

# Contents

<b>Introduction</b>	<b>1</b>
<b>1 A Review and background</b>	<b>8</b>
1.1 Bilevel programming	8
1.1.1 Optimistic case	10
1.1.2 Pessimist case	11
1.1.3 Bi-level programming applications	11
1.1.4 Solution methods	12
1.2 Location problems	14
1.2.1 Bi-level location problems	15
1.2.2 Multi-product location problem	17
1.3 Coalition problem	18
1.3.1 Coalition structure generation (CSG)	19
1.3.2 Payoff Distribution	20
1.3.3 Applications	22
1.4 Solution Method	23
1.4.1 Lagrangian relaxation	23
1.4.2 Cut generation	29
<b>2 Lagrangian relaxation for product line optimization with multiples sites</b>	<b>32</b>
2.1 Problem definition and formulations	32
2.1.1 Problem description	33
2.1.2 Bilevel model formulation	33
2.1.3 Single-level model formulation	35
2.2 Lagrangian relaxation approach	36
2.2.1 Lagrangian Relaxation LR <sup>1</sup>	37
2.2.2 Lagrangian relaxation LR <sup>2</sup>	37
2.2.3 Lagrangian relaxation LR <sup>3</sup>	38
2.2.4 Feasible solution	39
2.3 Numerical Experiments	40
2.3.1 Random instance	40
2.3.2 Solving the Original problem	41
2.3.3 Lagrangian Relaxation approach	42
2.4 Conclusions	42
<b>3 Cut generation to product line optimisation with multiples site</b>	<b>44</b>

44	section.3.1	
3.2	Valid inequalities . . . . .	45
3.3	Solution methods . . . . .	47
3.3.1	Existing Benders decomposition method . . . . .	48
3.3.2	Cut generation methods . . . . .	48
3.3.3	Problem preprocessing . . . . .	51
3.4	Computational experiments . . . . .	51
3.4.1	Instances: description . . . . .	51
3.4.2	Efficiency of problem formulation and benders decomposition on multi store instances . . . . .	53
3.4.3	The effectiveness of constraints (3.7) . . . . .	54
3.4.4	Evaluation of decomposition methods on multi store instances . . . . .	54
3.5	Conclusions . . . . .	56
<b>4</b>	<b>Mixed-Integer Programming for Combinatorial Coalition Formation Problem</b>	<b>58</b>
58	section.4.1	
4.2	Problem definition and formulations . . . . .	60
4.2.1	Problem description . . . . .	60
4.2.2	Model formulation . . . . .	64
4.3	Solution methods . . . . .	67
4.4	Computational experiments . . . . .	73
4.4.1	Instances: description . . . . .	73
4.4.2	Comparison between the different formulations . . . . .	74
4.4.3	Evaluation of Bender's decomposition . . . . .	75
4.5	Conclusions . . . . .	78
<b>5</b>	<b>Conclusion</b>	<b>80</b>
5.1	Contributions . . . . .	81
5.2	Future work . . . . .	82
	<b>Bibliography</b>	<b>83</b>
	<b>Appendix</b>	<b>94</b>
5.2.1	Stabilization root node . . . . .	94
5.2.2	Primal feasible heuristic . . . . .	96