

Contents

List of Figures.....	vi
List of Tables	viii
List of Abbreviations	ix
List of Symbols	x
1. Introduction.....	1
1.1. Motivation - Supply Chain Visibility and Random Yield.....	1
1.2. Outline	3
1.3. Contribution.....	5
2. Foundations of Inventory Management under Random Yield	7
2.1. Modeling of Random Yield.....	7
2.2. Implications of Random Yield on Inventory Management.....	10
2.3. Implications of Random Yield on Cost Modeling	14

3. The Value of Real Time Yield Information in Multi-State Inventory Systems	17
3.1. Abstract.....	17
3.2. Introduction and Literature Review.....	18
3.3. Model Formulation	21
3.3.1. Model with Real Time Yield Information	22
3.3.2. Model without Real Time Yield Information	25
3.4. Optimal Solution Approach for the Infinite Horizon Model with Discrete and Finite State Space.....	26
3.4.1. Solution Approach with Real Time Yield Information	26
3.4.2. Solution Approach without Real Time Yield Information	27
3.5. Heuristic Solution Approaches.....	28
3.5.1. MULT-Heuristic	30
3.5.2. OPT-Heuristic	30
3.6. Computational Results.....	31
3.6.1. Optimal Solutions	31
3.6.2. Heuristic Solutions	35
3.7. Value of Real Time Yield Information.....	40
3.8. Extension: Fixed Order Cost	45
3.9. Conclusion.....	47
Appendix 3.A Summary of Notation.....	48
Appendix 3.B Proof of Theorem 3-1	49
Appendix 3.C Proof of Lemma 3-1	49

Appendix 3.D Proof of Theorem 3-2	50
Appendix 3.E Proof of Theorem 3-3	50
Appendix 3.F Proof of Proposition 3-1	51
4. The Value of Supply Chain Visibility when Visibility is Costly	53
4.1. Abstract.....	53
4.2. Introduction and Literature Review.....	54
4.3. Model.....	56
4.4. Computational Results.....	59
4.4.1. The Value of a Flexible Tracking Policy	59
4.4.2. Influences on Tracking Decision	63
4.5. Conclusion.....	66
Appendix 4.A Proof of Theorem 4-1	68
Appendix 4.B Proof of Theorem 4-2	68
5. Co-Production and Partial Supply Chain Visibility in Semiconductor Manufacturing	69
5.1. Abstract.....	69
5.2. Introduction	70
5.3. Related Literature	72
5.4. Model.....	75
5.5. Structural Results.....	78
5.5.1. Single-Period Analysis.....	78

5.5.2. Two-Period Analysis.....	80
5.6. Solution Approaches	82
5.6.1. ε -optimal Solution Approach	82
5.6.2. Heuristic Solution Approach.....	85
5.7. Numerical Results	87
5.7.1. ε -optimal Solution Approach	87
5.7.2. Comparison of Heuristic with ε -optimal Solution	89
5.7.3. The Value of Preliminary Yield Information.....	92
5.8. Conclusion.....	95
Appendix 5.A. Proof of Theorem 5-1	97
Appendix 5.B. Profit function for two-period model	100
Appendix 5.C. First order derivatives for two-period model	102
Appendix 5.D. Proof of Theorem 5-2.....	104
6. Conclusion	113
6.1. Summary of Key Results.....	113
6.2. Critical Review of Modeling Approach	115
6.3. Directions for Further Research	116
Bibliography	119