Homework Assignment 8

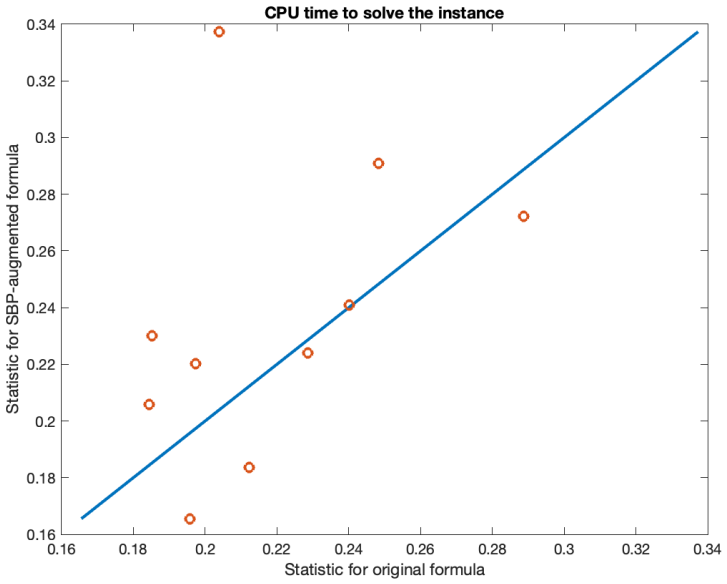
Statistics table for original CNF files:

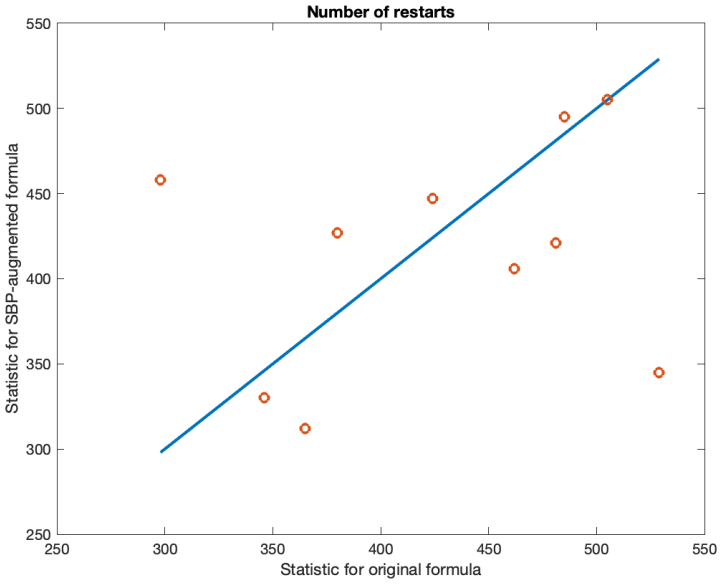
	From the CNF file		From the output of PySAT					From the output of saucy	
	Number of variables	Number of clauses	CPU time to solve the instance (s)	Number of restarts	Number of conflicts	Number of decisions	Number of propagations	Order of the formula's symmetry group	Number of symmetry generators
fdmus_b14_132.cnf	2580	7005	0.195733	462	9075	21590	1671780	3.07E+03	10
fdmus_b14_133.cnf	2688	7304	0.212261	505	9611	23065	1703493	3.07E+03	10
fdmus_b14_134.cnf	2811	7648	0.184344	365	9648	23053	1334422	3.07E+03	10
fdmus_b14_135.cnf	2916	7938	0.185284	424	9814	23038	1399131	3.07E+03	10
fdmus_b14_136.cnf	3018	8219	0.19741	380	10284	25131	1499762	3.07E+03	10
fdmus_b14_137.cnf	3102	8446	0.228534	485	12231	28516	1585604	3.07E+03	10
fdmus_b14_138.cnf	3186	8673	0.288753	529	13076	31583	2166873	3.07E+03	10
fdmus_b14_139.cnf	3261	8873	0.203887	481	10805	28484	1554428	3.07E+03	10
fdmus_b14_140.cnf	3369	9172	0.240093	346	12557	30019	1696294	3.07E+03	10
fdmus_b14_141.cnf	3534	9642	0.248326	298	12090	27294	1951766	3.07E+03	11

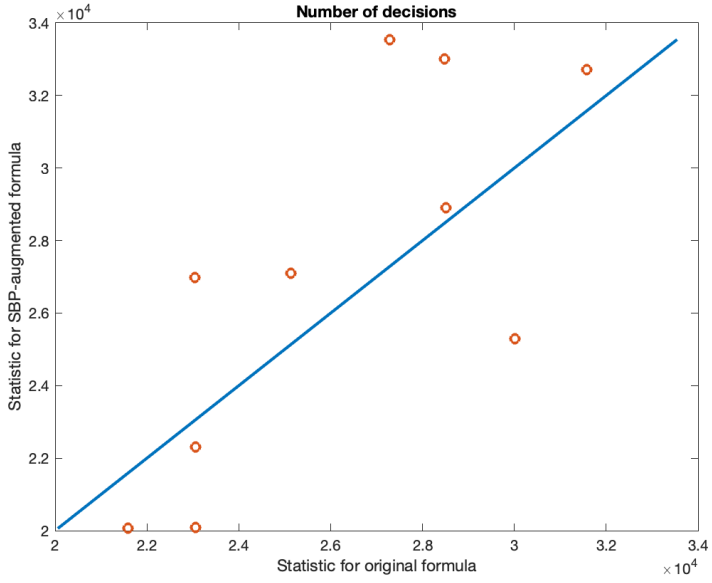
Statistics table for symmetry CNF files:

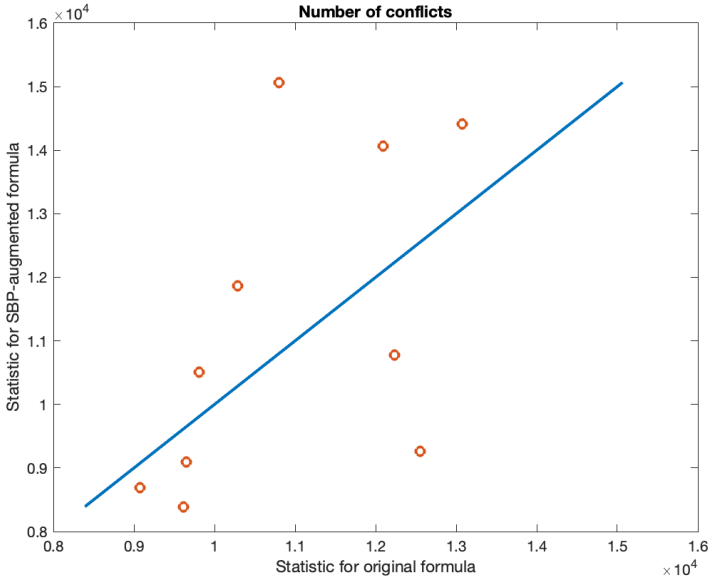
	From the CNF file		From the output of PySAT					From the output of saucy	
	Number of variables	Number of clauses	CPU time to solve the instance (s)	Number of restarts	Number of conflicts	Number of decisions	Number of propagations	Order of the formula's symmetry group	Number of symmetry generators
fdmus_b14_132.cnf	2756	7689	0.165506	406	8685	20060	1231079	2.00E+00	1
fdmus_b14_133.cnf	2864	7988	0.183646	505	8392	22310	1378892	4.00E+00	2
fdmus_b14_134.cnf	2987	8332	0.205721	312	9099	20083	1536123	4.00E+00	2
fdmus_b14_135.cnf	3092	8622	0.230071	447	10509	26979	1709530	4.00E+00	2
fdmus_b14_136.cnf	3194	8903	0.220151	427	11862	27101	1557884	4.00E+00	2
fdmus_b14_137.cnf	3278	9130	0.224011	495	10773	28902	1613495	2.00E+00	1
fdmus_b14_138.cnf	3362	9357	0.272287	345	14416	32718	1810704	2.00E+00	1
fdmus_b14_139.cnf	3437	9557	0.337334	421	15066	33002	2401611	4.00E+00	2
fdmus_b14_140.cnf	3545	9856	0.240977	330	9257	25299	1843874	4.00E+00	2
fdmus_b14_141.cnf	3716	10348	0.290774	458	14066	33544	1949260	2.00E+00	1

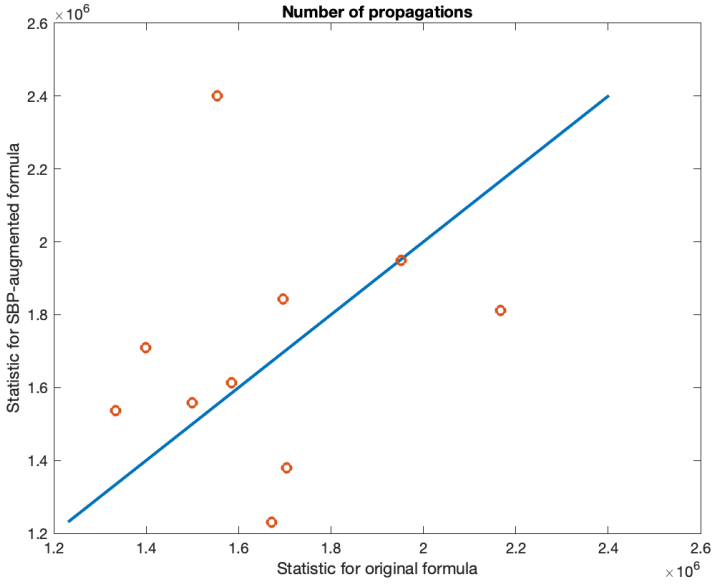
Scatter plots for output from PySAT:











Conclusion:

From these figures, we can notice that there's no evident improvement between the original formula and the SBP-augmented formula. Test cases run through the original formula even have less CPU time, number of decisions, and number of propagations in over half cases than test cases run through the SBP-augmented formula. However, when it comes to the number of restarts and conflicts, the SBP-augmented formula performs slightly better than the original formula. To sum up, symmetry breaking improves limited performance in these ten cases. In my opinion, we should increase the number of test cases to more effectively observe the impact of symmetry breaking on SAT solver performance.