S3 File. Diversity differences by democracy.

Legend:

Yellow: reported values

Green: main effects and interactions that corroborate reported results

Blue: means and standard deviations that drive the significant differences

Purple: alternate possible result that could have been reported

Noise = level of mutation (ranges from 0.000001 to 0.1)

Size = population sizes (10x10, 32x32, 100x100)

Alpha = level of institutional influence (usually between 0.5 and 0.95)

Alpha_prime = level of agent loyalty (values of 0.05, 0.5 or 0.95)

Diversity differences by democracy

For democracy = 1/10 vs 1/100 vs 1/1000, population 10x10

For a population size of 10x10, we observe a monotonous result for democracy when noise <=0.01 in Fig 6. (main paper), i.e. the higher the democracy, the lower the diversity.

1. The ANOVA 1 in Table 1 shows a significant effect for democracy, although observing the Fig 6. it is clear that the noise = 0.1 is driving a big portion of the effect,

2. For noise < 0.1, ANOVA 2 in Table 1, democracy still shows a significant difference, and there is a significant effect for the interaction.

Table 1 – Two-way ANOVA comparing main effect of democracy on cultural diversity. First reported ANOVA displays results for population 10x10 only. ANOVA 2 displays subset results for noise <= 0.01.

Anova Tables (Type I tests)
Response variable: Cultural Diversity

ANOVA 1
Factors: Noise*Democracy for population size of 10x10:

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Noise	5	18.547	3.709	1189.5	<0.0000000000000002	***
Democracy	2	2.662	1.331	426.8	<0.0000000000000002	***
Noise:Democracy	10	20.685	2.069	663.3	<0.0000000000000002	***
Residuals	882	2.751	0.003			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

ANOVA 2
Factors: Noise(<=0.01)*Democracy for population size of 10x10:

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Noise	4	1.7095	0.4274	122.464	< 0.0000000000000002	***
Democracy	2	0.3406	0.1703	48.806	< 0.0000000000000002	***
Noise:Democracy	8	0.1209	0.0151	4.331	0.0000407	***
Residuals	735	2.5649	0.0035			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Averages of the compared groups

	0.000001	0.00001	0.0001	0.001	0.01	0.1
1/10	0.1094	0.1148	0.0302	0.0140	0.0306	1.0000
1/100	0.1318	0.1142	0.0664	0.0246	0.0234	0.1716
1/1000	0.1772	0.1650	0.1252	0.0426	0.0394	0.1712

Standard deviations of the compared groups

	0.000001	0.00001	0.0001	0.001	0.01	0.1
1/10	0.05950167	0.05406874	0.03100296	0.01511858	0.01391079	0.00000000
1/100	0.07678993	0.08119239	0.06598577	0.03796938	0.01334166	0.04210579
1/1000	0.08845707	0.07568059	0.08813811	0.05041906	0.04661654	0.04488716

For democracy = 1/10 vs 1/100 vs 1/1000, populations 32x32 and 100x100

For bigger populations sizes (or smaller alphas), the effect of democracy is non-monotonous. We observe the lowest values of diversity with moderate democracy (1/100). To corroborate this observation we decided to test the two contrast, Low (1/1000) vs Moderate (1/100) and Moderate (1/100) vs High (1/10):

1. For noises <= 0.01, the contrast 1/1000 vs 1/100 (ANOVA 3 in Table 1) shows a significant difference for democracy with a strong effect. The ANOVA 2 in Table 1 removes the control for noise which in the Fig 6. (main paper) is evident that is driving a strong effect; the significance persist, but as expected the effect is moved to the interactions.

2. For noises <= 0.01, the contrast 1/100 vs 1/10 (ANOVA 5 in Table 1) also shows a significant difference with a strong effect. The ANOVA 4 in Table 1 removes the control for noise which in the Fig 6. (main paper) is evident that is driving a strong effect; the significance persist, but as expected the effect is moved to the interactions.

A complete ANOVA removing the controls for noise and democracy is also shown for reference (ANOVA 1 in Table 1)

Table 2 – Three-way ANOVA comparing main effect of democracy on cultural diversity. ANOVA 1 displays results for population 32x32 and 100x100. ANOVAs 2 and 3 display subset results for democracy at 1/1000 and 1/100, and ANOVA 3 displays results for noise <= 0.01. ANOVAs 4 and 5 dusplay subset results for democracy at 1/10 and 1/100 and ANOVA 5 displays results for noise <= 0.01.

Anova Tables (Type I tests)
Response variable: Cultural Diversity

ANOVA 1
Factors: Noise*Size(>=32x32)*Democracy (1/1000,1/100, 1/10):

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Noise	5	189.53	37.91	8675.34	< 0.0000000000000002	***
Size	1	0.17	0.17	38.17	0.000000000804	***
Democracy	2	0.56	0.28	64.11	< 0.0000000000000002	***
Noise:Size	5	2.32	0.46	106.01	< 0.0000000000000002	***
Noise:Democracy	10	4.33	0.43	99.00	< 0.0000000000000002	***
Size:Democracy	2	0.66	0.33	75.92	< 0.0000000000000002	***
Noise:Size:Democracy	10	4.14	0.41	94.75	< 0.0000000000000002	***
Residuals	1764	7.71	0.00			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

ANOVA 2
Factors: Noise*Size(>=32x32)*Democracy(1/1000,1/100):

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Noise	5	113.98	22.797	3513.33	< 0.0000000000000002	***
Size	1	0.30	0.304	46.84	0.00000000000123	***
Democracy	1	0.31	0.305	47.01	0.0000000000114	***
Noise:Size	5	3.38	0.676	104.11	< 0.0000000000000002	***
Noise:Democracy	5	3.36	0.673	103.69	< 0.0000000000000002	***
Size:Democracy	1	0.52	0.521	80.31	< 0.0000000000000002	***
Noise:Size:Democracy	5	3.08	0.615	94.79	< 0.0000000000000002	***
Residuals	1176	7.63	0.006			

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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
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ANOVA 3
Factors: Noise(<=0.01)*Size(>=32x32)*Democracy(1/1000,1/100):

```
                  Df Sum Sq Mean Sq F value               Pr(>F)
Noise              4 0.3808 0.09521 420.305 < 0.0000000000000002 ***
Size               1 0.0594 0.05941 262.274 < 0.0000000000000002 ***
Democracy          1 0.0588 0.05880 259.595 < 0.0000000000000002 ***
Noise:Size         4 0.0292 0.00731  32.271 < 0.0000000000000002 ***
Noise:Democracy    4 0.0188 0.00470  20.750 < 0.0000000000000002 ***
Size:Democracy     1 0.0032 0.00321  14.187             0.000175 ***
Noise:Size:Democracy  4 0.0022 0.00056   2.452             0.044485 *
Residuals        980 0.2220 0.00023
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

ANOVA 4
Factors: Noise*Size(>=32x32)*Democracy(1/100,1/10):

```
                    Df Sum Sq Mean Sq    F value               Pr(>F)
Noise                5 154.57  30.915 215284.136 < 0.0000000000000002 ***
Size                 1   0.02   0.019    129.615 < 0.0000000000000002 ***
Democracy            1   0.03   0.026    181.358 < 0.0000000000000002 ***
Noise:Size           5   0.01   0.003     18.730 < 0.0000000000000002 ***
Noise:Democracy      5   0.03   0.007     46.648 < 0.0000000000000002 ***
Size:Democracy       1   0.00   0.001      8.109              0.00448 **
Noise:Size:Democracy  5   0.00   0.000      2.684              0.02024 *
Residuals         1176   0.17   0.000
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

ANOVA 5
Factors: Noise(<=0.01)*Size(>=32x32)*Democracy(1/100,1/10):

```
                    Df Sum Sq Mean Sq F value               Pr(>F)
Noise                4 0.4327 0.10816 627.728 < 0.0000000000000002 ***
Size                 1 0.0224 0.02237 129.824 < 0.0000000000000002 ***
Democracy            1 0.0312 0.03124 181.324 < 0.0000000000000002 ***
Noise:Size           4 0.0097 0.00242  14.059       0.0000000000369 ***
Noise:Democracy      4 0.0283 0.00707  41.047 < 0.0000000000000002 ***
Size:Democracy       1 0.0014 0.00141   8.154              0.00439 **
Noise:Size:Democracy  4 0.0017 0.00042   2.446              0.04491 *
Residuals          980 0.1689 0.00017
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Averages of the compared groups
32x32:

```
         0.000001    0.00001     0.0001      0.001       0.01       0.1
1/10   0.08638672 0.07287109 0.03712891 0.01599609 0.02455078 0.9999414
1/100  0.06660156 0.05585938 0.03074219 0.01355469 0.02613281 0.9999023
1/1000 0.09386719 0.08761719 0.05460937 0.02238281 0.02902344 0.4639063
```

100x100:

```
        0.000001  0.00001   0.0001    0.001     0.01      0.1
1/10   0.074994 0.063752 0.025664 0.013628 0.023452 0.999946
1/100  0.046554 0.033660 0.018570 0.010562 0.024394 0.999972
1/1000 0.062926 0.055344 0.029582 0.013508 0.031136 0.999958
```

Standard deviations of the compared groups
32x32:

```
         0.000001    0.00001     0.0001       0.001        0.01          0.1
1/10   0.02478725 0.01947626 0.01302671 0.007270249 0.008854169 0.0002342747
1/100  0.01947936 0.02021195 0.01485654 0.012223785 0.017675908 0.0002959424
```

1/1000	0.02968469	0.02265209	0.02050149	0.011604996	0.017506053	0.3888418404

100x100:

	0.000001	0.00001	0.0001	0.001	0.01	0.1
1/10	0.00998407	0.010479294	0.005551163	0.004795620	0.003979039	0.00008621284
1/100	0.01294161	0.007113769	0.006142500	0.008590286	0.008499806	0.00005360475
1/1000	0.01259677	0.008950776	0.006065953	0.004614522	0.010260062	0.00006417451

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