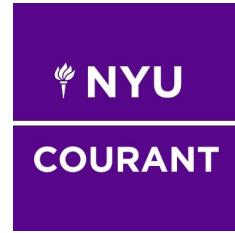


Report



Simulation of the Inequality Process

Transactions and the Surplus Theory

Yao Xiao, Ziyue Wang

Modeling and Simulation in Science, Engineering, and Economics

Abstract

This report is for collecting the simulation results and organizing the code, preparing for the final write-up. Also, this report collects the potential intuitions and implications of this economic simulation project, intending to make meaning of the various transactions of wealth among the population in various different patterns.

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1. Intuitions and Implications

1.1 The Surplus Theory [1]

Proposition 1 (Fugivity of Surplus Wealth Principle) *Surplus is the difference between subsistence and the total production of wealth; societal net product. At the level of the individual person, where people are able to produce a surplus, some of the surplus will be fugitive and leave the possession of people who produce it. Moreover, this implies encounters in which surplus wealth changes hands fairly readily.*

Proposition 2 (The Snowball) *Wealth confers on those who possess it the ability to extract wealth from others. So netting out each person's ability to do this in a general competition for surplus wealth, the rich tend to take surplus away from the poor.*

Proposition 3 (Resistance Principle) *Surplus should be viewed as being made up of layers and that the top layers are more fugitive, more easily lost than the bottom layers, those close to the level of subsistence.*

1.2 Distribution Fitting

- About the real-world inequality process, economics exchange, and wealth distribution, see [5]. It argues that the unique property of generalized beta prime (and beta prime), that makes it suitable for describing wealth/income and other distributions in natural and life sciences, is that it can mimic various behaviors, such as exponential, both for small and large variable.
- Previous research on different countries has shown that the income distribution of the richest approximates the Pareto distribution [2] [3]. Moreover, we know that the gamma distribution is a conjugate prior to the Pareto distribution [4], meaning that it is giving a closed-form expression for the latter.
- The Gini coefficient of China since 2004 is presented [here](#), which shows range from approximately 0.46 to 0.49. Note that the increase of Gini coefficient in China has already begun back since 1980.

2. Simulation Results

2.1 Strategies

`win_take_partial(population:*float, A:int, B:int) -> *float`

$$X'_A = X_A + dU \cdot X_B - (1 - d)U \cdot X_A, \quad (1)$$

$$X'_B = X_B + (1 - d)U \cdot X_A - dU \cdot X_B, \quad (2)$$

where

X_A = the surplus wealth of A before an encounter with B ,

X'_A = the surplus wealth of A after an encounter with B ,

X_B = the surplus wealth of B before an encounter with A ,

X'_B = the surplus wealth of B after an encounter with A ,

$$d = \begin{cases} 1, & \text{with probability 0.5,} \\ 0, & \text{otherwise,} \end{cases}$$

U = a 0, 1 continuous uniform random variate.

`win_take_biased(population:*float, A:int, B:int, δ:float) -> *float`

$$X'_A = X_A + dU \cdot X_B - (1 - d)U \cdot X_A, \quad (3)$$

$$X'_B = X_B + (1 - d)U \cdot X_A - dU \cdot X_B, \quad (4)$$

where

X_A , X'_A , X_B , and X'_B are as previously stated,

$$d = \begin{cases} 1, & \text{with probability } \delta \text{ if } X_A > X_B \text{ and } (1 - \delta) \text{ otherwise,} \\ 0, & \text{otherwise,} \end{cases}$$

U = a 0, 1 continuous uniform random variate.

`win_take_layer(population:*float, A:int, B:int, δ:float, l:int) -> *float`

$$X'_A = X_A + dZ \cdot X_B - (1 - d)Z \cdot X_A, \quad (5)$$

$$X'_B = X_B + (1 - d)Z \cdot X_A - dZ \cdot X_B, \quad (6)$$

where

X_A , X'_A , X_B , and X'_B are as previously stated,

$$d = \begin{cases} 1, & \text{with probability } \delta \text{ if } X_A > X_B \text{ and } (1 - \delta) \text{ otherwise,} \\ 0, & \text{otherwise,} \end{cases}$$

$$Z = \sum_{k=1}^l \frac{U_k}{l}, \quad \text{with each } U_k \text{ a 0, 1 continuous uniform random variate.}$$

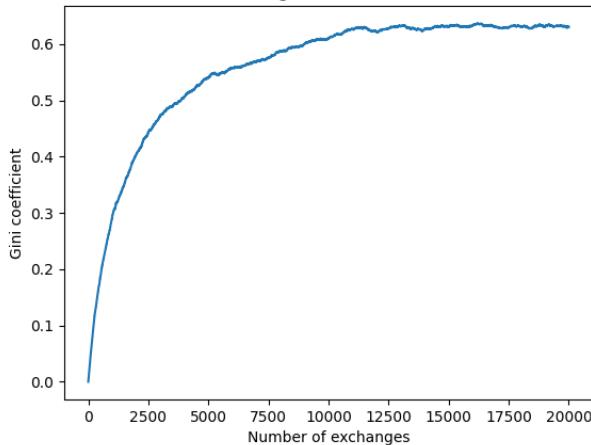
2.2 Equally-Distributed Initial Wealth

Equal population, size=2000, mean=100.0, simulating 20000 steps

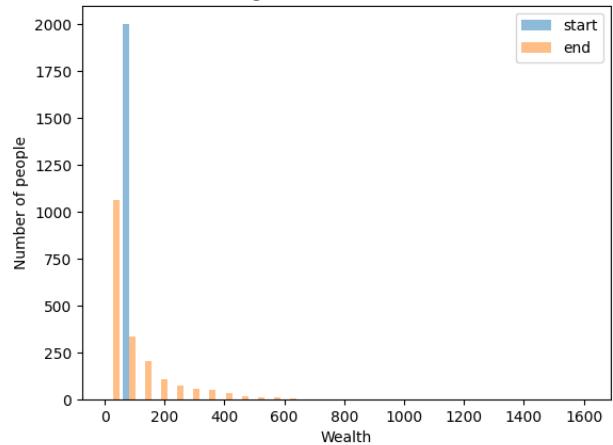
Exchange strategy: winner takes random proportion of wealth from the loser

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.41	74.62	0	3	41	100	139	237	320
4000	0.51	97.35	0	1	23	73	147	294	404
6000	0.56	113.12	0	1	17	62	140	323	490
8000	0.59	122.36	0	0	14	56	133	356	557
10000	0.61	133.63	0	0	13	51	132	357	592
12000	0.62	135.18	0	0	12	47	137	365	613
14000	0.63	134.91	0	0	11	45	140	382	597
16000	0.63	140.42	0	0	9	45	136	376	638
18000	0.63	138.91	0	0	9	46	136	372	609
20000	0.63	139.88	0	0	10	46	133	378	603

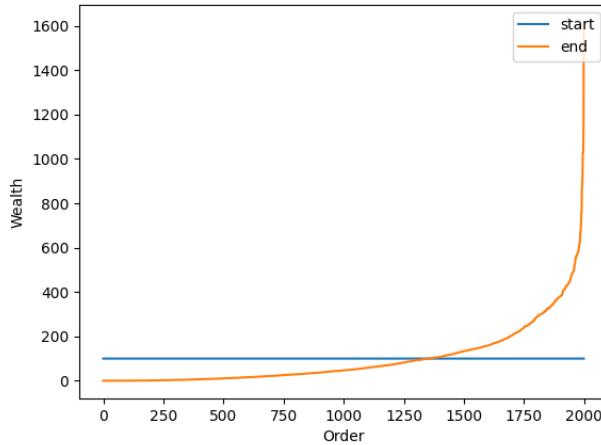
The change of Gini coefficient



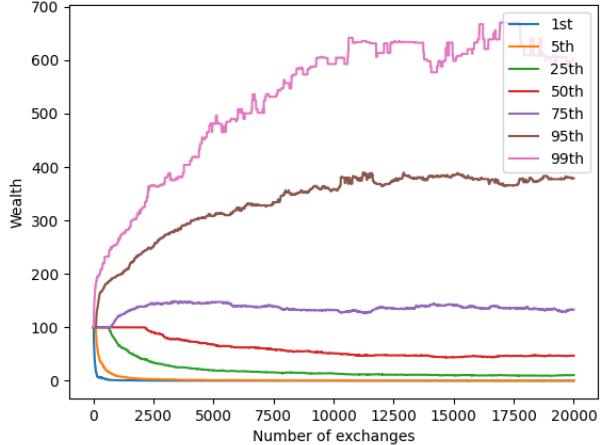
The histograms in the start and the end



The ordered curves in the start and the end



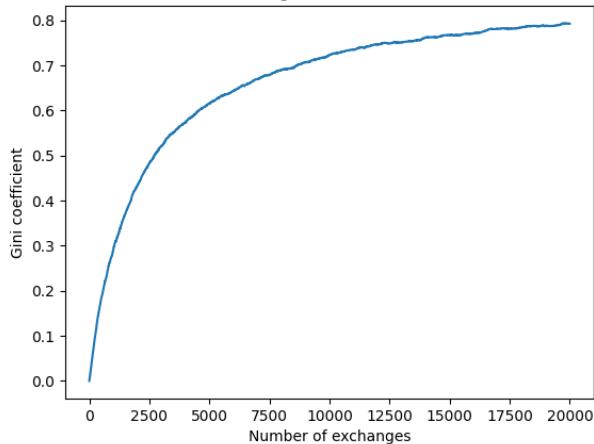
The change of wealth distribution



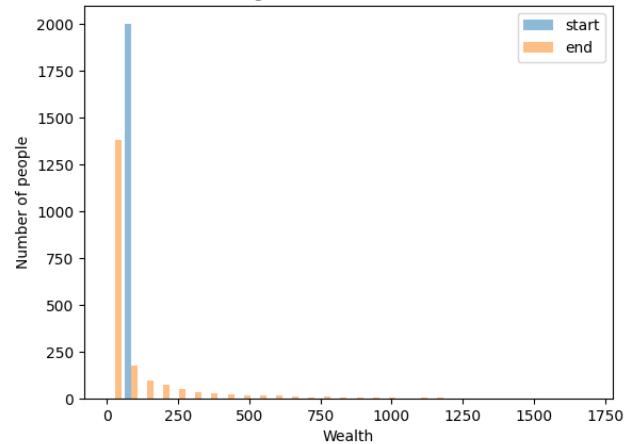
Equal population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.43	80.77	0	2	31	100	139	257	356
4000	0.57	113.32	0	0	11	64	145	342	477
6000	0.64	136.25	0	0	5	42	145	363	632
8000	0.69	153.72	0	0	2	30	140	402	741
10000	0.72	166.94	0	0	1	22	125	449	776
12000	0.75	177.94	0	0	1	18	114	469	843
14000	0.76	185.20	0	0	0	14	104	502	831
16000	0.77	191.89	0	0	0	13	101	537	891
18000	0.78	201.22	0	0	0	12	95	550	957
20000	0.79	209.72	0	0	0	10	90	536	1065

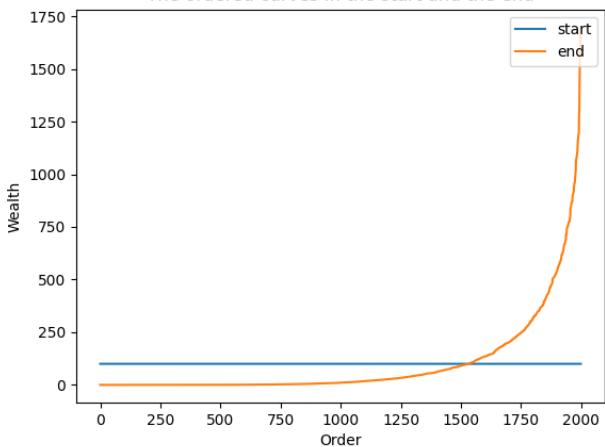
The change of Gini coefficient



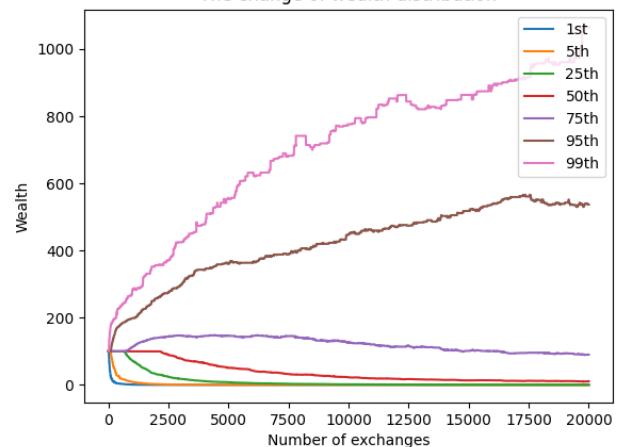
The histograms in the start and the end



The ordered curves in the start and the end



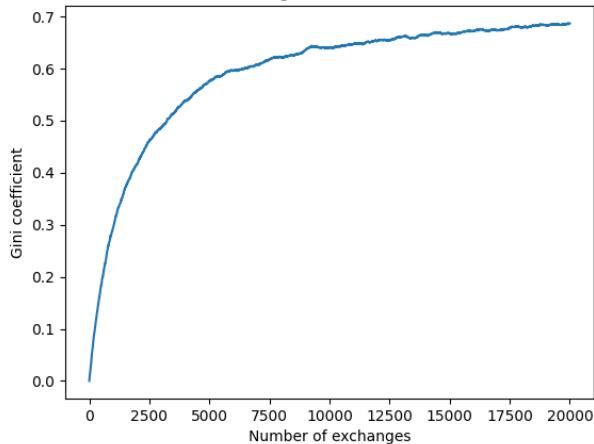
The change of wealth distribution



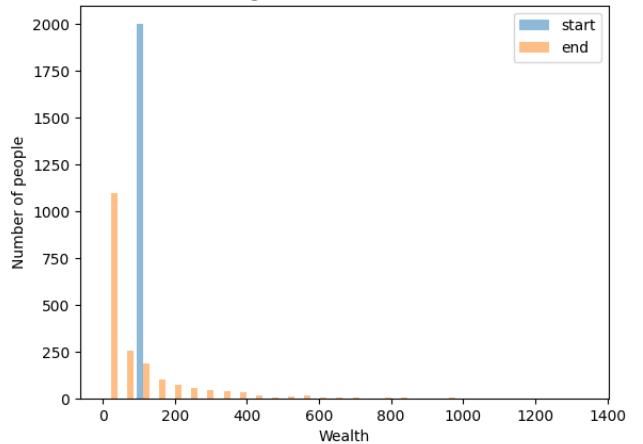
Equal population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 60% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.42	78.41	0	3	39	100	136	249	363
4000	0.54	106.00	0	1	17	72	143	308	482
6000	0.60	122.39	0	0	11	56	144	346	565
8000	0.62	133.45	0	0	9	48	142	361	636
10000	0.64	136.92	0	0	7	42	138	389	619
12000	0.65	144.07	0	0	7	41	137	390	671
14000	0.67	148.14	0	0	6	39	131	416	681
16000	0.67	147.34	0	0	5	34	134	412	670
18000	0.68	153.62	0	0	5	35	125	416	711
20000	0.69	158.94	0	0	4	34	124	403	789

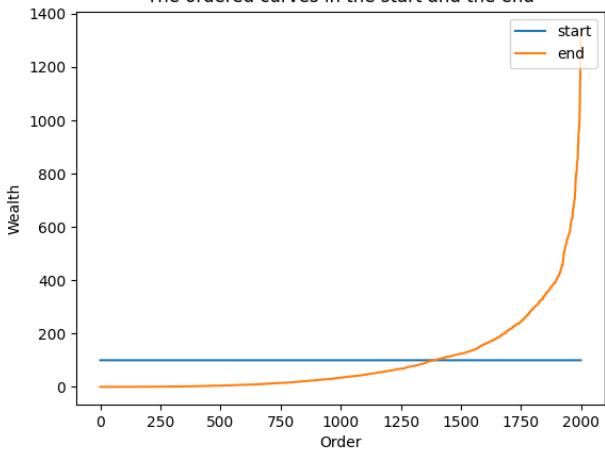
The change of Gini coefficient



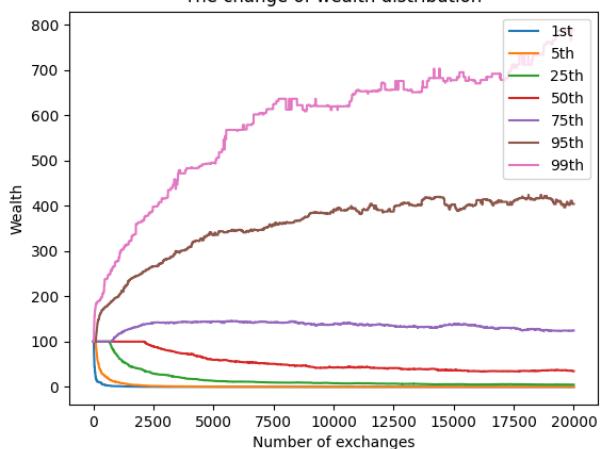
The histograms in the start and the end



The ordered curves in the start and the end

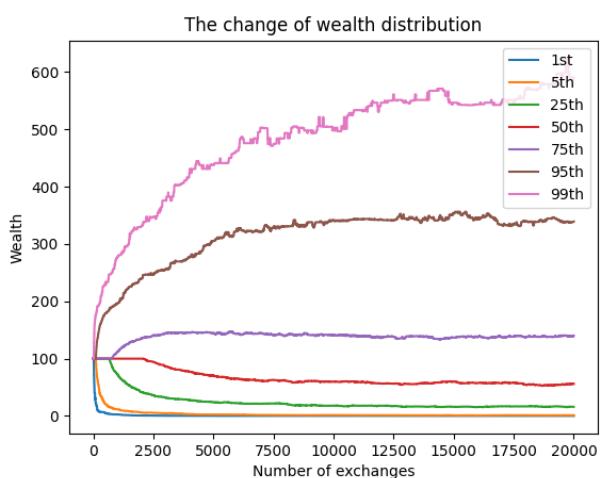
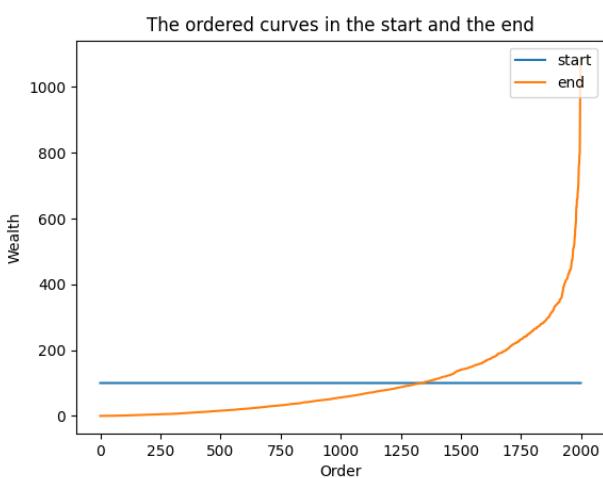
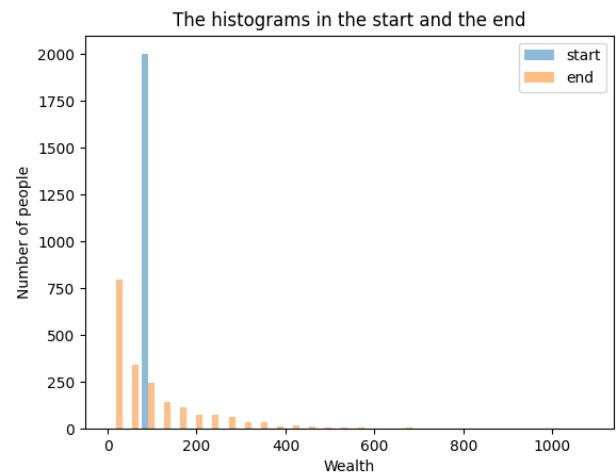
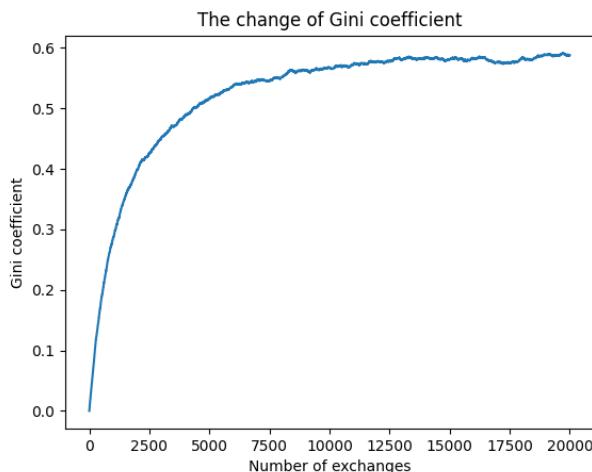


The change of wealth distribution



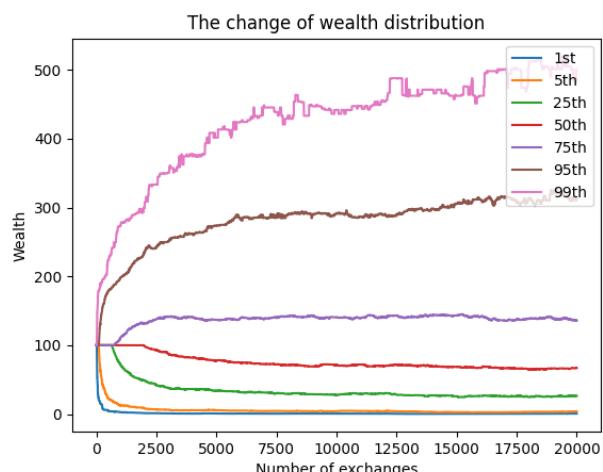
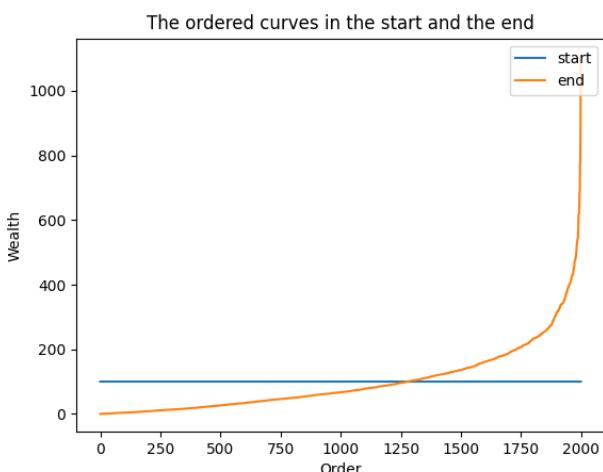
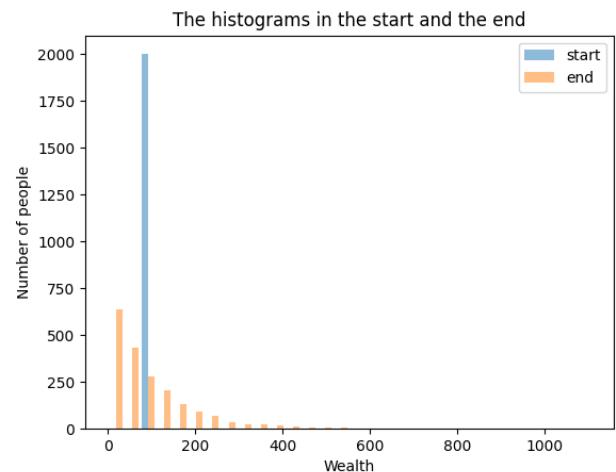
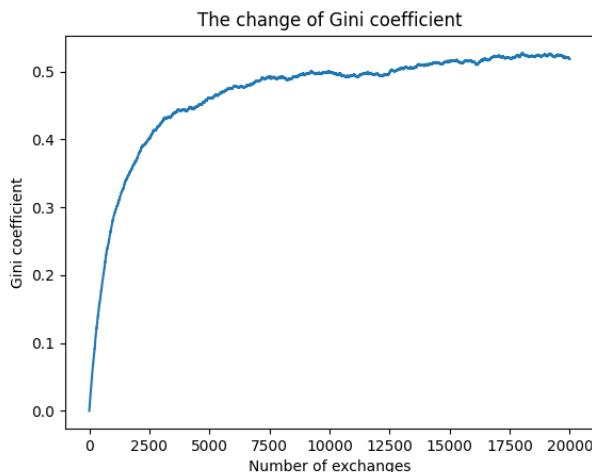
Equal population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 40% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.40	74.30	0	5	41	100	135	239	331
4000	0.49	93.68	0	3	27	77	145	277	422
6000	0.54	107.54	0	2	22	64	143	323	462
8000	0.55	110.53	0	1	21	61	139	330	493
10000	0.57	114.67	0	1	17	59	141	341	502
12000	0.58	121.11	0	1	17	56	137	342	546
14000	0.58	121.83	0	1	16	56	137	346	567
16000	0.58	120.38	0	1	15	57	137	343	543
18000	0.58	123.44	0	1	16	54	137	339	569
20000	0.59	125.50	0	1	15	55	140	339	590



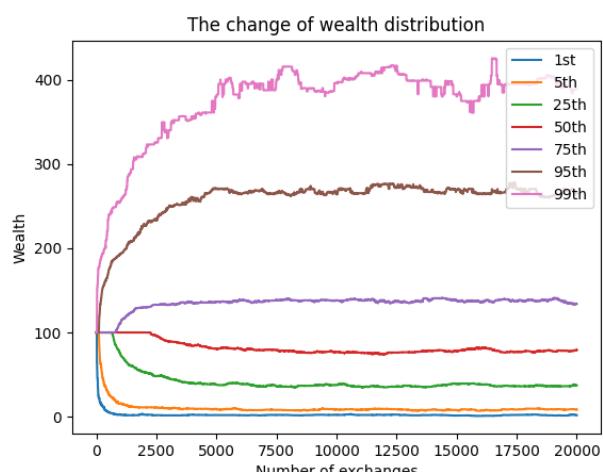
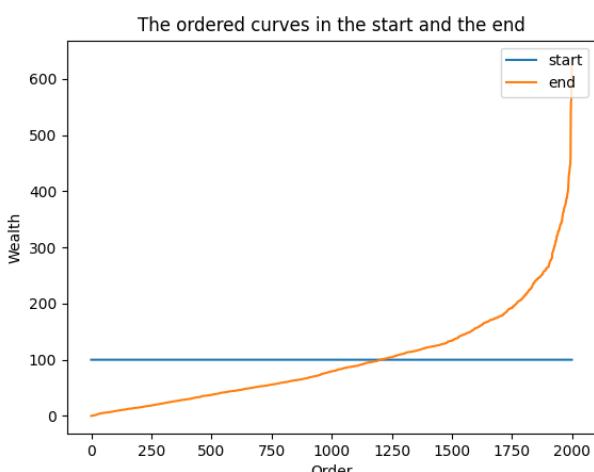
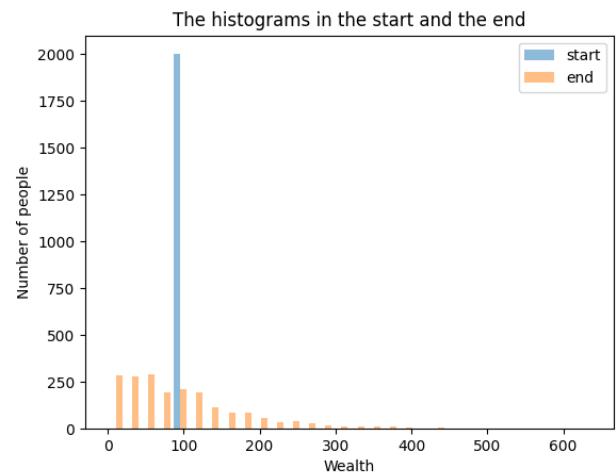
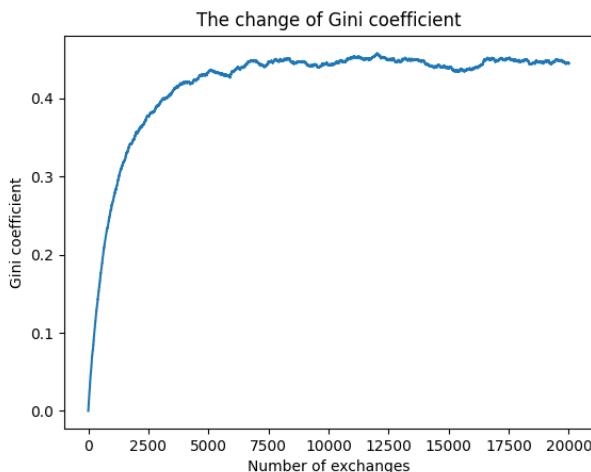
Equal population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 20% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.37	69.05	1	8	48	98	131	235	299
4000	0.44	83.41	0	5	36	82	140	261	374
6000	0.48	92.12	0	4	31	74	138	282	424
8000	0.49	96.47	0	4	29	71	141	290	428
10000	0.50	99.56	0	4	27	71	140	291	441
12000	0.50	100.15	0	4	29	69	140	290	453
14000	0.51	101.91	0	3	26	69	143	297	471
16000	0.51	102.71	0	2	26	67	141	311	462
18000	0.53	108.02	0	3	24	64	138	313	512
20000	0.52	107.24	0	3	26	66	135	314	484



Equal population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 0% chance of winning

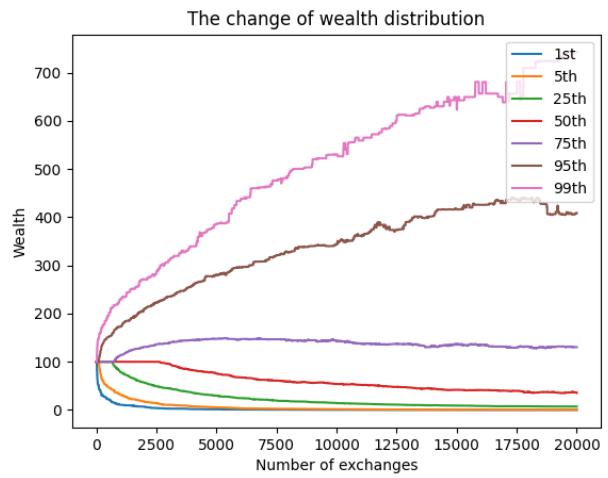
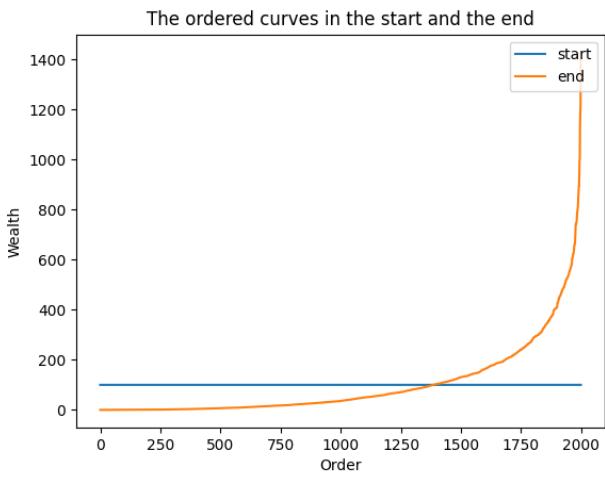
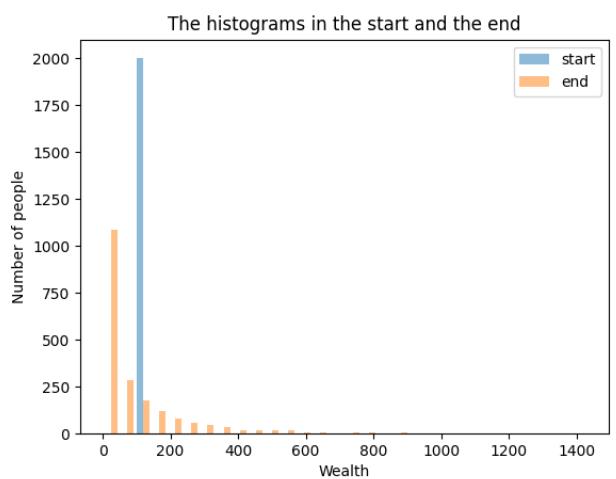
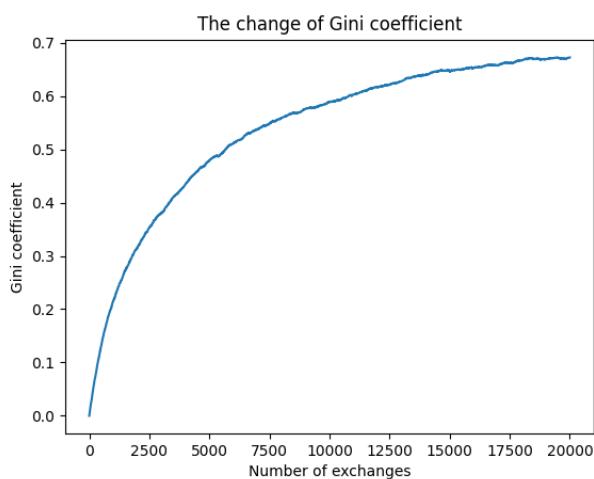
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.36	66.85	2	10	52	100	129	227	312
4000	0.42	79.10	2	9	39	84	135	260	353
6000	0.43	83.19	1	8	38	80	137	264	394
8000	0.45	86.86	1	7	35	77	139	263	415
10000	0.44	84.62	2	8	37	77	138	263	395
12000	0.46	89.08	2	9	34	74	136	276	414
14000	0.45	85.46	2	8	35	77	139	269	391
16000	0.44	84.75	0	7	38	80	136	264	380
18000	0.45	86.30	2	9	36	77	138	266	394
20000	0.44	85.95	1	8	37	79	133	264	388



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
with the loser resisting the loss of wealth at Lvl. 2
the richer party has 80% chance of winning

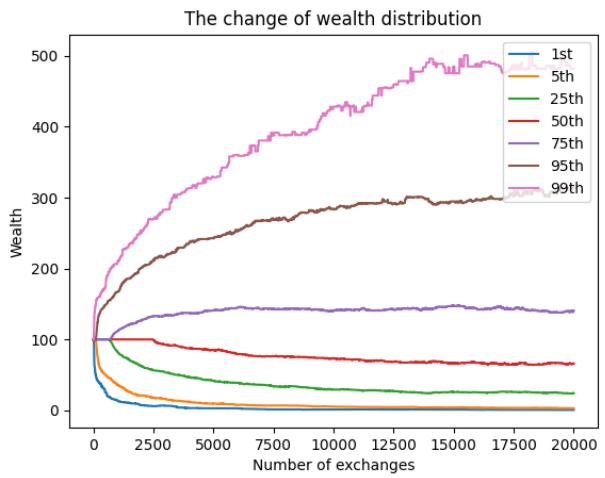
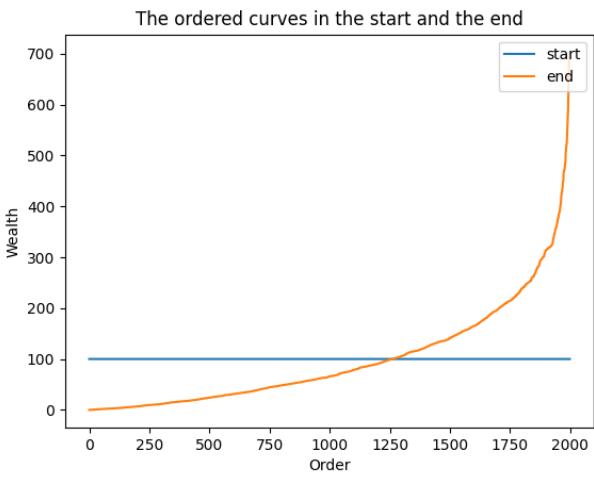
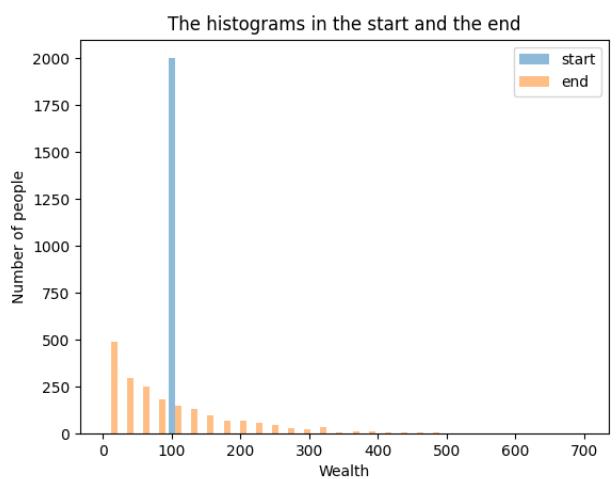
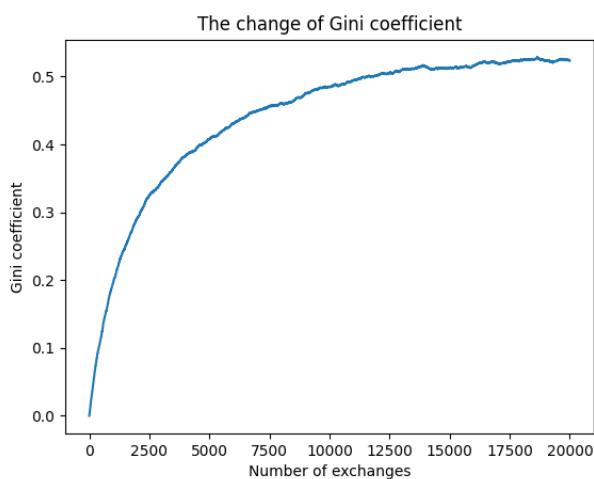
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.32	57.46	6	17	56	100	130	209	270
4000	0.43	80.06	1	7	35	82	144	258	339
6000	0.51	98.67	0	3	24	67	147	295	433
8000	0.56	111.21	0	2	18	59	145	326	486
10000	0.59	120.38	0	1	14	53	143	343	529
12000	0.62	130.25	0	0	11	49	136	384	584
14000	0.64	137.97	0	0	9	43	131	401	627
16000	0.65	143.35	0	0	8	41	135	425	656
18000	0.67	149.99	0	0	7	36	131	437	709
20000	0.67	153.83	0	0	6	35	130	408	742



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 60% chance of winning

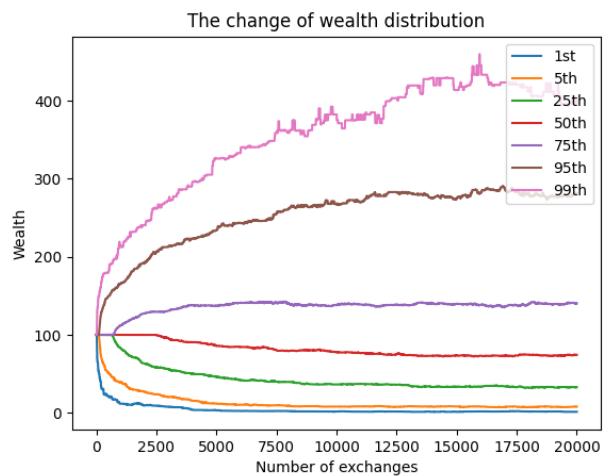
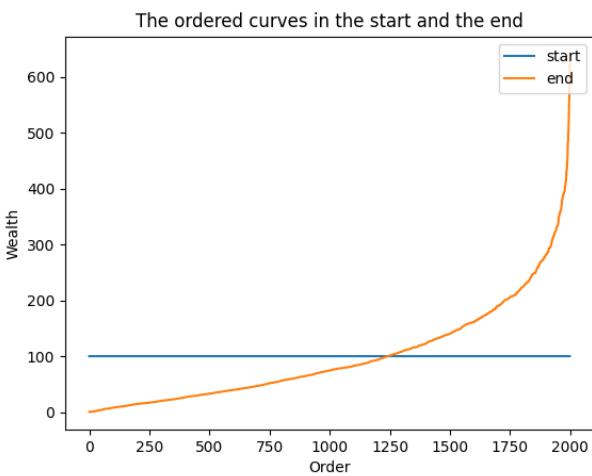
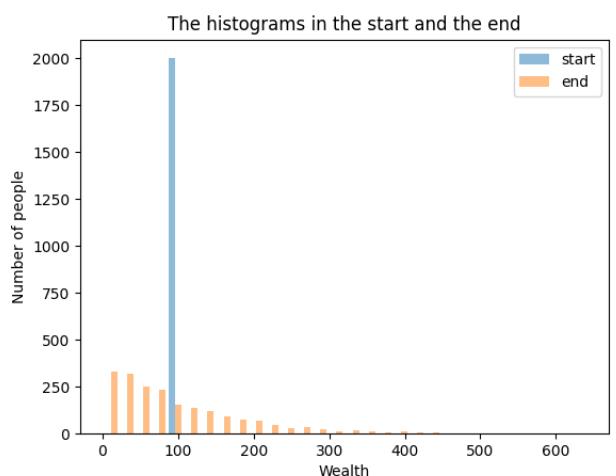
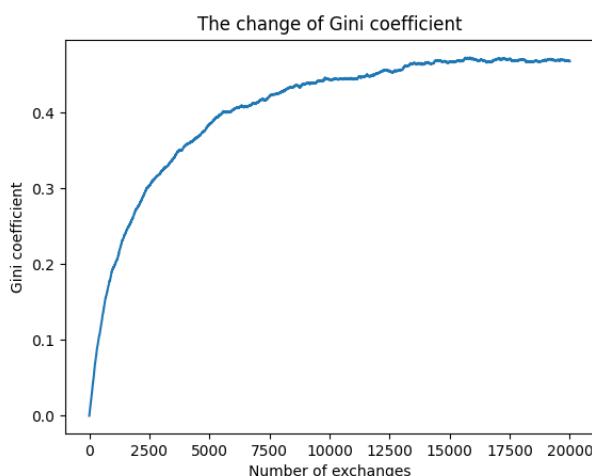
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.29	52.88	7	20	62	100	126	201	253
4000	0.38	70.10	3	12	46	87	137	236	312
6000	0.43	80.46	2	7	38	79	144	253	360
8000	0.46	87.42	1	6	33	75	143	269	388
10000	0.48	94.90	1	5	29	72	139	283	428
12000	0.50	98.43	1	4	27	69	141	292	444
14000	0.51	102.68	1	3	24	68	142	294	496
16000	0.52	104.08	0	3	25	66	142	297	488
18000	0.52	106.82	0	3	25	66	141	308	481
20000	0.52	104.40	0	2	24	65	140	313	482



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 50% chance of winning

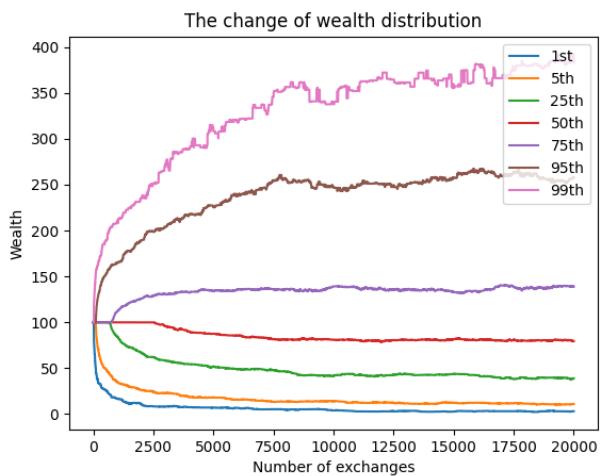
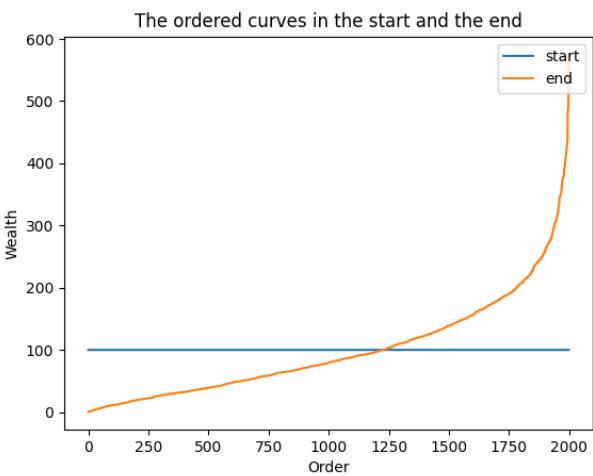
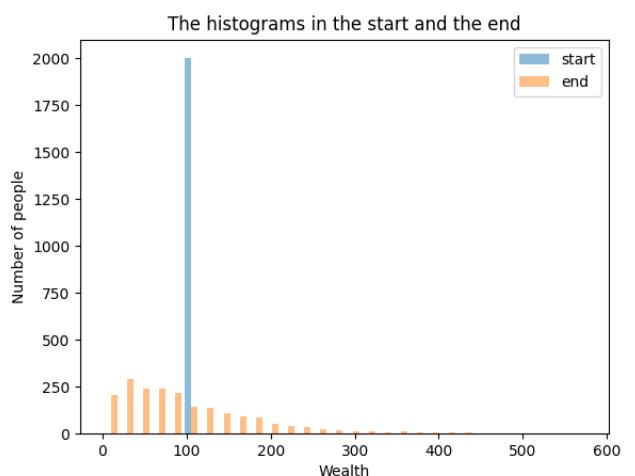
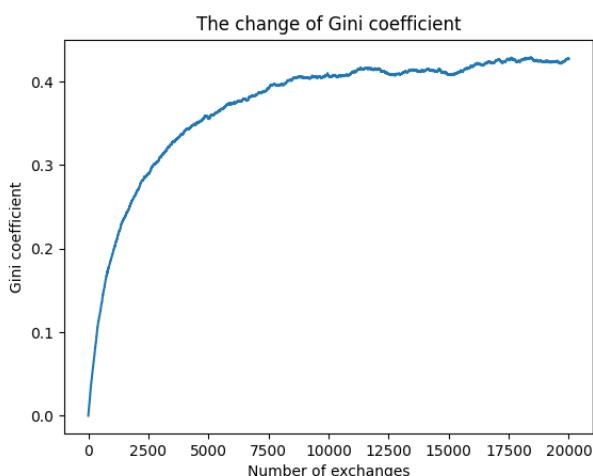
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.27	50.03	9	27	63	100	127	191	240
4000	0.36	64.91	4	15	50	90	138	223	296
6000	0.40	75.63	2	10	42	84	140	243	332
8000	0.43	80.98	2	8	39	79	140	261	358
10000	0.44	84.96	1	7	36	77	138	268	382
12000	0.45	86.62	1	8	36	75	137	278	392
14000	0.47	90.44	1	7	33	73	140	274	429
16000	0.47	92.88	1	8	33	73	138	281	445
18000	0.47	91.32	1	7	32	74	139	280	411
20000	0.47	90.48	1	8	32	74	140	281	403



Equal population, size=2000, mean=100.0, simulating 20000 steps

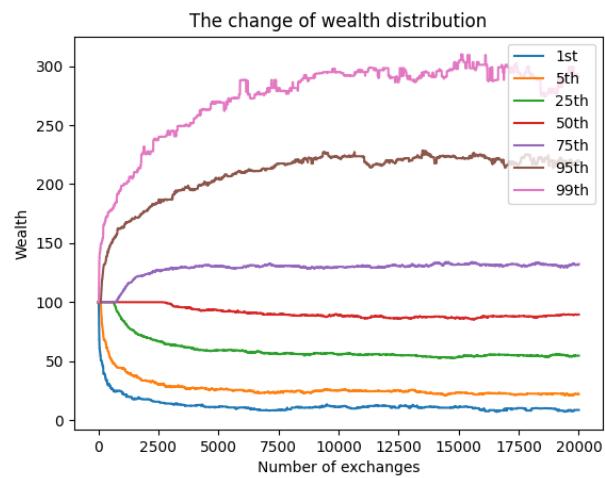
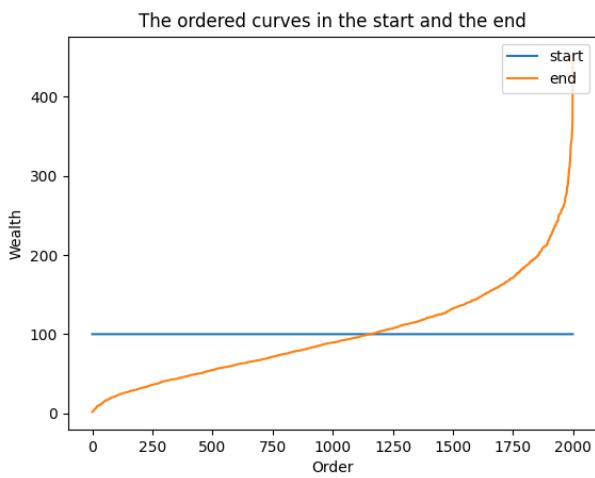
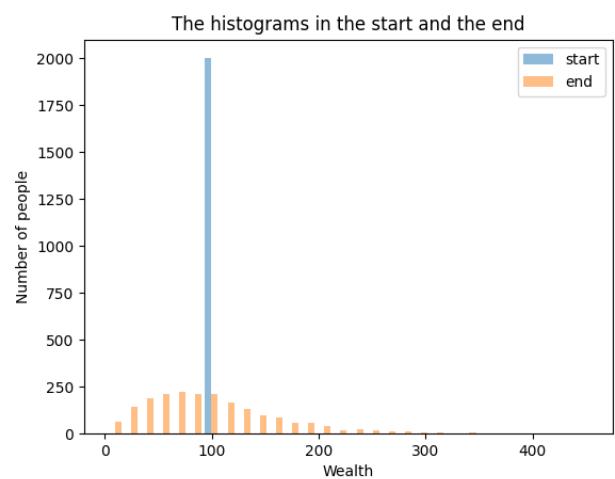
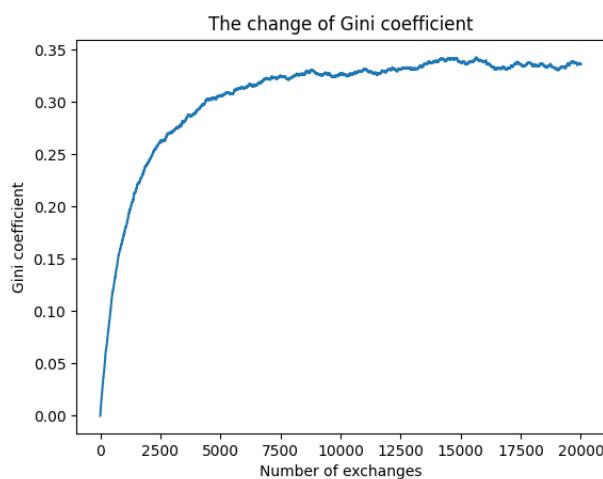
Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 40% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.27	48.21	10	26	66	100	125	189	235
4000	0.34	62.56	7	18	54	89	132	217	288
6000	0.37	70.02	6	15	48	85	135	237	318
8000	0.40	75.00	4	13	46	81	136	255	356
10000	0.41	76.69	4	14	41	81	139	247	337
12000	0.41	79.21	2	12	42	78	136	251	365
14000	0.41	78.79	2	11	42	81	136	253	365
16000	0.42	80.96	3	12	42	80	133	262	380
18000	0.42	81.22	2	11	39	80	136	261	379
20000	0.43	81.57	3	11	38	79	139	257	383



Equal population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 20% chance of winning

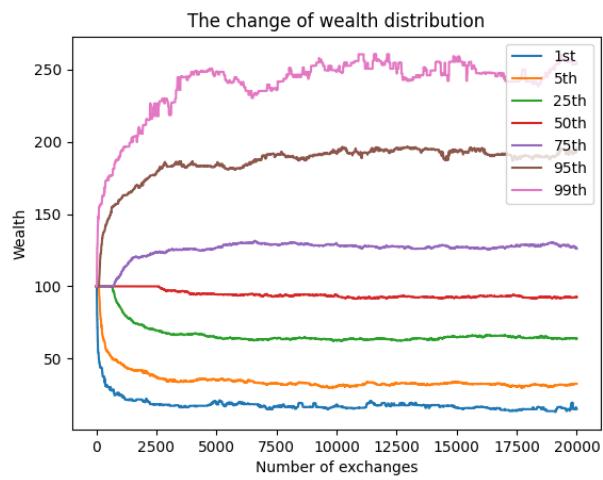
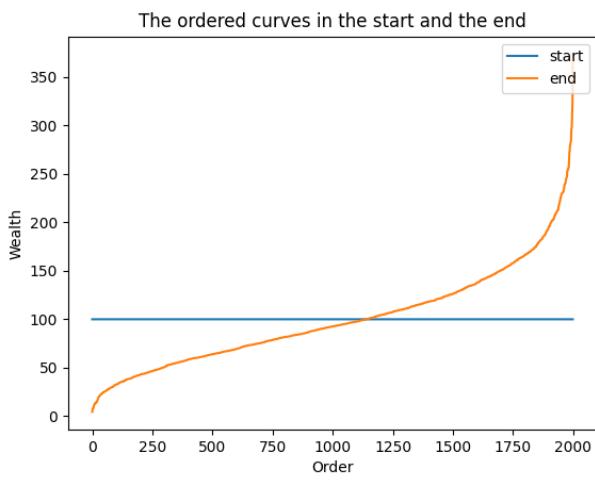
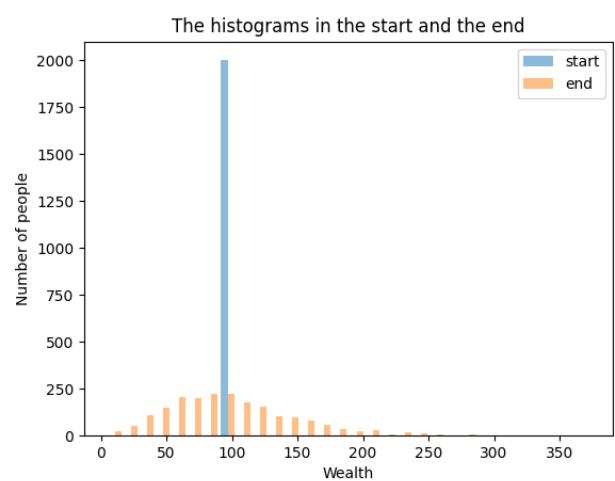
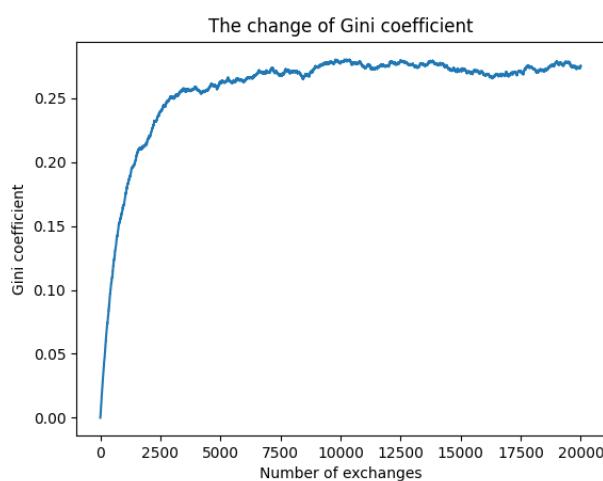
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.24	43.88	17	33	70	100	123	177	225
4000	0.29	52.91	12	27	60	93	129	195	255
6000	0.31	57.42	10	25	59	91	129	209	288
8000	0.32	59.59	9	24	56	89	130	217	278
10000	0.33	61.04	11	25	55	89	129	222	294
12000	0.33	62.03	11	24	55	86	130	220	298
14000	0.34	62.45	11	22	53	87	132	218	290
16000	0.34	62.97	8	22	54	87	131	223	301
18000	0.33	62.04	8	22	54	87	131	220	290
20000	0.34	62.00	8	22	54	89	132	218	291



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 0% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.22	39.71	20	41	71	100	121	172	211
4000	0.26	47.19	17	34	67	94	125	185	248
6000	0.26	47.69	18	34	63	94	130	181	241
8000	0.27	49.24	16	32	63	93	129	189	246
10000	0.28	50.21	18	31	62	94	129	192	248
12000	0.28	50.16	19	32	63	92	127	194	253
14000	0.28	50.69	17	32	63	92	126	194	249
16000	0.27	48.64	16	32	65	93	126	193	246
18000	0.27	49.65	15	31	64	92	128	190	241
20000	0.28	50.48	15	32	63	92	126	195	254

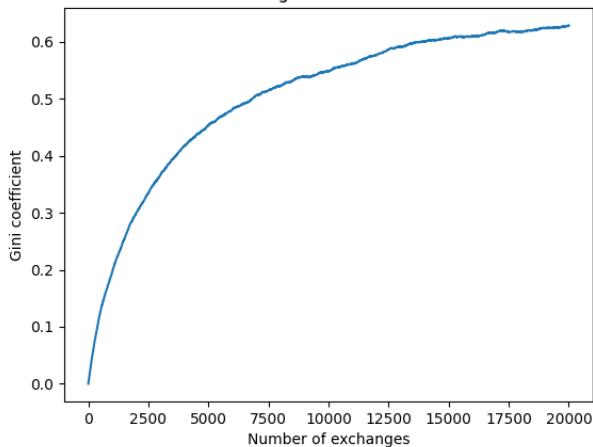


Equal population, size=2000, mean=100.0, simulating 20000 steps

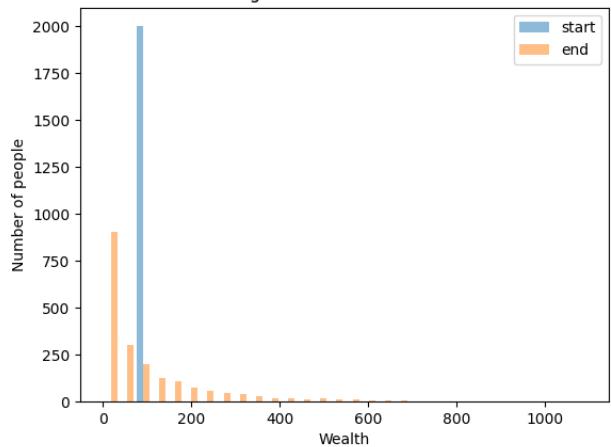
Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.30	54.69	12	25	59	100	129	201	269
4000	0.42	78.04	4	11	40	81	140	247	344
6000	0.48	92.04	1	5	29	71	143	281	388
8000	0.52	101.45	0	3	22	68	143	308	440
10000	0.55	108.15	0	2	19	62	144	327	493
12000	0.58	117.64	0	1	17	56	139	345	546
14000	0.60	124.96	0	1	14	51	136	375	566
16000	0.61	128.01	0	0	13	49	137	382	577
18000	0.62	131.91	0	0	12	46	133	390	589
20000	0.63	134.98	0	0	11	44	136	376	595

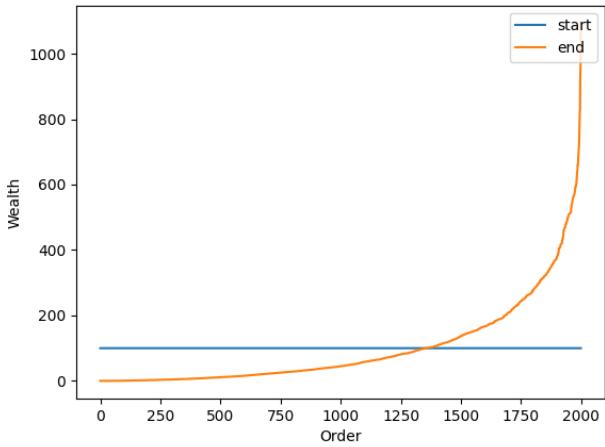
The change of Gini coefficient



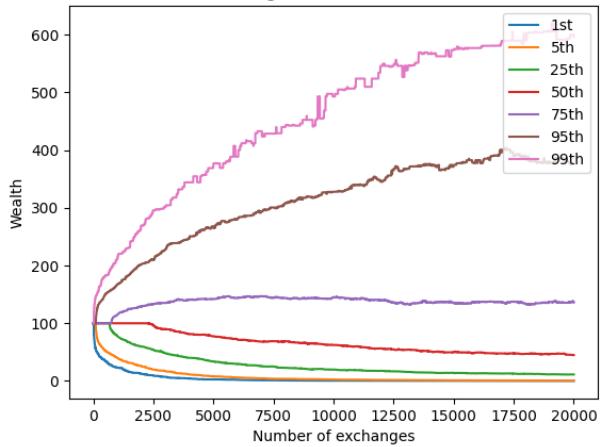
The histograms in the start and the end



The ordered curves in the start and the end



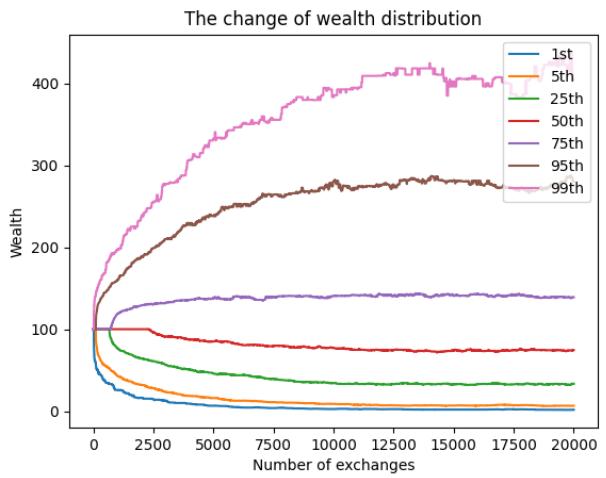
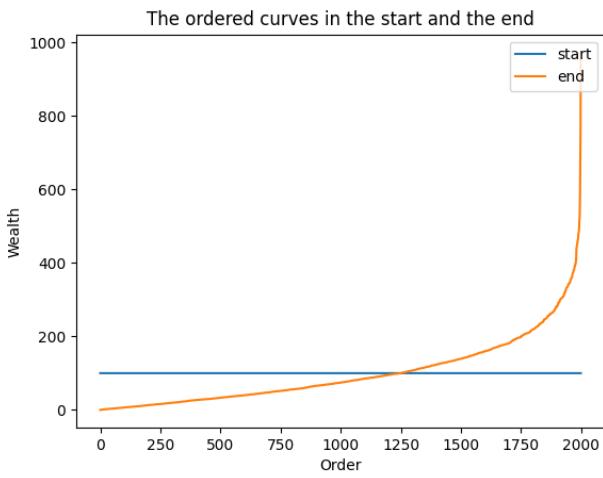
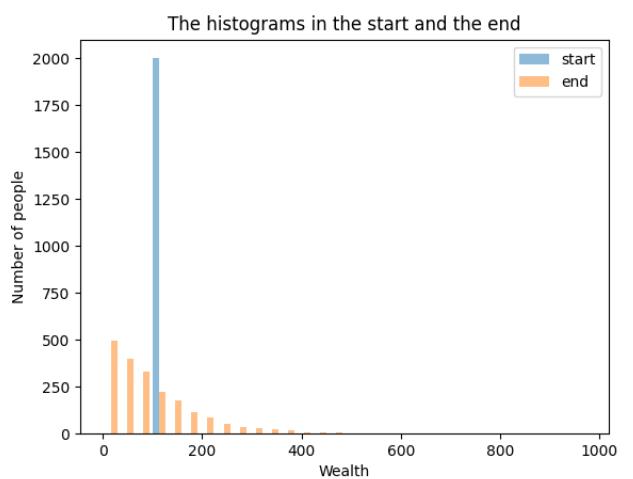
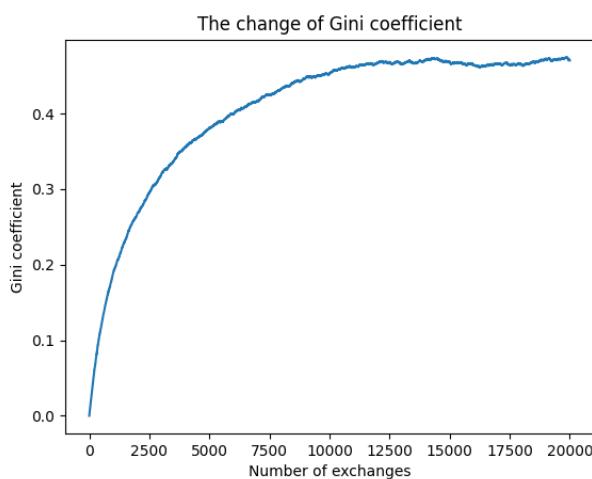
The change of wealth distribution



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 60% chance of winning

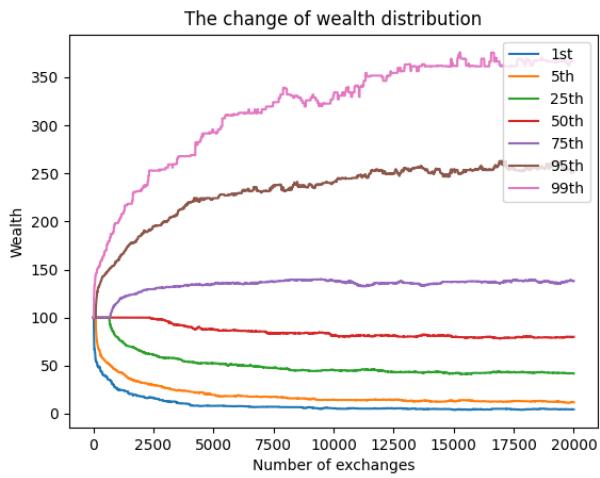
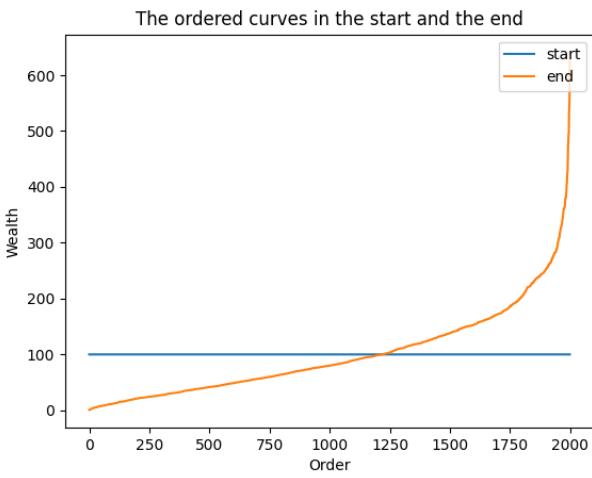
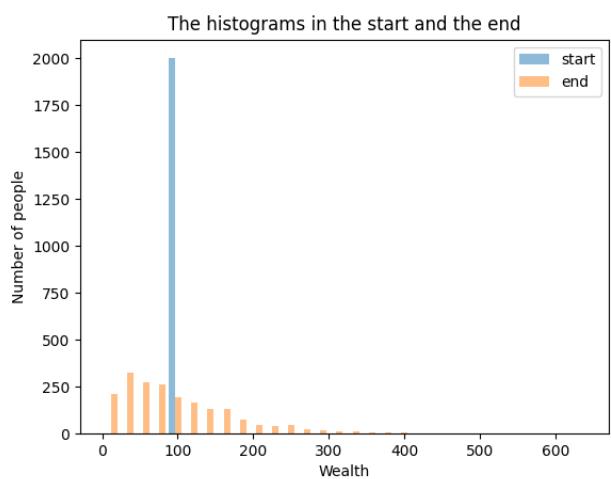
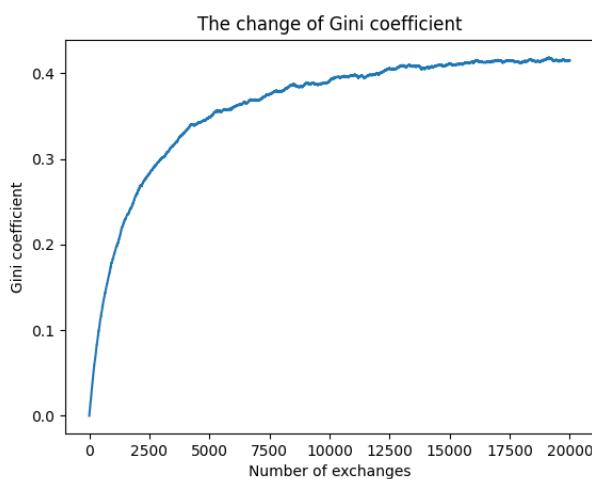
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.27	48.46	16	31	64	100	129	188	237
4000	0.36	65.73	9	18	50	87	135	229	306
6000	0.40	74.60	4	12	43	82	140	250	346
8000	0.43	81.88	3	10	37	79	140	262	370
10000	0.45	86.73	2	8	33	77	140	280	383
12000	0.47	91.87	2	6	32	74	142	275	409
14000	0.47	92.61	1	6	33	73	139	281	424
16000	0.46	90.96	1	6	33	73	142	276	405
18000	0.46	90.94	2	7	33	73	140	270	386
20000	0.47	93.03	1	6	33	74	138	280	404



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 50% chance of winning

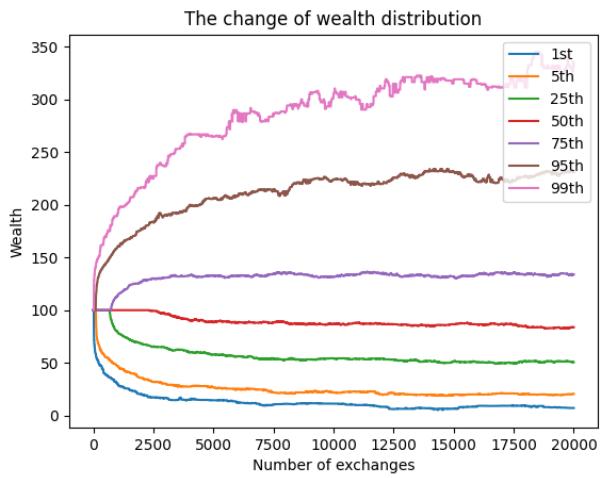
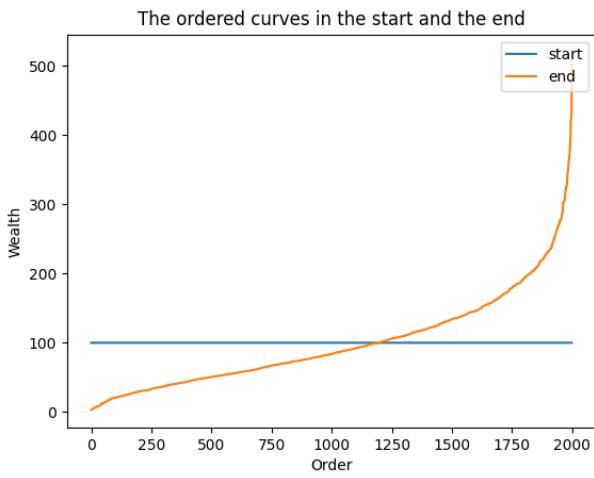
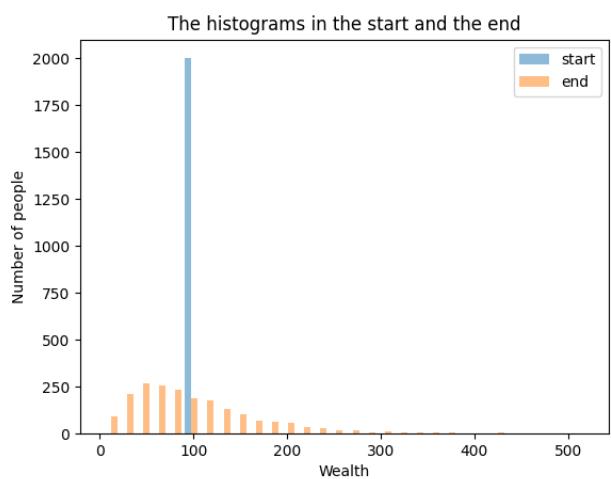
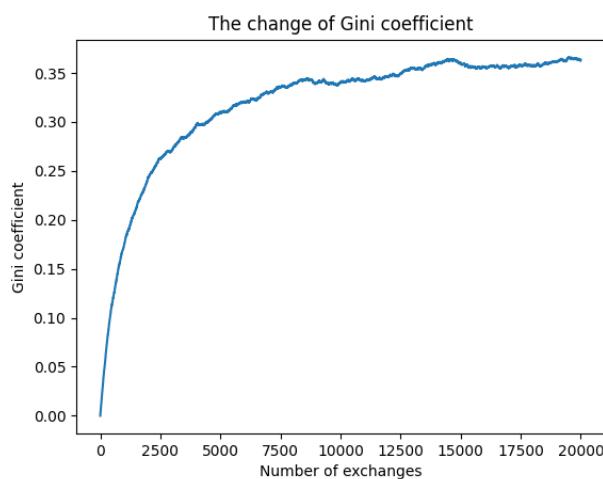
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.26	47.07	18	32	64	100	126	186	232
4000	0.33	60.28	9	23	53	90	133	219	267
6000	0.36	66.69	7	18	50	86	136	229	311
8000	0.38	70.76	6	16	46	83	138	231	338
10000	0.39	73.59	5	14	45	81	138	240	330
12000	0.40	76.55	5	14	45	81	135	252	351
14000	0.41	77.22	4	12	43	80	134	250	361
16000	0.41	78.84	4	12	42	79	137	254	361
18000	0.41	78.61	4	12	43	80	138	254	362
20000	0.42	79.90	4	11	41	79	138	251	366



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 40% chance of winning

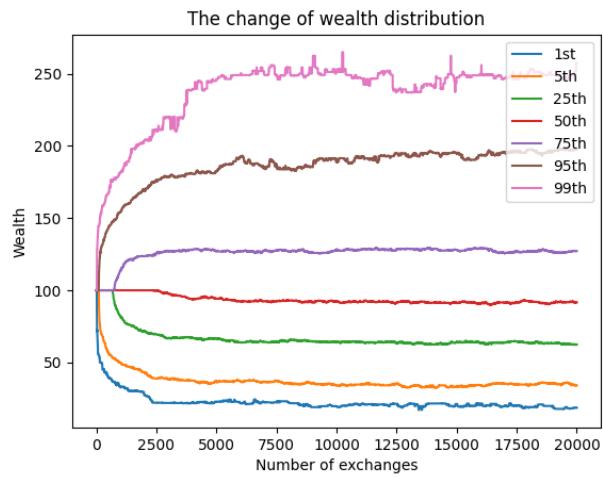
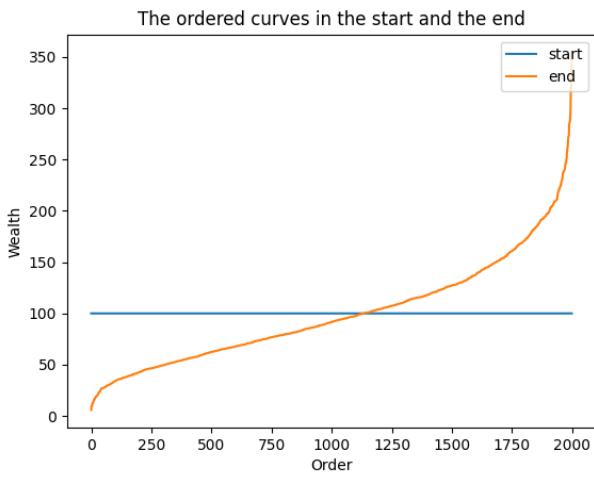
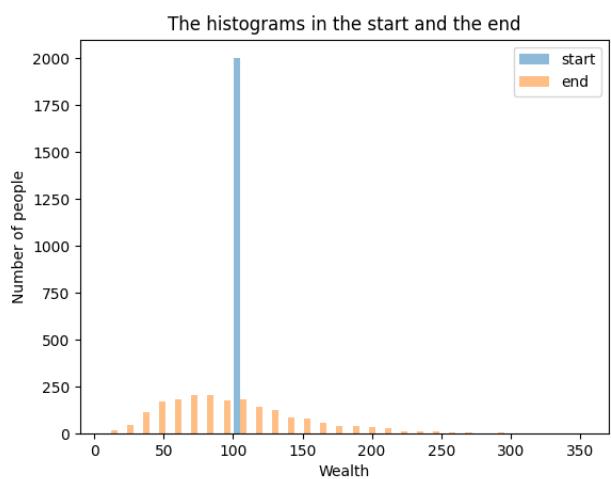
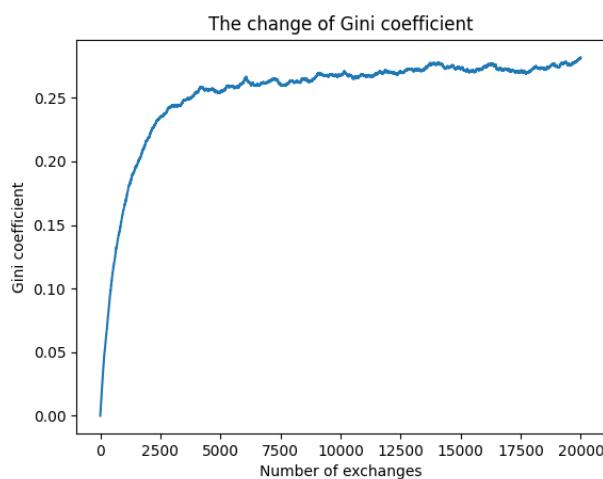
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.24	43.73	20	35	68	100	126	177	216
4000	0.30	53.79	14	27	60	90	132	198	266
6000	0.32	58.69	12	25	56	88	132	208	287
8000	0.34	62.22	11	21	53	88	135	210	288
10000	0.34	63.83	11	21	54	87	131	223	305
12000	0.35	64.48	8	20	54	86	134	219	310
14000	0.36	67.77	7	19	51	85	132	233	319
16000	0.36	66.94	9	20	50	86	133	221	314
18000	0.36	66.62	9	20	51	84	133	227	320
20000	0.36	68.74	7	20	50	83	133	231	331



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 20% chance of winning

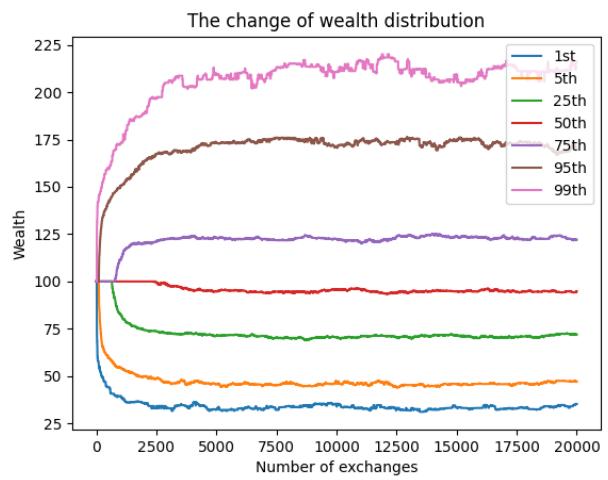
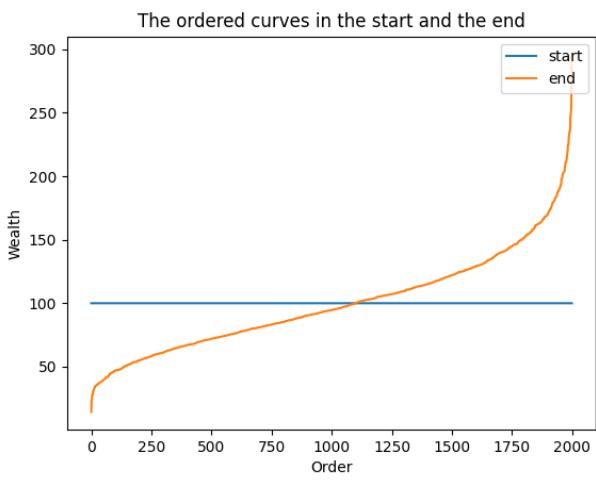
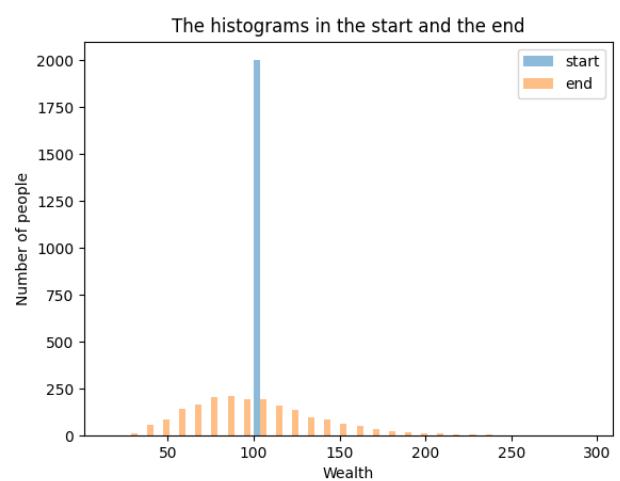
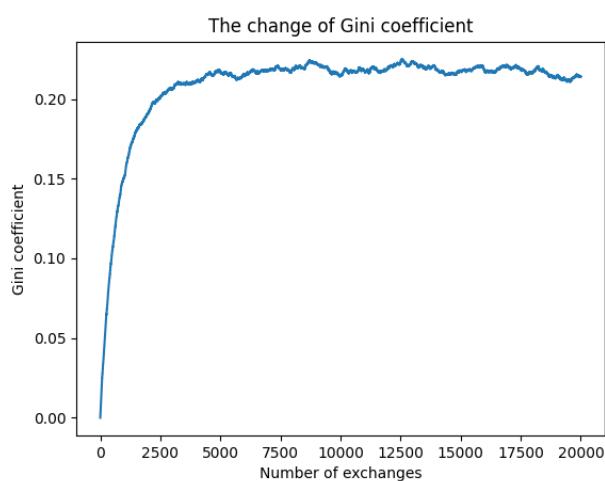
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.22	39.33	27	43	71	100	123	169	203
4000	0.25	45.77	22	37	67	93	127	180	238
6000	0.26	48.24	21	36	63	92	127	192	249
8000	0.26	47.96	22	35	64	92	126	185	254
10000	0.27	48.95	19	34	64	91	128	190	251
12000	0.27	49.47	20	34	64	92	127	193	251
14000	0.28	50.20	21	33	62	91	128	195	241
16000	0.27	50.50	21	34	63	90	129	193	249
18000	0.27	50.09	18	34	63	92	126	197	251
20000	0.28	51.56	18	34	62	91	127	197	257



Equal population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 0% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.19	34.22	35	49	74	100	120	163	188
4000	0.21	37.92	34	46	72	95	124	170	203
6000	0.22	38.60	32	45	71	95	122	173	209
8000	0.22	39.66	34	45	70	94	122	175	214
10000	0.21	38.65	35	46	70	95	122	170	210
12000	0.22	40.13	33	46	71	93	121	172	218
14000	0.22	39.11	32	44	71	95	125	171	205
16000	0.22	39.01	33	45	70	95	123	174	208
18000	0.22	39.02	32	45	71	94	121	173	211
20000	0.21	38.87	35	47	72	94	122	169	216

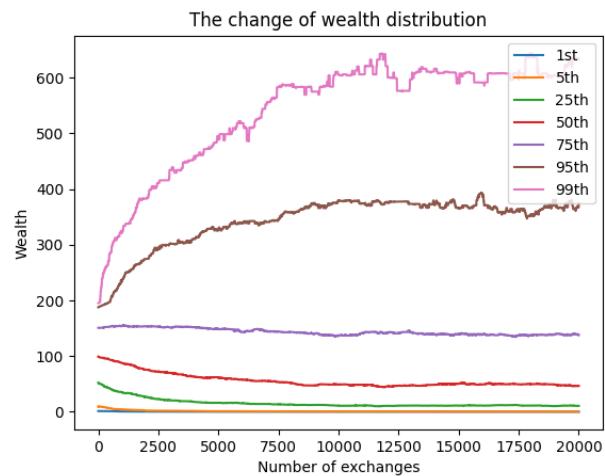
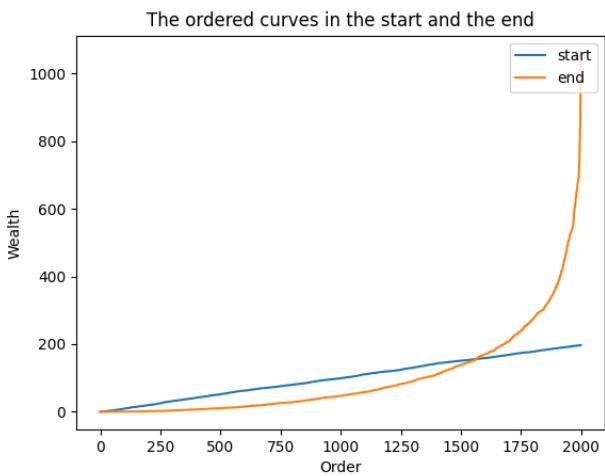
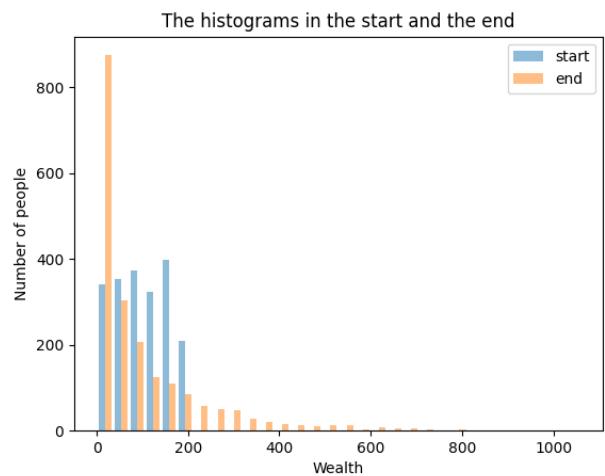
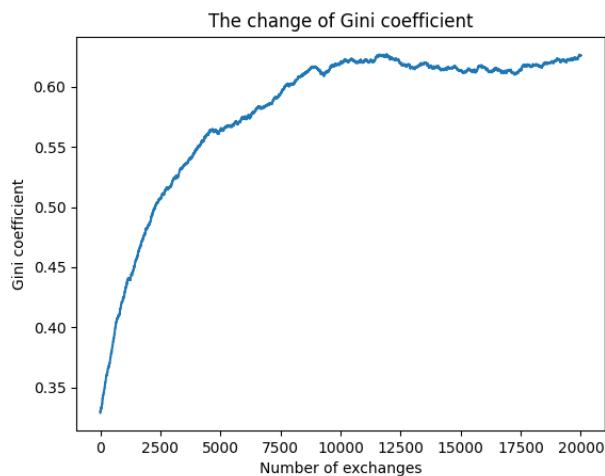


2.3 Uniformly-Distributed Initial Wealth

Uniform population, size=2000, mean=100.0, simulating 20000 steps

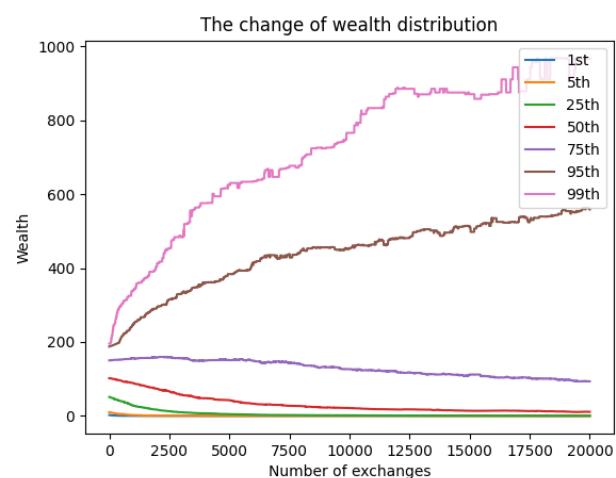
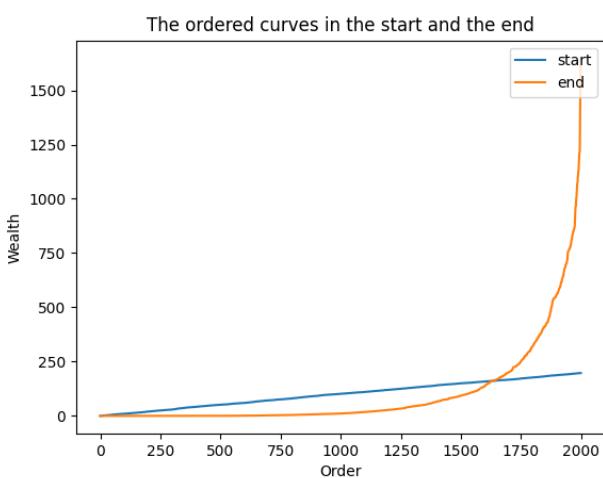
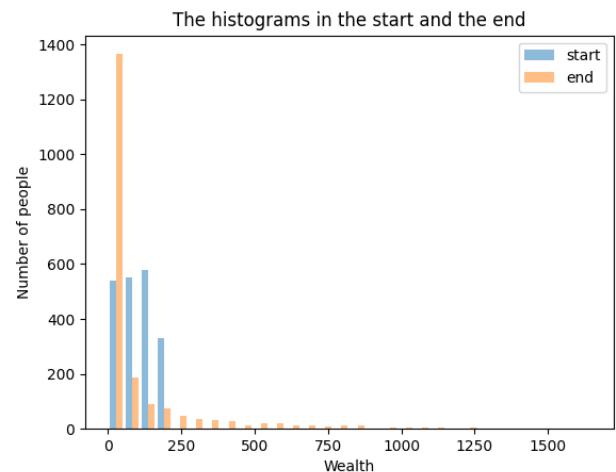
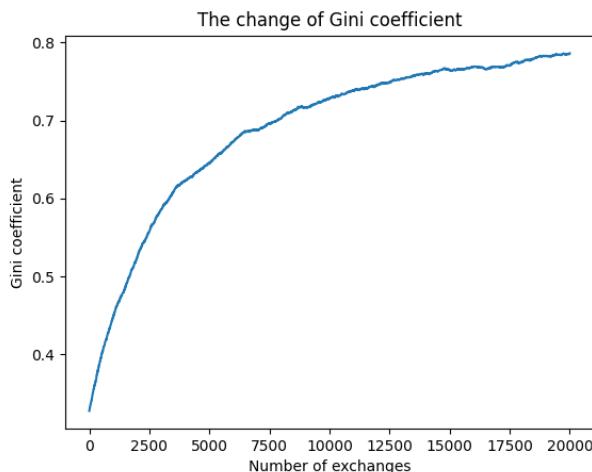
Exchange strategy: winner takes random proportion of wealth from the loser

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.02	1	9	52	99	150	187	195
2000	0.48	90.62	0	2	26	75	153	274	383
4000	0.55	106.81	0	1	17	63	151	310	459
6000	0.57	116.22	0	0	15	57	143	339	518
8000	0.60	125.44	0	0	13	52	143	358	586
10000	0.62	132.18	0	0	11	48	136	379	605
12000	0.62	132.40	0	0	10	45	141	376	620
14000	0.62	130.03	0	0	11	48	139	370	616
16000	0.62	129.10	0	0	11	49	139	385	591
18000	0.62	131.84	0	0	11	49	137	352	643
20000	0.63	133.99	0	0	10	46	137	374	633



Uniform population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 80% chance of winning

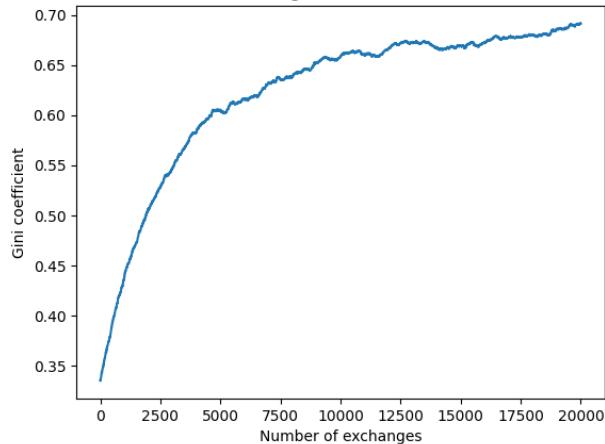
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	56.73	2	9	51	101	150	187	195
2000	0.52	99.82	0	0	16	73	158	294	412
4000	0.62	128.66	0	0	7	47	149	361	575
6000	0.67	144.44	0	0	3	33	148	414	634
8000	0.70	155.77	0	0	1	26	139	448	678
10000	0.73	167.29	0	0	1	21	126	454	765
12000	0.75	180.28	0	0	1	17	117	480	888
14000	0.76	187.87	0	0	0	15	112	496	885
16000	0.77	191.27	0	0	0	14	105	535	870
18000	0.78	196.59	0	0	0	12	100	539	912
20000	0.79	202.29	0	0	0	10	93	558	967



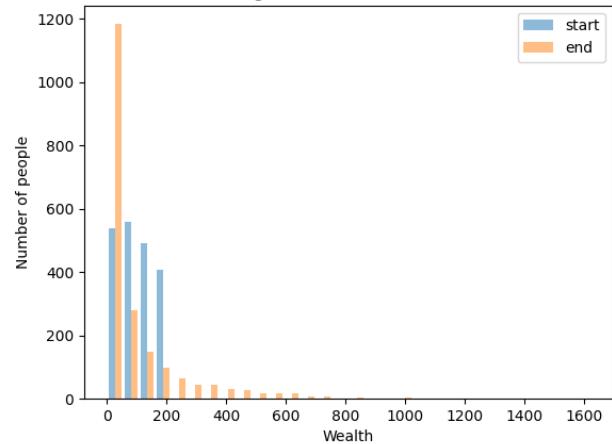
Uniform population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 60% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	58.15	2	12	49	98	152	189	196
2000	0.51	96.07	0	1	22	76	156	279	426
4000	0.58	116.41	0	0	11	57	148	341	476
6000	0.62	127.60	0	0	9	49	145	361	559
8000	0.64	135.41	0	0	7	44	138	389	597
10000	0.66	145.35	0	0	6	40	135	393	643
12000	0.67	148.63	0	0	6	35	134	398	646
14000	0.67	151.94	0	0	6	35	129	394	719
16000	0.67	151.98	0	0	6	36	126	401	725
18000	0.68	152.78	0	0	5	33	127	421	730
20000	0.69	160.64	0	0	5	32	120	444	741

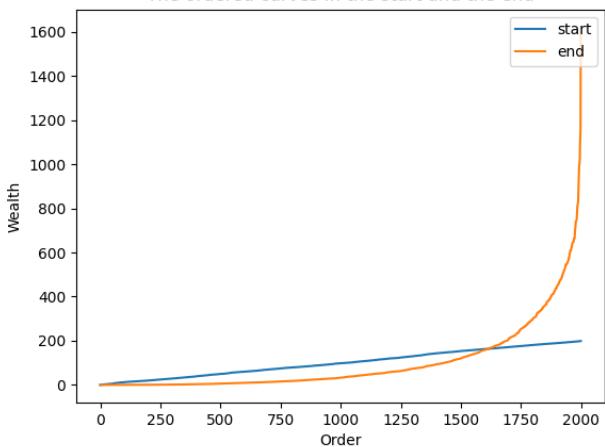
The change of Gini coefficient



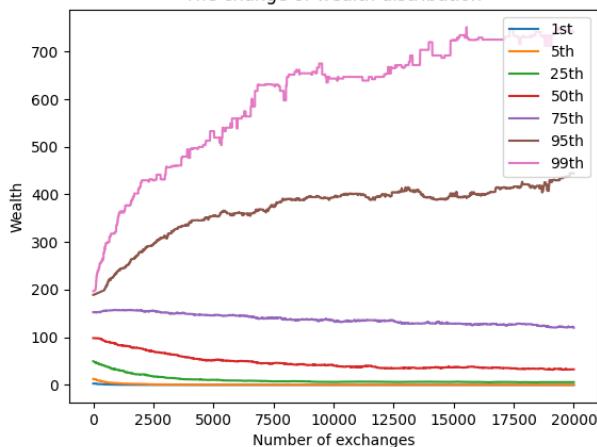
The histograms in the start and the end



The ordered curves in the start and the end

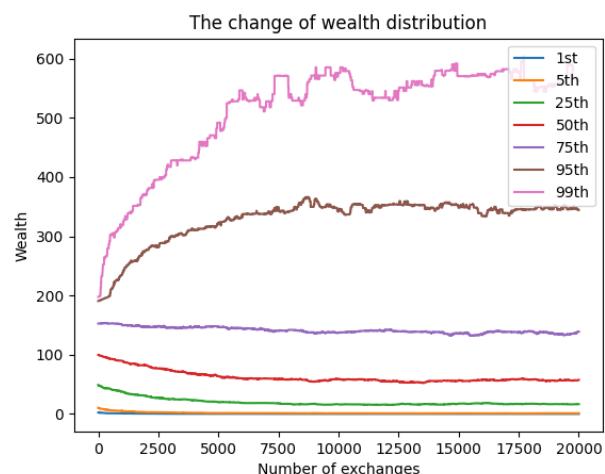
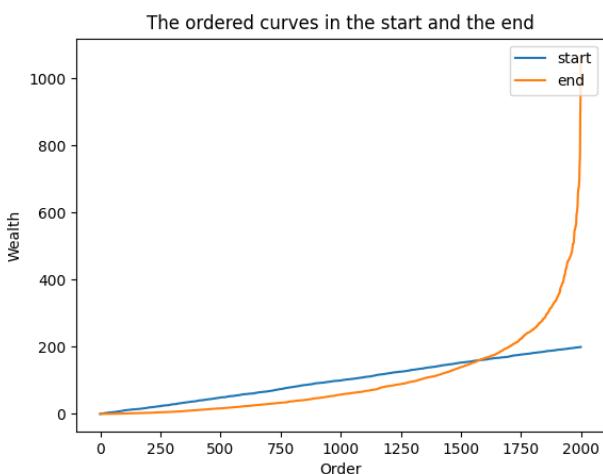
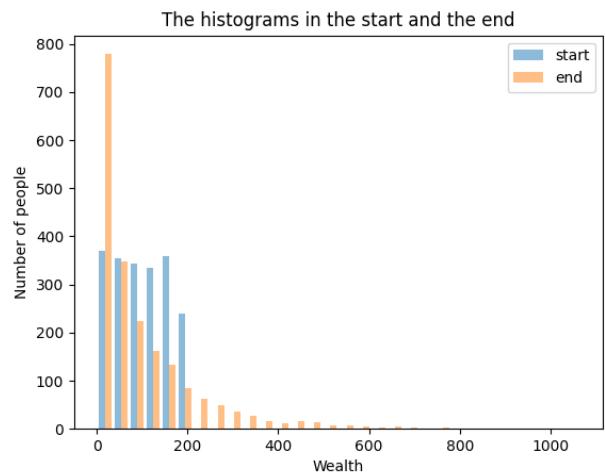
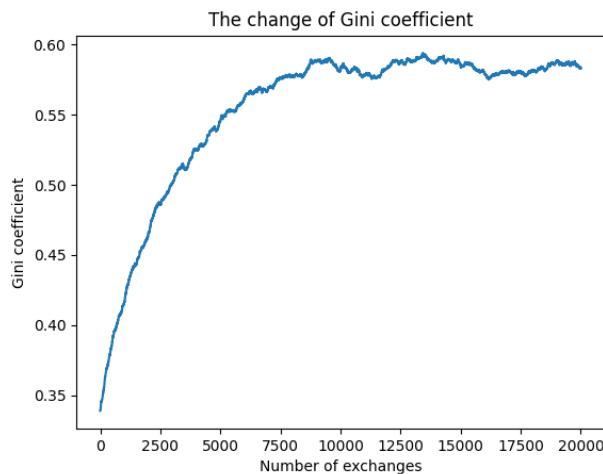


The change of wealth distribution



Uniform population, size=2000, mean=100.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 40% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	58.68	2	10	48	99	152	190	197
2000	0.47	86.49	0	2	30	82	146	277	371
4000	0.52	102.19	0	2	23	67	147	310	432
6000	0.56	115.73	0	1	18	59	144	336	546
8000	0.58	119.66	0	1	16	58	142	342	540
10000	0.58	121.64	0	1	16	58	137	343	575
12000	0.58	121.35	0	1	15	54	141	352	533
14000	0.59	124.79	0	0	16	55	138	344	572
16000	0.58	123.63	0	1	18	57	133	334	571
18000	0.58	122.38	0	0	16	58	139	345	562
20000	0.58	122.92	0	1	16	57	138	344	562

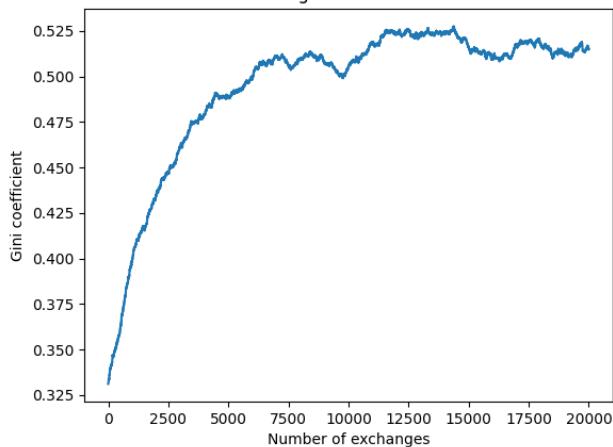


Uniform population, size=2000, mean=100.0, simulating 20000 steps

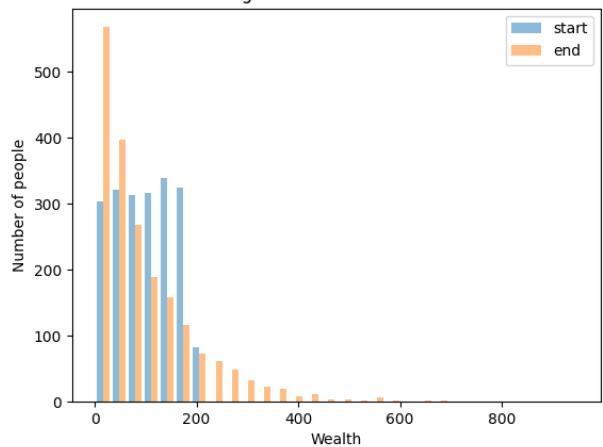
Exchange strategy: winner takes random proportion of wealth from the loser
however, the richer party has 20% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.37	2	9	49	100	149	188	196
2000	0.44	80.05	0	5	37	83	145	256	350
4000	0.48	91.74	0	4	30	72	143	282	396
6000	0.50	97.99	0	4	28	69	143	293	421
8000	0.51	102.55	0	4	27	69	141	294	493
10000	0.51	100.57	0	3	27	70	140	296	469
12000	0.52	107.76	0	3	25	67	134	303	507
14000	0.52	107.29	0	2	25	66	134	317	505
16000	0.51	103.50	0	3	26	70	135	303	480
18000	0.52	105.48	0	3	25	67	137	311	464
20000	0.51	104.08	0	4	26	66	143	305	474

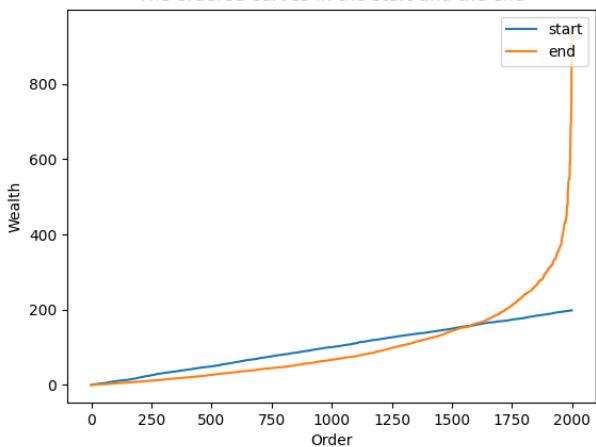
The change of Gini coefficient



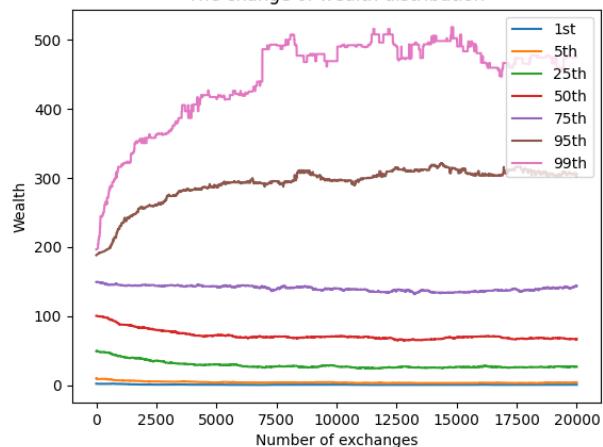
The histograms in the start and the end



The ordered curves in the start and the end



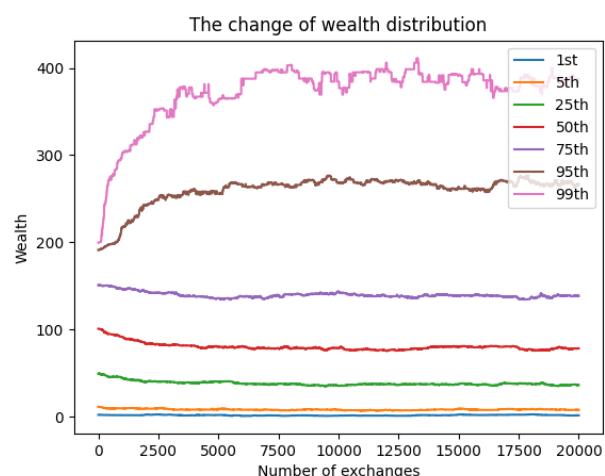
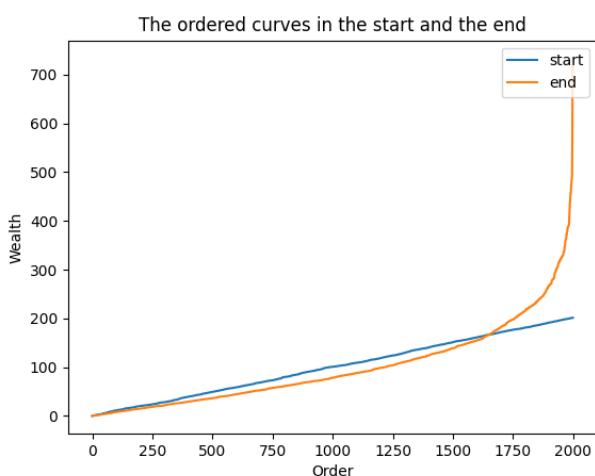
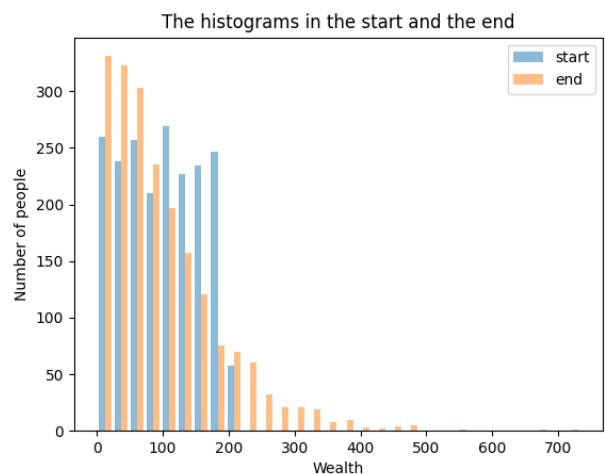
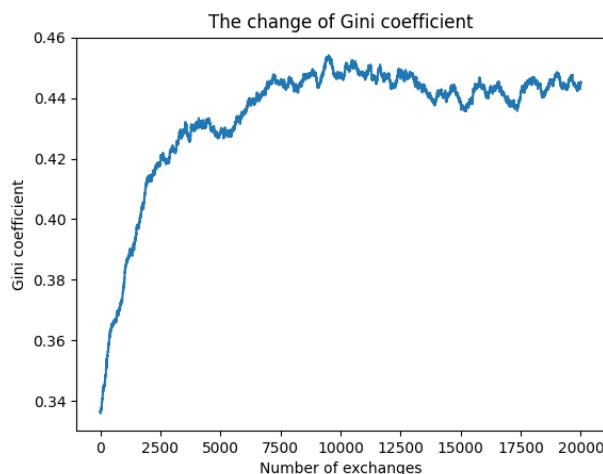
The change of wealth distribution



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes random proportion of wealth from the loser
however, the richer party has 0% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	58.32	2	11	49	100	150	191	199
2000	0.41	77.71	2	9	40	83	143	242	327
4000	0.43	81.58	1	8	38	81	138	260	367
6000	0.44	83.50	0	7	38	80	137	266	387
8000	0.44	86.00	1	7	37	78	140	263	403
10000	0.45	85.91	1	8	35	78	143	267	384
12000	0.45	86.89	1	7	37	75	138	270	406
14000	0.44	84.70	1	7	37	80	138	265	384
16000	0.44	87.11	1	7	36	79	139	261	392
18000	0.45	86.68	2	8	37	77	136	269	389
20000	0.45	85.76	1	7	36	78	138	267	387

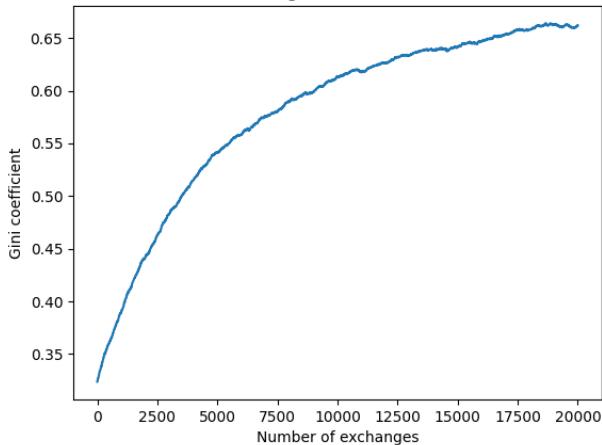


Uniform population, size=2000, mean=100.0, simulating 20000 steps

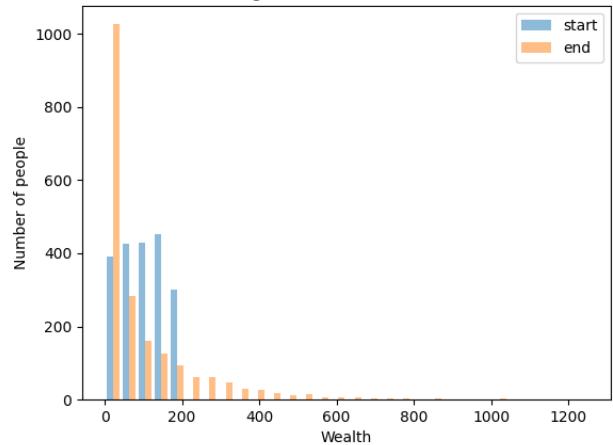
Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.32	56.08	1	10	52	100	148	186	194
2000	0.44	79.74	0	4	32	83	154	250	322
4000	0.51	96.95	0	2	21	68	155	300	402
6000	0.56	109.29	0	1	16	59	151	325	458
8000	0.59	117.92	0	0	13	53	147	345	489
10000	0.61	125.40	0	0	10	47	143	363	541
12000	0.63	130.03	0	0	9	45	141	379	551
14000	0.64	136.79	0	0	8	43	139	381	648
16000	0.65	142.08	0	0	7	44	132	394	656
18000	0.66	146.22	0	0	6	39	133	397	695
20000	0.66	148.81	0	0	6	37	135	388	694

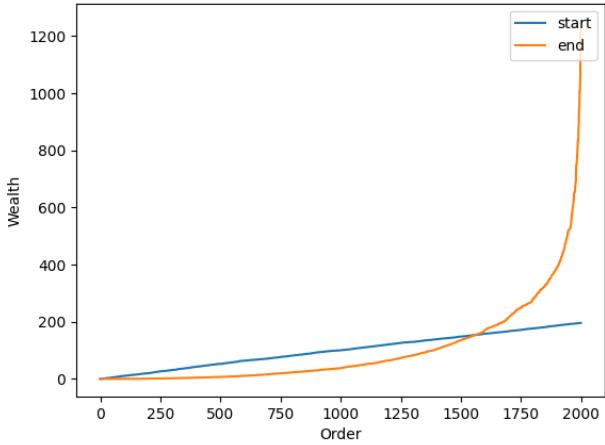
The change of Gini coefficient



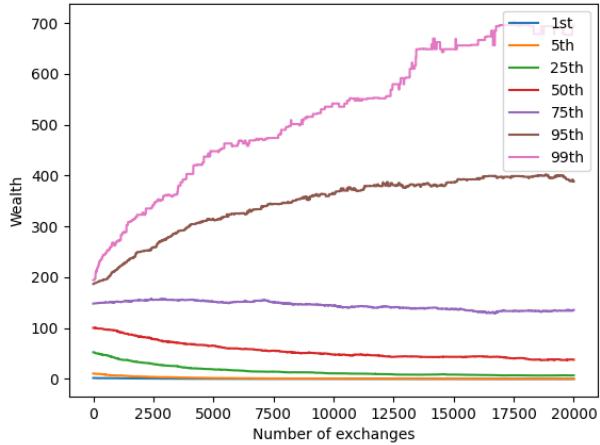
The histograms in the start and the end



The ordered curves in the start and the end



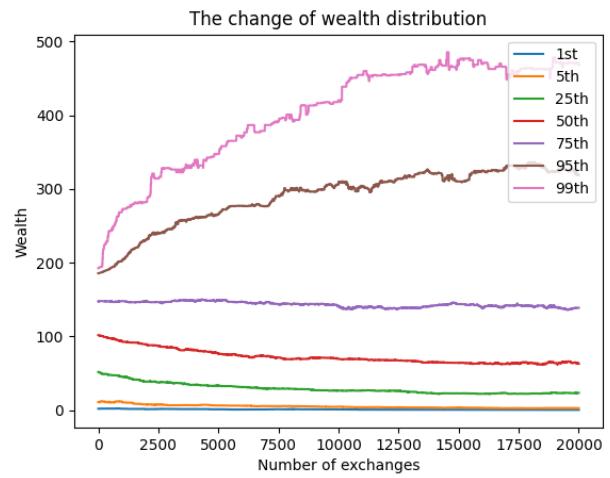
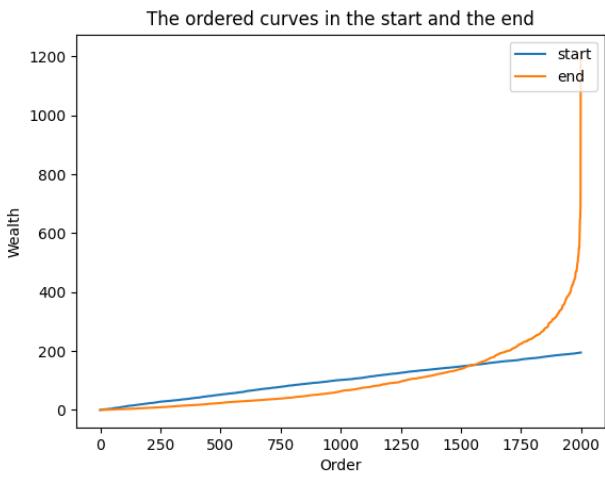
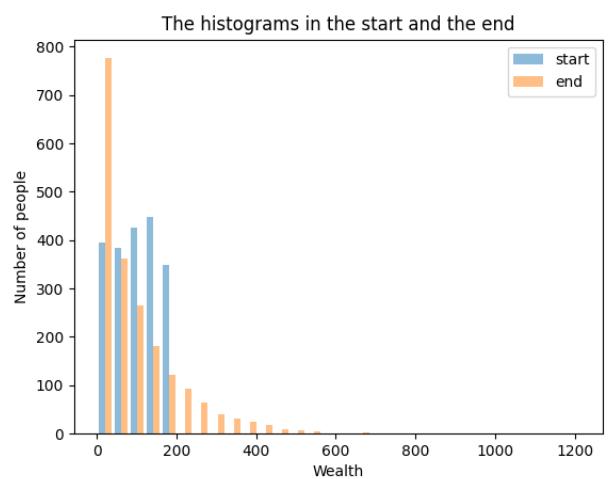
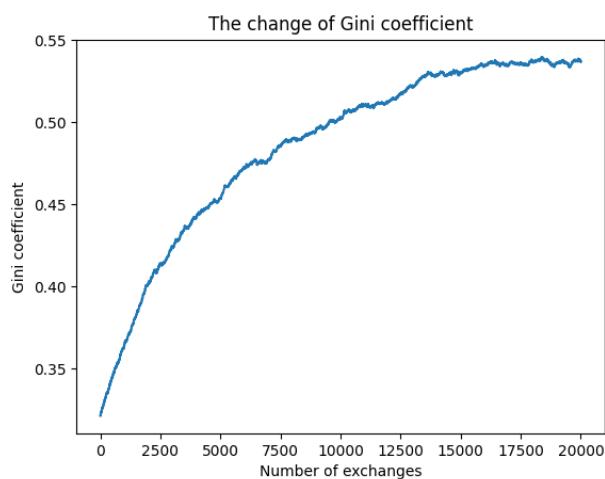
The change of wealth distribution



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 60% chance of winning

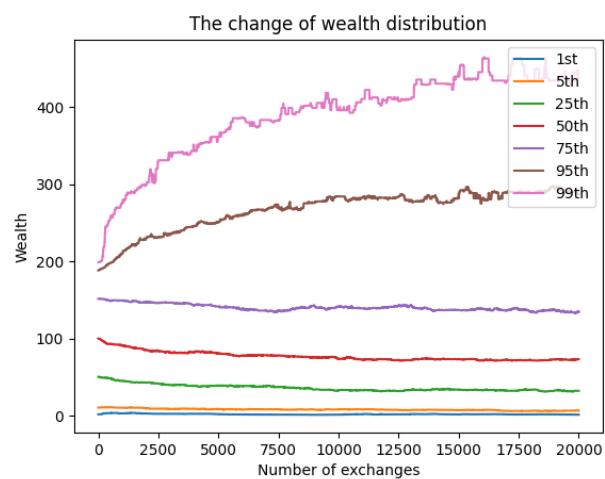
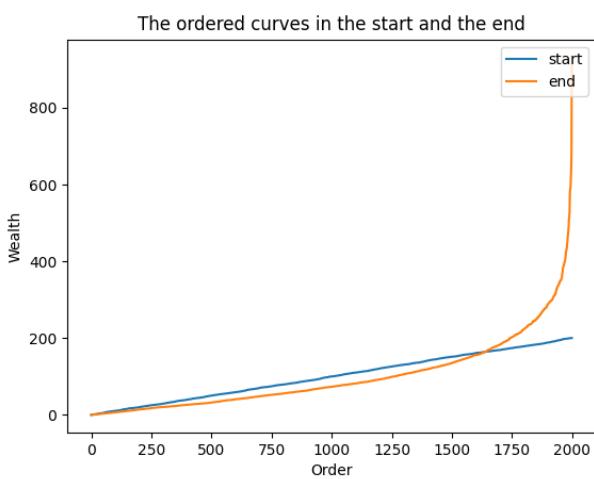
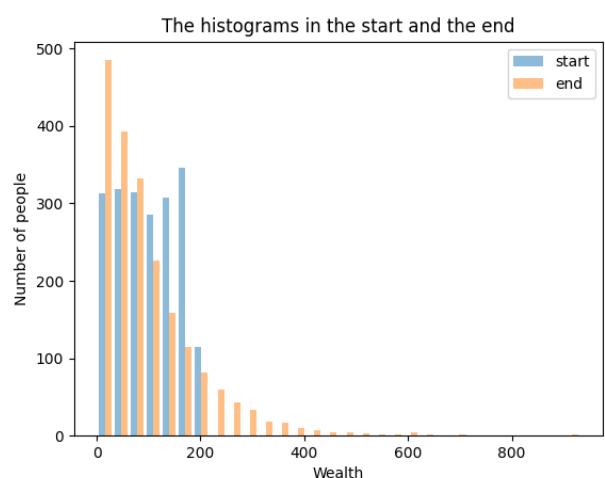
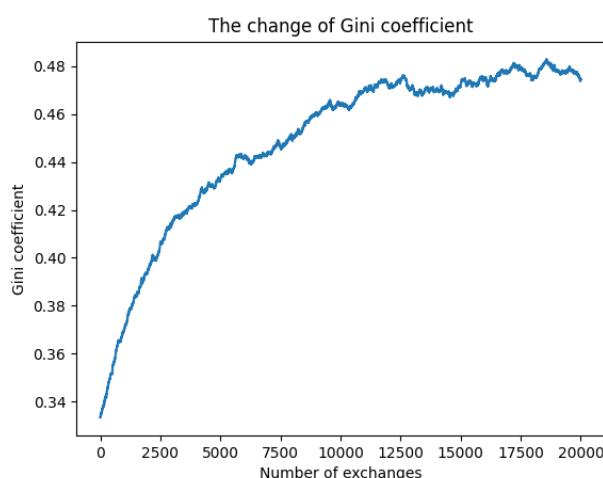
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.32	55.69	1	10	51	101	147	185	192
2000	0.40	72.22	1	7	38	88	147	231	282
4000	0.44	81.02	1	6	34	81	148	260	334
6000	0.47	88.88	0	6	31	73	146	276	371
8000	0.49	93.94	1	5	29	68	144	298	400
10000	0.50	97.77	1	4	26	69	140	309	420
12000	0.51	100.80	0	3	26	67	137	309	454
14000	0.53	104.65	0	3	22	64	142	320	461
16000	0.54	106.28	0	3	22	63	138	324	469
18000	0.54	107.62	0	2	22	64	140	334	463
20000	0.54	108.23	0	2	23	63	138	318	467



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 50% chance of winning

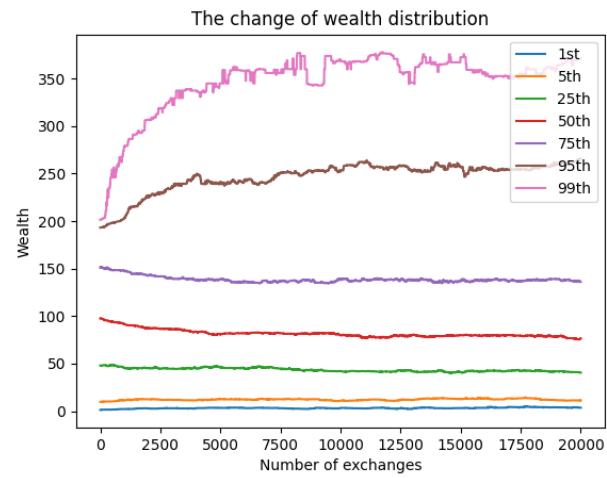
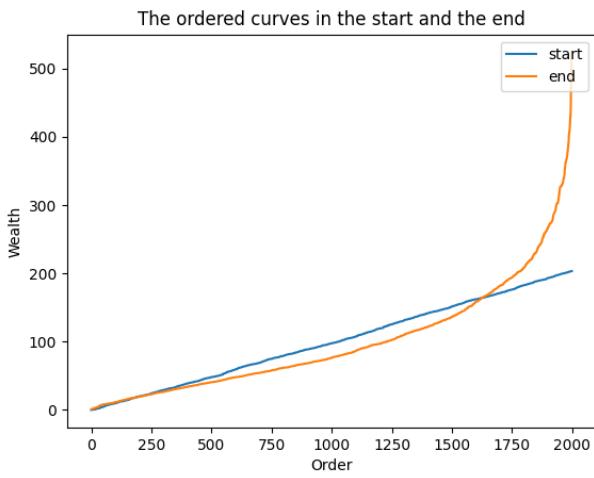
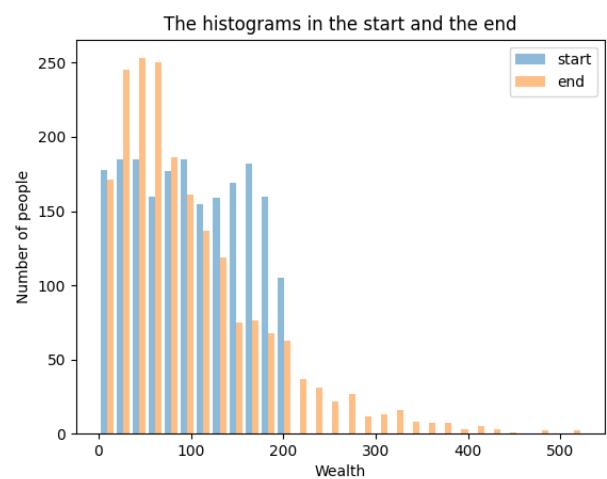
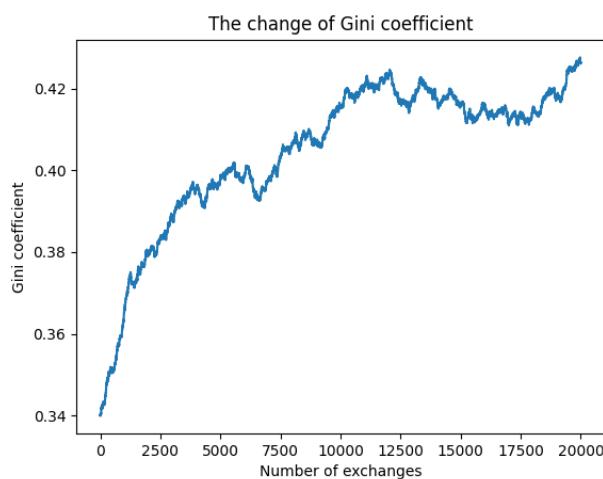
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.73	1	10	50	100	151	188	198
2000	0.40	71.67	2	9	43	85	147	229	299
4000	0.42	78.49	2	9	38	81	143	246	344
6000	0.44	84.76	1	7	38	77	138	260	386
8000	0.45	86.92	1	7	36	76	137	268	399
10000	0.46	90.66	1	8	32	73	141	284	396
12000	0.47	92.66	1	7	32	73	140	282	405
14000	0.47	92.76	2	7	34	73	135	283	435
16000	0.47	94.31	1	7	33	71	138	281	463
18000	0.47	94.70	1	6	33	72	134	288	434
20000	0.47	95.29	1	6	32	73	134	287	437



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
with the loser resisting the loss of wealth at Lvl. 2
the richer party has 40% chance of winning

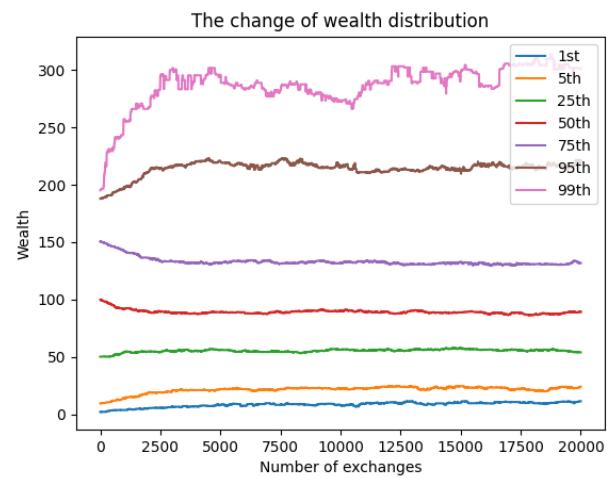
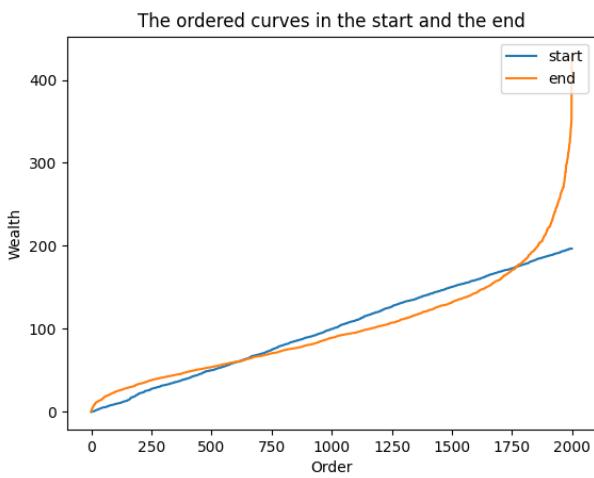
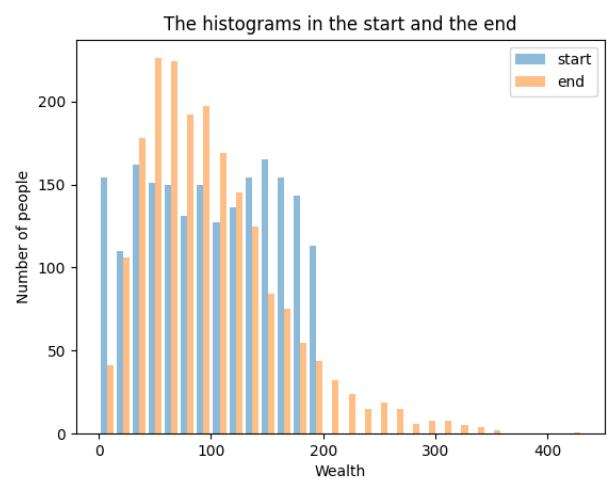
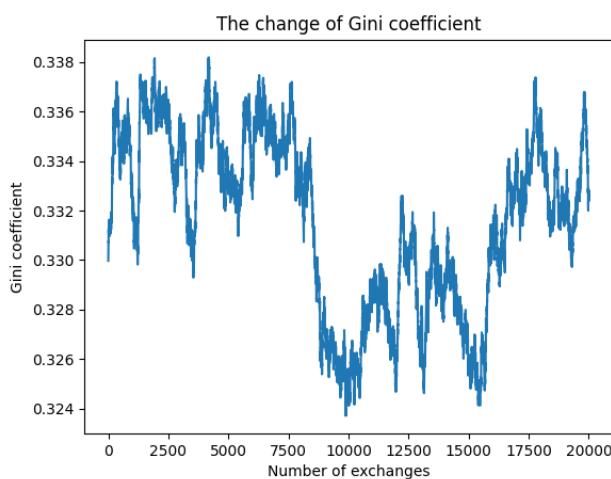
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	58.91	1	9	48	97	151	193	201
2000	0.38	68.82	2	12	45	87	142	226	306
4000	0.40	73.88	3	11	45	83	138	248	337
6000	0.40	75.27	3	12	45	82	136	243	357
8000	0.41	77.05	2	12	43	81	137	250	359
10000	0.42	79.11	3	11	42	79	139	252	369
12000	0.42	81.18	3	11	41	77	138	254	376
14000	0.42	79.58	3	13	41	79	135	261	364
16000	0.42	78.83	3	13	41	79	136	256	356
18000	0.41	78.59	4	13	41	79	138	255	359
20000	0.43	81.37	3	11	40	76	136	265	370



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 20% chance of winning

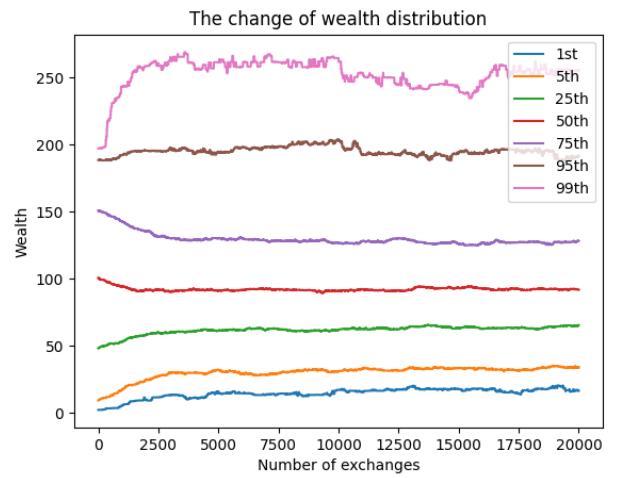
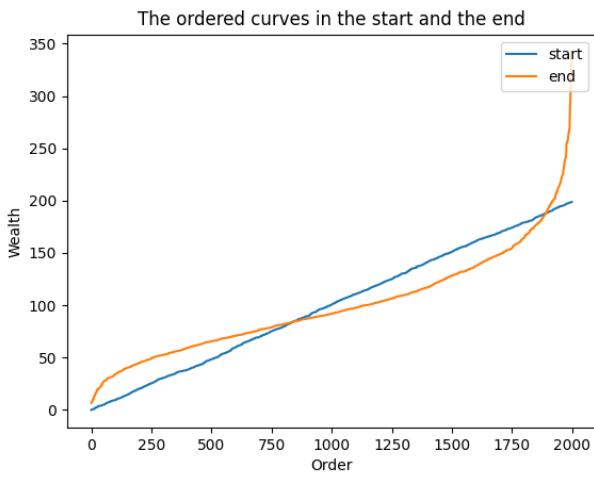
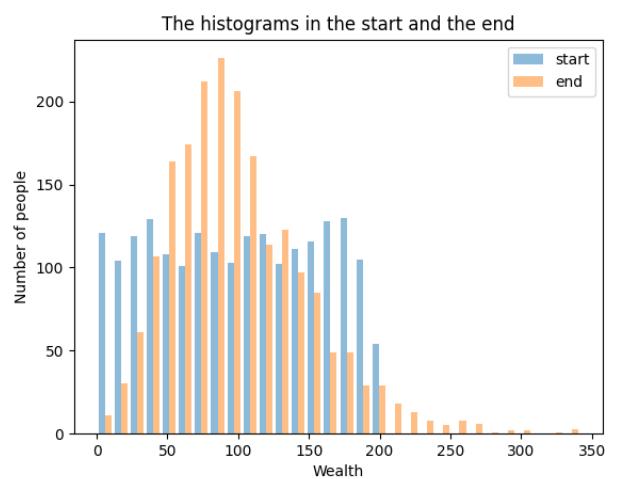
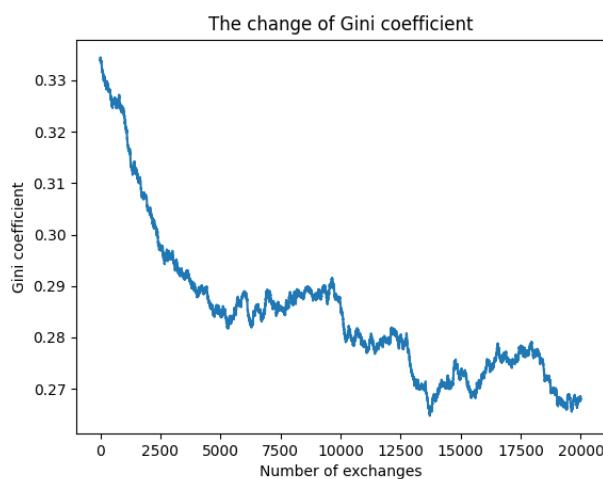
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.16	2	9	50	99	150	187	195
2000	0.34	60.82	5	18	54	89	136	211	267
4000	0.34	61.85	6	20	55	87	131	220	295
6000	0.33	60.93	7	21	55	88	133	216	283
8000	0.33	61.42	8	22	54	89	131	218	287
10000	0.32	59.39	7	22	56	90	131	214	272
12000	0.33	60.02	10	24	56	88	131	211	287
14000	0.33	61.43	9	24	56	88	131	214	296
16000	0.33	62.07	9	22	56	88	131	218	285
18000	0.34	62.64	10	21	55	86	130	216	304
20000	0.33	61.61	11	24	53	89	131	221	300



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
with the loser resisting the loss of wealth at Lvl. 2
the richer party has 0% chance of winning

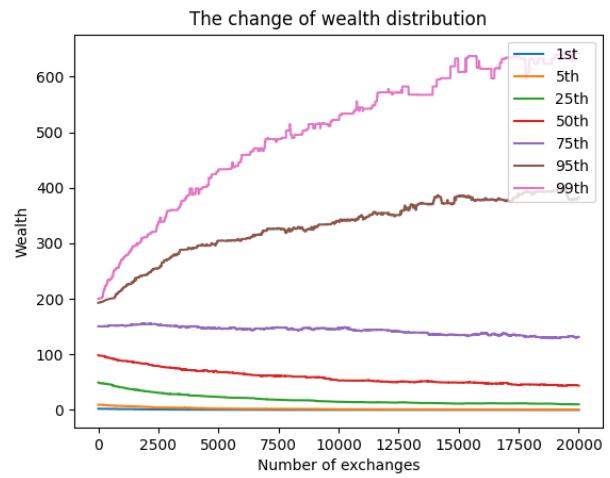
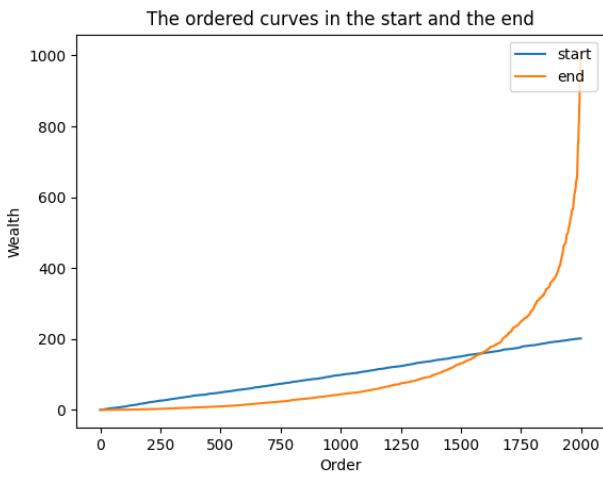
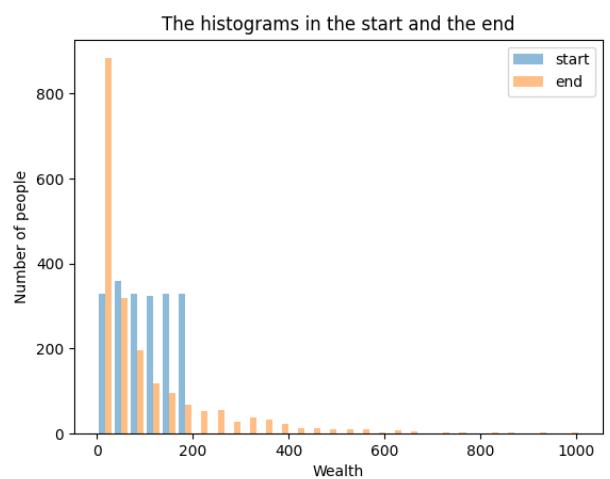
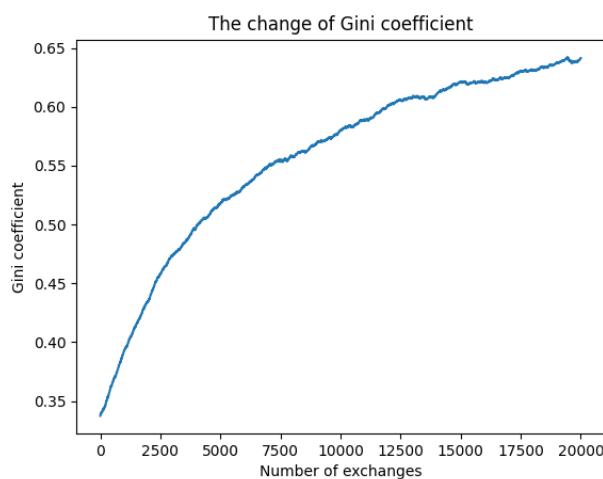
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.83	2	9	48	100	150	188	197
2000	0.31	54.85	10	25	58	91	135	195	258
4000	0.29	52.65	11	30	61	92	129	193	259
6000	0.29	52.76	14	29	61	91	130	197	258
8000	0.29	52.30	14	31	61	91	128	200	257
10000	0.29	52.46	17	31	62	91	126	203	264
12000	0.28	51.27	18	31	63	90	128	193	250
14000	0.27	48.96	18	34	65	92	126	192	244
16000	0.27	49.79	18	33	62	92	127	193	243
18000	0.28	50.98	16	32	63	92	127	195	253
20000	0.27	49.11	16	34	65	91	128	191	255



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	58.48	2	9	49	98	150	192	200
2000	0.44	78.34	1	5	33	83	154	243	311
4000	0.50	94.95	0	3	25	71	150	291	389
6000	0.53	104.80	0	2	21	65	145	307	459
8000	0.56	111.64	0	1	17	61	146	322	503
10000	0.58	116.81	0	1	14	53	147	340	522
12000	0.60	124.67	0	1	13	50	143	354	571
14000	0.61	129.26	0	0	12	50	136	381	582
16000	0.62	132.67	0	0	11	48	137	378	614
18000	0.63	136.39	0	0	11	45	132	392	632
20000	0.64	140.59	0	0	10	43	131	383	642

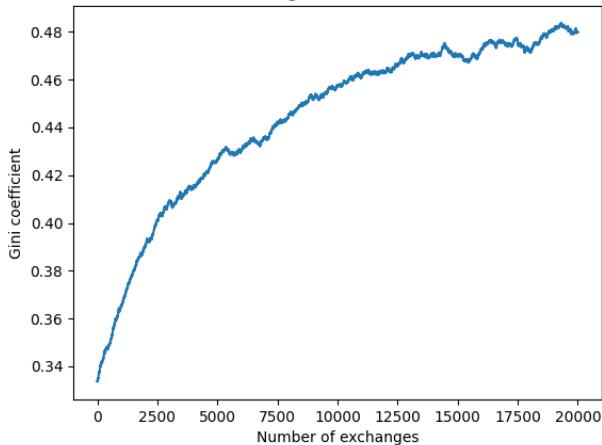


Uniform population, size=2000, mean=100.0, simulating 20000 steps

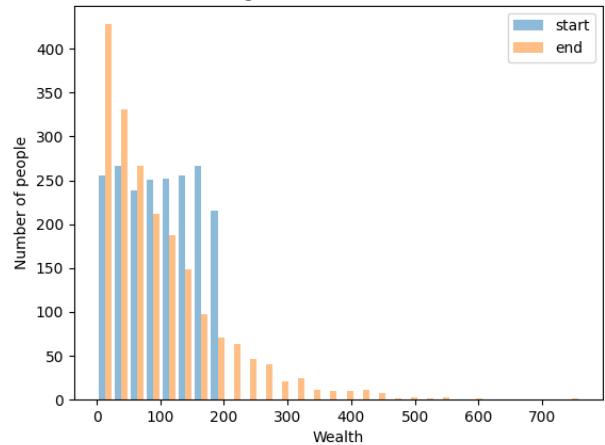
Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 60% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.83	1	9	48	99	150	189	197
2000	0.39	70.23	1	10	44	86	144	230	298
4000	0.41	77.49	2	9	41	82	139	242	354
6000	0.43	81.47	2	9	37	81	138	253	357
8000	0.45	85.15	2	9	36	77	138	277	379
10000	0.46	87.87	1	6	35	74	141	277	403
12000	0.46	89.76	2	7	34	72	141	283	412
14000	0.47	92.11	2	7	32	73	138	286	430
16000	0.47	91.22	1	7	31	72	143	289	411
18000	0.47	91.08	1	6	32	72	142	281	414
20000	0.48	93.56	0	6	30	73	140	283	429

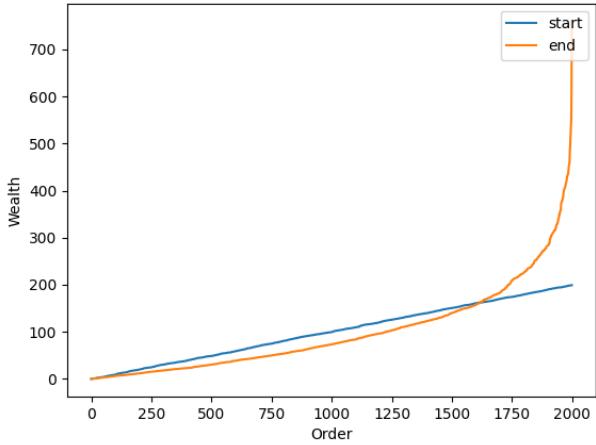
The change of Gini coefficient



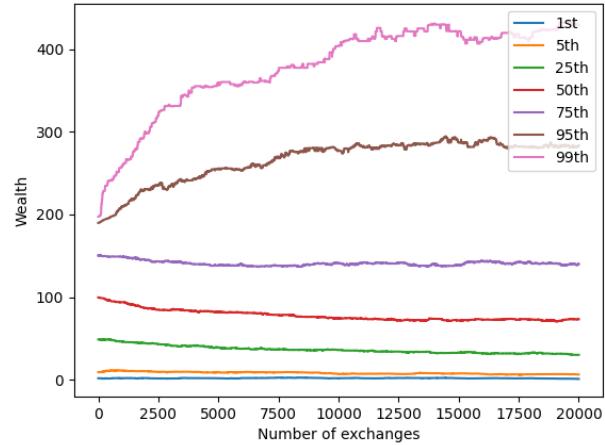
The histograms in the start and the end



The ordered curves in the start and the end



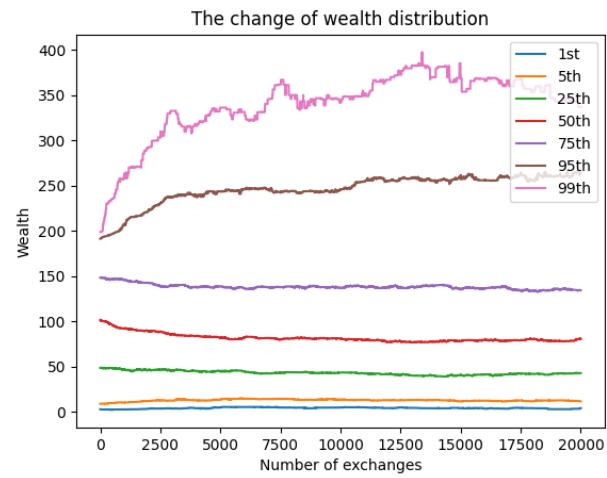
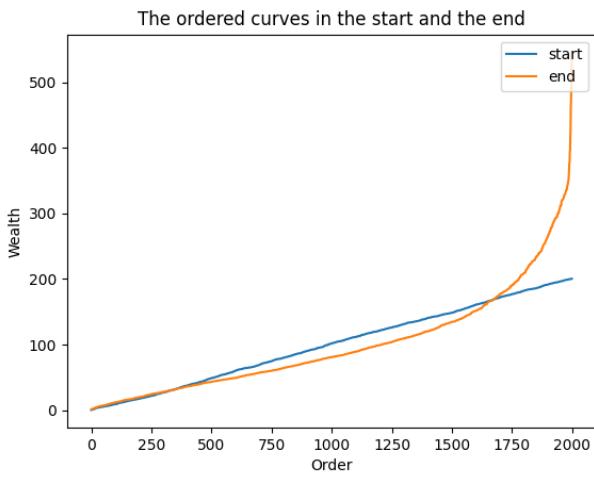
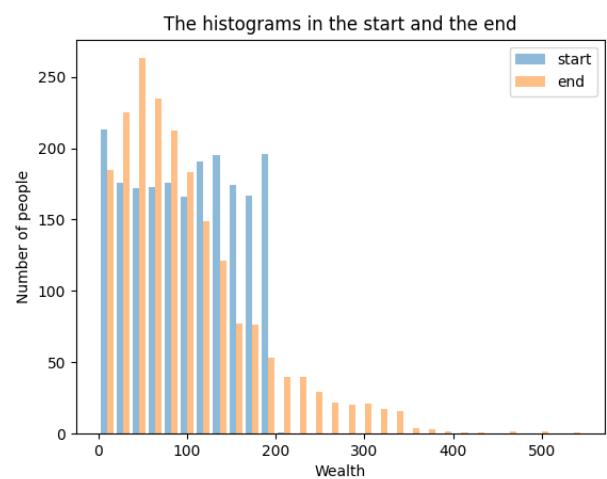
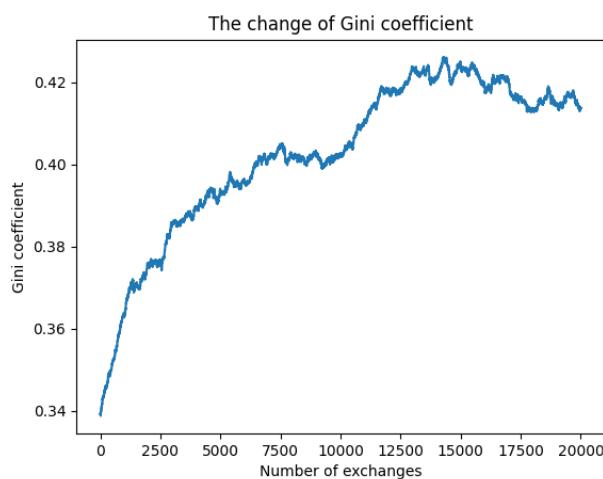
The change of wealth distribution



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 50% chance of winning

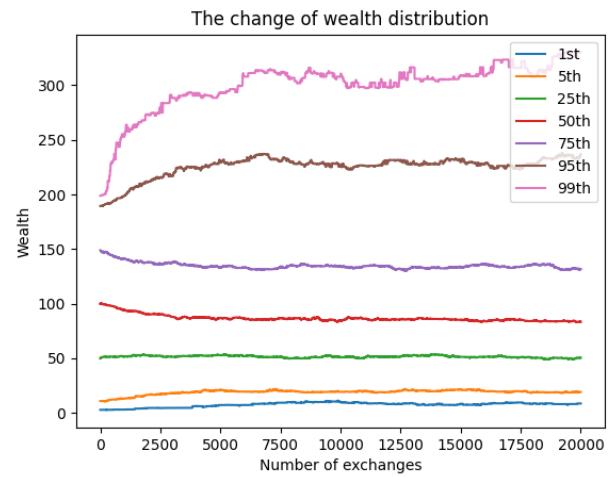
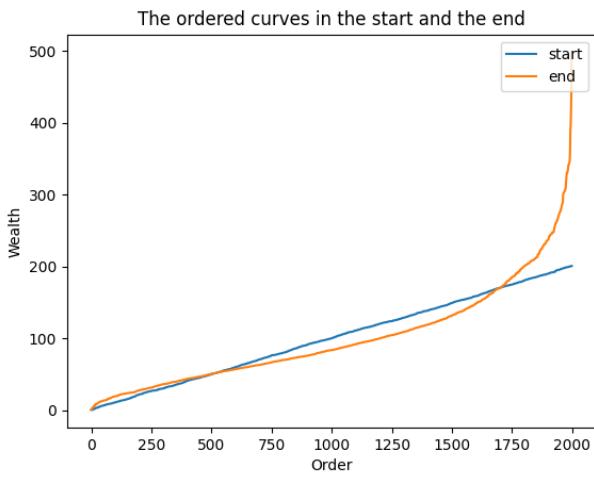
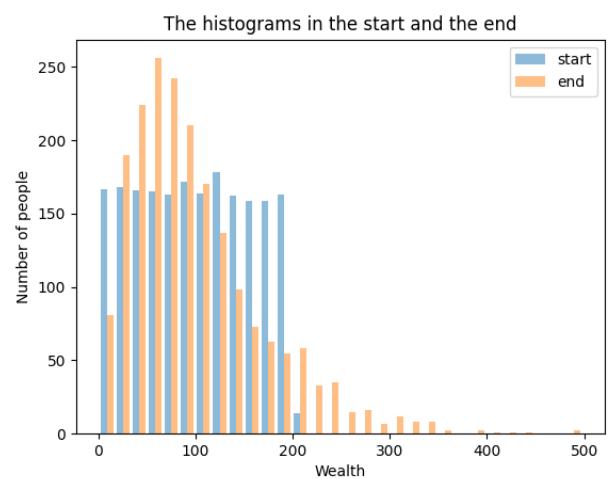
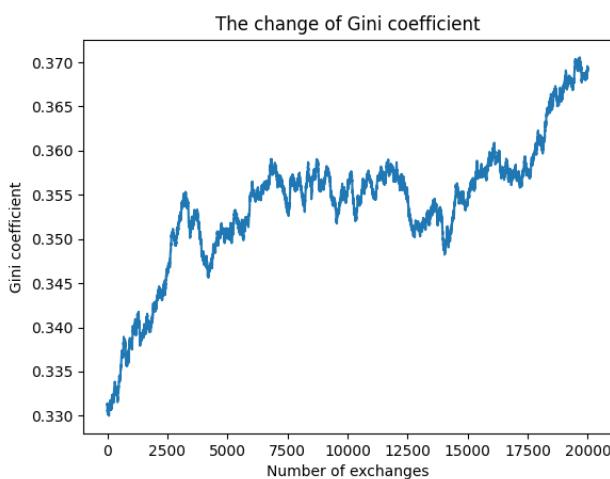
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	58.76	3	9	48	101	148	191	198
2000	0.38	67.90	3	12	46	89	142	222	292
4000	0.39	72.73	4	12	45	84	138	237	316
6000	0.40	74.89	5	14	44	82	136	246	331
8000	0.40	75.69	5	14	44	81	138	244	350
10000	0.40	75.87	5	13	43	81	137	245	343
12000	0.42	79.61	4	13	41	77	138	255	367
14000	0.42	80.22	4	13	39	77	140	253	379
16000	0.42	80.17	3	12	41	79	137	256	367
18000	0.41	78.83	4	12	42	80	134	256	355
20000	0.41	78.49	4	11	43	80	134	264	337



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 40% chance of winning

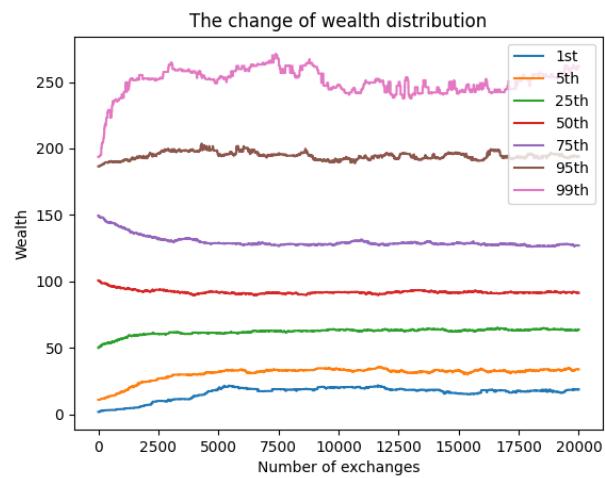
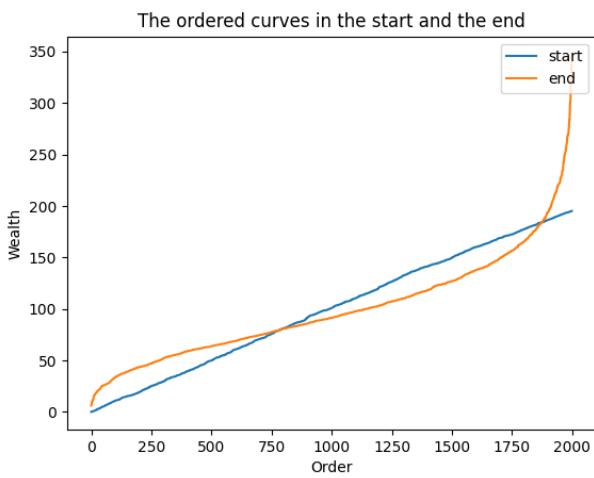
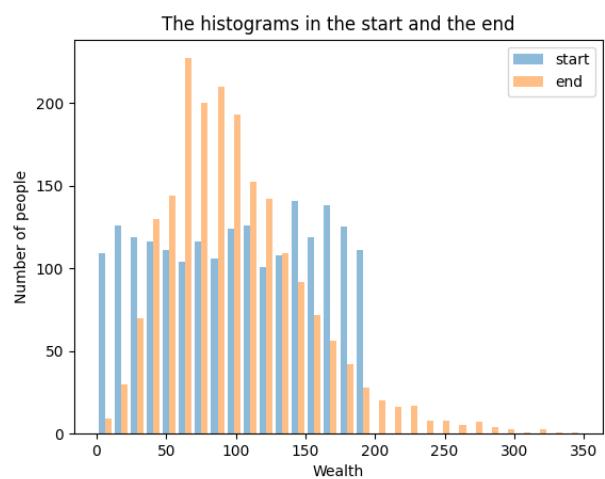
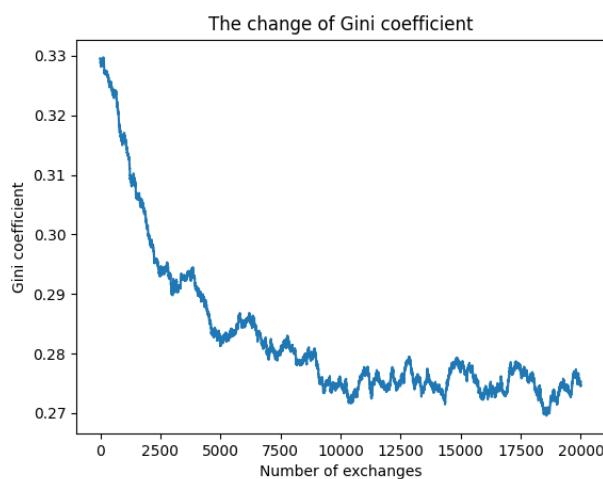
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.38	2	10	49	99	148	189	198
2000	0.34	61.42	4	16	52	90	137	211	272
4000	0.35	63.67	6	19	52	87	134	224	292
6000	0.35	66.09	7	19	51	86	132	230	307
8000	0.36	66.68	9	20	49	86	134	230	306
10000	0.36	65.91	9	19	50	84	133	225	307
12000	0.36	65.92	8	19	51	85	134	230	297
14000	0.35	65.01	7	19	53	86	132	227	303
16000	0.36	67.03	8	19	51	83	136	228	308
18000	0.36	67.35	8	18	50	84	135	228	307
20000	0.37	69.57	8	19	50	83	131	236	330



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 20% chance of winning

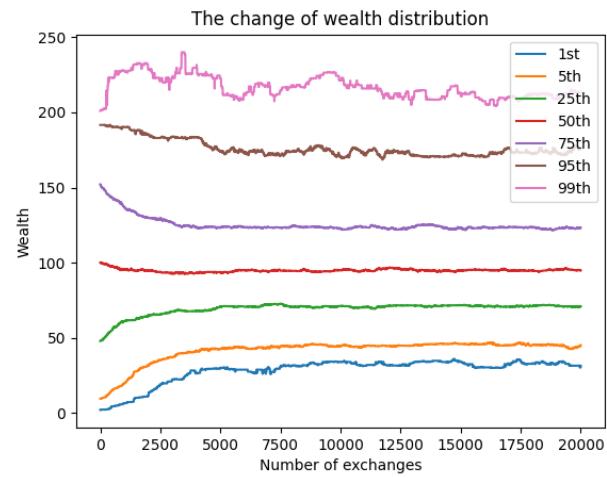
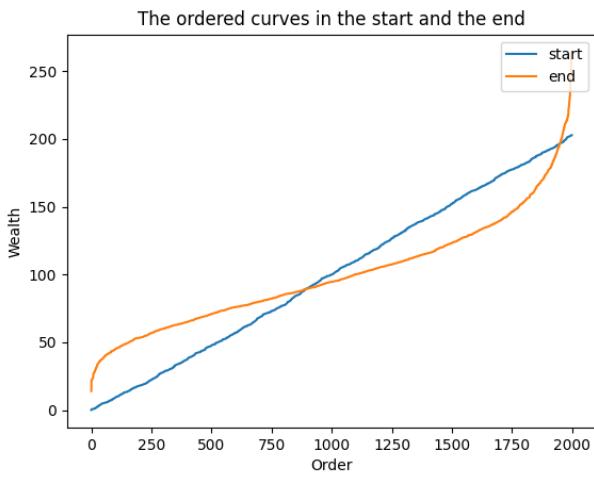
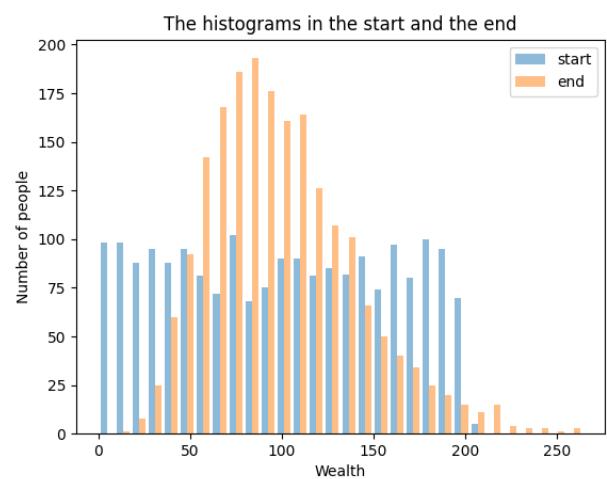
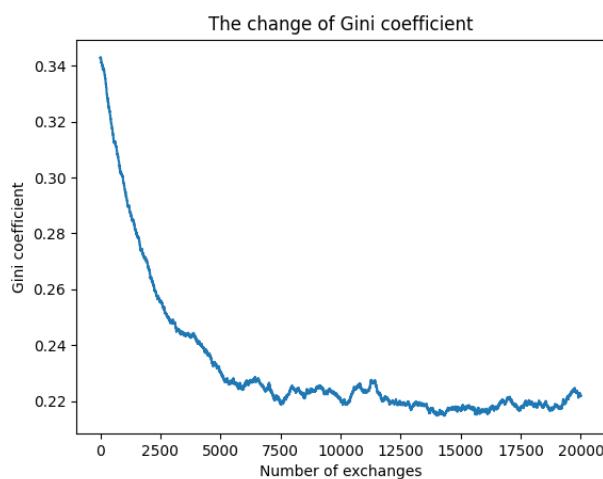
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.33	57.10	1	11	50	100	149	186	193
2000	0.30	53.94	6	24	60	92	134	193	252
4000	0.29	52.91	13	30	61	89	131	197	258
6000	0.28	52.09	19	33	61	91	127	197	262
8000	0.28	51.30	18	33	62	91	128	194	256
10000	0.28	50.05	19	34	63	91	128	190	248
12000	0.27	49.82	19	34	63	91	128	196	242
14000	0.27	49.86	18	33	64	92	128	193	242
16000	0.27	49.65	18	33	63	91	128	190	249
18000	0.28	50.44	17	33	63	91	126	195	252
20000	0.27	50.62	18	33	63	91	127	193	261



Uniform population, size=2000, mean=100.0, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 0% chance of winning

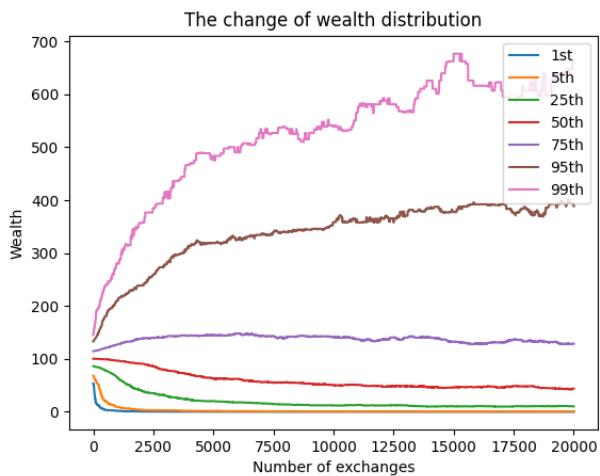
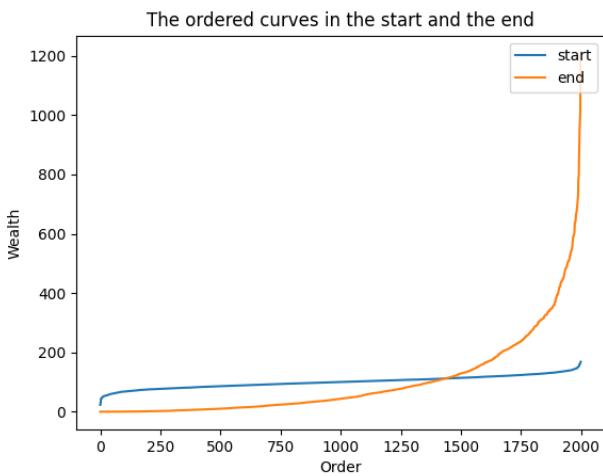
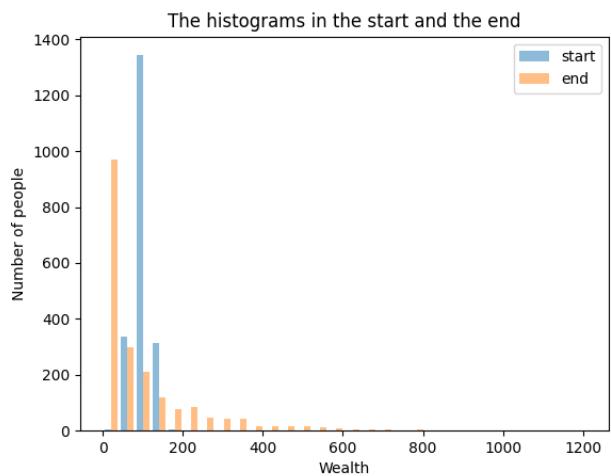
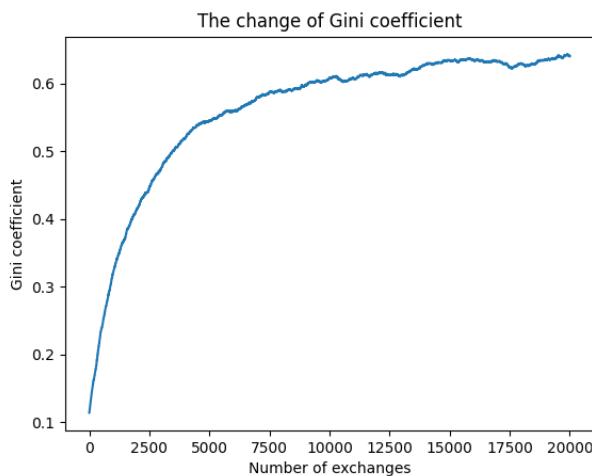
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.34	59.37	1	9	47	100	152	191	201
2000	0.27	47.75	11	31	64	94	129	184	228
4000	0.24	44.07	26	41	67	93	123	183	229
6000	0.23	40.77	28	43	70	95	123	172	212
8000	0.23	40.68	31	43	70	94	124	173	218
10000	0.22	40.15	33	44	71	95	122	170	221
12000	0.22	39.80	31	44	71	96	122	173	212
14000	0.22	38.70	34	45	71	94	124	170	208
16000	0.22	38.70	30	45	70	95	123	170	207
18000	0.22	39.43	33	45	71	94	123	172	212
20000	0.22	40.09	31	45	70	94	123	175	213



2.4 Normally-Distributed Initial Wealth

Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser

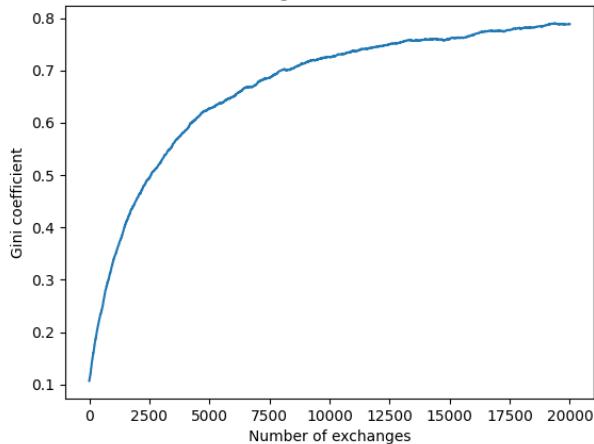
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.22	53	68	86	100	114	132	145
2000	0.42	78.09	0	3	40	91	138	238	356
4000	0.52	102.51	0	1	22	70	144	313	466
6000	0.56	112.76	0	1	17	62	147	325	500
8000	0.59	121.55	0	0	13	55	140	339	537
10000	0.61	126.64	0	0	11	50	141	358	538
12000	0.61	131.69	0	0	11	48	136	364	586
14000	0.63	136.24	0	0	9	46	140	384	625
16000	0.64	140.84	0	0	10	46	129	392	616
18000	0.63	137.27	0	0	10	48	132	385	606
20000	0.64	142.29	0	0	10	43	128	388	664



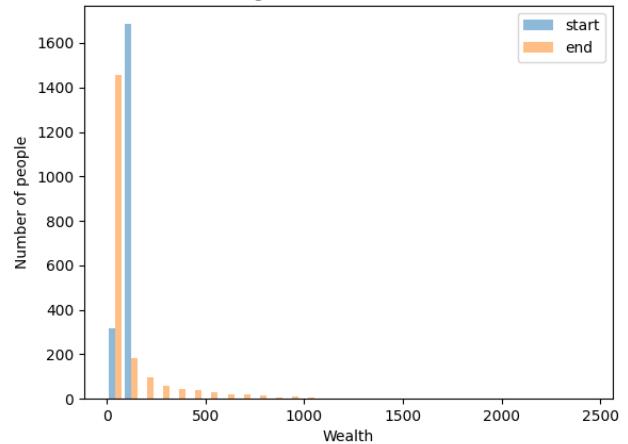
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.12	56	69	88	101	114	132	145
2000	0.46	87.25	0	1	30	89	142	266	371
4000	0.58	118.85	0	0	11	59	152	334	526
6000	0.65	138.96	0	0	4	43	143	403	619
8000	0.70	158.74	0	0	2	28	135	439	667
10000	0.73	171.98	0	0	1	24	124	478	778
12000	0.75	183.61	0	0	1	18	119	488	913
14000	0.76	192.41	0	0	0	17	110	498	881
16000	0.77	201.99	0	0	0	15	109	497	964
18000	0.78	204.40	0	0	0	11	104	519	950
20000	0.79	210.70	0	0	0	9	99	529	969

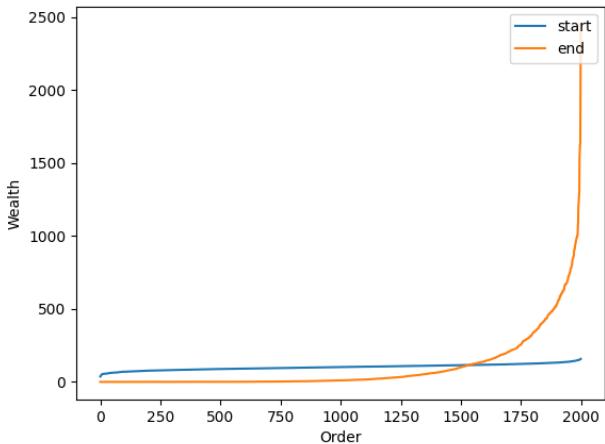
The change of Gini coefficient



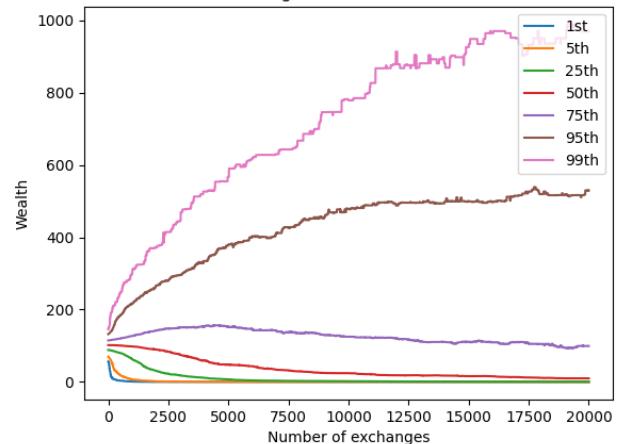
The histograms in the start and the end



The ordered curves in the start and the end

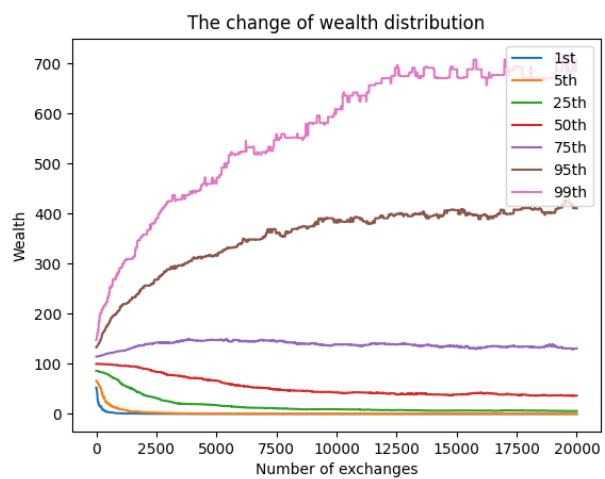
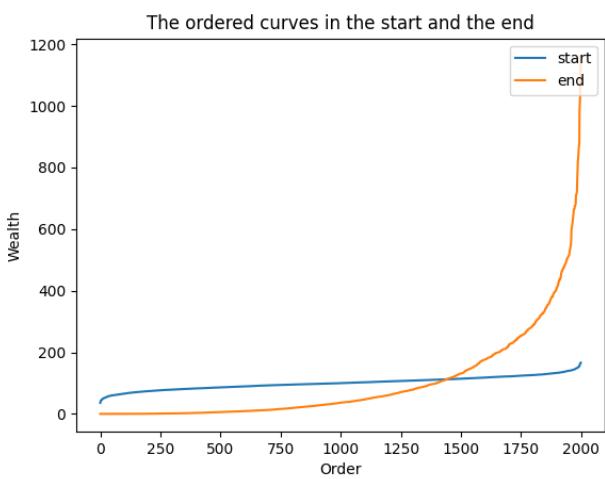
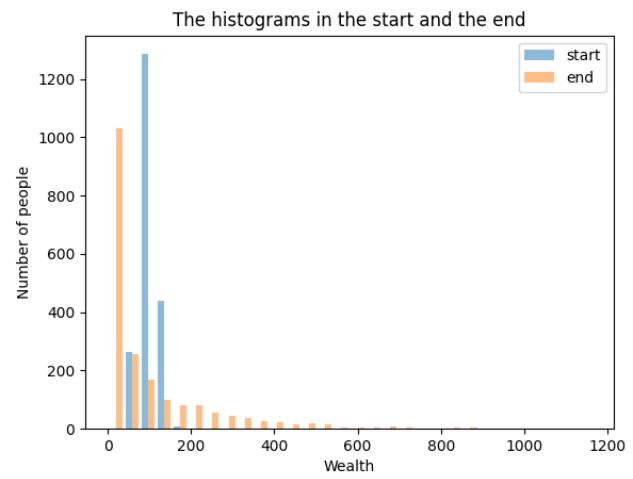
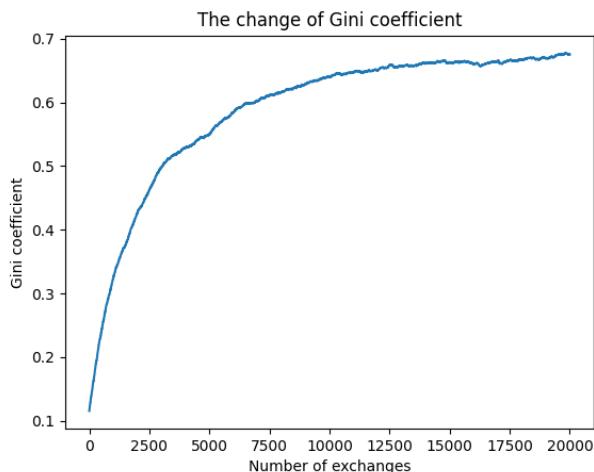


The change of wealth distribution



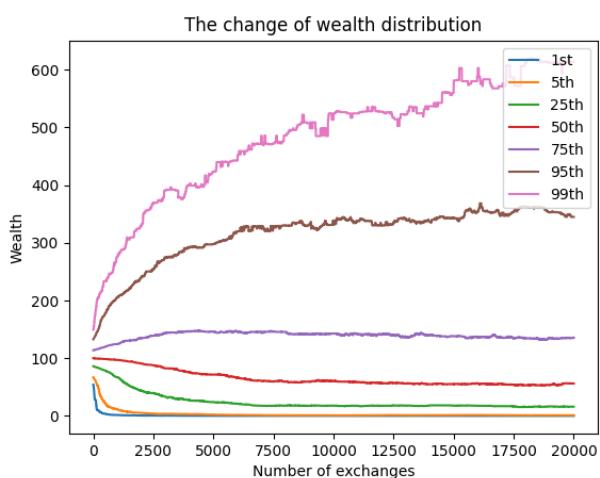
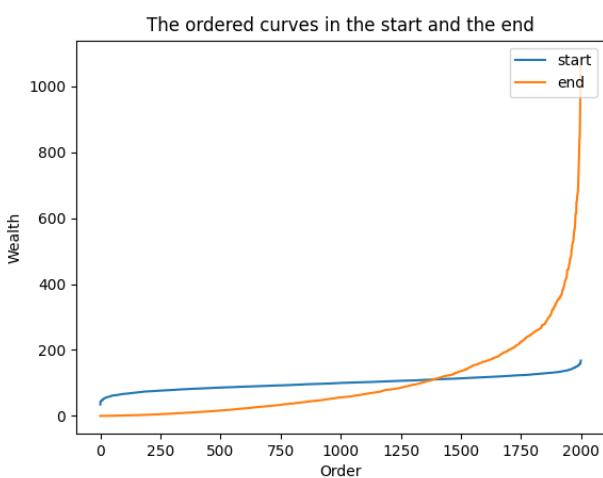
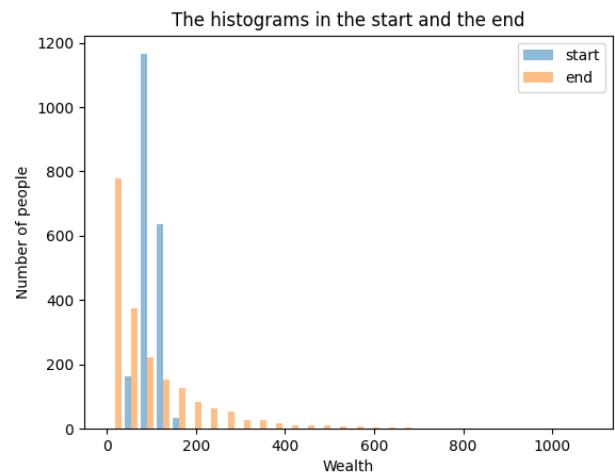
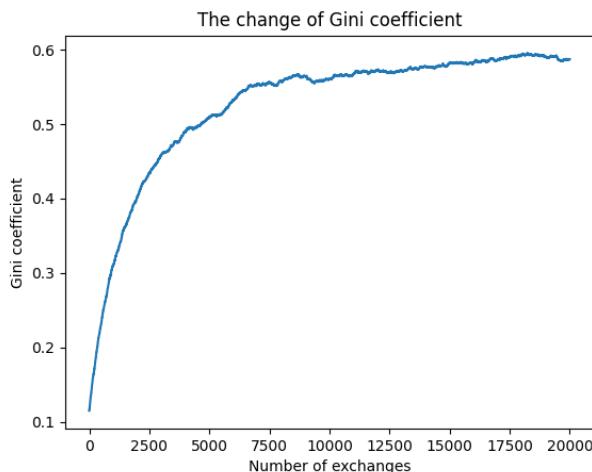
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 60% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.12	20.44	52	65	86	99	114	132	147
2000	0.43	79.06	0	3	37	90	137	255	358
4000	0.53	102.15	0	0	19	71	147	310	439
6000	0.58	119.19	0	0	13	56	145	339	520
8000	0.62	128.63	0	0	10	47	143	362	551
10000	0.64	138.40	0	0	9	43	138	381	608
12000	0.65	143.91	0	0	7	41	140	390	669
14000	0.66	144.76	0	0	6	38	136	394	690
16000	0.66	146.80	0	0	6	41	131	395	687
18000	0.67	148.08	0	0	6	37	134	411	670
20000	0.68	151.06	0	0	5	36	130	410	707



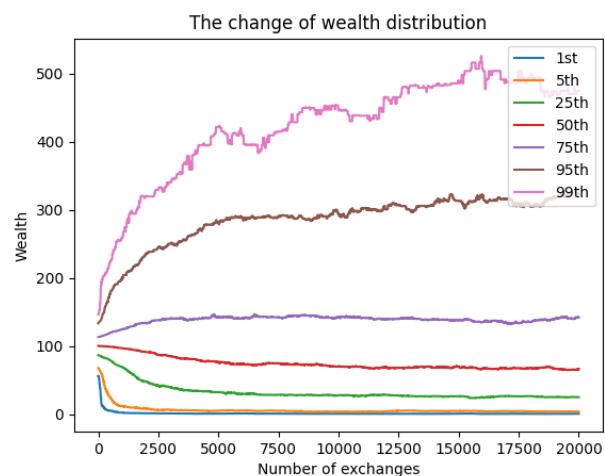
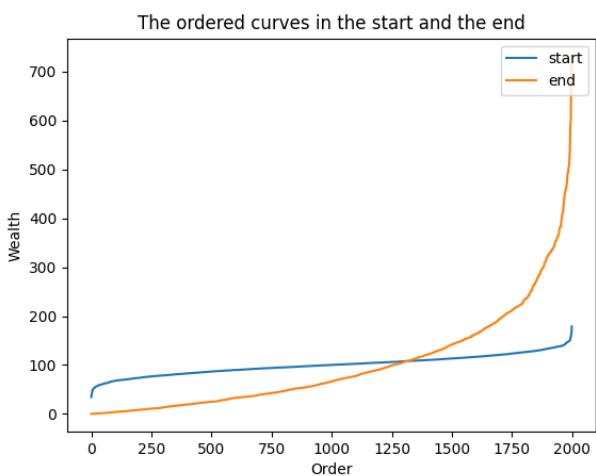
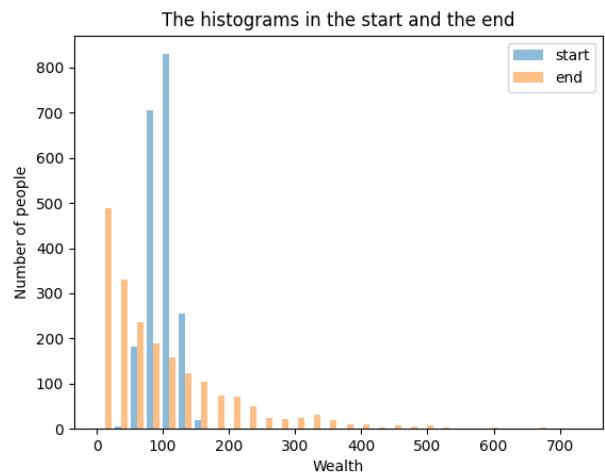
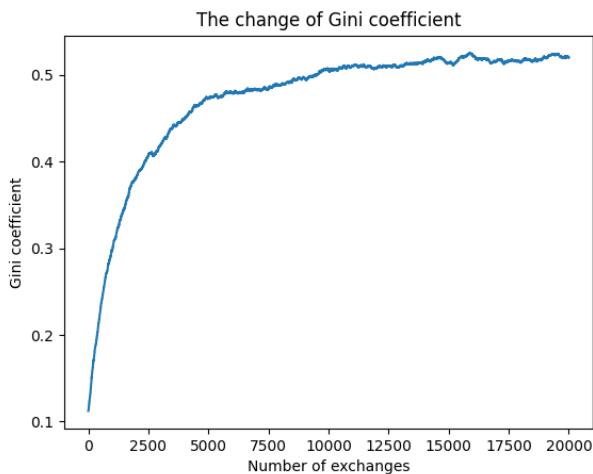
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 40% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.26	54	66	86	99	113	132	149
2000	0.40	74.70	0	5	43	90	134	239	330
4000	0.49	93.45	0	2	27	75	146	291	399
6000	0.53	104.09	0	1	21	66	145	319	443
8000	0.56	111.54	0	1	17	59	145	330	485
10000	0.56	113.16	0	1	17	60	142	331	524
12000	0.57	117.09	0	1	17	56	140	330	527
14000	0.58	119.71	0	1	18	54	140	336	536
16000	0.58	124.52	0	1	17	56	136	353	587
18000	0.59	127.01	0	1	15	53	134	362	611
20000	0.59	126.67	0	1	16	56	135	344	613



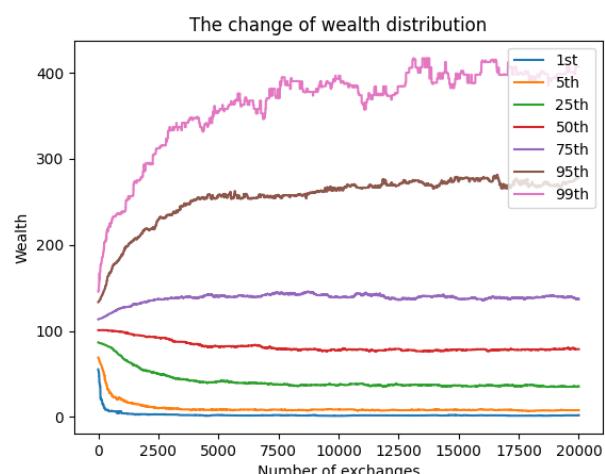
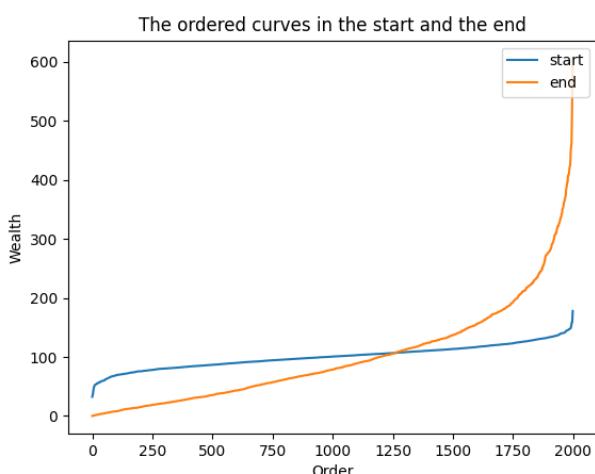
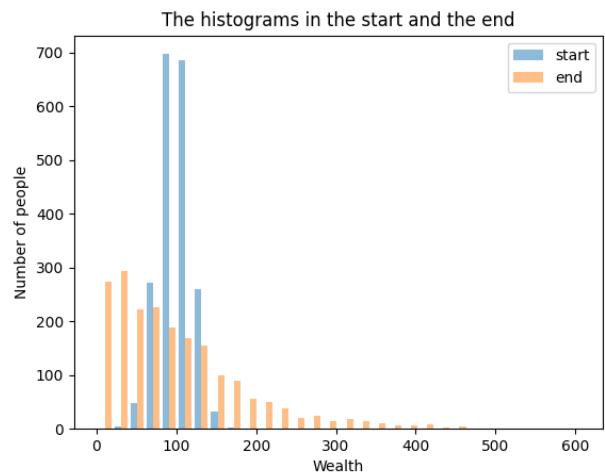
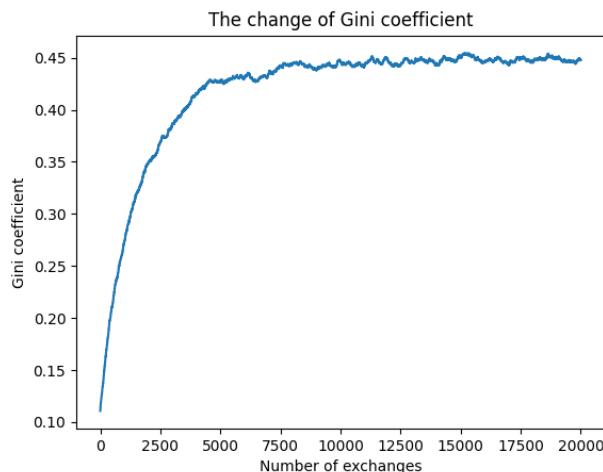
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 20% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.89	55	67	86	100	113	133	146
2000	0.38	70.45	1	7	47	91	133	235	319
4000	0.45	85.91	0	5	34	80	139	264	380
6000	0.48	91.68	0	5	29	74	140	287	409
8000	0.49	94.99	0	4	28	73	143	290	428
10000	0.51	100.55	0	3	27	69	142	294	447
12000	0.51	102.41	0	4	28	69	139	300	465
14000	0.52	105.04	0	4	26	67	139	310	482
16000	0.52	106.26	0	4	25	66	135	318	507
18000	0.51	105.20	0	4	26	67	135	304	494
20000	0.52	103.71	0	3	24	66	141	322	474



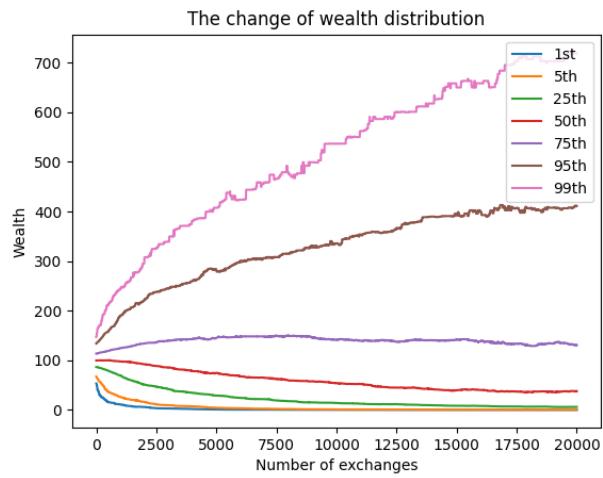
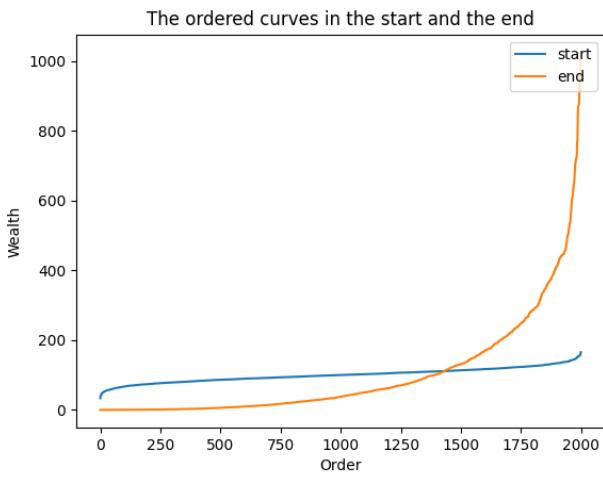
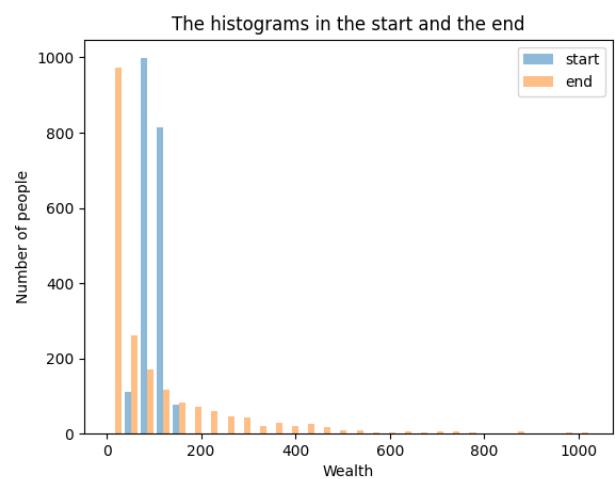
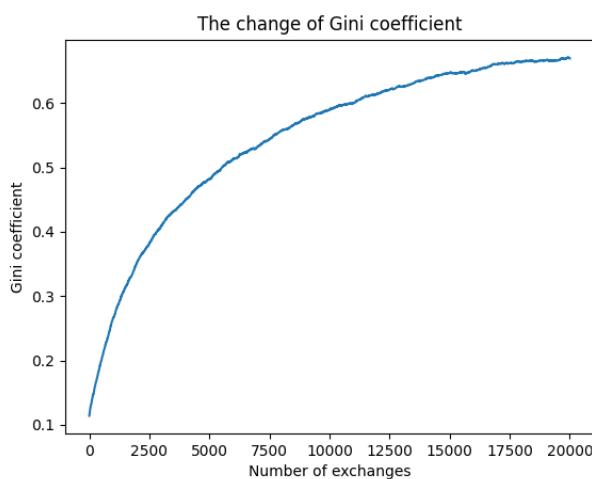
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes random proportion of wealth from the loser
 however, the richer party has 0% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.74	55	69	86	100	113	133	145
2000	0.35	64.38	3	12	53	92	133	219	295
4000	0.42	77.46	2	8	41	84	138	252	347
6000	0.43	82.70	1	8	39	82	141	254	362
8000	0.44	86.12	1	7	36	78	144	257	381
10000	0.45	86.56	1	8	37	77	138	265	392
12000	0.45	85.50	1	7	35	77	138	269	375
14000	0.44	85.01	1	8	37	77	140	266	388
16000	0.45	86.89	1	8	36	78	135	277	414
18000	0.45	86.06	1	7	37	78	138	269	395
20000	0.45	86.68	2	7	35	78	136	277	407



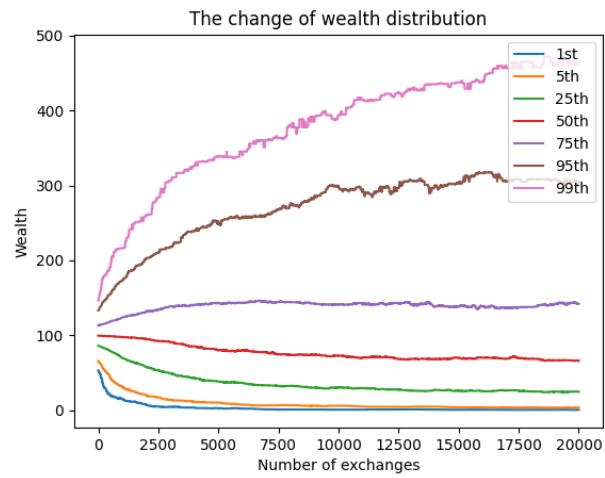
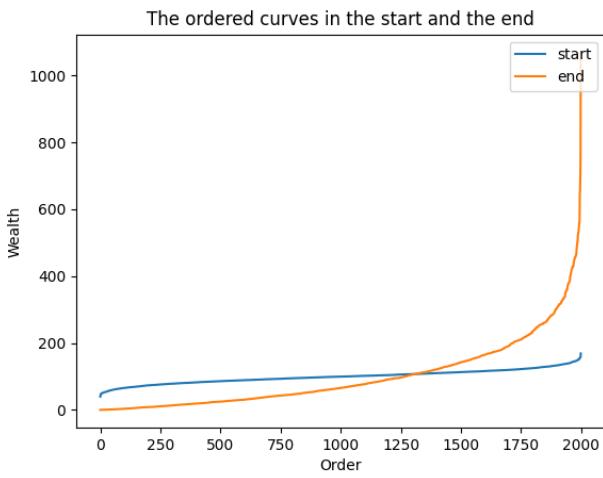
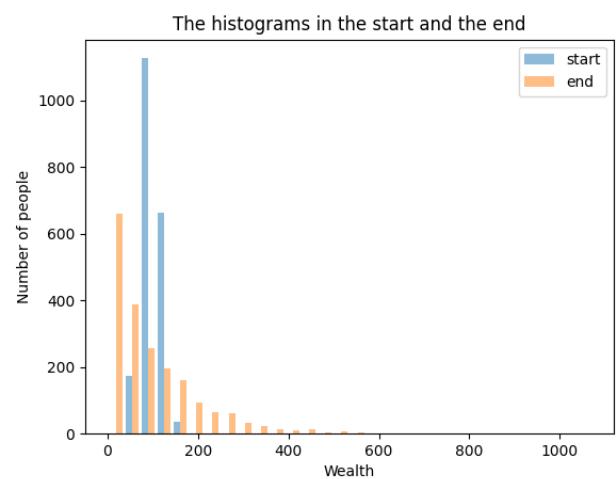
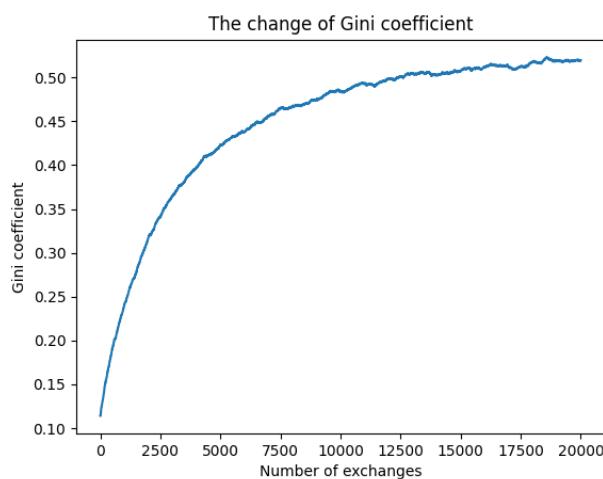
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.21	53	67	86	99	113	133	147
2000	0.35	64.88	5	16	51	91	133	221	307
4000	0.45	84.26	1	7	34	78	142	259	381
6000	0.51	98.80	0	3	24	67	148	298	423
8000	0.56	110.06	0	1	17	59	149	314	479
10000	0.59	120.04	0	1	14	53	141	335	536
12000	0.62	128.11	0	0	11	46	139	359	590
14000	0.64	134.94	0	0	9	41	140	389	617
16000	0.65	140.36	0	0	8	40	138	398	658
18000	0.66	145.35	0	0	6	36	129	406	707
20000	0.67	148.88	0	0	6	37	130	411	718



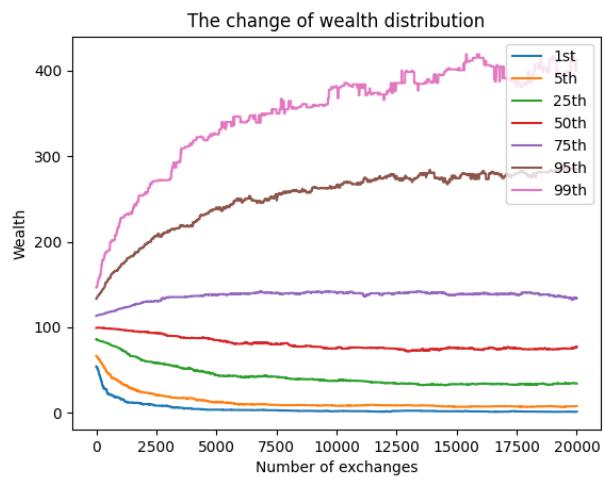
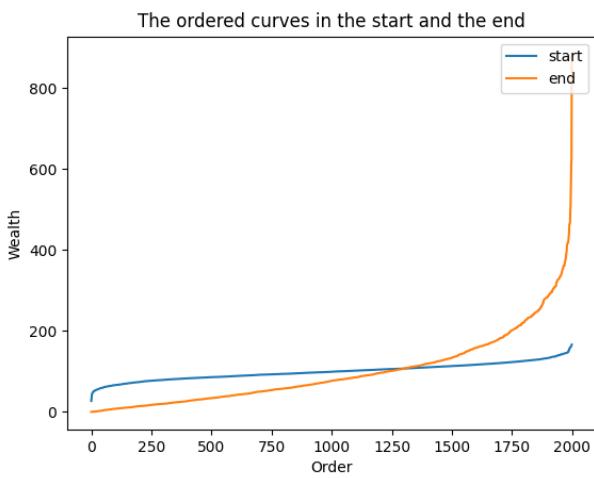
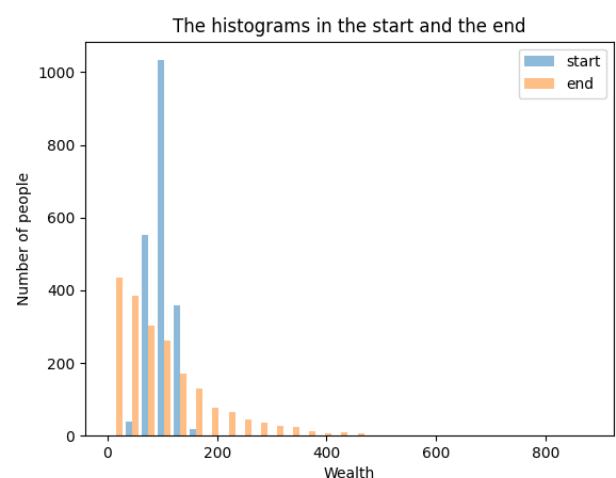
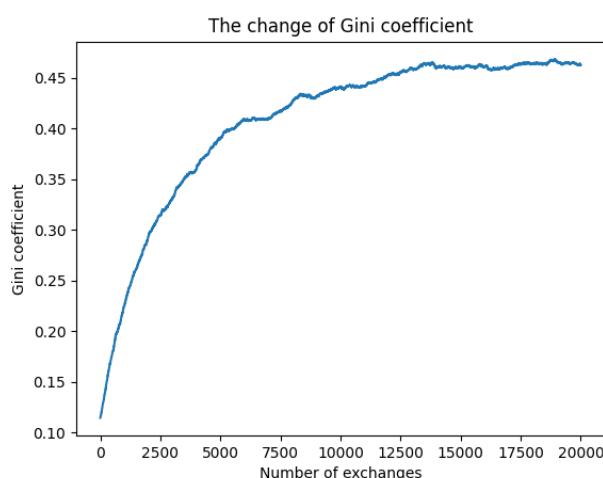
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 60% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.12	53	65	86	99	113	133	146
2000	0.32	57.30	7	20	57	94	132	203	260
4000	0.40	72.79	3	11	42	85	140	239	325
6000	0.44	81.13	2	7	36	79	143	258	340
8000	0.47	88.43	1	6	32	73	144	276	379
10000	0.48	92.42	0	5	30	72	140	297	393
12000	0.50	95.92	1	4	27	70	141	299	422
14000	0.50	97.75	1	4	27	68	137	300	434
16000	0.51	100.36	0	4	25	70	138	316	438
18000	0.52	103.27	0	3	25	68	137	308	464
20000	0.52	104.11	0	3	24	65	142	304	462



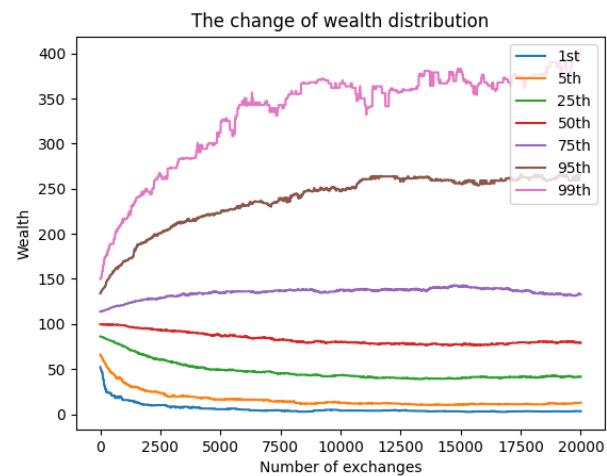
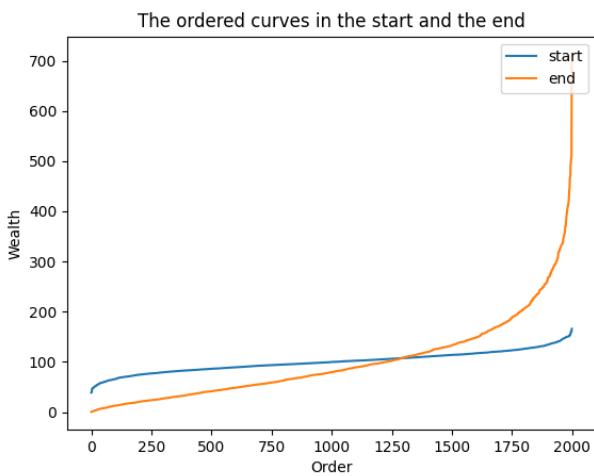
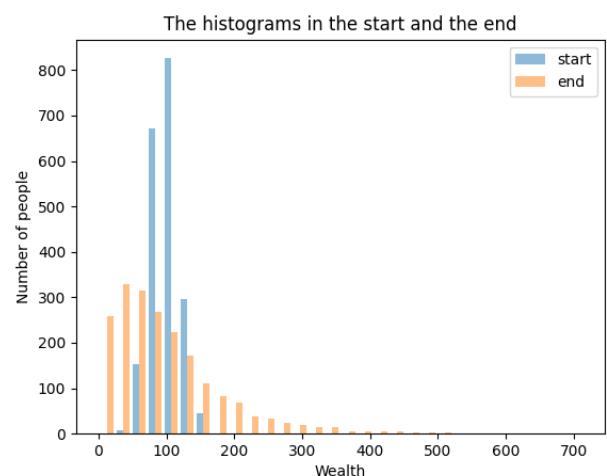
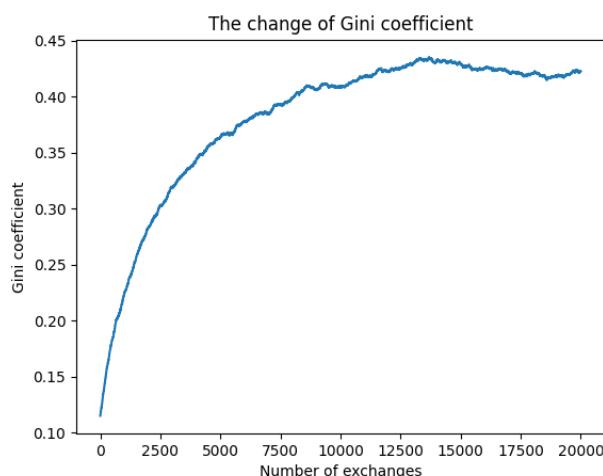
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 50% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.27	54	66	85	99	113	133	146
2000	0.29	53.04	10	23	60	94	129	195	255
4000	0.36	66.03	4	17	51	87	136	218	315
6000	0.41	75.89	3	10	42	80	138	249	339
8000	0.43	80.55	2	8	40	79	139	258	364
10000	0.44	83.49	1	8	37	75	141	264	381
12000	0.45	86.56	1	8	34	75	139	274	371
14000	0.46	88.63	2	8	33	74	140	280	386
16000	0.46	89.33	1	7	34	74	139	279	414
18000	0.46	90.39	1	6	33	74	140	275	398
20000	0.46	90.30	1	7	34	76	133	285	412



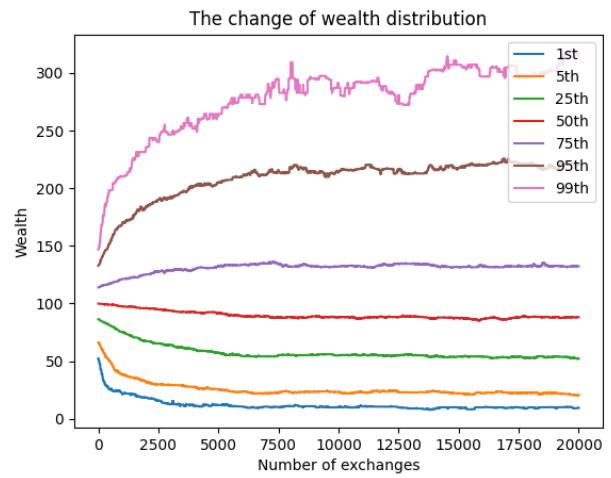
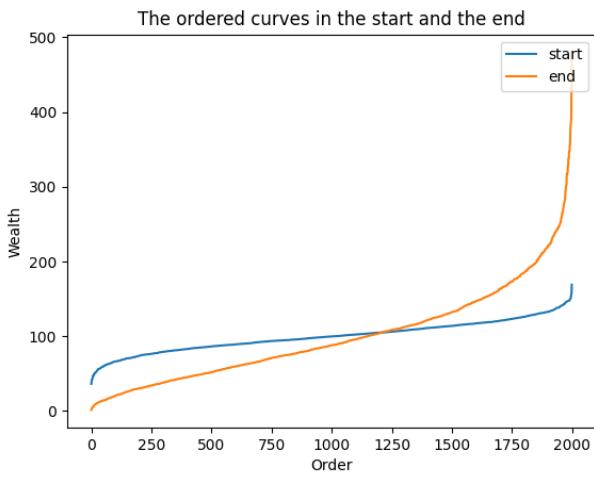
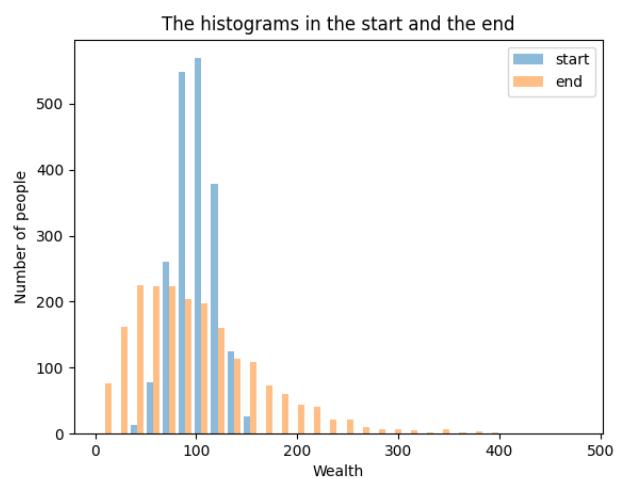
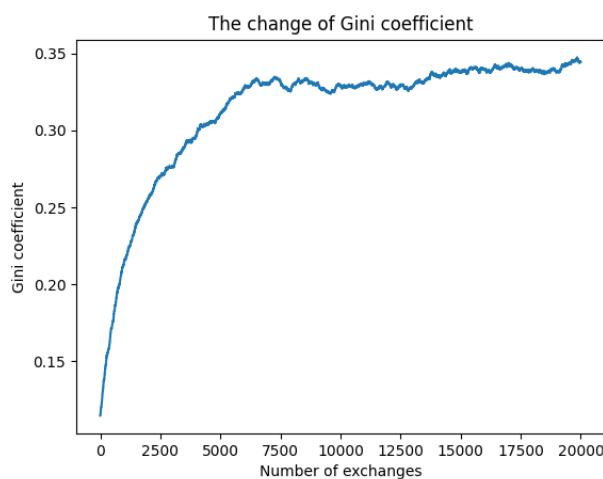
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 40% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.12	20.42	52	65	86	99	113	133	149
2000	0.28	51.41	10	25	63	95	128	193	246
4000	0.34	63.14	7	18	52	90	133	216	291
6000	0.38	71.39	5	16	47	86	136	231	342
8000	0.40	75.42	3	13	44	81	137	242	355
10000	0.41	77.91	4	12	43	80	137	247	366
12000	0.42	79.93	4	12	40	78	138	263	341
14000	0.43	82.32	3	10	39	77	140	259	378
16000	0.43	80.83	3	11	41	76	139	258	367
18000	0.42	80.13	3	10	41	79	134	262	373
20000	0.42	82.38	3	12	41	79	132	265	399



Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 20% chance of winning

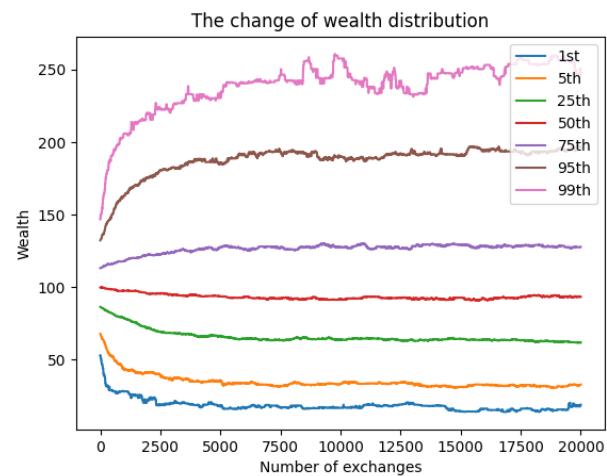
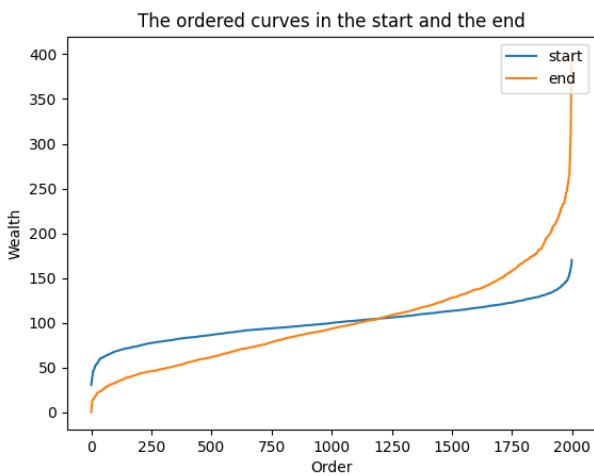
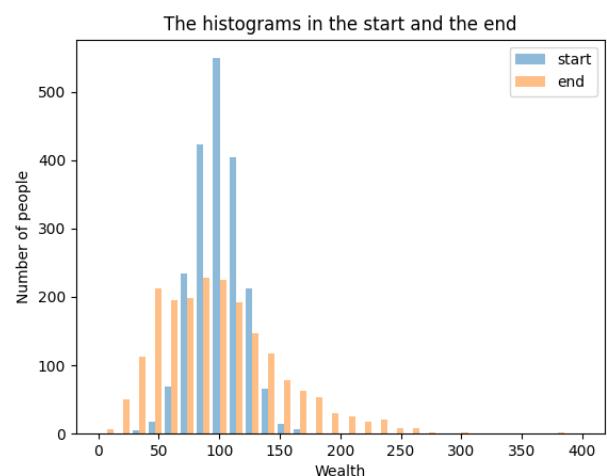
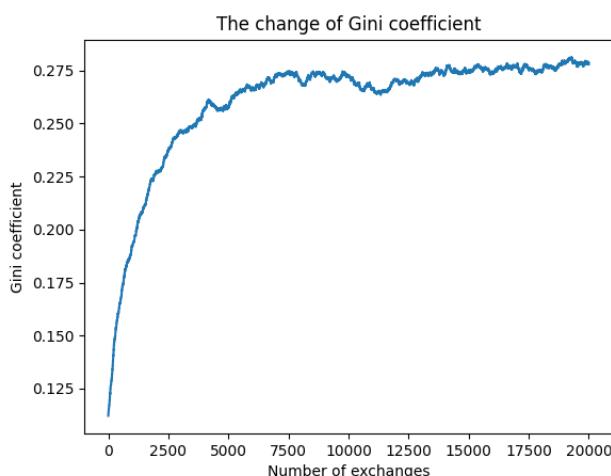
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.22	52	66	86	99	113	132	146
2000	0.26	46.45	18	31	67	96	125	184	235
4000	0.30	54.12	11	27	60	92	129	202	251
6000	0.33	59.88	10	23	54	89	133	209	278
8000	0.33	61.40	10	23	55	88	132	218	297
10000	0.33	60.39	10	23	54	88	132	213	291
12000	0.33	61.03	10	23	54	87	133	217	284
14000	0.34	62.35	8	23	54	86	133	216	302
16000	0.34	62.91	9	22	54	86	132	220	296
18000	0.34	62.94	9	21	52	88	133	221	297
20000	0.34	64.07	9	20	52	88	132	220	317



Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps

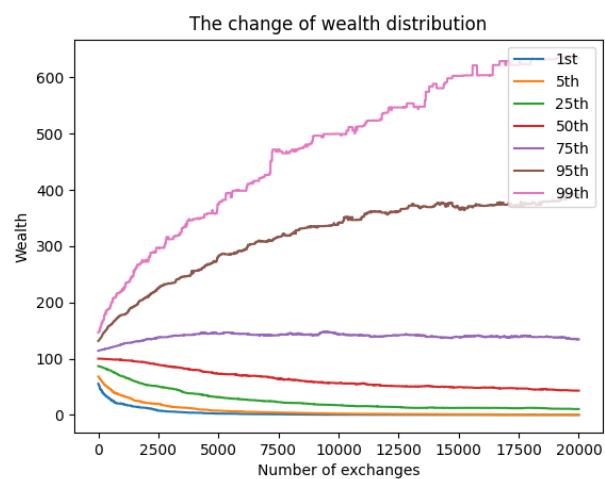
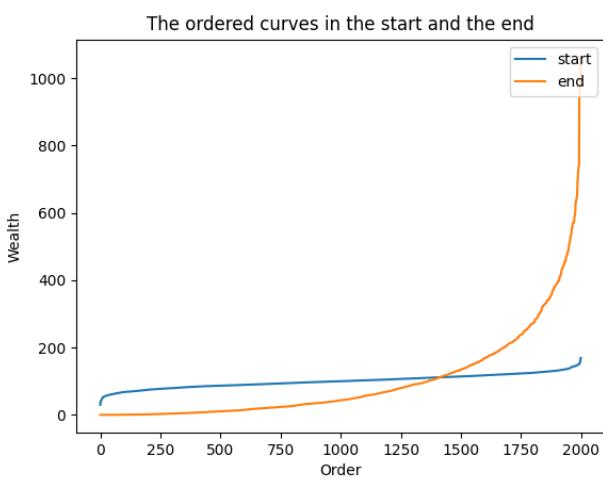
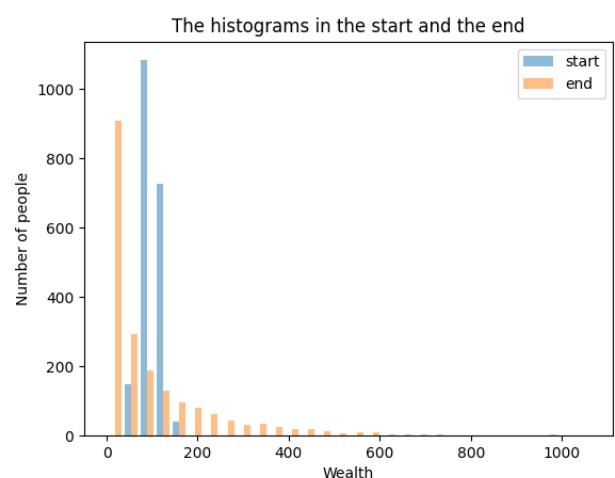
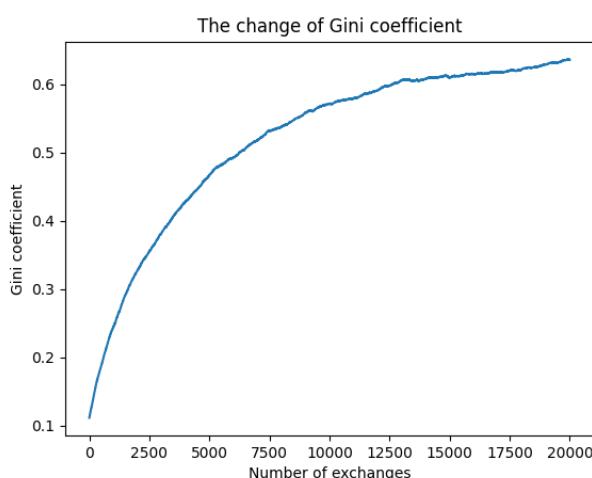
Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 2
 the richer party has 0% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.94	53	67	86	99	113	132	146
2000	0.23	41.21	21	40	71	95	122	175	220
4000	0.26	46.41	18	34	66	94	125	187	230
6000	0.27	48.34	16	33	64	93	126	191	240
8000	0.27	49.23	18	33	64	91	126	194	242
10000	0.27	49.67	16	33	63	92	127	189	257
12000	0.27	48.85	17	33	63	92	126	191	246
14000	0.27	49.40	18	32	64	92	129	190	244
16000	0.27	49.98	16	32	63	91	128	193	253
18000	0.27	50.01	15	32	63	94	128	193	253
20000	0.28	50.95	18	32	61	93	127	196	246



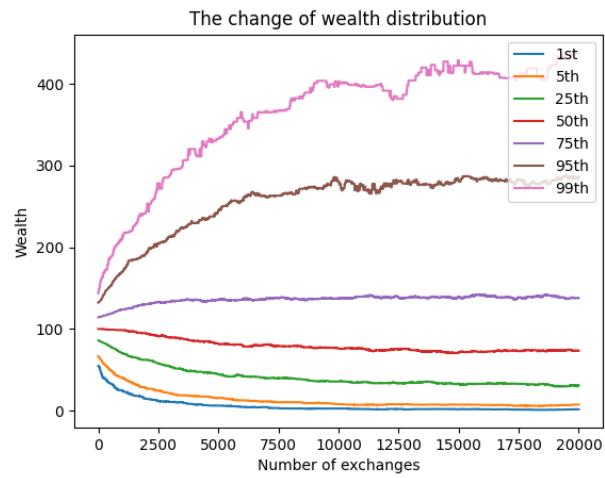
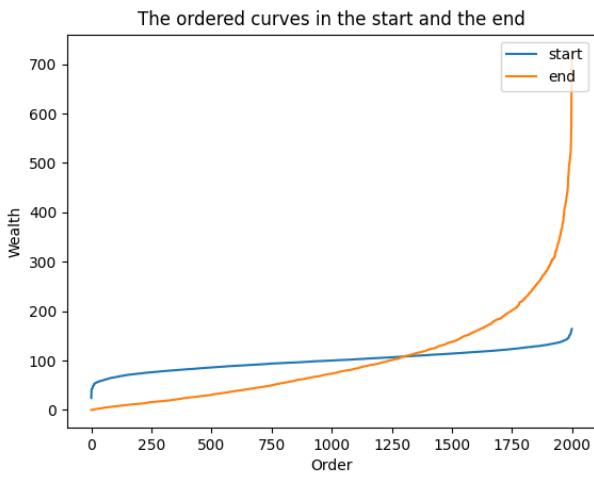
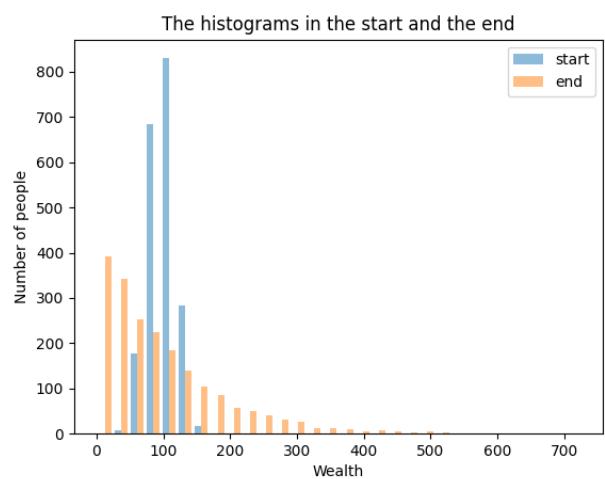
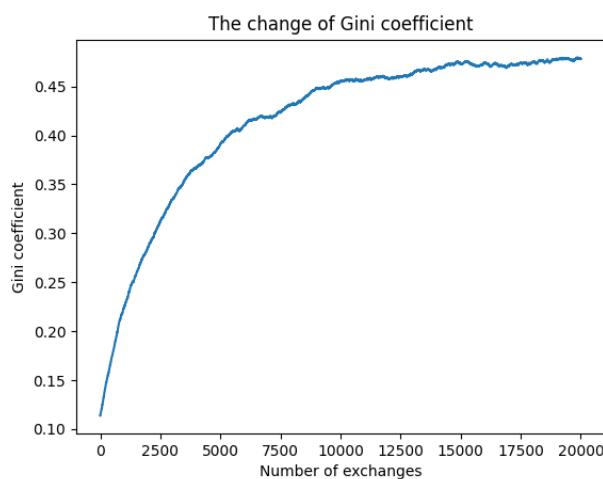
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 80% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.74	55	68	86	100	114	131	146
2000	0.33	59.36	12	21	53	92	134	209	272
4000	0.43	79.73	3	11	37	80	143	256	348
6000	0.49	94.23	1	6	27	69	144	292	398
8000	0.54	106.79	0	3	21	62	144	319	468
10000	0.57	114.94	0	2	17	56	143	341	499
12000	0.59	120.87	0	1	14	51	140	357	537
14000	0.61	126.82	0	1	12	50	139	372	588
16000	0.61	131.03	0	0	12	48	139	371	604
18000	0.62	133.96	0	0	12	45	139	374	629
20000	0.64	138.94	0	0	10	43	134	391	634



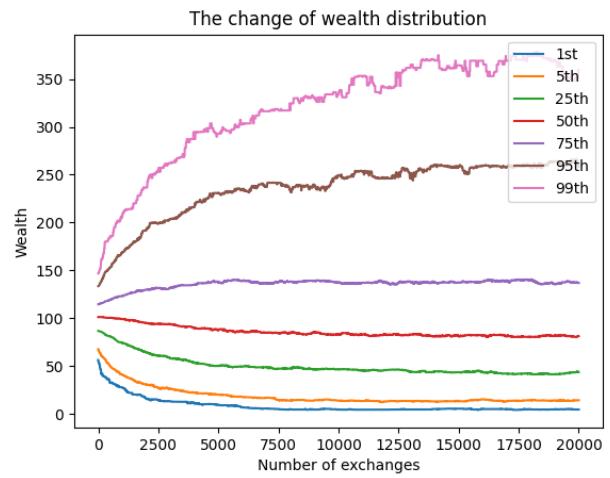
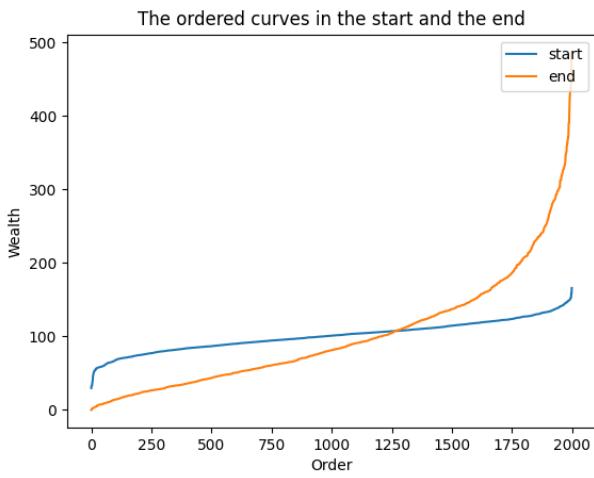
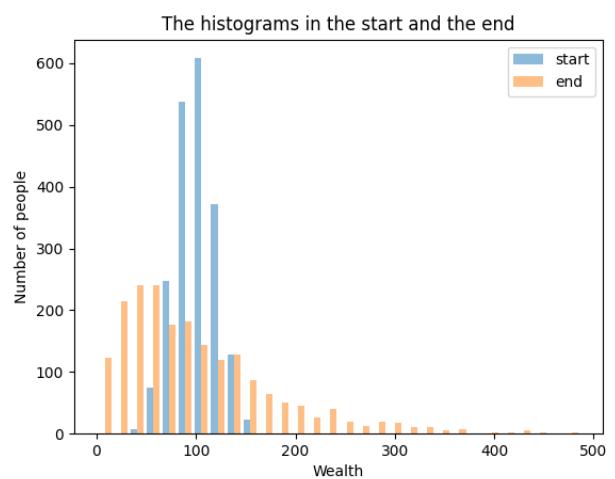
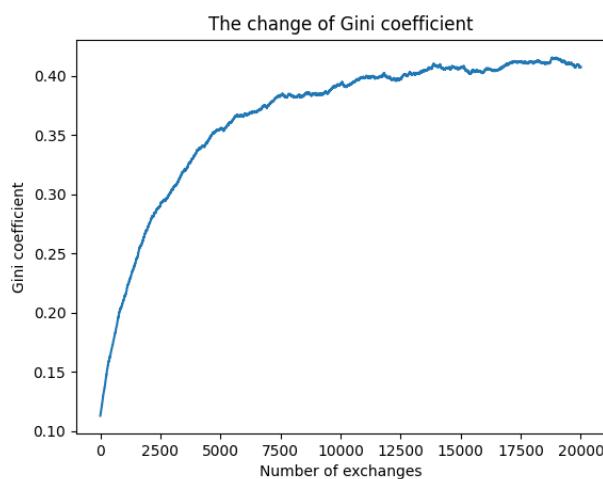
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 60% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.07	54	66	86	100	114	132	143
2000	0.29	51.72	14	28	62	94	130	193	243
4000	0.37	68.28	7	18	48	85	135	229	320
6000	0.41	77.44	4	12	42	80	136	256	358
8000	0.43	82.42	2	10	39	78	136	266	378
10000	0.46	87.46	2	8	35	76	137	280	400
12000	0.46	88.06	1	7	33	74	139	277	391
14000	0.47	91.03	2	7	34	73	138	275	423
16000	0.47	91.87	1	7	32	71	141	285	412
18000	0.48	91.96	1	5	32	73	139	278	418
20000	0.48	93.86	1	7	30	73	137	286	437



Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 50% chance of winning

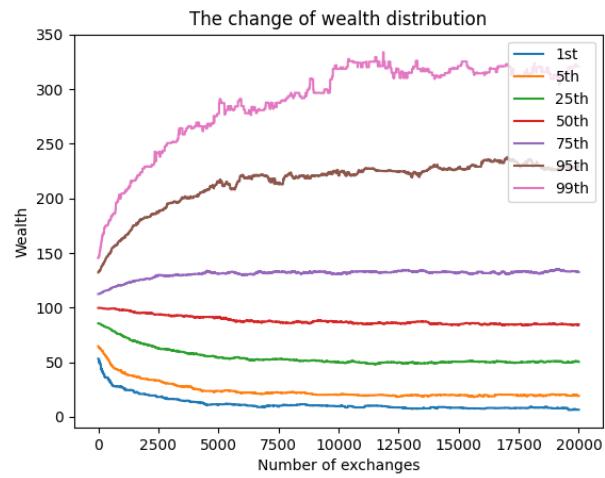
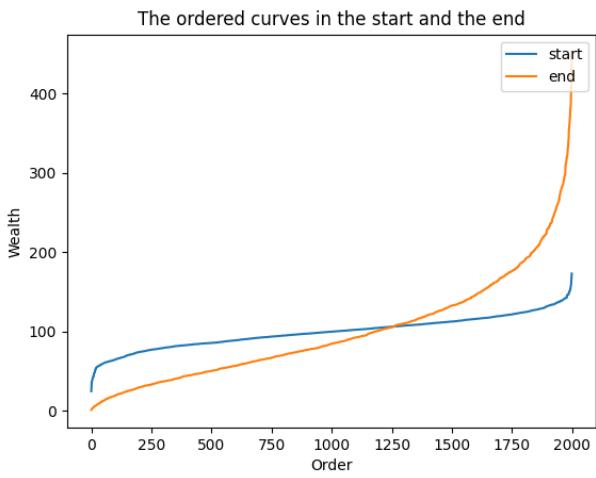
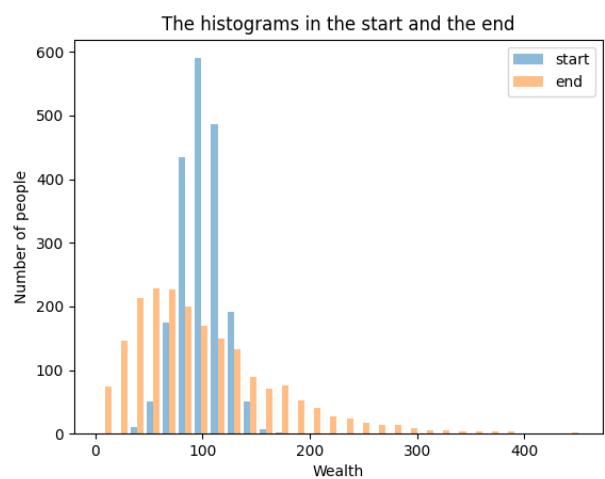
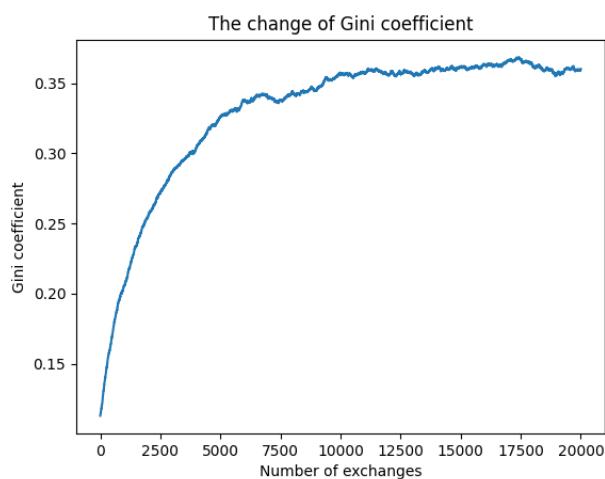
step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.16	56	67	86	101	114	133	146
2000	0.27	49.53	15	30	64	95	129	192	236
4000	0.34	61.91	11	22	53	89	134	216	294
6000	0.37	67.70	6	17	49	86	138	234	303
8000	0.38	71.30	4	14	47	84	138	232	324
10000	0.39	73.99	4	13	46	83	137	249	333
12000	0.40	76.03	4	12	45	82	137	247	341
14000	0.41	79.08	5	13	44	81	137	260	369
16000	0.40	77.96	5	15	43	81	138	259	369
18000	0.41	78.87	4	14	41	80	140	258	374
20000	0.41	77.99	4	14	43	81	136	258	359



Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps

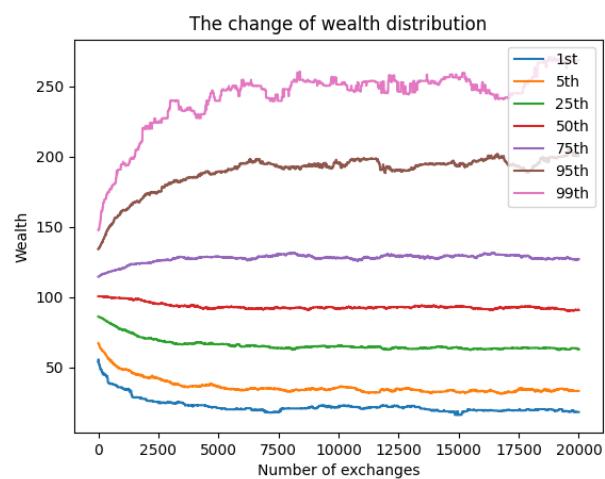
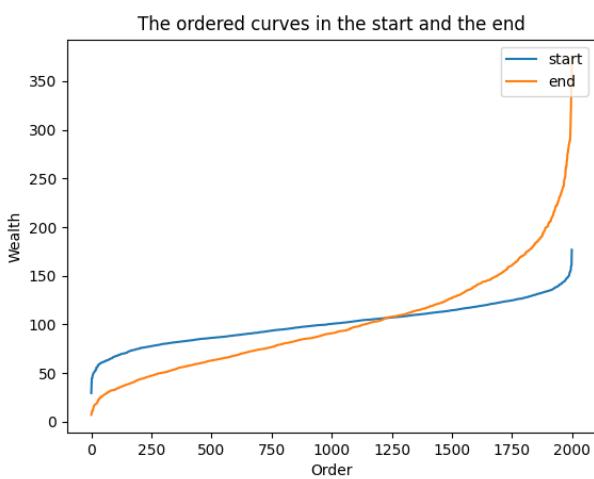
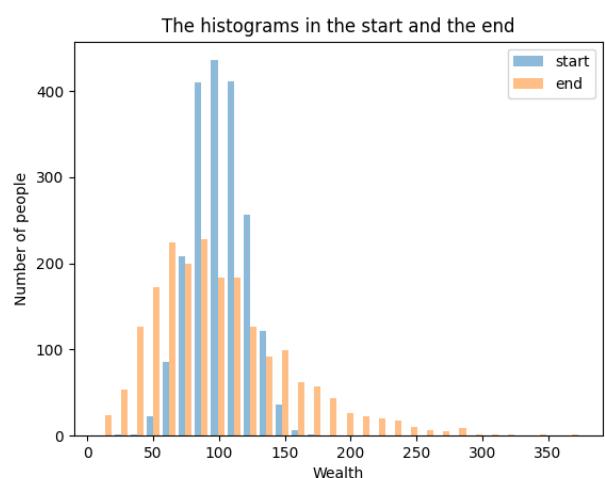
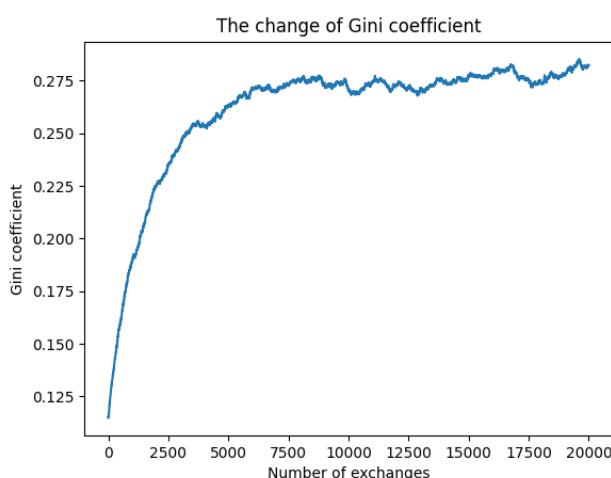
Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 40% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.96	53	64	85	99	112	132	145
2000	0.26	45.61	20	34	66	94	126	182	229
4000	0.30	54.92	13	25	57	91	130	201	265
6000	0.34	61.87	11	22	53	87	129	221	284
8000	0.34	63.16	10	22	52	85	132	223	294
10000	0.36	66.49	9	20	50	86	131	221	318
12000	0.36	66.85	9	19	50	86	132	225	318
14000	0.36	67.75	8	20	49	85	132	229	309
16000	0.36	68.00	7	18	50	84	131	233	314
18000	0.36	67.65	9	20	50	84	132	235	314
20000	0.36	67.11	6	19	50	84	132	229	320



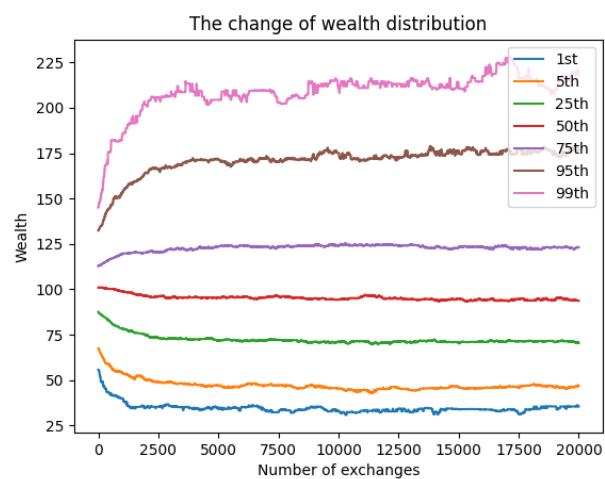
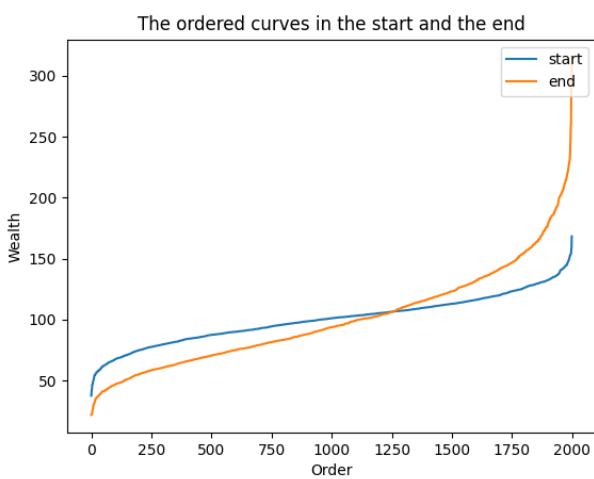
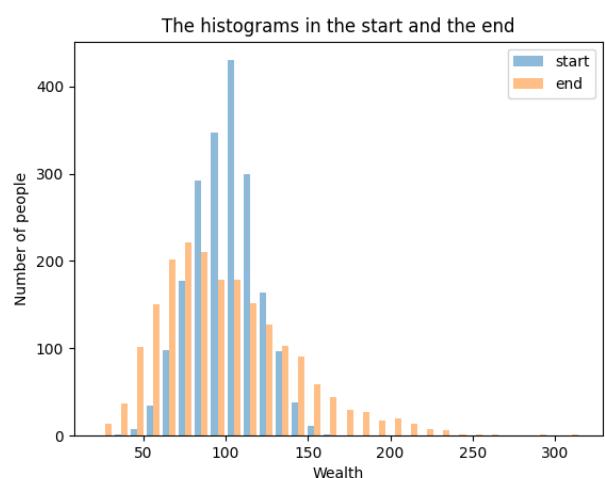
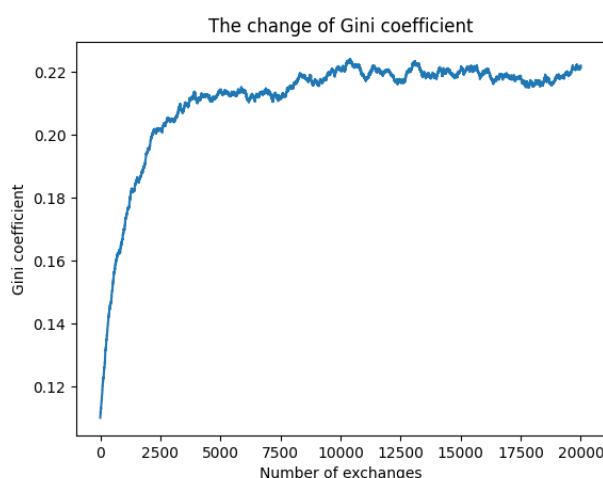
Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 20% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	20.43	53	67	86	100	114	134	147
2000	0.23	40.95	26	43	70	96	124	173	219
4000	0.25	46.32	23	36	66	93	127	185	230
6000	0.27	49.86	20	33	64	92	127	195	252
8000	0.27	50.31	20	32	63	92	130	191	250
10000	0.27	49.61	22	35	65	91	127	194	251
12000	0.27	49.87	22	34	62	91	129	192	245
14000	0.27	50.27	19	32	64	93	127	194	252
16000	0.28	51.19	19	33	63	91	130	197	251
18000	0.27	50.74	19	34	63	93	128	189	254
20000	0.28	52.51	18	33	62	90	126	200	268



Normal population, size=2000, mean=100.0, std=20.0, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 0% chance of winning

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.11	19.59	55	67	87	101	112	132	145
2000	0.20	35.48	35	50	74	96	120	164	201
4000	0.21	38.32	34	47	72	95	121	171	208
6000	0.21	38.48	35	46	71	95	124	170	206
8000	0.21	38.70	32	47	71	95	123	171	205
10000	0.22	39.97	33	45	71	94	124	175	211
12000	0.22	39.67	33	45	70	94	124	173	211
14000	0.22	39.52	32	45	72	94	122	174	211
16000	0.22	40.16	33	45	71	94	123	176	217
18000	0.22	39.41	33	47	71	93	122	174	216
20000	0.22	40.60	35	46	70	93	123	177	217

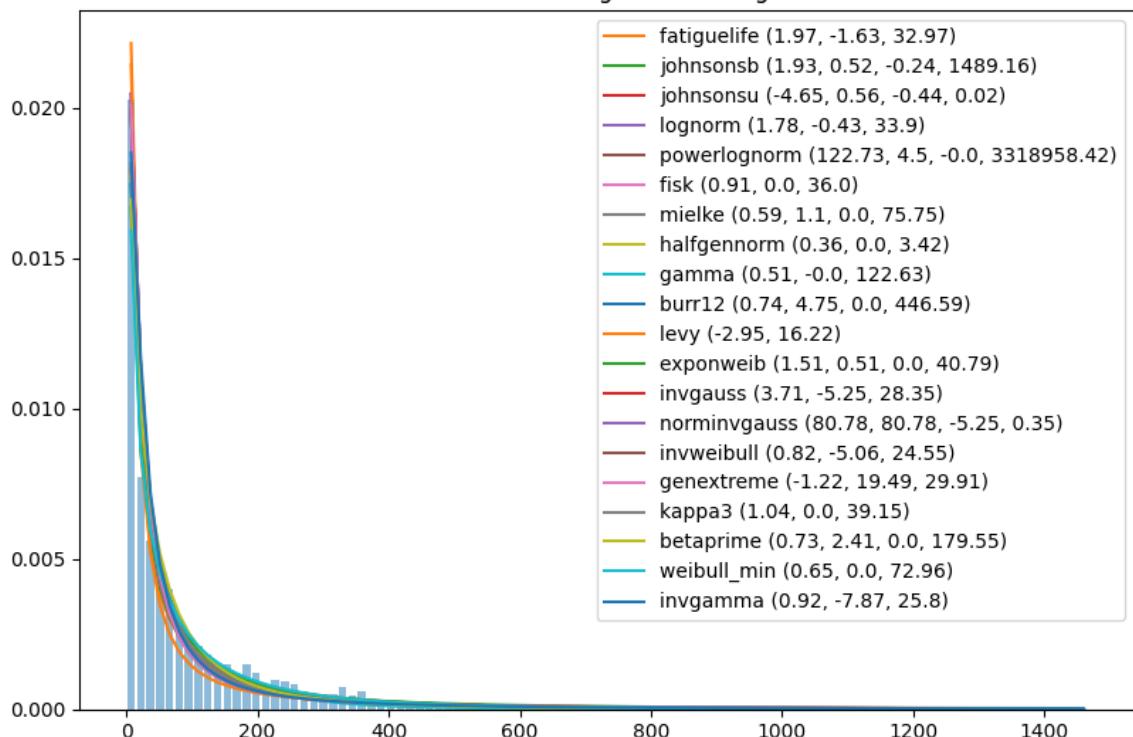


2.5 Distribution Fitting

Fitting with transaction function `win_take_layer`, simulating 200000 steps
 Testing on equal population of size=2000, mean=100.00, transaction bias=60%, layers=1

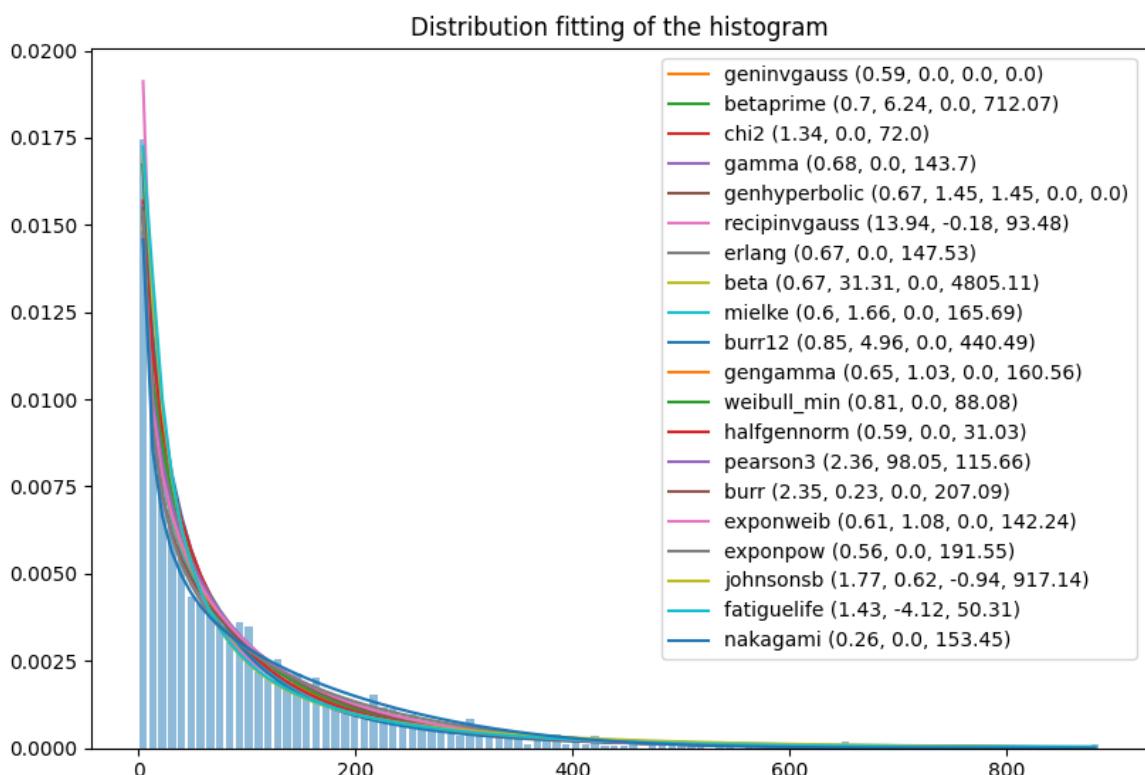
distr	MSE	KS-stat	KS-pval
+-----+-----+-----+			
fatiguelife	5.38E-06	8.62E-02	2.30E-13
johnsonsb	5.65E-06	6.41E-02	1.40E-07
johnsonsu	7.86E-06	6.91E-02	9.44E-09
lognorm	7.87E-06	6.93E-02	8.67E-09
powerlognorm	9.49E-06	5.02E-02	8.00E-05
fisk	9.84E-06	6.25E-02	3.03E-07
mielke	1.06E-05	8.42E-02	8.82E-13
halfgennorm	1.08E-05	4.05E-02	2.75E-03
gamma	1.30E-05	1.11E-01	7.70E-22
burr12	1.43E-05	6.01E-02	1.03E-06
levy	1.59E-05	1.21E-01	8.09E-26
exponweib	1.59E-05	2.77E-02	9.05E-02
invgauss	1.70E-05	8.21E-02	3.60E-12
norminvgauss	1.71E-05	8.21E-02	3.61E-12
invweibull	1.74E-05	7.78E-02	5.52E-11
genextreme	1.74E-05	7.78E-02	5.52E-11
kappa3	1.83E-05	5.87E-02	1.97E-06
betaprime	2.06E-05	7.16E-02	2.34E-09
weibull_min	2.15E-05	2.67E-02	1.13E-01
invgamma	2.54E-05	7.73E-02	7.61E-11
+-----+-----+-----+			

Distribution fitting of the histogram



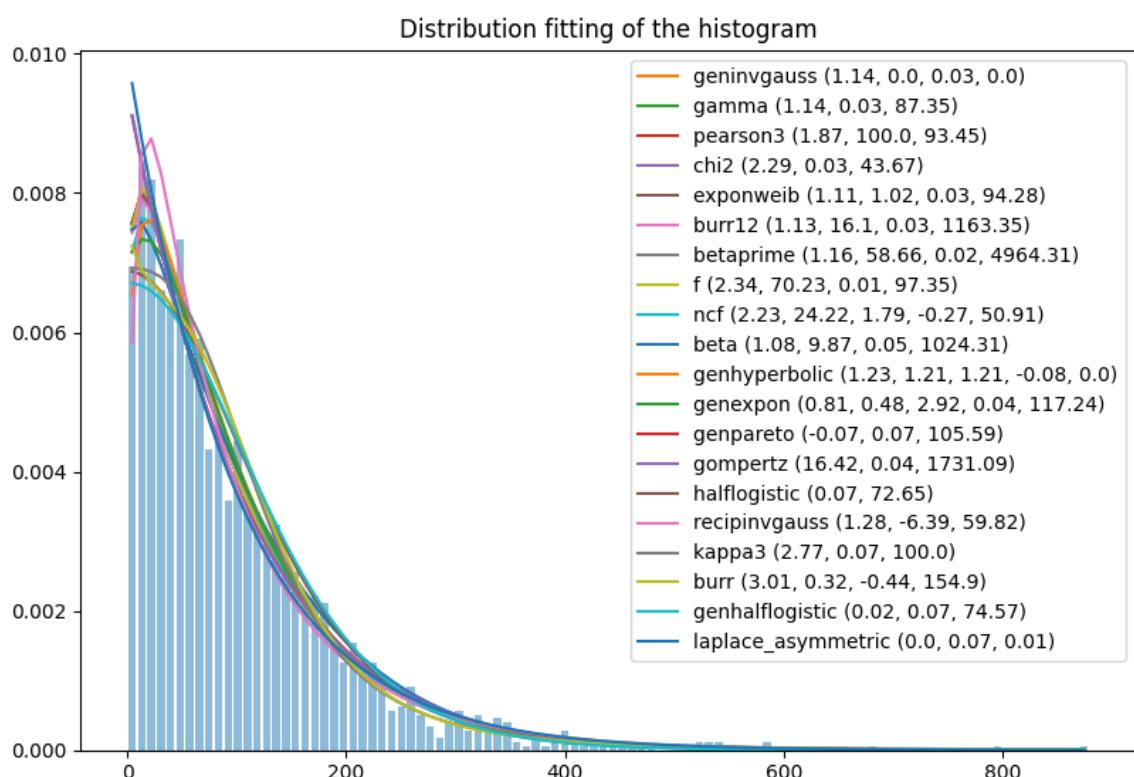
Fitting with transaction function `win_take_layer`, simulating 200000 steps
 Testing on equal population of size=2000, mean=100.00, transaction bias=50%, layers=1

distr	MSE	KS-stat	KS-pval
geninvgauss	5.67E-06	4.25E-02	1.43E-03
betaprime	6.30E-06	4.84E-02	1.66E-04
chi2	7.58E-06	2.16E-02	3.06E-01
gamma	8.13E-06	1.95E-02	4.28E-01
genhyperbolic	8.48E-06	1.00E+00	0.00E+00
recipinvgauss	8.60E-06	4.63E-02	3.65E-04
erlang	8.96E-06	1.32E-02	8.74E-01
beta	9.78E-06	1.32E-02	8.71E-01
mielke	1.11E-05	4.64E-02	3.46E-04
burr12	1.12E-05	6.20E-02	3.90E-07
gengamma	1.14E-05	1.96E-02	4.24E-01
weibull_min	1.22E-05	2.15E-02	3.11E-01
halfgennorm	1.24E-05	3.34E-02	2.28E-02
pearson3	1.27E-05	1.88E-02	4.71E-01
burr	1.31E-05	3.27E-02	2.70E-02
exponweib	1.32E-05	2.29E-02	2.42E-01
exponpow	1.37E-05	2.98E-02	5.57E-02
johnsonsb	1.38E-05	4.58E-02	4.31E-04
fatiguelife	1.80E-05	5.96E-02	1.31E-06
nakagami	2.42E-05	4.88E-02	1.39E-04



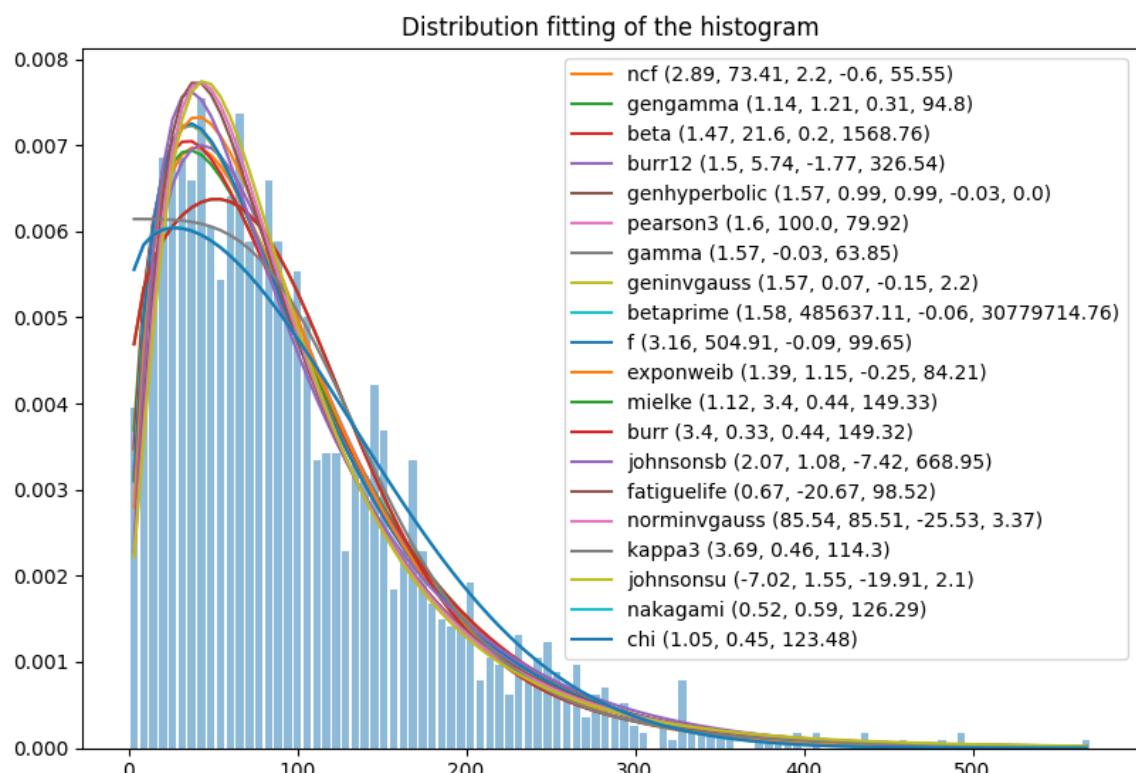
Fitting with transaction function `win_take_layer`, simulating 200000 steps
 Testing on equal population of size=2000, mean=100.00, transaction bias=60%, layers=5

distr	MSE	KS-stat	KS-pval
geninvgauss	5.51E-06	1.16E-02	9.47E-01
gamma	5.51E-06	1.16E-02	9.47E-01
pearson3	5.51E-06	1.16E-02	9.47E-01
chi2	5.51E-06	1.16E-02	9.47E-01
exponweib	5.51E-06	1.14E-02	9.55E-01
burr12	5.55E-06	1.29E-02	8.88E-01
betaprime	5.56E-06	1.41E-02	8.18E-01
f	5.62E-06	1.52E-02	7.39E-01
ncf	5.94E-06	1.31E-02	8.80E-01
beta	6.24E-06	2.33E-02	2.24E-01
genhyperbolic	6.28E-06	1.00E+00	0.00E+00
genexpon	6.56E-06	1.71E-02	5.99E-01
genpareto	9.95E-06	2.78E-02	8.88E-02
gompertz	1.01E-05	2.81E-02	8.26E-02
halflogistic	1.04E-05	4.03E-02	2.90E-03
recipinvgauss	1.04E-05	3.14E-02	3.79E-02
kappa3	1.08E-05	3.00E-02	5.30E-02
burr	1.12E-05	3.02E-02	5.13E-02
genhalflogistic	1.19E-05	4.71E-02	2.66E-04
laplace_asymmetric	1.31E-05	3.89E-02	4.55E-03



Fitting with transaction function `win_take_layer`, simulating 200000 steps
 Testing on equal population of size=2000, mean=100.00, transaction bias=50%, layers=5

distr	MSE	KS-stat	KS-pval
ncf	1.63E-05	1.25E-02	9.08E-01
gengamma	1.64E-05	1.41E-02	8.19E-01
beta	1.67E-05	1.47E-02	7.71E-01
burr12	1.73E-05	1.71E-02	5.95E-01
genhyperbolic	1.76E-05	1.00E+00	0.00E+00
pearson3	1.76E-05	1.88E-02	4.73E-01
gamma	1.76E-05	1.88E-02	4.73E-01
geninvgauss	1.76E-05	1.88E-02	4.77E-01
betaprime	1.76E-05	1.87E-02	4.83E-01
f	1.77E-05	1.92E-02	4.46E-01
exponweib	1.93E-05	2.92E-02	6.41E-02
mielke	2.08E-05	1.80E-02	5.31E-01
burr	2.08E-05	1.81E-02	5.23E-01
johnsonsb	2.23E-05	2.46E-02	1.74E-01
fatiguelife	2.52E-05	2.50E-02	1.61E-01
norminvgauss	2.64E-05	2.62E-02	1.27E-01
kappa3	2.75E-05	2.49E-02	1.64E-01
johnsonsu	2.86E-05	2.86E-02	7.38E-02
nakagami	2.86E-05	4.94E-02	1.12E-04
chi	2.87E-05	4.93E-02	1.18E-04



2.6 Taxed Transactions

Equal population, size=2000, mean=100.00, simulating 20000 steps

Exchange strategy: winner takes some proportion of wealth from the loser

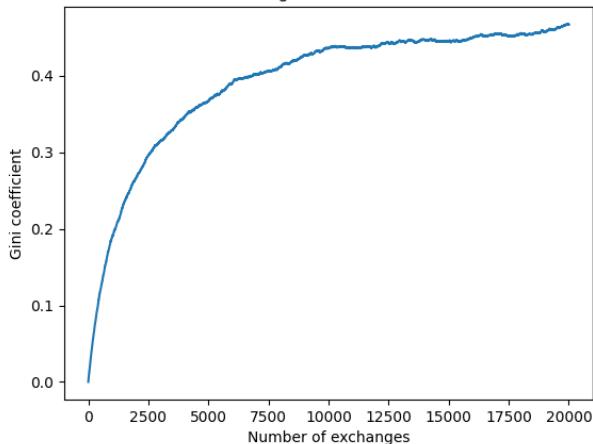
with the loser resisting the loss of wealth at Lvl. 5

the richer party has 60% chance of winning

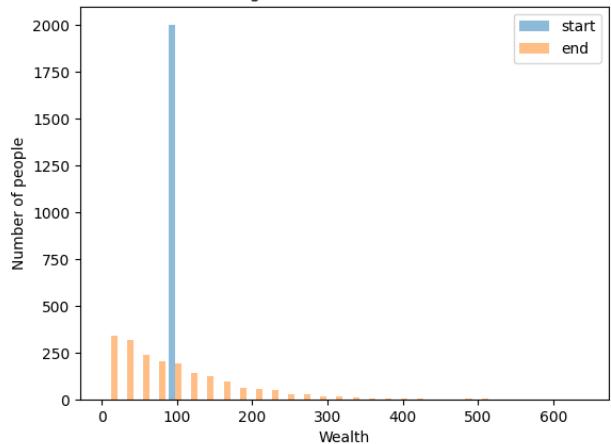
there is a 3% tax for each exchange, later distributed among all

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.27	48.23	15	30	64	100	130	181	241
4000	0.35	63.57	9	19	50	90	134	219	290
6000	0.39	72.17	6	15	44	82	140	243	315
8000	0.41	77.31	4	12	41	80	138	257	341
10000	0.44	83.79	4	9	37	77	141	260	363
12000	0.44	84.06	3	9	38	76	140	268	371
14000	0.45	84.82	3	9	34	77	138	269	374
16000	0.45	87.04	2	8	35	76	140	274	397
18000	0.46	88.42	2	9	35	73	139	275	405
20000	0.47	91.21	3	7	33	74	139	280	435

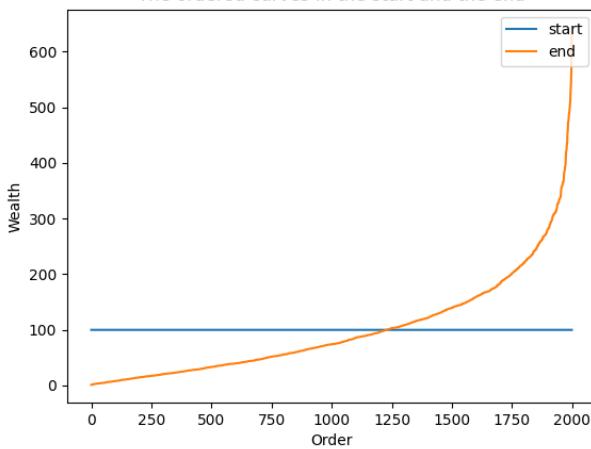
The change of Gini coefficient



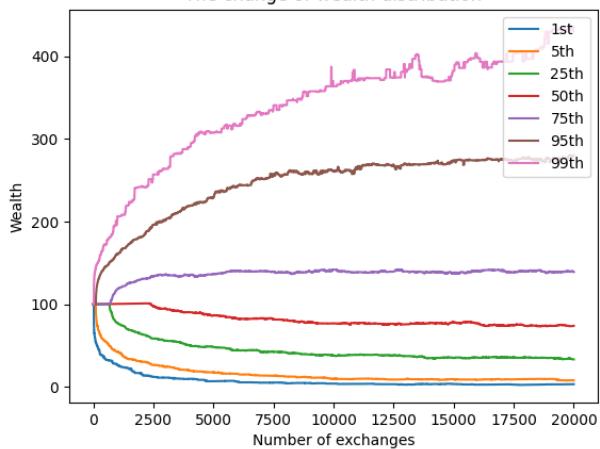
The histograms in the start and the end



The ordered curves in the start and the end

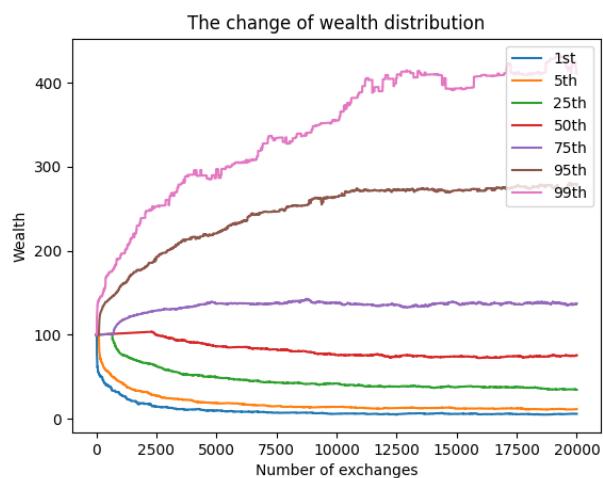
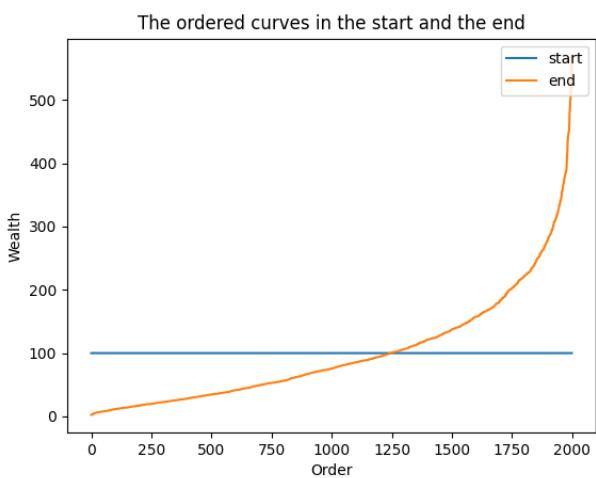
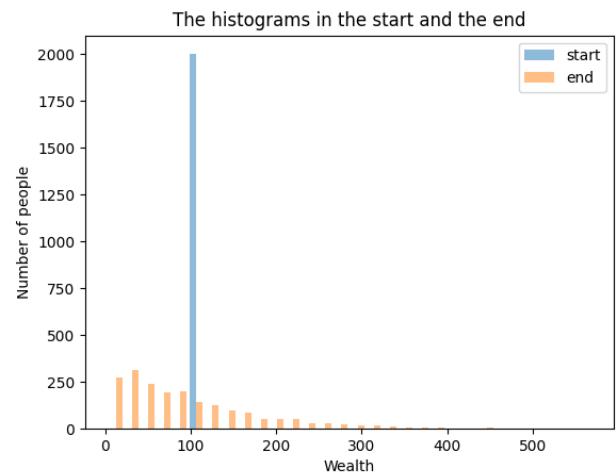
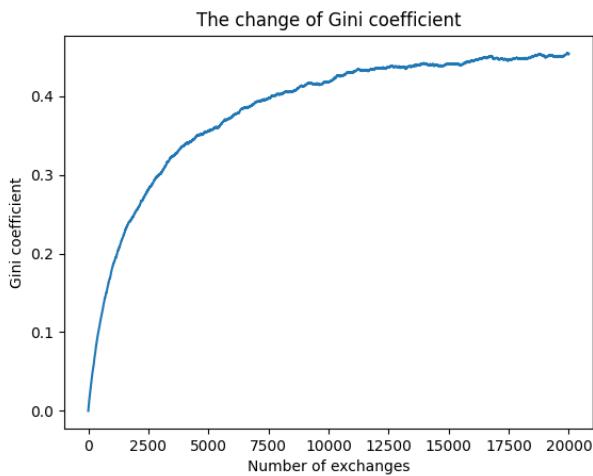


The change of wealth distribution



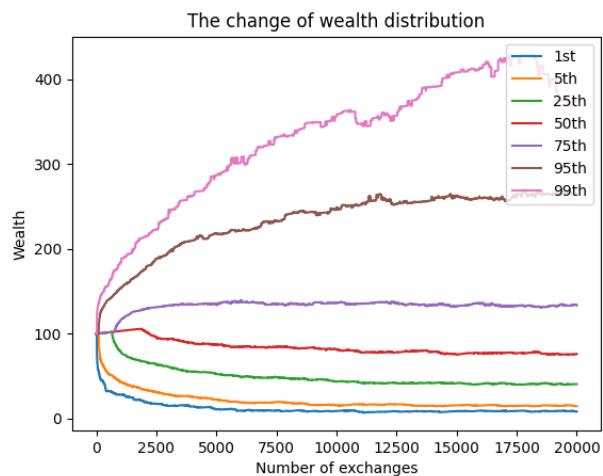
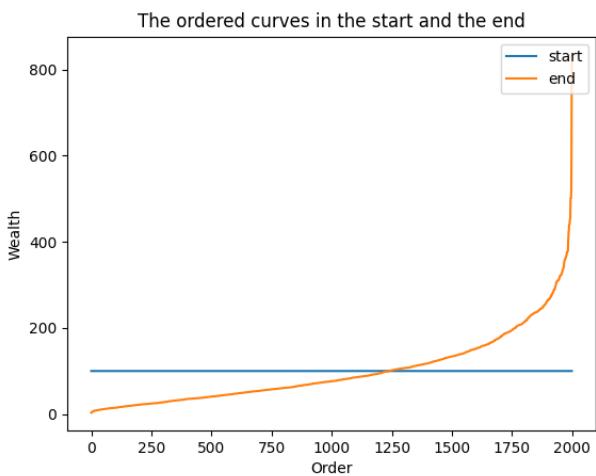
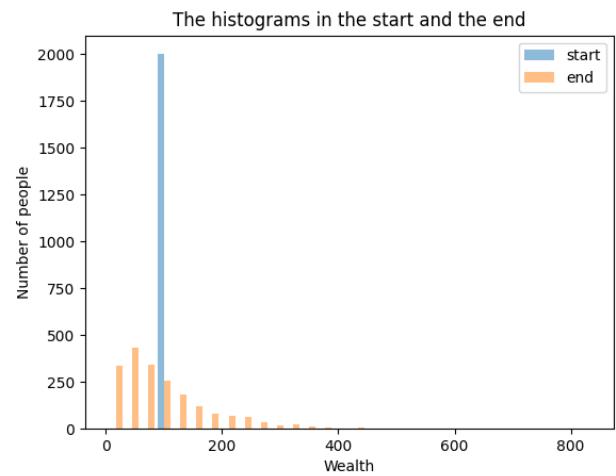
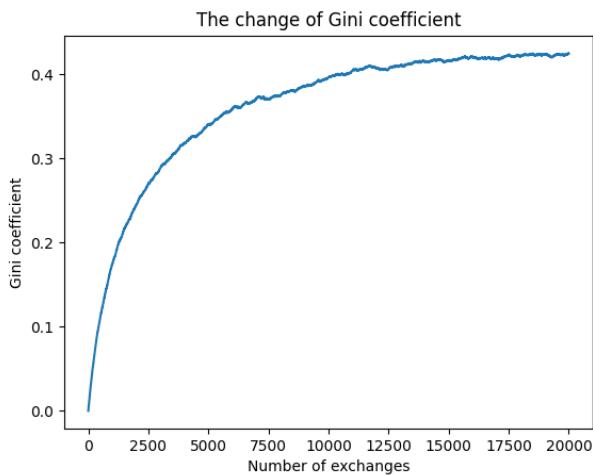
Equal population, size=2000, mean=100.00, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 60% chance of winning
 there is a 10% tax for each exchange, later distributed among all

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.26	46.05	17	31	66	103	126	179	239
4000	0.34	61.59	11	21	52	90	133	216	290
6000	0.37	68.69	8	17	46	85	137	233	304
8000	0.40	75.11	7	14	42	81	139	252	327
10000	0.42	79.68	6	14	41	76	137	264	355
12000	0.44	84.55	5	12	37	74	135	271	404
14000	0.44	87.26	6	12	37	73	136	273	410
16000	0.44	87.39	5	12	38	72	138	271	407
18000	0.45	88.05	5	11	36	73	138	274	411
20000	0.45	88.21	5	11	34	75	137	279	410



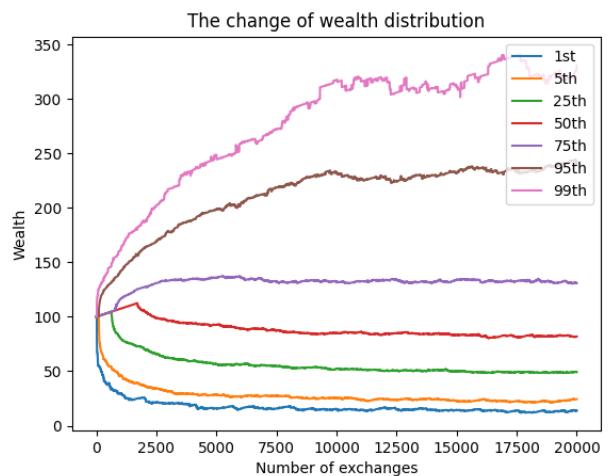
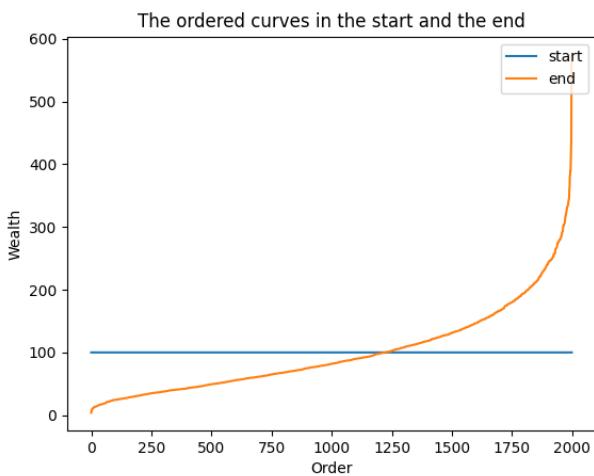
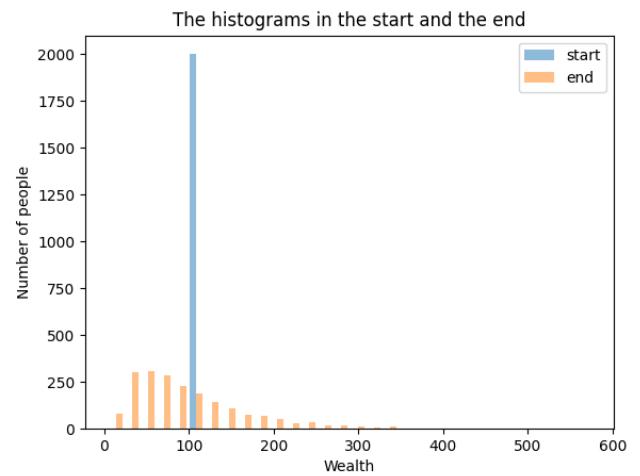
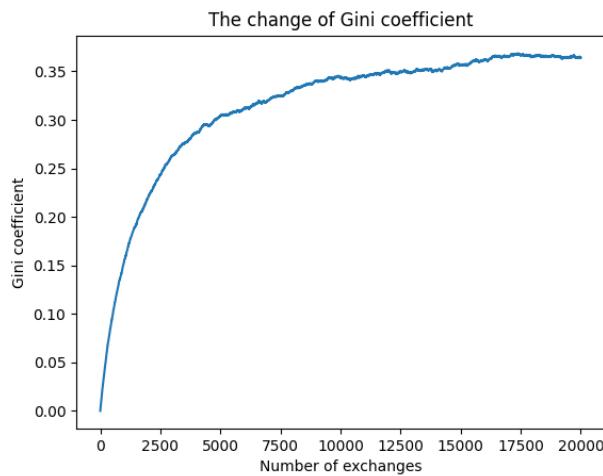
Equal population, size=2000, mean=100.00, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 60% chance of winning
 there is a 20% tax for each exchange, later distributed among all

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.24	43.41	19	34	67	103	129	175	213
4000	0.32	57.90	14	25	55	89	134	210	262
6000	0.36	65.81	9	19	49	84	138	221	301
8000	0.37	70.14	8	18	47	84	135	240	333
10000	0.40	75.03	8	15	43	81	136	247	356
12000	0.41	77.85	7	16	41	78	137	258	357
14000	0.42	79.98	8	15	41	78	134	257	391
16000	0.42	82.76	9	15	40	76	136	260	413
18000	0.42	83.74	8	15	40	77	133	262	427
20000	0.42	83.28	8	14	40	76	133	264	374

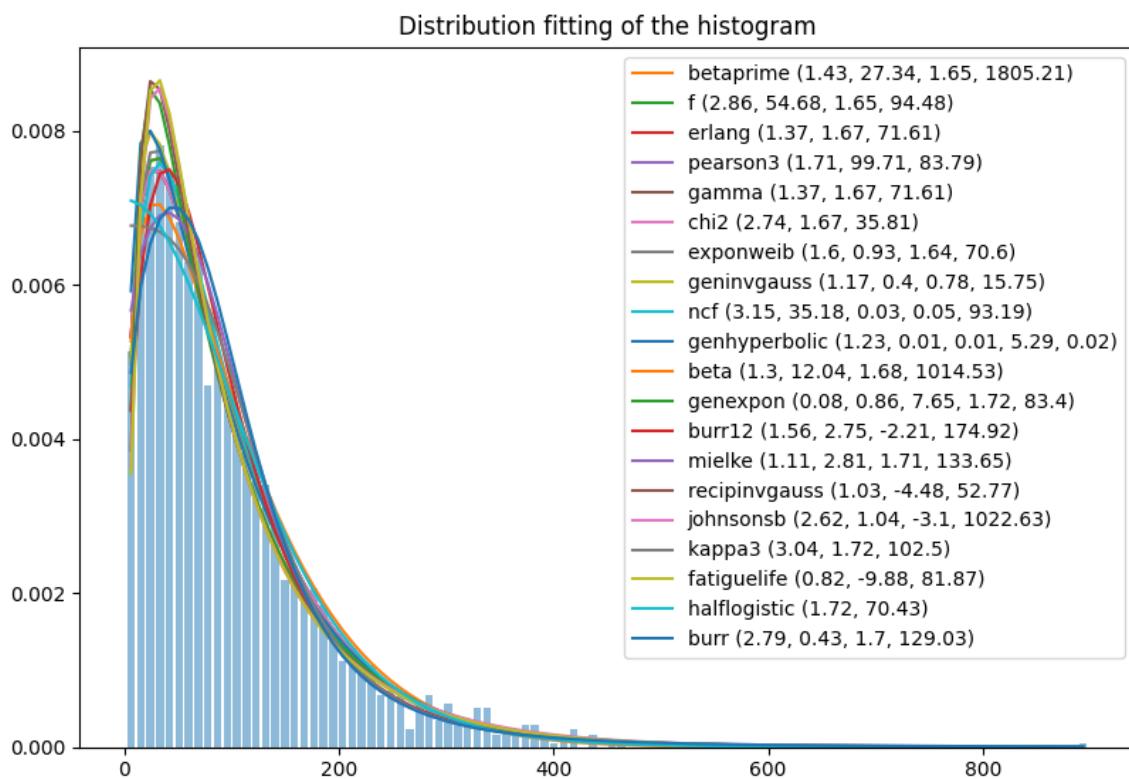
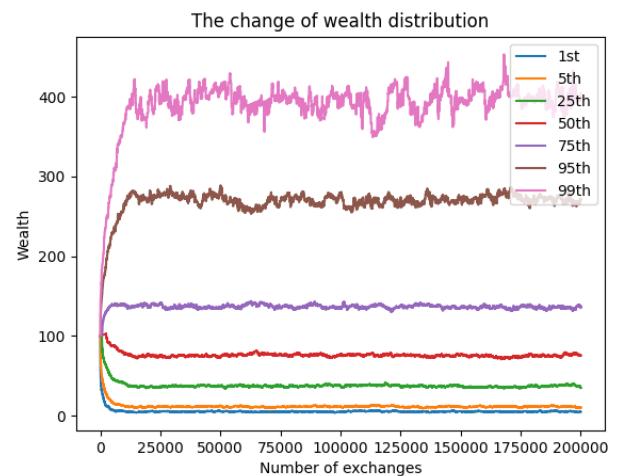
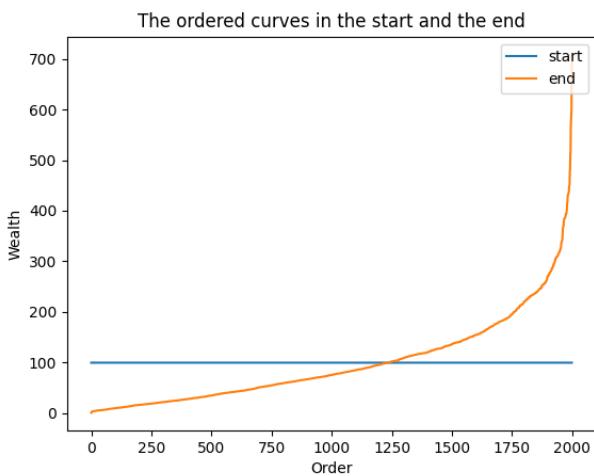
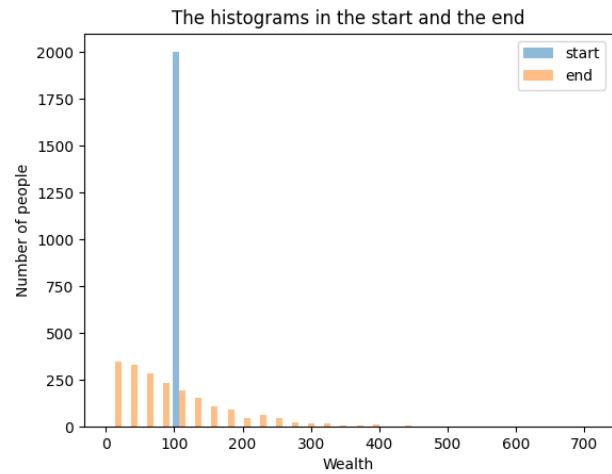
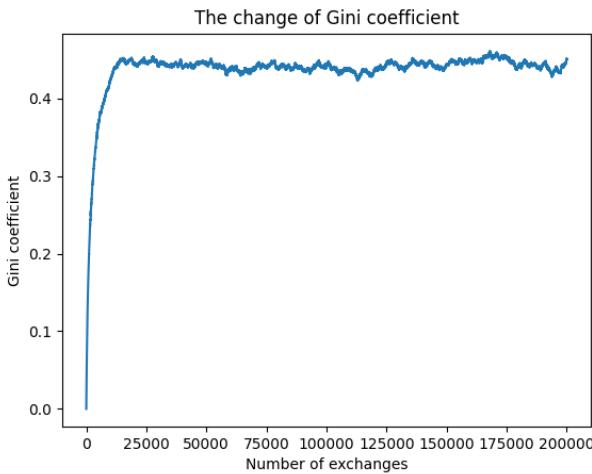


Equal population, size=2000, mean=100.00, simulating 20000 steps
 Exchange strategy: winner takes some proportion of wealth from the loser
 with the loser resisting the loss of wealth at Lvl. 5
 the richer party has 60% chance of winning
 there is a 45% tax for each exchange, later distributed among all

step	gini	std	1%	5%	25%	50%	75%	95%	99%
0	0.00	0.00	100	100	100	100	100	100	100
2000	0.22	38.77	25	37	70	105	127	163	186
4000	0.29	50.73	19	29	59	93	134	188	234
6000	0.31	56.12	15	26	56	89	136	202	258
8000	0.33	61.04	17	27	53	85	131	222	285
10000	0.34	64.20	15	25	52	85	132	232	317
12000	0.35	65.78	16	24	50	84	133	228	318
14000	0.35	65.78	14	23	51	84	131	229	309
16000	0.36	68.25	14	23	49	82	131	236	320
18000	0.37	69.16	12	21	49	83	132	233	328
20000	0.36	69.61	13	24	49	81	130	240	330



Equal population, size=2000, mean=100.00, simulating 200000 steps											
Exchange strategy: winner takes some proportion of wealth from the loser											
with the loser resisting the loss of wealth at Lvl. 5											
the richer party has 60% chance of winning											
Tax policy: part of the exchange is taken and equally distributed among all											
below 0.15 times initial mean 3%											
0.15 to 0.50 times initial mean 10%											
0.50 to 1.04 times initial mean 20%											
1.04 to 1.96 times initial mean 25%											
1.96 to 2.29 times initial mean 30%											
2.29 to 3.33 times initial mean 35%											
above 3.33 times initial mean 45%											
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+											
step gini std 1% 5% 25% 50% 75% 95% 99%											
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+											
0 0.00 0.00 100 100 100 100 100 100 100 100											
20000 0.45 85.33 5 11 35 77 136 271 390											
40000 0.44 84.68 5 11 36 76 138 268 396											
60000 0.44 85.21 5 12 37 75 137 260 400											
80000 0.44 85.50 5 12 37 74 136 271 401											
100000 0.44 85.67 5 11 37 77 134 276 387											
120000 0.44 85.41 5 12 39 76 133 280 407											
140000 0.45 87.31 4 10 36 74 136 269 414											
160000 0.45 86.74 5 11 35 74 139 275 407											
180000 0.44 86.12 5 11 37 74 137 270 399											
200000 0.45 87.59 4 10 35 75 136 270 404											
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+											
+-----+-----+-----+-----+-----+											
distr MSE KS-stat KS-pval											
+-----+-----+-----+-----+											
betaprime 2.04E-06 1.01E-02 9.85E-01											
f 2.04E-06 1.01E-02 9.85E-01											
erlang 2.06E-06 1.16E-02 9.48E-01											
pearson3 2.06E-06 1.16E-02 9.48E-01											
gamma 2.06E-06 1.16E-02 9.48E-01											
chi2 2.06E-06 1.16E-02 9.48E-01											
exponweib 2.10E-06 1.21E-02 9.30E-01											
geninvgauss 2.28E-06 1.24E-02 9.16E-01											
ncf 2.78E-06 1.51E-02 7.45E-01											
genhyperbolic 3.17E-06 1.00E+00 0.00E+00											
beta 3.87E-06 3.13E-02 3.85E-02											
genexpon 4.79E-06 2.38E-02 2.04E-01											
burr12 5.85E-06 2.19E-02 2.87E-01											
mielke 6.41E-06 2.58E-02 1.38E-01											
recipinvgauss 6.96E-06 2.98E-02 5.58E-02											
johnsonsb 7.64E-06 2.94E-02 6.24E-02											
kappa3 8.27E-06 2.17E-02 3.01E-01											
fatiguelife 8.44E-06 3.28E-02 2.66E-02											
halflogistic 8.52E-06 2.17E-02 3.00E-01											
burr 8.96E-06 3.91E-02 4.34E-03											
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