Supporting Information: Interplay between Energy and Entropy Mediates Ambimodal Selectivity of Cycloadditions

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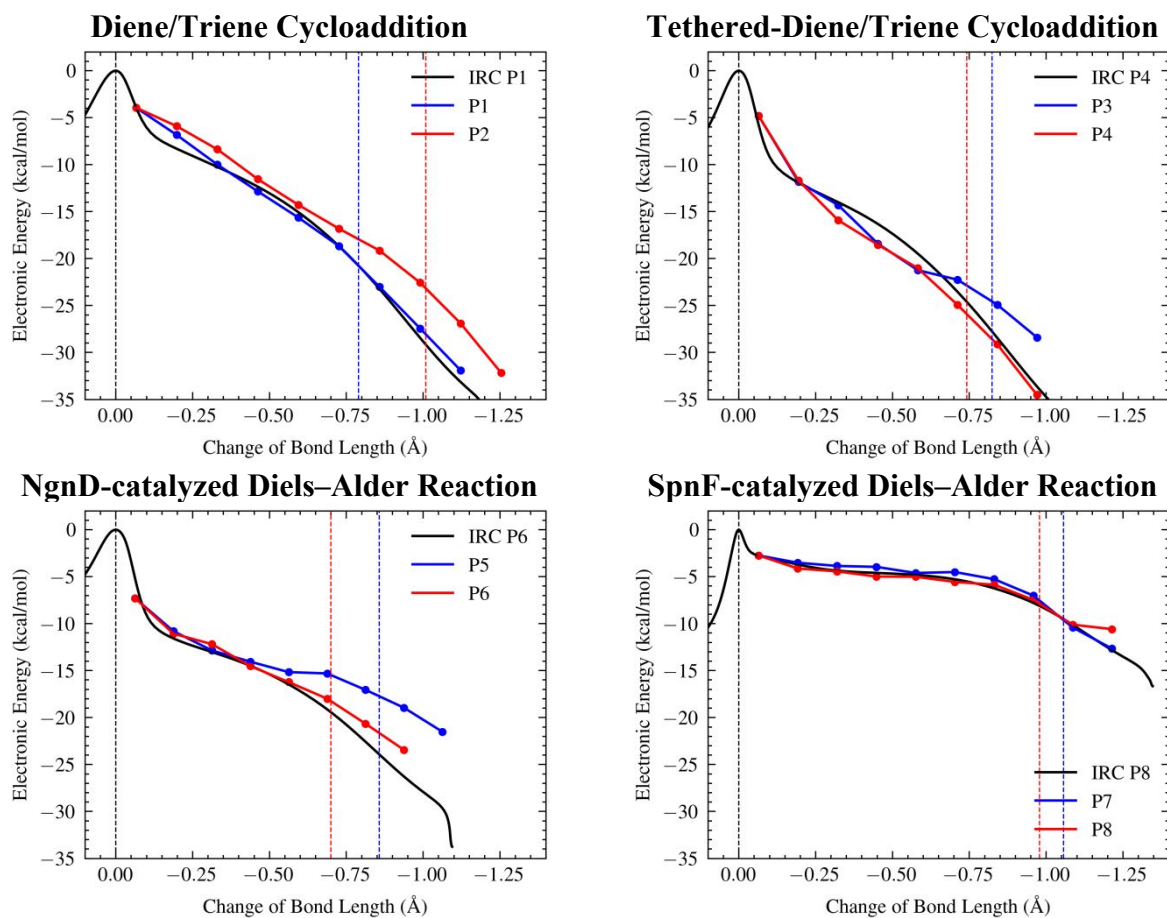
Figure S2. Comparison between the intrinsic reaction coordinate and the energy profiles derived from averaging the trajectories.
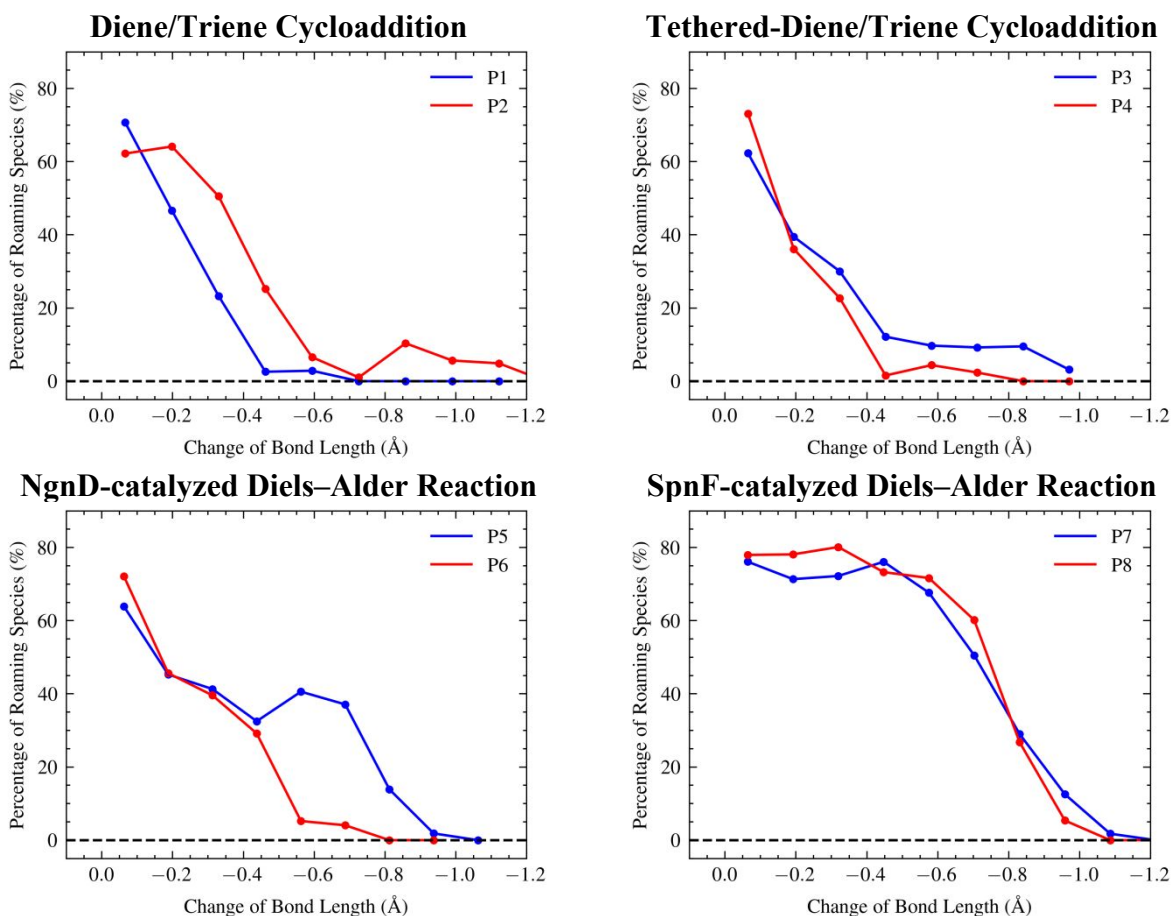
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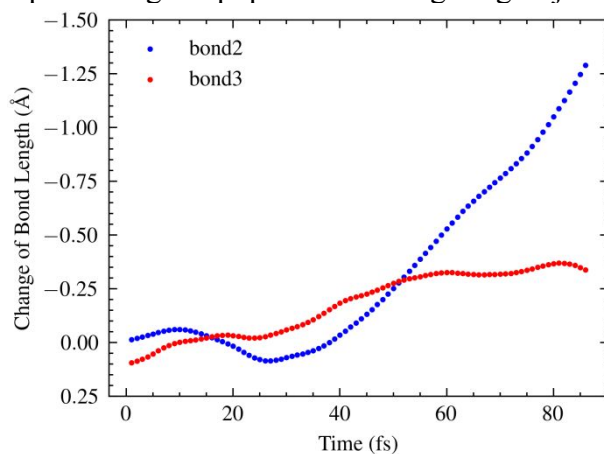
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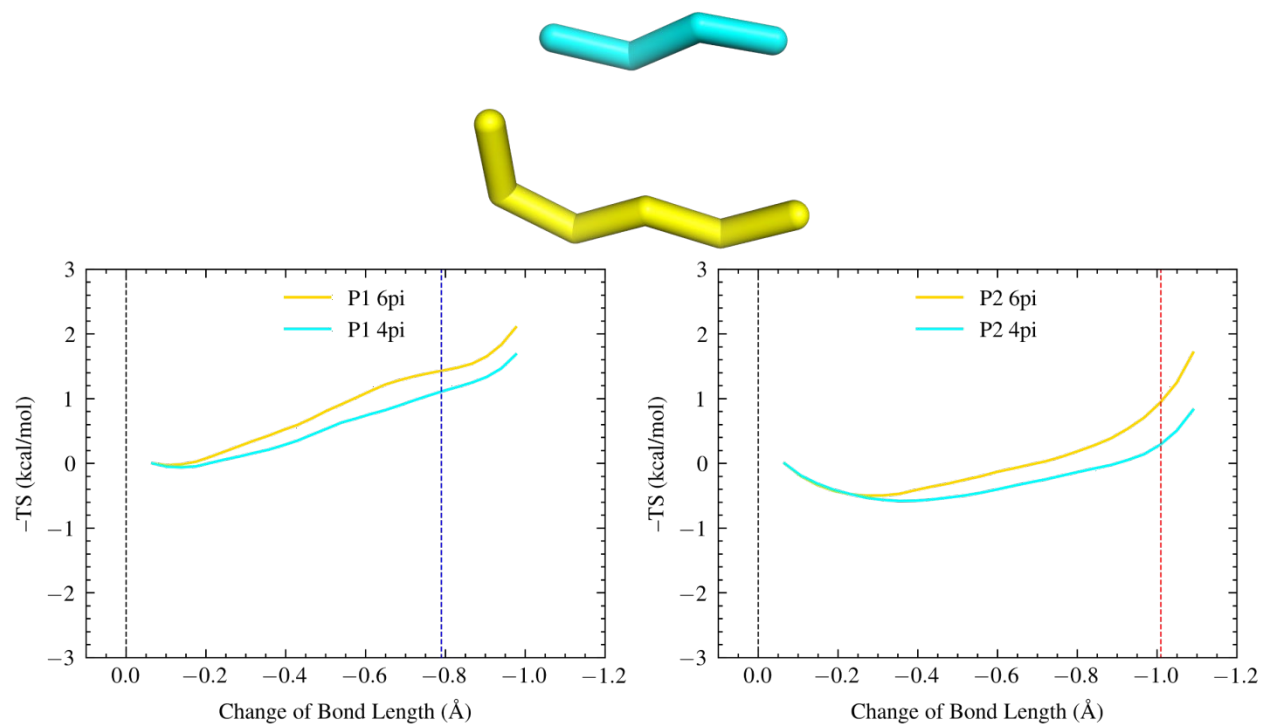
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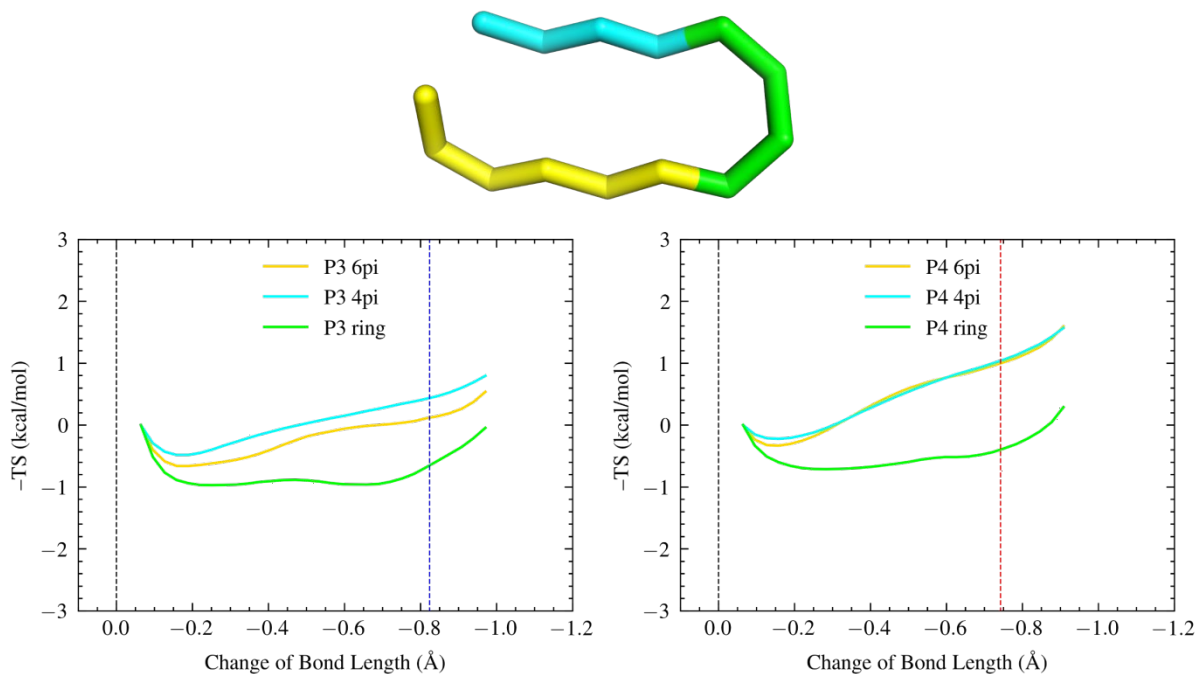
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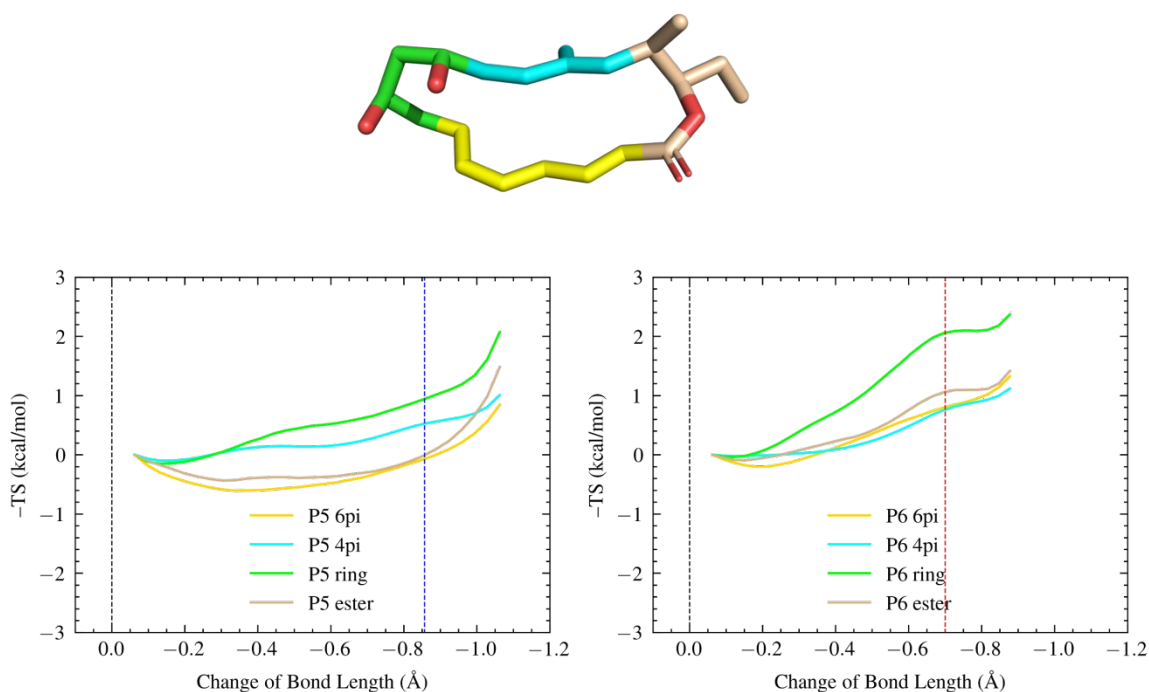
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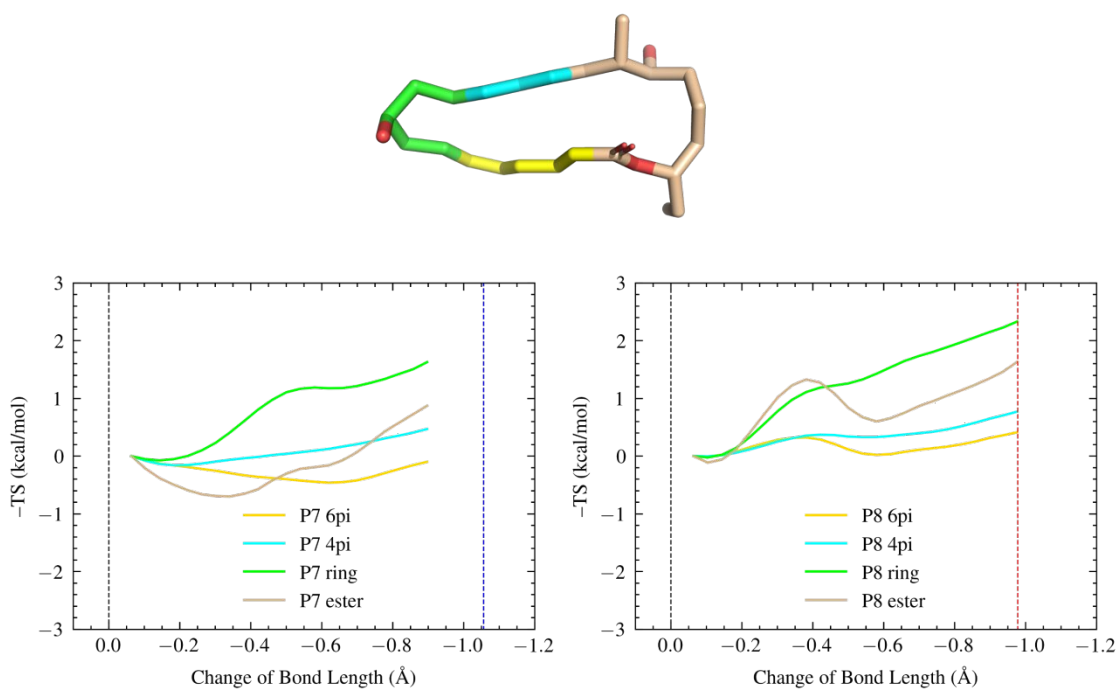
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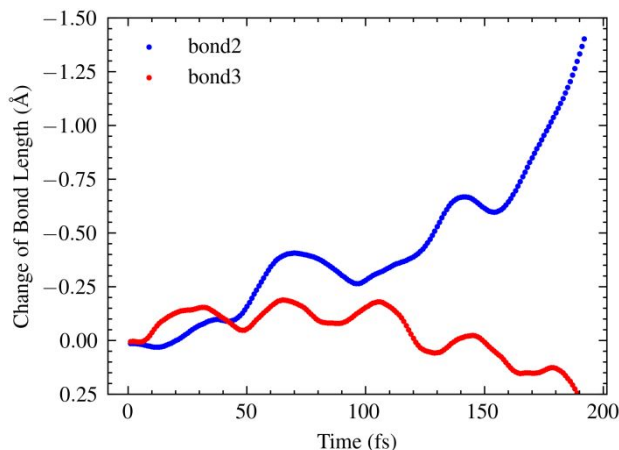
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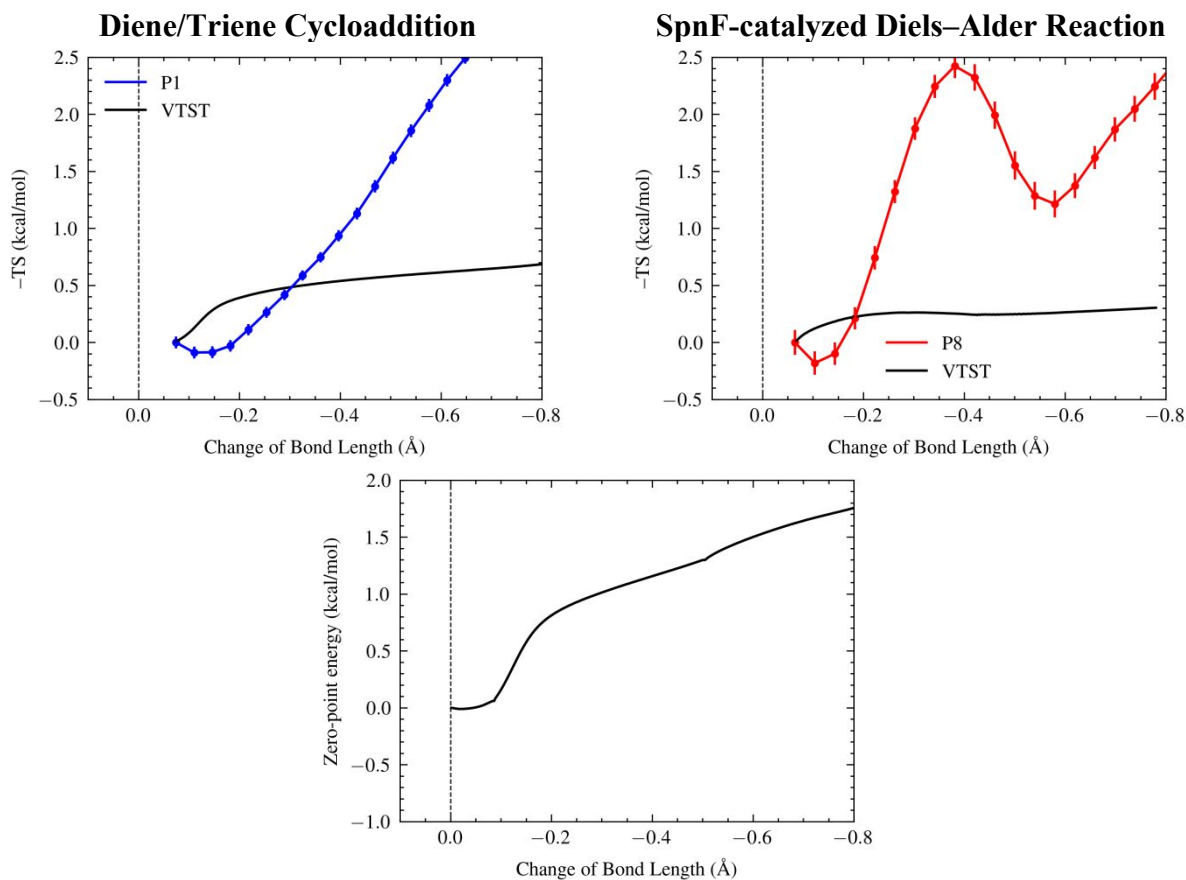
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Table S1. The parameters used for the quasiclassical trajectory simulation.

Parameter	Value
Method/Basis Set	B3LYP-D3/6-31G(d)
Simulation Timestep	1 fs
Bond Length Formation Criterion	1.7 Å (C-C)
Temperature	298.15 K
Software Used	Progdyn / Gaussian16

Table S2. The parameters used for the BGAN model training.

Parameter	Value
Batch Size	64
Learning Rate	1e-4
Adam Optimizer Momentum (β_1, β_2)	(0.5, 0.999)
Epochs	50
Number of Entropy Evaluation Loops	20

Table S3. The number of structural ensembles and ensemble width for energy and entropy profiles. Moving average strategy only applies to entropy profiles.

Adduct	Ensemble Width (Å)	Number of Ensembles	Number of Moving Averages
Diene/Triene Cycloaddition			
[4+2]-adduct	0.132	9	30
[6+4]-adduct	0.132	10	30
Tethered-Diene/Triene Cycloaddition			
[4+2]-adduct	0.129	8	30
[6+4]-adduct	0.129	8	30
NgnD-catalyzed Diels–Alder Reaction			
[4+2]-adduct	0.125	9	30
[6+4]-adduct	0.125	8	30
SpnF-catalyzed Diels–Alder Reacction			
[4+2]-adduct	0.128	10	30
[6+4]-adduct	0.128	10	30

Table S4. The distribution of reactive trajectories.

Reaction	[4+2]-adduct (%)	[6+4]-adduct (%)	Recrossing (%)
Diene/triene cycloaddition	7377 (74)	1961 (20)	583 (6)
Tethered-diene/triene cycloaddition	102 (33)	197 (63)	12 (4)
NgnD-catalyzed Diels–Alder reaction	117 (19)	370 (59)	141 (22)
SpnF-catalyzed Diels–Alder reaction	132 (33)	121 (30)	144 (36)

Table S5. Specific bond range for structural ensembles and the number of generated samples per ensemble for the diene/triene cycloaddition. Percentages are calculated relative to the highest populated structural ensemble. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	**Number of Samples (%)**	**Bond Range (Å)**	**Number of Samples (%)**
(2.790, 2.642]	54320 (100.00)	(3.009, 2.862]	35428 (85.88)
(2.754, 2.606]	50402 (92.79)	(2.969, 2.822]	38849 (94.18)
(2.718, 2.570]	45564 (83.88)	(2.928, 2.781]	40745 (98.77)
(2.682, 2.534]	40876 (75.25)	(2.888, 2.741]	41252 (100.00)
(2.647, 2.498]	36319 (66.86)	(2.847, 2.700]	40629 (98.49)
(2.611, 2.462]	32439 (59.72)	(2.807, 2.660]	39183 (94.98)
(2.575, 2.426]	29104 (53.58)	(2.766, 2.620]	37376 (90.60)
(2.539, 2.391]	26217 (48.27)	(2.726, 2.579]	35405 (85.83)
(2.503, 2.355]	23705 (43.64)	(2.685, 2.539]	33624 (81.51)
(2.467, 2.319]	21546 (39.67)	(2.645, 2.498]	31931 (77.41)
(2.432, 2.283]	19665 (36.20)	(2.604, 2.458]	30365 (73.61)
(2.396, 2.247]	18032 (33.20)	(2.564, 2.417]	28671 (69.50)
(2.360, 2.211]	16737 (30.81)	(2.523, 2.377]	26947 (65.32)
(2.324, 2.176]	15673 (28.85)	(2.483, 2.336]	25068 (60.77)
(2.288, 2.140]	14851 (27.34)	(2.443, 2.296]	23175 (56.18)
(2.252, 2.104]	14270 (26.27)	(2.402, 2.255]	21431 (51.95)
(2.216, 2.068]	13938 (25.66)	(2.362, 2.215]	19975 (48.42)
(2.181, 2.032]	13735 (25.29)	(2.321, 2.175]	18946 (45.93)
(2.145, 1.996]	13702 (25.22)	(2.281, 2.134]	18334 (44.44)
(2.109, 1.960]	13852 (25.50)	(2.240, 2.094]	18032 (43.71)
(2.073, 1.925]	14158 (26.06)	(2.200, 2.053]	17912 (43.42)
(2.037, 1.889]	14567 (26.82)	(2.159, 2.013]	17709 (42.93)
(2.001, 1.853]	15005 (27.62)	(2.119, 1.972]	17345 (42.05)
(1.966, 1.817]	15271 (28.11)	(2.078, 1.932]	16526 (40.06)
(1.930, 1.781]	15041 (27.69)	(2.038, 1.891]	15032 (36.44)
(1.894, 1.745]	13872 (25.54)	(1.998, 1.851]	12537 (30.39)
(1.858, 1.710]	11279 (20.76)	(1.957, 1.810]	8938 (21.67)
(1.822, 1.674]	7662 (14.11)	(1.917, 1.770]	5112 (12.39)
(1.786, 1.638]	4095 (7.54)	(1.876, 1.729]	2161 (5.24)
(1.751, 1.602]	1605 (2.96)	(1.836, 1.689]	672 (1.63)

Table S6. Specific bond range for structural ensembles and the number of generated samples per ensemble for the tethered-diene/triene cycloaddition. Percentages are calculated relative to the highest populated structural ensemble. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	Number of Samples (%)	Bond Range (Å)	Number of Samples (%)
(2.824, 2.695]	46618 (100.00)	(2.742, 2.613]	51783 (100.00)
(2.793, 2.663]	45295 (97.16)	(2.711, 2.581]	49005 (94.63)
(2.762, 2.632]	43176 (92.62)	(2.680, 2.550]	45664 (88.18)
(2.730, 2.601]	40564 (87.01)	(2.648, 2.519]	42015 (81.14)
(2.699, 2.570]	37845 (81.18)	(2.617, 2.488]	38455 (74.26)
(2.668, 2.538]	35326 (75.78)	(2.586, 2.456]	35195 (67.97)
(2.637, 2.507]	32878 (70.53)	(2.555, 2.425]	32229 (62.24)
(2.605, 2.476]	30722 (65.90)	(2.523, 2.394]	29564 (57.09)
(2.574, 2.445]	28820 (61.82)	(2.492, 2.363]	27203 (52.53)
(2.543, 2.414]	27089 (58.11)	(2.461, 2.332]	25076 (48.43)
(2.512, 2.382]	25650 (55.02)	(2.430, 2.300]	23254 (44.91)
(2.480, 2.351]	24379 (52.30)	(2.398, 2.269]	21668 (41.84)
(2.449, 2.320]	23273 (49.92)	(2.367, 2.238]	20270 (39.14)
(2.418, 2.289]	22407 (48.07)	(2.336, 2.207]	19172 (37.02)
(2.387, 2.257]	21618 (46.37)	(2.305, 2.175]	18244 (35.23)
(2.356, 2.226]	20975 (44.99)	(2.274, 2.144]	17515 (33.82)
(2.324, 2.195]	20490 (43.95)	(2.242, 2.113]	16953 (32.74)
(2.293, 2.164]	20125 (43.17)	(2.211, 2.082]	16495 (31.86)
(2.262, 2.133]	19876 (42.64)	(2.180, 2.051]	16130 (31.15)
(2.231, 2.101]	19835 (42.55)	(2.149, 2.019]	15767 (30.45)
(2.199, 2.070]	19845 (42.57)	(2.117, 1.988]	15442 (29.82)
(2.168, 2.039]	19900 (42.69)	(2.086, 1.957]	15160 (29.28)
(2.137, 2.008]	19963 (42.82)	(2.055, 1.926]	14952 (28.87)
(2.106, 1.976]	19962 (42.82)	(2.024, 1.894]	14855 (28.69)
(2.075, 1.945]	19866 (42.61)	(1.993, 1.863]	14810 (28.60)
(2.043, 1.914]	19715 (42.29)	(1.961, 1.832]	14678 (28.34)
(2.012, 1.883]	19532 (41.90)	(1.930, 1.801]	14337 (27.69)
(1.981, 1.851]	19240 (41.27)	(1.899, 1.769]	13471 (26.01)
(1.950, 1.820]	18759 (40.24)	(1.868, 1.738]	11745 (22.68)
(1.918, 1.789]	17854 (38.30)	(1.836, 1.707]	9142 (17.66)

Table S7. Specific bond range for structural ensembles and the number of generated samples per ensemble for the NgnD-catalyzed Diels–Alder reaction. Percentages are calculated relative to the highest populated structural ensemble. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	**Number of Samples (%)**	**Bond Range (Å)**	**Number of Samples (%)**
(2.857, 2.732]	50772 (100.00)	(2.700, 2.575]	59892 (100.00)
(2.823, 2.698]	48641 (95.80)	(2.670, 2.545]	56189 (93.82)
(2.788, 2.663]	45521 (89.66)	(2.640, 2.515]	51918 (86.69)
(2.754, 2.629]	42238 (83.19)	(2.609, 2.484]	47747 (79.72)
(2.719, 2.594]	39248 (77.30)	(2.579, 2.454]	43900 (73.30)
(2.685, 2.560]	36560 (72.01)	(2.549, 2.424]	40618 (67.82)
(2.650, 2.525]	34332 (67.62)	(2.519, 2.394]	37817 (63.14)
(2.616, 2.491]	32705 (64.42)	(2.489, 2.364]	35366 (59.05)
(2.581, 2.456]	31519 (62.08)	(2.459, 2.334]	33153 (55.36)
(2.547, 2.422]	30785 (60.63)	(2.428, 2.303]	31164 (52.03)
(2.512, 2.387]	30442 (59.96)	(2.398, 2.273]	29344 (49.00)
(2.478, 2.353]	30353 (59.78)	(2.368, 2.243]	27529 (45.97)
(2.443, 2.318]	30322 (59.72)	(2.338, 2.213]	25844 (43.15)
(2.409, 2.284]	30370 (59.82)	(2.308, 2.183]	24226 (40.45)
(2.374, 2.249]	30217 (59.52)	(2.278, 2.153]	22701 (37.90)
(2.340, 2.215]	30009 (59.11)	(2.247, 2.122]	21245 (35.47)
(2.305, 2.180]	29710 (58.52)	(2.217, 2.092]	19936 (33.29)
(2.271, 2.146]	29215 (57.54)	(2.187, 2.062]	18740 (31.29)
(2.236, 2.111]	28670 (56.47)	(2.157, 2.032]	17797 (29.72)
(2.202, 2.077]	27993 (55.14)	(2.127, 2.002]	17131 (28.60)
(2.167, 2.042]	27128 (53.43)	(2.097, 1.972]	16721 (27.92)
(2.133, 2.008]	26157 (51.52)	(2.066, 1.941]	16590 (27.70)
(2.098, 1.973]	25128 (49.49)	(2.036, 1.911]	16647 (27.80)
(2.064, 1.939]	24108 (47.48)	(2.006, 1.881]	16796 (28.04)
(2.029, 1.904]	23278 (45.85)	(1.976, 1.851]	16989 (28.37)
(1.995, 1.870]	22696 (44.70)	(1.946, 1.821]	17016 (28.41)
(1.960, 1.835]	22227 (43.78)	(1.916, 1.791]	16693 (27.87)
(1.926, 1.801]	21389 (42.13)	(1.885, 1.760]	15612 (26.07)
(1.891, 1.766]	19412 (38.23)	(1.855, 1.730]	13470 (22.49)
(1.857, 1.732]	15882 (31.28)	(1.825, 1.700]	10332 (17.25)

Table S8. Specific bond range for structural ensembles and the number of generated samples per ensemble for the SpnF-catalyzed Diels–Alder reaction. Percentages are calculated relative to the highest populated structural ensemble. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	Number of Samples (%)	Bond Range (Å)	Number of Samples (%)
(3.056, 2.928]	106056 (95.79)	(2.978, 2.850]	110506 (100.00)
(3.016, 2.889]	110080 (99.43)	(2.938, 2.811]	109692 (99.26)
(2.977, 2.849]	110714 (100.00)	(2.899, 2.771]	107690 (97.45)
(2.937, 2.809]	108709 (98.19)	(2.859, 2.731]	105087 (95.10)
(2.897, 2.770]	105411 (95.21)	(2.819, 2.692]	101667 (92.00)
(2.858, 2.730]	101222 (91.43)	(2.780, 2.652]	97051 (87.82)
(2.818, 2.690]	96733 (87.37)	(2.740, 2.612]	91188 (82.52)
(2.778, 2.651]	92263 (83.33)	(2.700, 2.573]	84576 (76.54)
(2.739, 2.611]	87706 (79.22)	(2.661, 2.533]	77747 (70.36)
(2.699, 2.571]	82938 (74.91)	(2.621, 2.493]	71157 (64.39)
(2.659, 2.532]	77611 (70.10)	(2.581, 2.454]	65130 (58.94)
(2.620, 2.492]	71805 (64.86)	(2.542, 2.414]	60099 (54.39)
(2.580, 2.452]	65535 (59.19)	(2.502, 2.374]	56337 (50.98)
(2.540, 2.413]	59165 (53.44)	(2.462, 2.335]	53509 (48.42)
(2.501, 2.373]	53344 (48.18)	(2.423, 2.295]	51254 (46.38)
(2.461, 2.333]	48073 (43.42)	(2.383, 2.255]	48966 (44.31)
(2.421, 2.294]	43656 (39.43)	(2.343, 2.216]	46346 (41.94)
(2.382, 2.254]	39822 (35.97)	(2.304, 2.176]	43361 (39.24)
(2.342, 2.214]	36587 (33.05)	(2.264, 2.136]	40036 (36.23)
(2.302, 2.175]	33734 (30.47)	(2.224, 2.097]	36715 (33.22)
(2.263, 2.135]	31254 (28.23)	(2.185, 2.057]	33686 (30.48)
(2.223, 2.095]	28975 (26.17)	(2.145, 2.017]	31179 (28.21)
(2.183, 2.056]	27086 (24.47)	(2.105, 1.978]	29302 (26.52)
(2.144, 2.016]	25510 (23.04)	(2.066, 1.938]	27911 (25.26)
(2.104, 1.976]	24277 (21.93)	(2.026, 1.898]	26601 (24.07)
(2.064, 1.937]	23347 (21.09)	(1.986, 1.859]	24539 (22.21)
(2.025, 1.897]	22532 (20.35)	(1.947, 1.819]	20939 (18.95)
(1.985, 1.857]	21259 (19.20)	(1.907, 1.779]	15669 (14.18)
(1.945, 1.818]	18646 (16.84)	(1.867, 1.740]	9617 (8.70)
(1.906, 1.778]	14066 (12.71)	(1.828, 1.700]	4588 (4.15)

Table S9. Specific bond range for structural ensembles and the initial total configurational entropy calculated in each structural ensemble for the **diene/triene cycloaddition**. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	$-TS$ ($kcal / mol$)	Bond Range (Å)	$-TS$ ($kcal / mol$)
(2.790, 2.642]	30.78 ± 0.05	(3.009, 2.862]	31.54 ± 0.06
(2.754, 2.606]	30.69 ± 0.05	(2.969, 2.822]	31.12 ± 0.06
(2.718, 2.570]	30.69 ± 0.05	(2.928, 2.781]	30.85 ± 0.05
(2.682, 2.534]	30.75 ± 0.05	(2.888, 2.741]	30.66 ± 0.05
(2.647, 2.498]	30.89 ± 0.05	(2.847, 2.700]	30.54 ± 0.05
(2.611, 2.462]	31.04 ± 0.05	(2.807, 2.660]	30.48 ± 0.05
(2.575, 2.426]	31.20 ± 0.05	(2.766, 2.620]	30.47 ± 0.06
(2.539, 2.391]	31.37 ± 0.04	(2.726, 2.579]	30.50 ± 0.06
(2.503, 2.355]	31.53 ± 0.05	(2.685, 2.539]	30.59 ± 0.06
(2.467, 2.319]	31.72 ± 0.05	(2.645, 2.498]	30.68 ± 0.06
(2.432, 2.283]	31.91 ± 0.05	(2.604, 2.458]	30.77 ± 0.06
(2.396, 2.247]	32.15 ± 0.05	(2.564, 2.417]	30.88 ± 0.06
(2.360, 2.211]	32.40 ± 0.06	(2.523, 2.377]	30.99 ± 0.06
(2.324, 2.176]	32.64 ± 0.06	(2.483, 2.336]	31.11 ± 0.06
(2.288, 2.140]	32.86 ± 0.06	(2.443, 2.296]	31.23 ± 0.06
(2.252, 2.104]	33.08 ± 0.05	(2.402, 2.255]	31.36 ± 0.06
(2.216, 2.068]	33.27 ± 0.05	(2.362, 2.215]	31.49 ± 0.05
(2.181, 2.032]	33.45 ± 0.05	(2.321, 2.175]	31.67 ± 0.05
(2.145, 1.996]	33.62 ± 0.05	(2.281, 2.134]	31.86 ± 0.05
(2.109, 1.960]	33.77 ± 0.06	(2.240, 2.094]	32.07 ± 0.05
(2.073, 1.925]	33.93 ± 0.07	(2.200, 2.053]	32.28 ± 0.05
(2.037, 1.889]	34.08 ± 0.07	(2.159, 2.013]	32.55 ± 0.05
(2.001, 1.853]	34.25 ± 0.07	(2.119, 1.972]	32.86 ± 0.06
(1.966, 1.817]	34.49 ± 0.07	(2.078, 1.932]	33.28 ± 0.06
(1.930, 1.781]	34.85 ± 0.07	(2.038, 1.891]	33.82 ± 0.07
(1.894, 1.745]	35.37 ± 0.07	(1.998, 1.851]	34.63 ± 0.07
(1.858, 1.710]	36.20 ± 0.08	(1.957, 1.810]	35.93 ± 0.08
(1.822, 1.674]	37.55 ± 0.11	(1.917, 1.770]	38.40 ± 0.15
(1.786, 1.638]	40.32 ± 0.24	(1.876, 1.729]	44.41 ± 0.39
(1.751, 1.602]	48.18 ± 0.80	(1.836, 1.689]	60.73 ± 0.81

Table S10. Specific range of change of bond lengths for structural ensembles relative to the respective bond lengths in the transition state structure and the unified zero (take the first point as zero point) total configurational entropy calculated in each structural ensemble for the diene/triene cycloaddition. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	$-TS$ (*kcal / mol*)	Bond Range (Å)	$-TS$ (*kcal / mol*)
(0.000, -0.148]	0.00 ± 0.05	(0.000, -0.147]	0.00 ± 0.06
(-0.036, -0.184]	-0.09 ± 0.05	(-0.040, -0.187]	-0.42 ± 0.06
(-0.072, -0.220]	-0.09 ± 0.05	(-0.081, -0.228]	-0.69 ± 0.05
(-0.108, -0.256]	-0.03 ± 0.05	(-0.121, -0.268]	-0.88 ± 0.05
(-0.143, -0.292]	0.11 ± 0.05	(-0.162, -0.309]	-0.99 ± 0.05
(-0.179, -0.328]	0.26 ± 0.05	(-0.202, -0.349]	-1.06 ± 0.05
(-0.215, -0.364]	0.42 ± 0.05	(-0.243, -0.389]	-1.06 ± 0.06
(-0.251, -0.399]	0.59 ± 0.04	(-0.283, -0.430]	-1.03 ± 0.06
(-0.287, -0.435]	0.75 ± 0.05	(-0.324, -0.470]	-0.95 ± 0.06
(-0.323, -0.471]	0.94 ± 0.05	(-0.364, -0.511]	-0.86 ± 0.06
(-0.358, -0.507]	1.13 ± 0.05	(-0.405, -0.551]	-0.76 ± 0.06
(-0.394, -0.543]	1.37 ± 0.05	(-0.445, -0.592]	-0.66 ± 0.06
(-0.430, -0.579]	1.62 ± 0.06	(-0.486, -0.632]	-0.55 ± 0.06
(-0.466, -0.614]	1.86 ± 0.06	(-0.526, -0.673]	-0.43 ± 0.06
(-0.502, -0.650]	2.08 ± 0.06	(-0.566, -0.713]	-0.31 ± 0.06
(-0.538, -0.686]	2.30 ± 0.05	(-0.607, -0.754]	-0.18 ± 0.06
(-0.574, -0.722]	2.49 ± 0.05	(-0.647, -0.794]	-0.04 ± 0.05
(-0.609, -0.758]	2.67 ± 0.05	(-0.688, -0.834]	0.13 ± 0.05
(-0.645, -0.794]	2.84 ± 0.05	(-0.728, -0.875]	0.32 ± 0.05
(-0.681, -0.830]	2.99 ± 0.06	(-0.769, -0.915]	0.53 ± 0.05
(-0.717, -0.865]	3.15 ± 0.07	(-0.809, -0.956]	0.75 ± 0.05
(-0.753, -0.901]	3.30 ± 0.07	(-0.850, -0.996]	1.02 ± 0.05
(-0.789, -0.937]	3.47 ± 0.07	(-0.890, -1.037]	1.32 ± 0.06
(-0.824, -0.973]	3.71 ± 0.07	(-0.931, -1.077]	1.74 ± 0.06
(-0.860, -1.009]	4.07 ± 0.07	(-0.971, -1.118]	2.28 ± 0.07
(-0.896, -1.045]	4.59 ± 0.07	(-1.011, -1.158]	3.09 ± 0.07
(-0.932, -1.080]	5.42 ± 0.08	(-1.052, -1.199]	4.39 ± 0.08
(-0.968, -1.116]	6.78 ± 0.11	(-1.092, -1.239]	6.86 ± 0.15
(-1.004, -1.152]	9.54 ± 0.24	(-1.133, -1.280]	12.87 ± 0.39
(-1.039, -1.188]	17.40 ± 0.80	(-1.173, -1.320]	29.20 ± 0.81

Table S11. Specific bond range for structural ensembles and the initial total configurational entropy calculated in each structural ensemble for the tethered-diene/triene cycloaddition. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	**$-TS$ ($kcal/mol$)**	**Bond Range (Å)**	**$-TS$ ($kcal/mol$)**
(2.824, 2.695]	47.35 ± 0.12	(2.742, 2.613]	45.79 ± 0.12
(2.793, 2.663]	46.11 ± 0.10	(2.711, 2.581]	45.02 ± 0.09
(2.762, 2.632]	45.47 ± 0.07	(2.680, 2.550]	44.63 ± 0.07
(2.730, 2.601]	45.17 ± 0.07	(2.648, 2.519]	44.45 ± 0.06
(2.699, 2.570]	45.06 ± 0.07	(2.617, 2.488]	44.38 ± 0.06
(2.668, 2.538]	45.04 ± 0.07	(2.586, 2.456]	44.38 ± 0.05
(2.637, 2.507]	45.09 ± 0.07	(2.555, 2.425]	44.44 ± 0.05
(2.605, 2.476]	45.17 ± 0.07	(2.523, 2.394]	44.54 ± 0.05
(2.574, 2.445]	45.26 ± 0.07	(2.492, 2.363]	44.69 ± 0.04
(2.543, 2.414]	45.38 ± 0.07	(2.461, 2.332]	44.87 ± 0.05
(2.512, 2.382]	45.52 ± 0.07	(2.430, 2.300]	45.06 ± 0.05
(2.480, 2.351]	45.64 ± 0.07	(2.398, 2.269]	45.24 ± 0.06
(2.449, 2.320]	45.76 ± 0.07	(2.367, 2.238]	45.42 ± 0.06
(2.418, 2.289]	45.86 ± 0.07	(2.336, 2.207]	45.59 ± 0.07
(2.387, 2.257]	45.95 ± 0.07	(2.305, 2.175]	45.75 ± 0.07
(2.356, 2.226]	46.01 ± 0.06	(2.274, 2.144]	45.90 ± 0.07
(2.324, 2.195]	46.05 ± 0.06	(2.242, 2.113]	46.05 ± 0.06
(2.293, 2.164]	46.11 ± 0.06	(2.211, 2.082]	46.18 ± 0.06
(2.262, 2.133]	46.16 ± 0.06	(2.180, 2.051]	46.29 ± 0.06
(2.231, 2.101]	46.22 ± 0.06	(2.149, 2.019]	46.40 ± 0.06
(2.199, 2.070]	46.27 ± 0.06	(2.117, 1.988]	46.52 ± 0.06
(2.168, 2.039]	46.36 ± 0.06	(2.086, 1.957]	46.67 ± 0.06
(2.137, 2.008]	46.47 ± 0.06	(2.055, 1.926]	46.85 ± 0.06
(2.106, 1.976]	46.60 ± 0.06	(2.024, 1.894]	47.04 ± 0.06
(2.075, 1.945]	46.77 ± 0.06	(1.993, 1.863]	47.30 ± 0.06
(2.043, 1.914]	46.96 ± 0.07	(1.961, 1.832]	47.60 ± 0.06
(2.012, 1.883]	47.19 ± 0.07	(1.930, 1.801]	48.01 ± 0.06
(1.981, 1.851]	47.46 ± 0.07	(1.899, 1.769]	48.59 ± 0.07
(1.950, 1.820]	47.83 ± 0.07	(1.868, 1.738]	49.44 ± 0.08
(1.918, 1.789]	48.30 ± 0.07	(1.836, 1.707]	50.76 ± 0.10

Table S12. Specific range of change of bond lengths for structural ensembles relative to the respective bond lengths in the transition state structure and the unified zero (take the first point as zero point) total configurational entropy calculated in each structural ensemble for the tethered-diene/triene cycloaddition. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	$-TS$ (*kcal / mol*)	Bond Range (Å)	$-TS$ (*kcal / mol*)
(0.000, -0.129]	0.00 ± 0.12	(0.000, -0.129]	0.00 ± 0.12
(-0.031, -0.161]	-1.23 ± 0.10	(-0.031, -0.161]	-0.77 ± 0.09
(-0.062, -0.192]	-1.87 ± 0.07	(-0.062, -0.192]	-1.16 ± 0.07
(-0.094, -0.223]	-2.17 ± 0.07	(-0.094, -0.223]	-1.34 ± 0.06
(-0.125, -0.254]	-2.28 ± 0.07	(-0.125, -0.254]	-1.41 ± 0.06
(-0.156, -0.286]	-2.30 ± 0.07	(-0.156, -0.286]	-1.41 ± 0.05
(-0.187, -0.317]	-2.25 ± 0.07	(-0.187, -0.317]	-1.35 ± 0.05
(-0.219, -0.348]	-2.17 ± 0.07	(-0.219, -0.348]	-1.24 ± 0.05
(-0.250, -0.379]	-2.08 ± 0.07	(-0.250, -0.379]	-1.09 ± 0.04
(-0.281, -0.410]	-1.96 ± 0.07	(-0.281, -0.410]	-0.92 ± 0.05
(-0.312, -0.442]	-1.83 ± 0.07	(-0.312, -0.442]	-0.73 ± 0.05
(-0.344, -0.473]	-1.71 ± 0.07	(-0.344, -0.473]	-0.55 ± 0.06
(-0.375, -0.504]	-1.58 ± 0.07	(-0.375, -0.504]	-0.37 ± 0.06
(-0.406, -0.535]	-1.48 ± 0.07	(-0.406, -0.535]	-0.20 ± 0.07
(-0.437, -0.567]	-1.40 ± 0.07	(-0.437, -0.567]	-0.04 ± 0.07
(-0.468, -0.598]	-1.34 ± 0.06	(-0.468, -0.598]	0.12 ± 0.07
(-0.500, -0.629]	-1.29 ± 0.06	(-0.500, -0.629]	0.26 ± 0.06
(-0.531, -0.660]	-1.24 ± 0.06	(-0.531, -0.660]	0.40 ± 0.06
(-0.562, -0.691]	-1.18 ± 0.06	(-0.562, -0.691]	0.50 ± 0.06
(-0.593, -0.723]	-1.13 ± 0.06	(-0.593, -0.723]	0.61 ± 0.06
(-0.625, -0.754]	-1.07 ± 0.06	(-0.625, -0.754]	0.74 ± 0.06
(-0.656, -0.785]	-0.99 ± 0.06	(-0.656, -0.785]	0.88 ± 0.06
(-0.687, -0.816]	-0.88 ± 0.06	(-0.687, -0.816]	1.06 ± 0.06
(-0.718, -0.848]	-0.75 ± 0.06	(-0.718, -0.848]	1.25 ± 0.06
(-0.749, -0.879]	-0.57 ± 0.06	(-0.749, -0.879]	1.51 ± 0.06
(-0.781, -0.910]	-0.39 ± 0.07	(-0.781, -0.910]	1.81 ± 0.06
(-0.812, -0.941]	-0.16 ± 0.07	(-0.812, -0.941]	2.22 ± 0.06
(-0.843, -0.973]	0.12 ± 0.07	(-0.843, -0.973]	2.80 ± 0.07
(-0.874, -1.004]	0.49 ± 0.07	(-0.874, -1.004]	3.65 ± 0.08
(-0.906, -1.035]	0.95 ± 0.07	(-0.906, -1.035]	4.97 ± 0.10

Table S13. Specific bond range for structural ensembles and the initial total configurational entropy calculated in each structural ensemble for the NgnD-catalyzed Diels–Alder reaction. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	$-TS$ (*kcal / mol*)	**Bond Range (Å)**	$-TS$ (*kcal / mol*)
(2.857, 2.732]	76.29 ± 0.10	(2.700, 2.575]	75.48 ± 0.07
(2.823, 2.698]	75.79 ± 0.09	(2.670, 2.545]	75.23 ± 0.07
(2.788, 2.663]	75.46 ± 0.09	(2.640, 2.515]	75.04 ± 0.07
(2.754, 2.629]	75.26 ± 0.09	(2.609, 2.484]	74.90 ± 0.07
(2.719, 2.594]	75.10 ± 0.09	(2.579, 2.454]	74.85 ± 0.07
(2.685, 2.560]	75.02 ± 0.09	(2.549, 2.424]	74.85 ± 0.07
(2.650, 2.525]	74.99 ± 0.09	(2.519, 2.394]	74.89 ± 0.07
(2.616, 2.491]	75.01 ± 0.09	(2.489, 2.364]	74.99 ± 0.07
(2.581, 2.456]	75.08 ± 0.09	(2.459, 2.334]	75.09 ± 0.07
(2.547, 2.422]	75.20 ± 0.09	(2.428, 2.303]	75.20 ± 0.07
(2.512, 2.387]	75.29 ± 0.09	(2.398, 2.273]	75.33 ± 0.07
(2.478, 2.353]	75.39 ± 0.09	(2.368, 2.243]	75.48 ± 0.07
(2.443, 2.318]	75.46 ± 0.09	(2.338, 2.213]	75.66 ± 0.07
(2.409, 2.284]	75.48 ± 0.09	(2.308, 2.183]	75.86 ± 0.07
(2.374, 2.249]	75.53 ± 0.09	(2.278, 2.153]	76.10 ± 0.07
(2.340, 2.215]	75.58 ± 0.09	(2.247, 2.122]	76.39 ± 0.07
(2.305, 2.180]	75.64 ± 0.09	(2.217, 2.092]	76.72 ± 0.07
(2.271, 2.146]	75.75 ± 0.09	(2.187, 2.062]	77.06 ± 0.07
(2.236, 2.111]	75.87 ± 0.09	(2.157, 2.032]	77.43 ± 0.08
(2.202, 2.077]	76.02 ± 0.09	(2.127, 2.002]	77.77 ± 0.07
(2.167, 2.042]	76.21 ± 0.09	(2.097, 1.972]	78.09 ± 0.08
(2.133, 2.008]	76.40 ± 0.09	(2.066, 1.941]	78.35 ± 0.08
(2.098, 1.973]	76.61 ± 0.09	(2.036, 1.911]	78.55 ± 0.08
(2.064, 1.939]	76.83 ± 0.10	(2.006, 1.881]	78.71 ± 0.08
(2.029, 1.904]	77.07 ± 0.10	(1.976, 1.851]	78.86 ± 0.08
(1.995, 1.870]	77.35 ± 0.11	(1.946, 1.821]	79.07 ± 0.09
(1.960, 1.835]	77.70 ± 0.11	(1.916, 1.791]	79.41 ± 0.09
(1.926, 1.801]	78.21 ± 0.10	(1.885, 1.760]	80.02 ± 0.10
(1.891, 1.766]	78.95 ± 0.10	(1.855, 1.730]	81.09 ± 0.12
(1.857, 1.732]	80.12 ± 0.11	(1.825, 1.700]	82.88 ± 0.15

Table S14. Specific range of change of bond lengths for structural ensembles relative to the respective bond lengths in the transition state structure and the unified zero (take the first point as zero point) total configurational entropy calculated in each structural ensemble for the NgnD-catalyzed Diels–Alder reaction. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	$-TS$ (**kcal / mol**)	Bond Range (Å)	$-TS$ (**kcal / mol**)
(0.000, -0.125]	0.00 ± 0.10	(0.000, -0.125]	0.00 ± 0.07
(-0.034, -0.159]	-0.49 ± 0.09	(-0.030, -0.155]	-0.25 ± 0.07
(-0.069, -0.194]	-0.82 ± 0.09	(-0.060, -0.185]	-0.44 ± 0.07
(-0.103, -0.228]	-1.03 ± 0.09	(-0.091, -0.216]	-0.57 ± 0.07
(-0.138, -0.263]	-1.18 ± 0.09	(-0.121, -0.246]	-0.63 ± 0.07
(-0.172, -0.297]	-1.26 ± 0.09	(-0.151, -0.276]	-0.63 ± 0.07
(-0.207, -0.332]	-1.29 ± 0.09	(-0.181, -0.306]	-0.58 ± 0.07
(-0.241, -0.366]	-1.27 ± 0.09	(-0.211, -0.336]	-0.49 ± 0.07
(-0.276, -0.401]	-1.20 ± 0.09	(-0.241, -0.366]	-0.38 ± 0.07
(-0.310, -0.435]	-1.09 ± 0.09	(-0.272, -0.397]	-0.27 ± 0.07
(-0.345, -0.470]	-0.99 ± 0.09	(-0.302, -0.427]	-0.15 ± 0.07
(-0.379, -0.504]	-0.90 ± 0.09	(-0.332, -0.457]	0.01 ± 0.07
(-0.414, -0.539]	-0.83 ± 0.09	(-0.362, -0.487]	0.18 ± 0.07
(-0.448, -0.573]	-0.81 ± 0.09	(-0.392, -0.517]	0.38 ± 0.07
(-0.483, -0.608]	-0.76 ± 0.09	(-0.422, -0.547]	0.63 ± 0.07
(-0.517, -0.642]	-0.71 ± 0.09	(-0.453, -0.578]	0.92 ± 0.07
(-0.552, -0.677]	-0.65 ± 0.09	(-0.483, -0.608]	1.25 ± 0.07
(-0.586, -0.711]	-0.54 ± 0.09	(-0.513, -0.638]	1.59 ± 0.07
(-0.621, -0.746]	-0.41 ± 0.09	(-0.543, -0.668]	1.95 ± 0.08
(-0.655, -0.780]	-0.26 ± 0.09	(-0.573, -0.698]	2.29 ± 0.07
(-0.690, -0.815]	-0.07 ± 0.09	(-0.603, -0.728]	2.61 ± 0.08
(-0.724, -0.849]	0.12 ± 0.09	(-0.634, -0.759]	2.87 ± 0.08
(-0.759, -0.884]	0.33 ± 0.09	(-0.664, -0.789]	3.08 ± 0.08
(-0.793, -0.918]	0.55 ± 0.10	(-0.694, -0.819]	3.24 ± 0.08
(-0.828, -0.953]	0.78 ± 0.10	(-0.724, -0.849]	3.39 ± 0.08
(-0.862, -0.987]	1.06 ± 0.11	(-0.754, -0.879]	3.59 ± 0.09
(-0.897, -1.022]	1.42 ± 0.11	(-0.784, -0.909]	3.93 ± 0.09
(-0.931, -1.056]	1.92 ± 0.10	(-0.815, -0.940]	4.54 ± 0.10
(-0.966, -1.091]	2.67 ± 0.10	(-0.845, -0.970]	5.62 ± 0.12
(-1.000, -1.125]	3.84 ± 0.11	(-0.875, -1.000]	7.41 ± 0.15

Table S15. Specific bond range for structural ensembles and the initial total configurational entropy calculated in each structural ensemble for the SpnF-catalyzed Diels–Alder reaction. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	**$-TS$ (kcal / mol)**	**Bond Range (Å)**	**$-TS$ (kcal / mol)**
(3.056, 2.928]	94.38 ± 0.12	(2.978, 2.850]	98.70 ± 0.11
(3.016, 2.889]	93.93 ± 0.12	(2.938, 2.811]	98.52 ± 0.10
(2.977, 2.849]	93.59 ± 0.12	(2.899, 2.771]	98.60 ± 0.10
(2.937, 2.809]	93.37 ± 0.12	(2.859, 2.731]	98.91 ± 0.10
(2.897, 2.770]	93.20 ± 0.12	(2.819, 2.692]	99.44 ± 0.10
(2.858, 2.730]	93.10 ± 0.12	(2.780, 2.652]	100.02 ± 0.10
(2.818, 2.690]	93.06 ± 0.12	(2.740, 2.612]	100.58 ± 0.10
(2.778, 2.651]	93.03 ± 0.12	(2.700, 2.573]	100.94 ± 0.10
(2.739, 2.611]	93.08 ± 0.12	(2.661, 2.533]	101.12 ± 0.11
(2.699, 2.571]	93.19 ± 0.12	(2.621, 2.493]	101.02 ± 0.12
(2.659, 2.532]	93.40 ± 0.12	(2.581, 2.454]	100.69 ± 0.12
(2.620, 2.492]	93.57 ± 0.12	(2.542, 2.414]	100.25 ± 0.12
(2.580, 2.452]	93.69 ± 0.12	(2.502, 2.374]	99.99 ± 0.12
(2.540, 2.413]	93.73 ± 0.12	(2.462, 2.335]	99.91 ± 0.12
(2.501, 2.373]	93.75 ± 0.12	(2.423, 2.295]	100.07 ± 0.11
(2.461, 2.333]	93.86 ± 0.11	(2.383, 2.255]	100.32 ± 0.10
(2.421, 2.294]	94.02 ± 0.11	(2.343, 2.216]	100.57 ± 0.11
(2.382, 2.254]	94.26 ± 0.11	(2.304, 2.176]	100.75 ± 0.11
(2.342, 2.214]	94.52 ± 0.11	(2.264, 2.136]	100.94 ± 0.12
(2.302, 2.175]	94.78 ± 0.11	(2.224, 2.097]	101.15 ± 0.13
(2.263, 2.135]	95.05 ± 0.10	(2.185, 2.057]	101.38 ± 0.13
(2.223, 2.095]	95.38 ± 0.10	(2.145, 2.017]	101.67 ± 0.14
(2.183, 2.056]	95.74 ± 0.10	(2.105, 1.978]	102.02 ± 0.13
(2.144, 2.016]	96.17 ± 0.11	(2.066, 1.938]	102.52 ± 0.11
(2.104, 1.976]	96.68 ± 0.11	(2.026, 1.898]	103.21 ± 0.11
(2.064, 1.937]	97.21 ± 0.12	(1.986, 1.859]	104.31 ± 0.14
(2.025, 1.897]	97.81 ± 0.13	(1.947, 1.819]	106.26 ± 0.17
(1.985, 1.857]	98.60 ± 0.14	(1.907, 1.779]	109.64 ± 0.23
(1.945, 1.818]	99.77 ± 0.16	(1.867, 1.740]	115.37 ± 0.34
(1.906, 1.778]	101.58 ± 0.18	(1.828, 1.700]	125.76 ± 0.58

Table S16. Specific range of change of bond lengths for structural ensembles relative to the respective bond lengths in the transition state structure and the unified zero (take the first point as zero point) total configurational entropy calculated in each structural ensemble for the SpnF-catalyzed Diels–Alder reaction. The mean and standard error were calculated from 20 rounds of BGAN-EPS. The ensembles labeled in red font indicate the eliminated ensembles from entropy profiling because the number of samples is below 25 %.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	$-TS$ $(kcal\,/\,mol)$	Bond Range (Å)	$-TS$ $(kcal\,/\,mol)$
(0.000, -0.128]	0.00 ± 0.12	(0.000, -0.128]	0.00 ± 0.11
(-0.040, -0.167]	-0.45 ± 0.12	(-0.040, -0.167]	-0.18 ± 0.10
(-0.079, -0.207]	-0.79 ± 0.12	(-0.079, -0.207]	-0.10 ± 0.10
(-0.119, -0.247]	-1.01 ± 0.12	(-0.119, -0.247]	0.21 ± 0.10
(-0.159, -0.286]	-1.18 ± 0.12	(-0.159, -0.286]	0.74 ± 0.10
(-0.198, -0.326]	-1.28 ± 0.12	(-0.198, -0.326]	1.32 ± 0.10
(-0.238, -0.366]	-1.32 ± 0.12	(-0.238, -0.366]	1.88 ± 0.10
(-0.278, -0.405]	-1.35 ± 0.12	(-0.278, -0.405]	2.24 ± 0.10
(-0.317, -0.445]	-1.30 ± 0.12	(-0.317, -0.445]	2.42 ± 0.11
(-0.357, -0.485]	-1.19 ± 0.12	(-0.357, -0.485]	2.32 ± 0.12
(-0.397, -0.524]	-0.98 ± 0.12	(-0.397, -0.524]	1.99 ± 0.12
(-0.436, -0.564]	-0.80 ± 0.12	(-0.436, -0.564]	1.55 ± 0.12
(-0.476, -0.604]	-0.69 ± 0.12	(-0.476, -0.604]	1.29 ± 0.12
(-0.516, -0.643]	-0.65 ± 0.12	(-0.516, -0.643]	1.21 ± 0.12
(-0.555, -0.683]	-0.63 ± 0.12	(-0.555, -0.683]	1.37 ± 0.11
(-0.595, -0.723]	-0.52 ± 0.11	(-0.595, -0.723]	1.62 ± 0.10
(-0.635, -0.762]	-0.36 ± 0.11	(-0.635, -0.762]	1.87 ± 0.11
(-0.674, -0.802]	-0.12 ± 0.11	(-0.674, -0.802]	2.05 ± 0.11
(-0.714, -0.842]	0.14 ± 0.11	(-0.714, -0.842]	2.24 ± 0.12
(-0.754, -0.881]	0.40 ± 0.11	(-0.754, -0.881]	2.45 ± 0.13
(-0.793, -0.921]	0.67 ± 0.10	(-0.793, -0.921]	2.68 ± 0.13
(-0.833, -0.961]	1.00 ± 0.10	(-0.833, -0.961]	2.97 ± 0.14
(-0.873, -1.000]	1.36 ± 0.10	(-0.873, -1.000]	3.32 ± 0.13
(-0.912, -1.040]	1.79 ± 0.11	(-0.912, -1.040]	3.82 ± 0.11
(-0.952, -1.080]	2.30 ± 0.11	(-0.952, -1.080]	4.51 ± 0.11
(-0.992, -1.119]	2.83 ± 0.12	(-0.992, -1.119]	5.61 ± 0.14
(-1.031, -1.159]	3.43 ± 0.13	(-1.031, -1.159]	7.56 ± 0.17
(-1.071, -1.199]	4.22 ± 0.14	(-1.071, -1.199]	10.94 ± 0.23
(-1.111, -1.238]	5.39 ± 0.16	(-1.111, -1.238]	16.67 ± 0.34
(-1.150, -1.278]	7.20 ± 0.18	(-1.150, -1.278]	27.06 ± 0.58

Table S17. Specific bond range for structural ensembles and the unified zero (take the first point as zero point) electronic energy (mean and standard error) calculated in each structural ensemble for the diene/triene cycloaddition. 1961 trajectories were used for each adduct.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	E (*kcal / mol*)	Bond Range (Å)	E (*kcal / mol*)
(2.790, 2.658]	0.00 ± 0.07	(3.009, 2.877]	0.00 ± 0.09
(2.658, 2.526]	-2.90 ± 0.07	(2.877, 2.745]	-1.97 ± 0.07
(2.526, 2.394]	-6.05 ± 0.08	(2.745, 2.613]	-4.43 ± 0.07
(2.394, 2.262]	-8.91 ± 0.09	(2.613, 2.481]	-7.61 ± 0.08
(2.262, 2.130]	-11.70 ± 0.10	(2.481, 2.349]	-10.35 ± 0.09
(2.130, 1.998]	-14.74 ± 0.11	(2.349, 2.217]	-12.88 ± 0.09
(1.998, 1.866]	-19.07 ± 0.12	(2.217, 2.085]	-15.21 ± 0.10
(1.866, 1.734]	-23.50 ± 0.13	(2.085, 1.953]	-18.63 ± 0.12
(1.734, 1.602]	-27.97 ± 0.13	(1.953, 1.821]	-22.97 ± 0.13
		(1.821, 1.689]	-28.24 ± 0.14

Table S18. Specific bond range for structural ensembles and the unified zero (take the first point as zero point) electronic energy (mean and standard error) calculated in each structural ensemble for the tethered-diene/triene cycloaddition. 102 trajectories were used for each adduct.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	E (*kcal / mol*)	Bond Range (Å)	E (*kcal / mol*)
(2.824, 2.695]	0.00 ± 0.62	(2.742, 2.613]	0.00 ± 0.52
(2.695, 2.565]	-7.02 ± 0.61	(2.613, 2.483]	-6.87 ± 0.56
(2.565, 2.436]	-9.50 ± 0.49	(2.483, 2.354]	-11.11 ± 0.49
(2.436, 2.306]	-13.61 ± 0.52	(2.354, 2.224]	-13.72 ± 0.52
(2.306, 2.177]	-16.42 ± 0.49	(2.224, 2.095]	-16.21 ± 0.57
(2.177, 2.048]	-17.44 ± 0.50	(2.095, 1.966]	-20.12 ± 0.64
(2.048, 1.918]	-20.10 ± 0.56	(1.966, 1.836]	-24.32 ± 0.70
(1.918, 1.789]	-23.59 ± 0.62	(1.836, 1.707]	-29.70 ± 0.73

Table S19. Specific bond range for structural ensembles and the unified zero (take the first point as zero point) electronic energy (mean and standard error) calculated in each structural ensemble for the NgnD-catalyzed Diels–Alder reaction. 117 trajectories were used for each adduct.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	E (*kcal / mol*)	Bond Range (Å)	E (*kcal / mol*)
(2.857, 2.732]	0.00 ± 0.53	(2.700, 2.575]	0.00 ± 0.47
(2.732, 2.607]	-3.51 ± 0.48	(2.575, 2.450]	-3.78 ± 0.48
(2.607, 2.482]	-5.56 ± 0.50	(2.450, 2.325]	-4.89 ± 0.48
(2.482, 2.357]	-6.76 ± 0.47	(2.325, 2.200]	-7.23 ± 0.54
(2.357, 2.232]	-7.87 ± 0.43	(2.200, 2.075]	-8.93 ± 0.61
(2.232, 2.107]	-8.01 ± 0.43	(2.075, 1.950]	-10.70 ± 0.65

(2.107, 1.982]	-9.76 ± 0.53	(1.950, 1.825]	-13.36 ± 0.72
(1.982, 1.857]	-11.66 ± 0.63	(1.825, 1.700]	-16.15 ± 0.78
(1.857, 1.732]	-14.22 ± 0.74		

Table S20. Specific bond range for structural ensembles and the unified zero (take the first point as zero point) electronic energy (mean and standard error) calculated in each structural ensemble for the SpnF-catalyzed Diels–Alder reaction. 121 trajectories were used for each adduct.

[4+2]-adduct		[6+4]-adduct	
Bond Range (Å)	E (*kcal / mol*)	**Bond Range (Å)**	E (*kcal / mol*)
(3.056, 2.928]	0.00 ± 0.31	(2.978, 2.850]	0.00 ± 0.32
(2.928, 2.800]	-0.78 ± 0.26	(2.850, 2.722]	-1.39 ± 0.28
(2.800, 2.673]	-1.12 ± 0.25	(2.722, 2.595]	-1.70 ± 0.29
(2.673, 2.545]	-1.22 ± 0.25	(2.595, 2.467]	-2.25 ± 0.33
(2.545, 2.417]	-1.87 ± 0.32	(2.467, 2.339]	-2.27 ± 0.37
(2.417, 2.289]	-1.77 ± 0.36	(2.339, 2.211]	-2.82 ± 0.40
(2.289, 2.161]	-2.53 ± 0.44	(2.211, 2.083]	-3.12 ± 0.50
(2.161, 2.034]	-4.28 ± 0.53	(2.083, 1.956]	-4.73 ± 0.59
(2.034, 1.906]	-7.67 ± 0.64	(1.956, 1.828]	-7.37 ± 0.70
(1.906, 1.778]	-9.92 ± 0.71	(1.828, 1.700]	-7.85 ± 0.74