05   | 0.00274              | 0.00561                  | 0.03999               | 0.02932              | 0.04172                  | 0.15625               | 0.1220 |
| 0.06   | 0.00307              | 0.00594                  | 0.03962               | 0.03016              | 0.04148                  | 0.1545                | 0.1285 |
| 0.07   | 0.00283              | 0.00544                  | 0.0401                | 0.02936              | 0.04185                  | 0.15187               | 0.1170 |
| 0.08   | 0.00255              | 0.00558                  | 0.04048               | 0.02945              | 0.04088                  | 0.15117               | 0.1173 |
| 0.09   | 0.00301              | 0.00581                  | 0.03927               | 0.02923              | 0.0407                   | 0.14874               | 0.1154 |
| 0.1    | 0.0028               | 0.00528                  | 0.03933               | 0.0288               | 0.04003                  | 0.14669               | 0.1156 |
| 0.2    | 0.00263              | 0.00448                  | 0.03511               | 0.02743              | 0.03698                  | 0.12708               | 0.1136 |
| 0.3    | 0.00261              | 0.00432                  | 0.03316               | 0.0263               | 0.03424                  | 0.11508               | 0.1151 |
| 0.4    | 0.00199              | 0.0036                   | 0.03194               | 0.02414              | 0.03146                  | 0.10427               | 0.1136 |
| 0.5    | 0.00212              | 0.00349                  | 0.02911               | 0.02351              | 0.02996                  | 0.09471               | 0.1176 |
| 0.6    | 0.00179              | 0.00306                  | 0.02742               | 0.02172              | 0.02754                  | 0.08744               | 0.1081 |
| 0.7    | 0.00159              | 0.00284                  | 0.02632               | 0.02098              | 0.02593                  | 0.08314               | 0.1122 |
| 0.8    | 0.00156              | 0.00247                  | 0.0251                | 0.01986              | 0.02389                  | 0.07718               | 0.1137 |
| 0.9    | 0.00158              | 0.00258                  | 0.02353               | 0.01851              | 0.02255                  | 0.07281               | 0.1114 |
| 1.0    | 0.00137              | 0.00209                  | 0.02256               | 0.01909              | 0.02202                  | 0.06977               | 0.1081 |
| 1.5    | 0.00121              | 0.00157                  | 0.01856               | 0.0163               | 0.01831                  | 0.05694               | 0.1046 |
| 2.0    | 0.00096              | 0.00136                  | 0.01593               | 0.01453              | 0.01574                  | 0.05157               | 0.0990 |
| 4.0    | 0.00046              | 0.00056                  | 0.01138               | 0.01132              | 0.01046                  | 0.03969               | 0.0829 |
| 6.0    | 0.00043              | 0.00066                  | 0.01013               | 0.00955              | 0.0094                   | 0.03555               | 0.0773 |
| 8.0    | 0.00035              | 0.00046                  | 0.00897               | 0.00901              | 0.00856                  | 0.03442               | 0.0725 |
| 10.0   | 0.00031              | 0.00042                  | 0.00852               | 0.00833              | 0.00746                  | 0.03234               | 0.0694 |

\* SKD-test from [37]