1. Preliminary experiments for Sevilla and Sioux Falls networks

1.1. for (MC)

Network	Formulation using (??)-(??)		Formulation using (??)-(??)	
	t	LP gap	t	LP gap
Sioux	48.81	2.96	177.39	7.4
	gap	LP gap	gap	LP gap
Sevilla	3.02	1.26	$+\infty$	2.31

Table 1: Comparing the performance of the two different types of mode choice and capacity constraints for (MC) within a time limit of 1 hour for Sevilla and Sioux Falls instances.

Network	BD_Norm1		BD_Norm2		BD_Norm3	
	t	cuts	t	cuts	t	cuts
Sioux	24.67	2352	1186.46	4761	53.06	19480
Sevilla	341.61	7479	-		526.56	68203

Table 2: Comparing the performance of the three dual normalizations within a time limit of 1 hour for (MC) for Sevilla and Sioux Falls instances..

Network	BD_CW		Algorithm ??+BD_CW	
	t	cuts	t	cuts
Sioux	30.22	2959	34.08	3254
Sevilla	438.39	6322	706.78	8824

Table 3: Comparing the performance of the Algorithm ?? for (MC) for Sevilla and Sioux Falls instances.

2. Time performance

3. Branch-and-Benders-cut performance for Germany instances

Para la instancia de Germany50 se han utilizado los datos reales proporcionados a excepción del coste de los nodos y la utilidad privada.

Para la instancia de Ta2 se han utilizado los datos reales proporcionados a excepción del coste de los nodos, coste de las aristas y la utilidad privada.

		BD_Trd		BD_Norm		BD_CW	
		t_master	t_subpbs	t_master	t_subpbs	t_master	t_subpbs
MC	without CS	1040.49	54.76	501.53	39.5	445.91	11.9
	+CS	607.52	29.97	546.50	29.37	267.76	4.63
PC	without CS	467.26	36.8	485.61	28.81	824.85	12.56
	+CS	223.79	37.95	278.61	44.6	187.08	10.47

Table 4: Comparing the performance of the master and the subproblems in the three algorithms for (MC) and (PC).

	Network	CPLEX	Auto_BD		BD_Trd		BD_Norm		BD_CW	
without CS	G50	gap	gap	cuts	gap	cuts	gap	cuts	gap	cuts
		$+\infty$	26.31	4274	37.34	9788	30.06	11842	31.51	11472
	Ta2	t	t	cuts	t	cuts	t	cuts	t	cuts
		-	-	6455	1109.98	12969	471.03	13560	215.13	12628
+CS	G50	gap	gap	cuts	gap	cuts	gap	cuts	gap	cuts
			20.85	3176	36.27	11856	40.74	15847	19.22	8836
	Ta2	t	t	cuts	t	cuts	t	cuts	t	cuts
			-	6364	486.52	8890	280.52	7704	156.11	11117

Table 5: Comparing the performance of the three algorithms for (MC).

	Network	CPLEX	Auto_BD		BD_Trd		BD_Norm		BD_CW	
without CS	G50	gap	gap	cuts	gap	cuts	gap	cuts	gap	cuts
		72.44	11.38	7450	28.57	14176	21.78	9977	20.68	7602
	Ta2	t	t	cuts	t	cuts	t	cuts	t	cuts
		-	-	2822	257.44	6950	-	6436	190.80	6386
+CS	G50	gap	gap	cuts	gap	cuts	gap	cuts	gap	cuts
			10.04	5459	18.76	8185	23.96	11915	14.22	9819
	Ta2	t	t	cuts	t	cuts	t	cuts	t	cuts
			-	1117	138.94	2763	127.19	2645	75.78	2702

Table 6: Comparing the performance of the three algorithms for (PC).

	Auto_BD		BD_Trd		BD_Norm		BD_CW	
	gap	cuts	gap	cuts	gap	cuts	gap	cuts
without{CS, IS, RNC}	26.31	4274	37.34	9788	30.06	11842	31.51	11472
+CS	20.85	3176	36.27	11856	40.74	15847	19.22	8836
+CS+IS	56.12	3492	27.28	11635	29.74	11707	17.83	8206
+CS+IS+RNC	-		31.33	10150	32.27	11538	14.14	9064

Table 7: Computing gaps to solve (MC) for Germany50 instance comparing the performance of three families of Benders cuts.

	Auto_BD		BD_Trd		BD_Norm		BD_CW	
	gap	cuts	gap	cuts	gap	cuts	gap	cuts
without{CS, IS, RNC}	11.38	7450	28.57	14176	21.78	9977	20.68	7602
+CS	10.04	5459	18.76	8185	23.96	11915	14.22	9819
+CS+IS	11.65	3446	21.32	9552	21.14	9087	18.54	5075
+CS+IS+RNC	-		23.85	9771	19.93	8326	13.87	7955

Table 8: Computing gaps to solve (PC) for Germany50 instance comparing the performance of three families of Benders cuts.

	Auto_BD		BD_Trd		BD_Norm		BD_CW	
	t	cuts	t	cuts	t	cuts	t	cuts
without{CS, IS, RNC}	-	6455	1109.98	12969	471.03	13560	215.13	12628
+CS	-	6364	486.52	8890	280.52	7704	156.11	11117
+CS+IS	-	191	587.41	13452	884.95	12530	161.14	8893
+CS+IS+RNC	-		500.14	10302	530.34	8238	136.13	8307

Table 9: Computing gaps to solve (MC) for Ta2 instance comparing the performance of three families of Benders cuts.

	Auto_BD		BD_Trd		BD_Norm		BD_CW	
	t	cuts	t	cuts	t	cuts	t	cuts
without{CS, IS, RNC}	-	2822	257.44	6950	-	6436	190.80	6386
+CS	-	1117	138.94	2763	127.19	2645	75.78	2702
+CS+IS	1456.67	254	153.48	3322	141.69	3535	57.88	2411
+CS+IS+RNC	-		196.55	3286	136.94	2096	68.39	2512

Table 10: Computing gaps to solve (PC) for Ta2 instance comparing the performance of three families of Benders cuts.

C_{max}	BD_Norm+CS		BD_CW+CS	
	gap	cuts	gap	cuts
$0.3\,TC$	74.40	5026	48.01	5806
$0.5\,TC$	56.84	15490	18.91	10121
$0.7\,TC$	19.56	19193	11.53	14858

a.

u	BD_Norm+CS		BD_CW+CS	
	gap	cuts	gap	cuts
$1.5\,SPath$	67.57	13531	11.95	7545
$2\,SPath$	56.84	15490	18.91	10121
$3\,SPath$	29.53	11875	18.22	8559

b.

Table 11: Sensitivity analysis for (MC) with G50 instance

β	BD_Norm+CS		BD_CW+CS	
	gap	cuts	gap	cuts
0.3	21.14	9174	18.22	4154
0.5	24.01	11915	17.44	6678
0.7	17.47	15498	17.80	12736

a.

u	BD_Norm+CS		BD_CW+CS	
	t	cuts	t	cuts
$1.5\,SPath$	23.91	12491	10.14	6651
$2\,SPath$	24.01	11915	17.44	6678
$3\,SPath$	15.95	11761	13.02	6744

b.

Table 12: Sensitivity analysis for (PC) with G50 instance

C_{max}	BD_Norm+CS		BD_CW+CS	
	t	cuts	t	cuts
$0.3\,TC$	1124.30	7746	329.89	7124
$0.5\,TC$	827.92	12435	194.53	10257
$0.7\,TC$	84.25	3220	23.30	3936

a.

u	BD_Norm+CS		BD_CW+CS	
	t	cuts	t	cuts
$1.5\,SPath$	-		457.70	11266
$2\,SPath$	827.92	12435	194.53	10257
$3\,SPath$	458.73	8775	109.36	9604

b.

Table 13: Sensitivity analysis for (MC) with Ta2 instance

β	BD_Norm+CS		BD_CW+CS	
	t	cuts	t	cuts
0.3	214.30	1177	162.83	2715
0.5	127.44	2645	78.61	2811
0.7	2689.41	6668	461.44	5573

a.

u	BD_Norm+CS		BD_CW+CS	
	t	cuts	t	cuts
$1.5\,SPath$	327.73	4821	130.81	3251
$2\,SPath$	127.44	2645	78.61	2811
$3\,SPath$	130.03	2745	65.98	2277

b.

Table 14: Sensitivity analysis for (PC) with Ta2 instance