ANOVA with binary variables -
The F-test and some Alternatives

Appendix B 7
Tables and Graphs of the Type I Error Rate of all considered methods for fixed n_i (5,10,..,50) in mixed designs

All tables refer to α=0.05 and α=0.01, graphs to α=0.05. Reported are the proportions of rejections of the corresponding null hypothesis.

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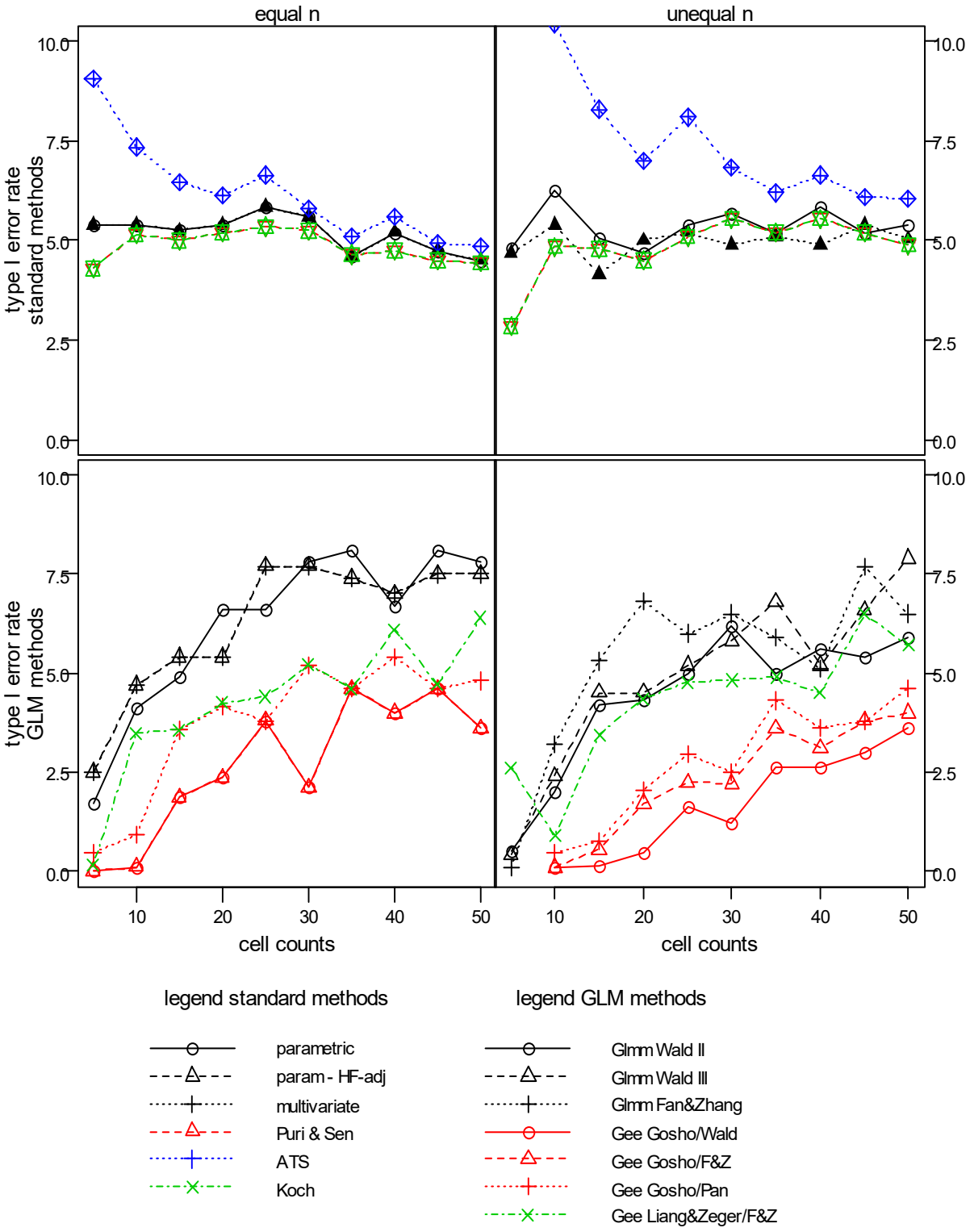
7. 1. Main effect A - null model

7. 1. 1. equal correlations on B (r=0.3)

7. 1. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.40	5.40	5.25	5.40	5.60	5.20	4.50	4.80	6.25	5.05	4.7	5.70	5.85	5.40
	par./ HF-corr.														
	multivariate	5.40	5.40	5.25	5.40	5.60	5.20	4.50	4.70	5.40	4.15	5.0	4.90	4.90	5.05
	Puri & Sen	4.30	5.15	5.00	5.20	5.25	4.75	4.45	2.85	4.85	4.80	4.5	5.55	5.55	4.90
	ATS	9.05	7.35	6.45	6.15	5.80	5.60	4.85	16.90	10.45	8.30	7.0	6.85	6.65	6.05
	Koch	4.30	5.15	5.00	5.20	5.25	4.75	4.45	2.85	4.85	4.80	4.5	5.55	5.55	4.90
	Glmm Wald II	2.5	1.9	2.1	3.5	4.6	5.3	5.5	0.2	0.7	1.9	2.7	4.0	4.0	4.6
	Glmm Wald III	2.5	1.9	2.1	3.5	4.6	5.3	5.5	0.2	0.7	1.9	2.7	4.0	4.0	4.6
	Glmm Fan&Zhang	5.4	3.4	2.3	3.1	3.0	3.1	4.1	0.1	2.0	5.4	6.5	6.6	6.1	6.8
	Gee Gosho/Wald	0.0	0.1	1.9	2.4	2.1	4.0	3.6		0.1	0.1	0.5	1.2	2.6	3.6
	Gee Gosho/F&Z	0.0	0.1	1.9	2.4	2.1	4.0	3.6		0.1	0.5	1.7	2.2	3.1	4.0
	Gee Gosho/Pan	0.5	0.9	3.6	4.2	5.2	5.4	4.8		0.4	0.8	2.0	2.5	3.6	4.6
	Gee Liang&Zeger	0.2	3.5	3.6	4.2	5.2	6.1	6.4	2.6	0.9	3.4	4.4	4.8	4.5	5.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.30	1.05	0.85	1.40	1.20	1.10	0.90	1.25	0.90	1.00	0.75	1.00	1.00	1.15
	par./ HF-corr.														
	multivariate	1.30	1.05	0.85	1.40	1.20	1.10	0.90	0.80	1.50	0.75	1.00	1.00	1.40	0.95
	Puri & Sen	0.50	0.90	0.60	1.25	1.00	0.95	0.75	0.15	0.55	0.65	0.65	0.85	0.95	1.05
	ATS	3.35	1.90	1.50	1.90	1.35	1.30	1.10	8.50	4.85	3.50	2.50	2.60	2.15	2.10
	Koch	0.50	0.90	0.60	1.25	1.00	0.95	0.75	0.15	0.55	0.65	0.65	0.85	0.95	1.05
	Glmm Wald II	0.7	0.9	0.6	1.4	1.8	2.0	1.9	0.2	0.4	1.2	0.7	0.7	0.9	1.1
	Glmm Wald III	0.7	0.9	0.6	1.4	1.8	2.0	1.9	0.2	0.4	1.2	0.7	0.7	0.9	1.1
	Glmm Fan&Zhang	1.8	1.2	0.7	1.1	1.4	1.4	2.0	0.0	0.6	2.4	1.9	1.9	1.7	2.0
	Gee Gosho/Wald	0.0	0.0	0.2	0.2	0.8	1.0	0.7		0.1	0.1	0.1	0.0	0.2	0.3
	Gee Gosho/F&Z	0.0	0.0	0.2	0.2	0.8	1.0	0.7		0.1	0.1	0.2	0.5	0.5	0.9
	Gee Gosho/Pan	0.4	0.0	0.2	0.4	0.8	1.4	0.7		0.1	0.1	0.2	0.2	0.5	0.6
	Gee Liang&Zeger	0.2	0.1	0.6	0.4	0.8	1.7	0.7	2.6	0.2	0.2	0.8	1.0	0.7	1.9

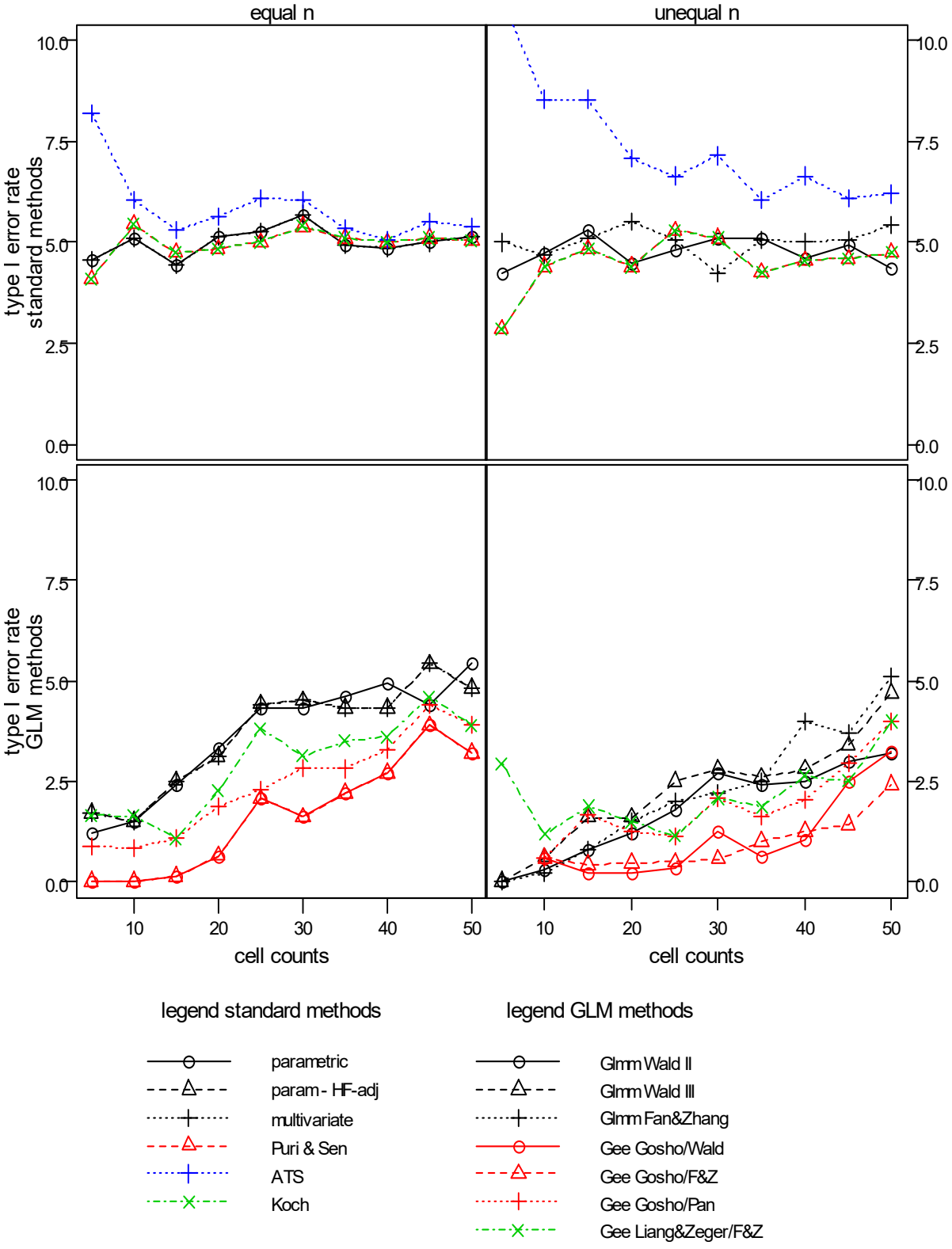
Graphic for α=0.05:



7. 1. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.55	5.10	4.45	5.15	5.70	4.85	5.15	4.25	4.75	5.30	4.5	5.10	4.60	4.35
	par./ HF-corr.														
	multivariate	4.55	5.10	4.45	5.15	5.70	4.85	5.15	5.00	4.70	5.10	5.5	4.25	5.00	5.45
	Puri & Sen	4.10	5.45	4.75	4.85	5.40	5.00	5.05	2.85	4.40	4.85	4.4	5.10	4.55	4.75
	ATS	8.20	6.05	5.30	5.65	6.05	5.05	5.40	11.05	8.55	8.55	7.1	7.15	6.65	6.20
	Koch	4.10	5.45	4.75	4.85	5.40	5.00	5.05	2.85	4.40	4.85	4.4	5.10	4.55	4.75
	Glmm Wald II	1.2	1.5	2.4	3.3	4.3	4.9	5.4	0.0	0.3	0.8	1.2	2.7	2.5	3.2
	Glmm Wald III	1.7	1.5	2.5	3.1	4.5	4.3	4.8	0.0	0.6	1.6	1.6	2.8	2.8	4.7
	Glmm Fan&Zhang	1.7	1.5	2.5	3.1	4.5	4.3	4.8	0.0	0.2	0.8	1.5	2.2	4.0	5.1
	Gee Gosho/Wald	0.0	0.0	0.1	0.6	1.6	2.7	3.2		0.6	0.2	0.2	1.2	1.0	3.3
	Gee Gosho/F&Z	0.0	0.0	0.1	0.6	1.6	2.7	3.2		0.6	0.4	0.5	0.6	1.3	2.4
	Gee Gosho/Pan	0.9	0.8	1.1	1.9	2.8	3.3	3.9		0.6	1.7	1.3	2.1	2.1	4.0
	Gee Liang&Zeger	1.7	1.6	1.1	2.3	3.1	3.6	3.9	2.9	1.2	1.9	1.5	2.1	2.6	4.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.60	0.80	1.40	1.00	1.10	0.85	0.8	1.20	0.95	1.45	1.10	1.20	1.15	0.70
	par./ HF-corr.														
	multivariate	0.60	0.80	1.40	1.00	1.10	0.85	0.8	0.85	0.95	1.00	1.40	0.60	1.05	0.80
	Puri & Sen	0.35	0.75	1.15	0.65	1.10	0.85	1.1	0.20	0.50	0.85	0.90	1.35	0.80	0.70
	ATS	2.05	1.70	1.60	1.15	1.45	0.95	0.9	4.40	2.70	2.65	1.95	2.10	1.90	1.75
	Koch	0.35	0.75	1.15	0.65	1.10	0.85	1.1	0.20	0.50	0.85	0.90	1.35	0.80	0.70
	Glmm Wald II	0.8	0.9	0.9	0.6	1.0	1.2	1.1	0.0	0.1	0.2	0.0	0.2	0.4	0.5
	Glmm Wald III	0.8	1.0	0.7	0.5	0.8	0.9	1.5	0.0	0.1	0.0	0.1	0.5	0.5	0.9
	Glmm Fan&Zhang	0.8	1.0	0.7	0.5	0.8	0.9	1.5	0.0	0.1	0.2	0.1	0.1	0.4	0.6
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0	0.1	0.2		0.6	0.2	0.1	0.1	0.1	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0	0.1	0.2		0.6	0.2	0.1	0.0	0.1	0.2
	Gee Gosho/Pan	0.9	0.6	0.3	0.1	0	0.1	0.3		0.6	0.2	0.1	0.1	0.5	0.3
	Gee Liang&Zeger	1.7	0.5	0.3	0.1	0	0.3	0.6	2.9	1.2	1.5	0.3	0.3	0.3	0.3

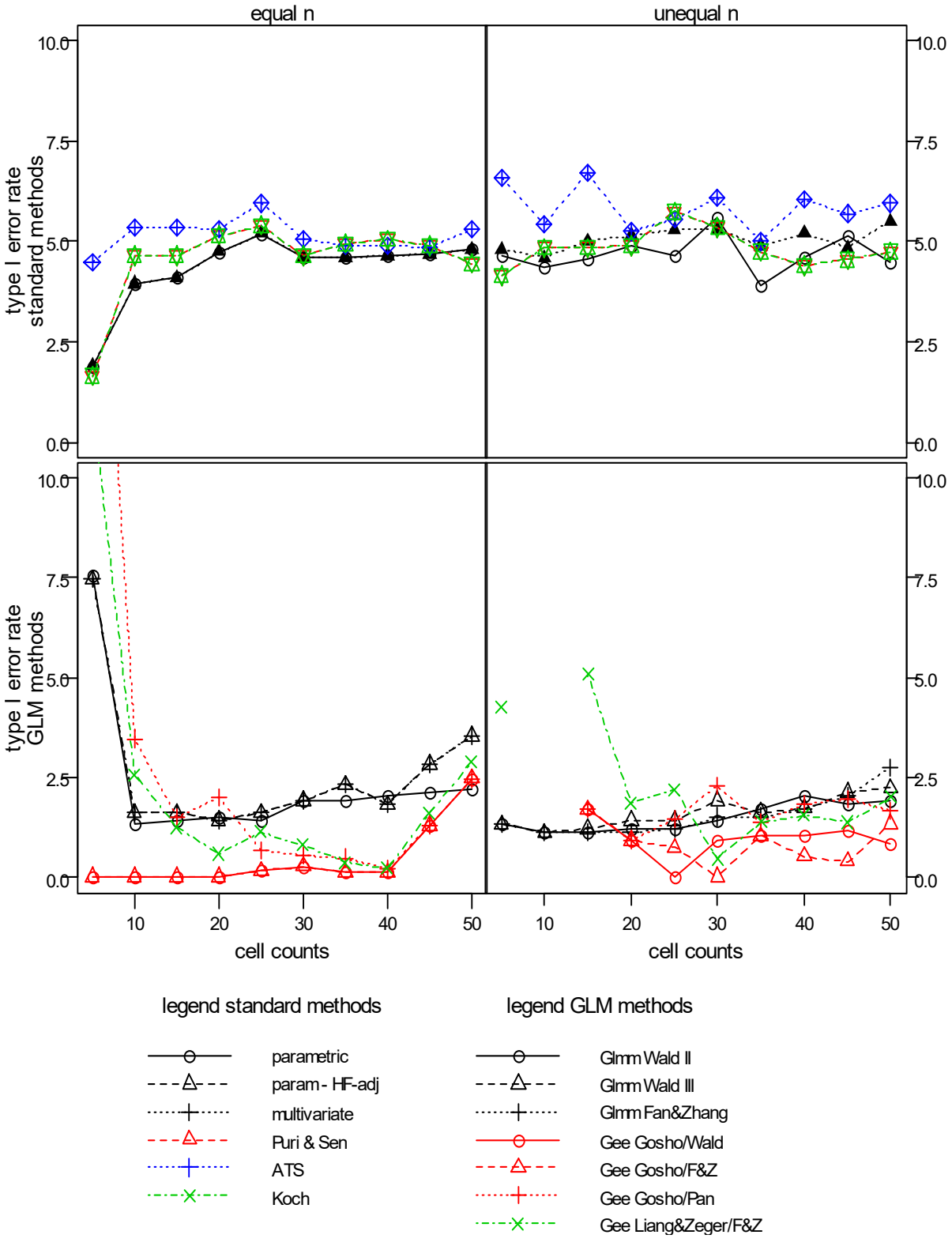
Graphic for α=0.05:



7. 1. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.90	3.95	4.10	4.75	4.60	4.65	4.80	4.65	4.35	4.55	4.90	5.60	4.60	4.50
	par./ HF-corr.														
	multivariate	1.90	3.95	4.10	4.75	4.60	4.65	4.80	4.80	4.60	5.00	5.15	5.30	5.20	5.50
	Puri & Sen	1.65	4.65	4.65	5.15	4.65	5.05	4.45	4.15	4.85	4.85	4.90	5.35	4.40	4.75
	ATS	4.50	5.35	5.35	5.30	5.05	4.90	5.30	6.60	5.45	6.70	5.25	6.10	6.05	5.95
	Koch	1.65	4.65	4.65	5.15	4.65	5.05	4.45	4.15	4.85	4.85	4.90	5.35	4.40	4.75
	Glmm Wald II	7.6	1.3	1.4	1.5	1.9	2.0	2.2	1.3	1.1	1.1	1.2	1.4	2.0	1.9
	Glmm Wald III	7.5	1.6	1.6	1.4	1.9	1.8	3.5	1.3	1.1	1.2	1.4	1.9	1.7	2.2
	Glmm Fan&Zhang	7.5	1.6	1.6	1.4	1.9	1.8	3.5	1.3	1.1	1.1	1.1	1.5	1.7	2.7
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.3	0.1	2.5			1.7	0.9	0.9	1.0	0.8
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.3	0.1	2.5			1.7	0.9	0.0	0.5	1.3
	Gee Gosho/Pan	20.5	3.5	1.5	2.0	0.5	0.2	2.5			1.7	0.9	2.3	1.8	1.7
	Gee Liang&Zeger	11.8	2.6	1.2	0.6	0.8	0.2	2.9	4.3	0.50	5.1	1.9	0.5	1.6	2.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.1	0.15	0.30	0.45	0.75	0.85	0.8	1.65	1.20	1.4	1.10	0.90	0.85	0.8
	par./ HF-corr.														
	multivariate	0.1	0.15	0.30	0.45	0.75	0.85	0.8	0.90	0.50	0.8	0.60	0.65	1.25	1.1
	Puri & Sen		0.15	0.55	0.80	0.75	0.90	0.9	0.75	0.60	1.0	0.95	0.85	0.65	1.1
	ATS	0.5	0.85	0.55	0.65	1.15	1.05	1.0	2.55	0.75	1.3	1.15	1.55	1.70	1.2
	Koch		0.15	0.55	0.80	0.75	0.90	0.9	0.75	0.60	1.0	0.95	0.85	0.65	1.1
	Glmm Wald II	7.5	1.3	1.4	1.3	1.4	1	1.1	1.3	1.1	1.1	1.1	1.1	1.3	1.2
	Glmm Wald III	7.5	1.3	1.4	1.3	1.2	1	1.1	1.3	1.1	1.1	1.2	1.1	1.2	1.2
	Glmm Fan&Zhang	7.5	1.3	1.4	1.3	1.2	1	1.1	1.3	1.1	1.1	1.1	1.2	1.3	1.2
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0	0			1.7	0.9	0	0.3	0.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0	0			1.7	0.9	0	0.3	0.0
	Gee Gosho/Pan	20.5	3.5	1.3	1.5	0.3	0	0			1.7	0.9	0	0.3	0.2
	Gee Liang&Zeger	11.8	2.6	0.8	0.6	0.1	0	0	4.3	0.50	5.1	1.9	0	0.5	0.0

Graphic for α=0.05:

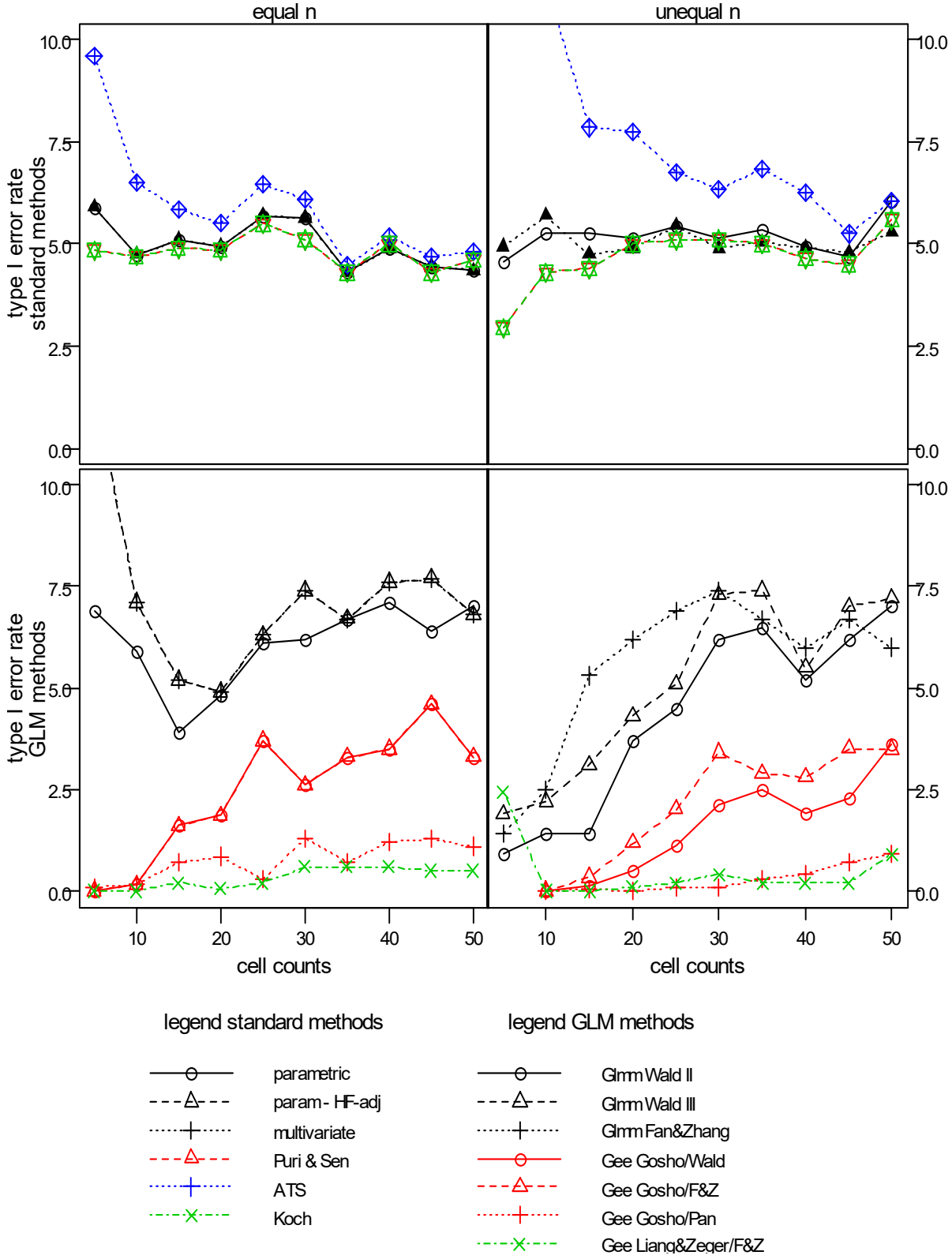


7. 1. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 1. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.90	4.75	5.10	4.95	5.65	4.9	4.35	4.55	5.25	5.25	5.15	5.15	4.95	6.05
	par./ HF-corr.														
	multivariate	5.90	4.75	5.10	4.95	5.65	4.9	4.35	4.95	5.70	4.75	4.90	4.90	4.90	5.30
	Puri & Sen	4.85	4.70	4.90	4.85	5.10	5.0	4.60	2.95	4.30	4.40	5.00	5.10	4.65	5.60
	ATS	9.60	6.50	5.85	5.50	6.10	5.2	4.80	17.50	11.40	7.85	7.75	6.35	6.25	6.05
	Koch	4.85	4.70	4.90	4.85	5.10	5.0	4.60	2.95	4.30	4.40	5.00	5.10	4.65	5.60
	Glmm Wald II	6.9	5.9	3.9	4.8	6.2	7.1	7.0	0.9	1.4	1.4	3.7	6.2	5.2	7.0
	Glmm Wald III	12.3	7.1	5.2	4.9	7.4	7.6	6.8	1.9	2.2	3.1	4.3	7.3	5.5	7.2
	Glmm Fan&Zhang	12.3	7.1	5.2	4.9	7.4	7.6	6.8	1.4	2.5	5.3	6.2	7.4	6.0	6.0
	Gee Gosho/Wald	0.0	0.2	1.6	1.8	2.6	3.5	3.3		0.0	0.1	0.5	2.1	1.9	3.6
	Gee Gosho/F&Z	0.0	0.2	1.6	1.8	2.6	3.5	3.3		0.0	0.3	1.2	3.4	2.8	3.5
	Gee Gosho/Pan	0.1	0.2	0.7	0.8	1.3	1.2	1.1		0.0	0.1	0.0	0.1	0.4	0.9
	Gee Liang&Zeger	0.0	0.0	0.2	0.0	0.6	0.6	0.5	2.4	0.0	0.0	0.1	0.4	0.2	0.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.60	1.20	1.35	1.40	1.05	0.90	0.95	0.80	1.05	0.85	1.2	1.40	1.1	1.20
	par./ HF-corr.														
	multivariate	1.60	1.20	1.35	1.40	1.05	0.90	0.95	1.25	1.10	1.10	1.0	0.85	1.0	0.70
	Puri & Sen	0.60	0.75	1.00	1.05	1.00	0.85	0.80	0.40	0.55	0.60	0.9	1.30	0.9	1.10
	ATS	4.15	2.15	2.00	1.60	1.40	1.00	0.95	8.80	5.65	3.70	3.0	2.20	1.9	2.55
	Koch	0.60	0.75	1.00	1.05	1.00	0.85	0.80	0.40	0.55	0.60	0.9	1.30	0.9	1.10
	Glmm Wald II	3.1	4.4	1.3	2.4	2.0	2.8	2.7	0.9	1.4	1.4	3.7	6.2	5.2	7.0
	Glmm Wald III	2.6	4.8	1.9	1.9	2.2	2.5	2.8	1.9	2.2	3.1	4.3	7.3	5.5	7.2
	Glmm Fan&Zhang	2.6	4.8	1.9	1.9	2.2	2.5	2.8	1.4	2.5	5.3	6.2	7.4	6.0	6.0
	Gee Gosho/Wald	0.0	0.0	0.1	0.0	0.6	0.6	0.8		0.0	0.0	0.0	0.0	0.4	1.0
	Gee Gosho/F&Z	0.0	0.0	0.1	0.0	0.6	0.6	0.8		0.0	0.0	0.1	0.4	0.3	0.9
	Gee Gosho/Pan	0.0	0.0	0.0	0.0	0.0	0.1	0.3		0.0	0.0	0.0	0.0	0.0	0.1
	Gee Liang&Zeger	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0

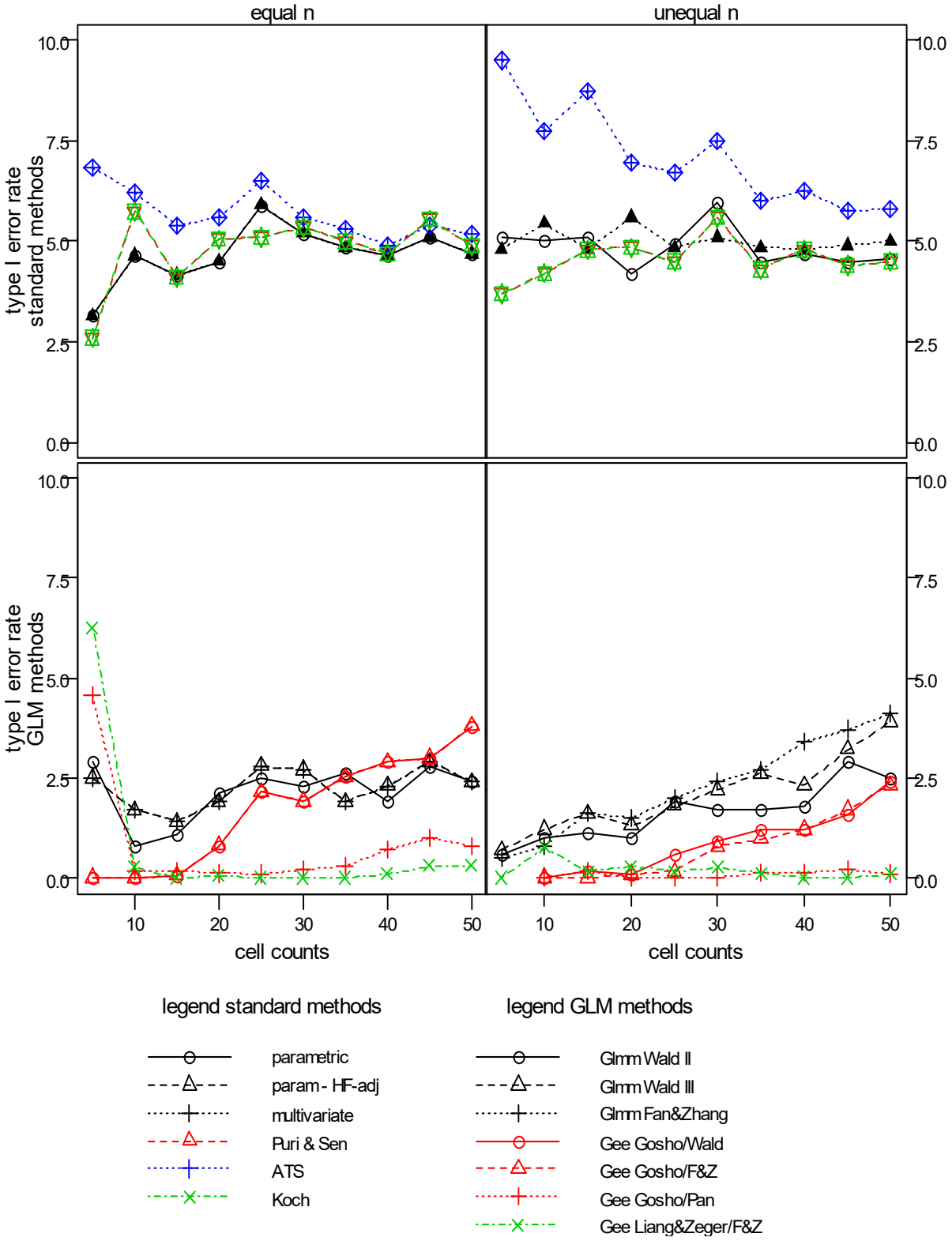
Graphic for α=0.05:



7. 1. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.15	4.65	4.15	4.50	5.20	4.65	4.7	5.1	5.00	5.10	4.20	5.95	4.70	4.55
	par./ HF-corr.														
	multivariate	3.15	4.65	4.15	4.50	5.20	4.65	4.7	4.8	5.45	4.80	5.60	5.10	4.80	5.00
	Puri & Sen	2.60	5.75	4.10	5.05	5.35	4.70	4.9	3.7	4.20	4.80	4.85	5.60	4.80	4.50
	ATS	6.85	6.20	5.40	5.60	5.60	4.90	5.2	9.5	7.75	8.75	6.95	7.50	6.25	5.80
	Koch	2.60	5.75	4.10	5.05	5.35	4.70	4.9	3.7	4.20	4.80	4.85	5.60	4.80	4.50
	Glmm Wald II	2.9	0.8	1.1	2.1	2.3	1.9	2.4	0.6	1.0	1.1	1.0	1.7	1.8	2.5
	Glmm Wald III	2.5	1.7	1.4	1.9	2.7	2.3	2.4	0.7	1.2	1.6	1.3	2.2	2.3	3.9
	Glmm Fan&Zhang	2.5	1.7	1.4	1.9	2.7	2.3	2.4	0.5	0.8	1.6	1.5	2.4	3.4	4.1
	Gee Gosho/Wald	0.0	0.0	0.1	0.8	1.9	2.9	3.8		0.0	0.2	0.1	0.9	1.2	2.4
	Gee Gosho/F&Z	0.0	0.0	0.1	0.8	1.9	2.9	3.8		0.0	0.0	0.1	0.8	1.2	2.3
	Gee Gosho/Pan	4.6	0.2	0.2	0.1	0.2	0.7	0.8		0.0	0.2	0.0	0.0	0.1	0.1
	Gee Liang&Zeger	6.3	0.3	0.0	0.1	0.0	0.1	0.3	0.0	0.8	0.2	0.3	0.3	0.0	0.1
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.30	0.60	0.7	0.85	1.10	0.80	1.20	1.70	1.05	1.25	0.70	1.30	1.00	0.60
	par./ HF-corr.														
	multivariate	0.30	0.60	0.7	0.85	1.10	0.80	1.20	0.95	0.80	0.80	1.15	1.05	1.20	0.70
	Puri & Sen	0.05	0.45	1.0	0.70	0.75	0.95	0.85	0.20	0.65	0.80	0.85	1.05	0.75	0.85
	ATS	1.50	1.45	1.4	1.05	1.35	0.95	1.30	4.25	2.30	2.60	1.95	2.60	1.85	1.90
	Koch	0.05	0.45	1.0	0.70	0.75	0.95	0.85	0.20	0.65	0.80	0.85	1.05	0.75	0.85
	Glmm Wald II	1.6	0.4	0.5	0.6	0.5	0.4	0.6	0.6	1.0	1.1	1.0	1.7	1.8	2.5
	Glmm Wald III	1.6	0.6	0.5	0.5	0.3	0.2	0.2	0.7	1.2	1.6	1.3	2.2	2.3	3.9
	Glmm Fan&Zhang	1.6	0.6	0.5	0.5	0.3	0.2	0.2	0.5	0.8	1.6	1.5	2.4	3.4	4.1
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0.3	0.3		0.0	0.0	0.0	0.0	0.1	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.3	0.3		0.0	0.0	0.0	0.0	0.1	0.4
	Gee Gosho/Pan	4.3	0.1	0.2	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	6.1	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.8	0.2	0.3	0.1	0.0	0.0

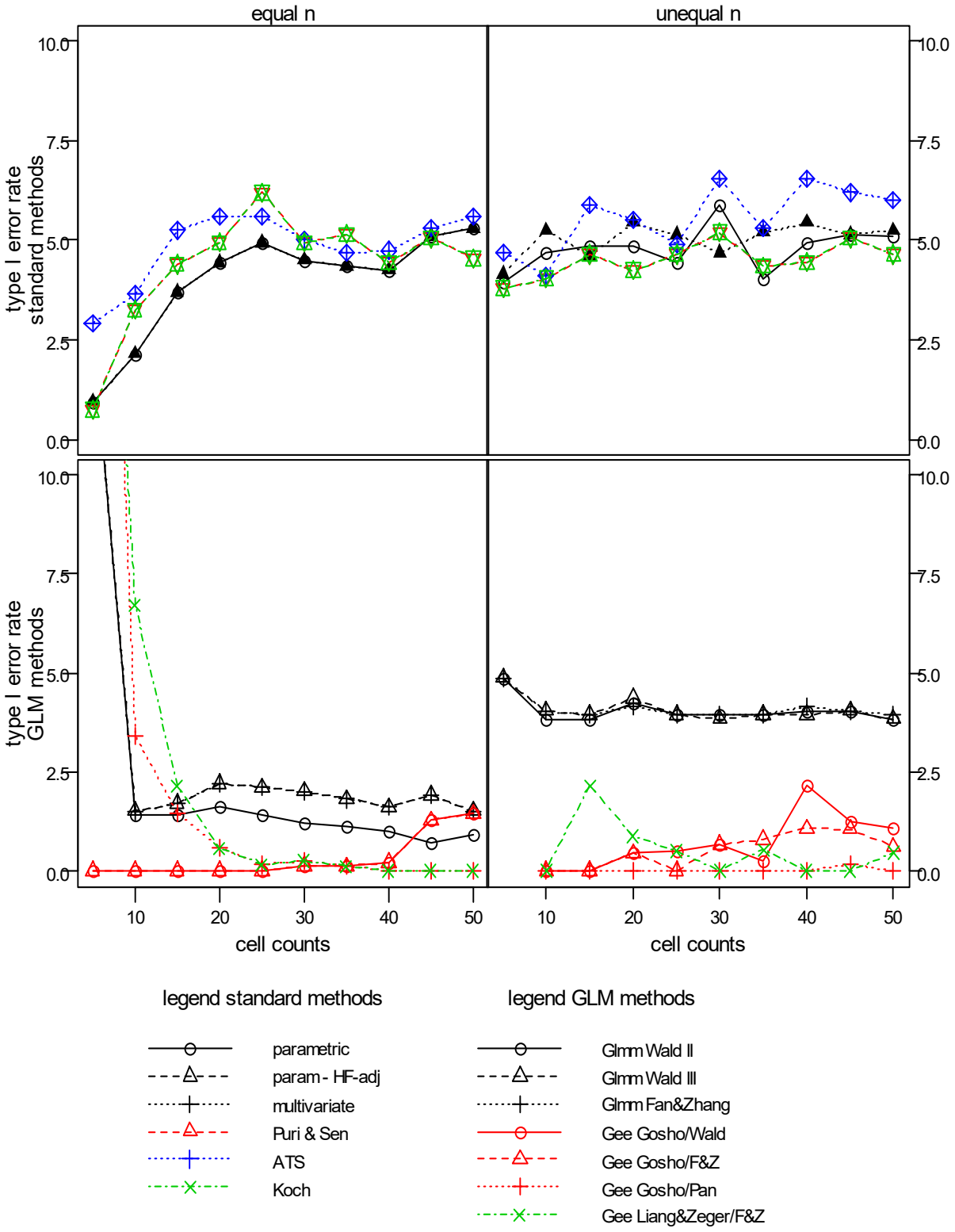
Graphic for α=0.05:



7. 1. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	0.95	2.15	3.70	4.45	4.50	4.25	5.30	3.95	4.70	4.85	4.85	5.90	4.95	5.10
	par./ HF-corr.														
	multivariate	0.95	2.15	3.70	4.45	4.50	4.25	5.30	4.15	5.25	4.60	5.45	4.70	5.45	5.25
	Puri & Sen	0.75	3.25	4.40	4.95	4.95	4.45	4.55	3.80	4.05	4.65	4.25	5.20	4.45	4.65
	ATS	2.90	3.65	5.25	5.60	5.00	4.75	5.60	4.70	4.10	5.90	5.50	6.55	6.55	6.00
	Koch	0.75	3.25	4.40	4.95	4.95	4.45	4.55	3.80	4.05	4.65	4.25	5.20	4.45	4.65
	Glmm Wald II	13.6	1.4	1.4	1.6	1.2	1.0	0.9	4.9	3.8	3.8	4.3	3.9	4.0	3.8
	Glmm Wald III	13.6	1.5	1.7	2.2	2.0	1.6	1.5	4.9	4.0	3.9	4.4	3.8	3.9	3.8
	Glmm Fan&Zhang	13.6	1.5	1.7	2.2	2.0	1.6	1.5	4.9	4.0	3.9	4.2	3.9	4.2	3.9
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.1	0.2	1.4		0.0	0.0	0.4	0.7	2.1	1.1
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.1	0.2	1.4		0.0	0.0	0.4	0.7	1.1	0.6
	Gee Gosho/Pan	30.0	3.4	1.5	0.6	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	24.7	6.7	2.1	0.6	0.3	0.0	0.0	0.0	0.0	2.2	0.9	0.0	0.0	0.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.05	0.25	0.30	0.30	0.75	0.6	0.75	1.1	1.40	1.15	1.10	1.05	1.10	0.60
	par./ HF-corr.														
	multivariate	0.05	0.25	0.30	0.30	0.75	0.6	0.75	0.4	0.75	1.00	0.85	0.55	1.30	0.85
	Puri & Sen	0.05	0.20	0.55	0.80	0.85	0.8	0.85	0.4	0.60	0.85	0.85	1.10	0.80	0.85
	ATS	0.30	0.25	0.50	0.65	1.00	0.7	0.80	1.6	0.60	0.80	0.85	1.45	1.25	1.70
	Koch	0.05	0.20	0.55	0.80	0.85	0.8	0.85	0.4	0.60	0.85	0.85	1.10	0.80	0.85
	Glmm Wald II	13.5	1.3	1.2	1.6	1.1	1.0	0.9	4.9	3.8	3.8	4.3	3.8	3.9	3.8
	Glmm Wald III	13.5	1.3	1.3	1.6	1.2	1.1	0.9	4.9	3.8	3.9	4.3	3.8	3.9	3.8
	Glmm Fan&Zhang	13.5	1.3	1.3	1.6	1.2	1.1	0.9	4.9	3.8	3.8	4.2	3.8	3.9	3.8
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan	30.0	3.1	1.2	0.5	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	24.7	6.7	2.1	0.6	0.3	0.0	0.0	0.0	0.0	2.2	0.9	0.0	0.0	0.3

Graphic for α=0.05:



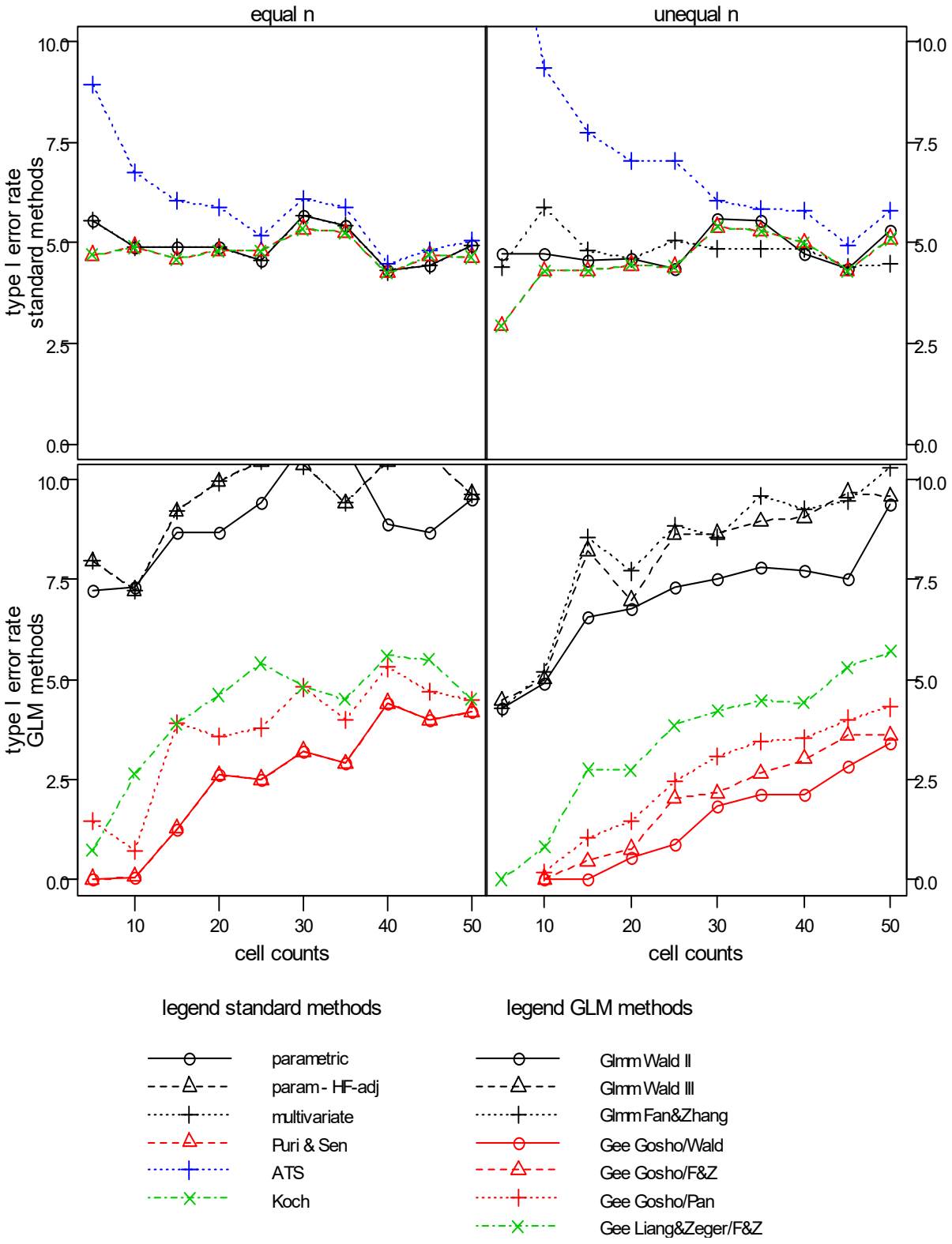
7. 2. Main effect A - B significant (effects b_i = 0.6*s)

7. 2. 1. equal correlations on B (r=0.3)

7. 2. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.55	4.90	4.90	4.9	5.70	4.30	4.95	4.75	4.75	4.55	4.60	5.60	4.75	5.3
	par./ HF-corr.														
	multivariate	5.55	4.90	4.90	4.9	5.70	4.30	4.95	4.40	5.90	4.80	4.60	4.85	4.85	4.5
	Puri & Sen	4.70	4.90	4.60	4.8	5.35	4.25	4.65	2.95	4.30	4.30	4.45	5.40	5.00	5.1
	ATS	8.95	6.75	6.05	5.9	6.10	4.50	5.05	14.80	9.35	7.75	7.05	6.05	5.80	5.8
	Koch	4.70	4.90	4.60	4.8	5.35	4.25	4.65	2.95	4.30	4.30	4.45	5.40	5.00	5.1
	Glmm Wald II	7.2	7.3	8.7	8.7	10.9	8.9	9.5	4.3	4.9	6.6	6.8	7.5	7.7	9.4
	Glmm Wald III	8.0	7.2	9.2	9.9	10.4	10.5	9.6	4.5	5.0	8.2	7.0	8.6	9.1	9.6
	Glmm Fan&Zhang	8.0	7.2	9.2	9.9	10.4	10.5	9.6	4.3	5.2	8.5	7.7	8.5	9.3	10.3
	Gee Gosho/Wald	0.0	0.1	1.3	2.6	3.2	4.4	4.2		0.0	0.0	0.5	1.8	2.1	3.4
	Gee Gosho/F&Z	0.0	0.1	1.3	2.6	3.2	4.4	4.2		0.0	0.4	0.8	2.2	3.0	3.6
	Gee Gosho/Pan	1.5	0.7	3.9	3.6	4.8	5.3	4.5		0.2	1.0	1.5	3.1	3.5	4.3
	Gee Liang&Zeger	0.7	2.6	3.9	4.6	4.8	5.6	4.5	0.0	0.8	2.7	2.7	4.2	4.4	5.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.35	0.85	1.20	0.95	1.00	0.75	1.05	0.90	1.10	1.50	1.0	1.20	0.9	0.95
	par./ HF-corr.														
	multivariate	1.35	0.85	1.20	0.95	1.00	0.75	1.05	1.20	1.35	0.80	1.0	0.95	1.0	1.00
	Puri & Sen	0.25	0.55	1.10	0.80	0.80	0.65	0.90	0.25	0.55	0.75	0.8	1.05	0.7	0.95
	ATS	3.50	2.00	1.75	1.25	1.25	0.85	1.05	8.15	3.85	3.20	2.4	2.15	1.6	1.95
	Koch	0.25	0.55	1.10	0.80	0.80	0.65	0.90	0.25	0.55	0.75	0.8	1.05	0.7	0.95
	Glmm Wald II	5.3	4.9	5.8	5.4	5.8	5.8	6.1	4.2	4.3	4.7	4.4	4.6	4.6	5.4
	Glmm Wald III	5.4	4.8	5.2	5.2	5.7	5.9	5.8	4.2	4.2	4.4	4.5	4.7	4.5	5.0
	Glmm Fan&Zhang	5.4	4.8	5.2	5.2	5.7	5.9	5.8	4.2	4.2	4.5	4.7	5.2	5.0	5.7
	Gee Gosho/Wald	0.0	0.0	0.0	2.6	3.2	4.4	4.2		0.0	0.0	0.0	0.4	0.0	0.5
	Gee Gosho/F&Z	0.0	0.0	0.0	2.6	3.2	4.4	4.2		0.0	0.0	0.1	0.1	0.2	0.8
	Gee Gosho/Pan	1.5	0.7	3.9	3.6	4.8	5.3	4.5		0.0	0.0	0.1	0.4	0.1	0.7
	Gee Liang&Zeger	0.7	2.6	3.9	4.6	4.8	5.6	4.5	0.0	0.2	0.5	0.4	0.7	0.6	1.5

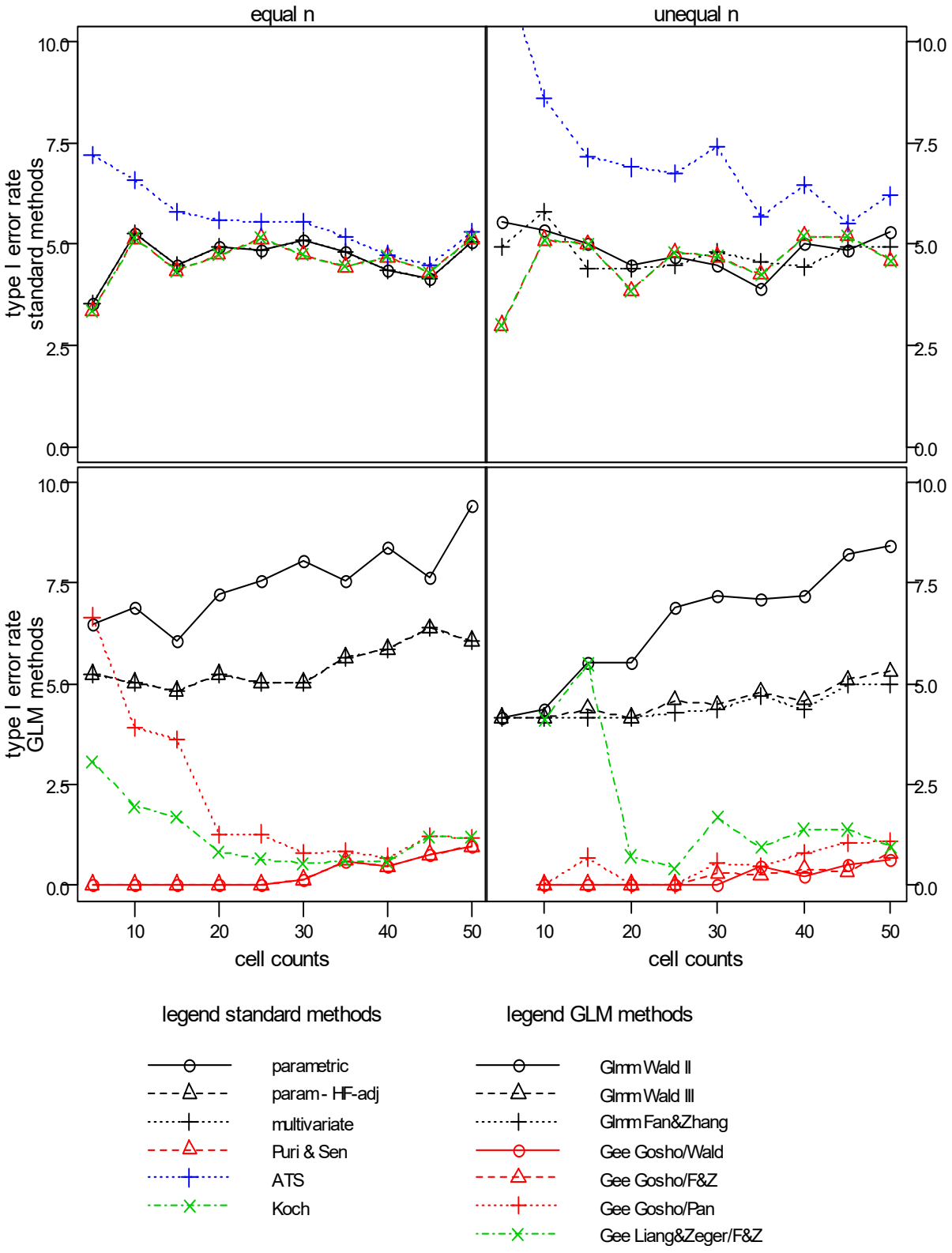
Graphic for α=0.05:



7. 2. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.55	5.25	4.50	4.95	5.10	4.35	5.05	5.55	5.35	5.00	4.50	4.5	5.00	5.30
	par./ HF-corr.														
	multivariate	3.55	5.25	4.50	4.95	5.10	4.35	5.05	4.95	5.80	4.40	4.40	4.8	4.45	4.95
	Puri & Sen	3.35	5.15	4.35	4.75	4.75	4.70	5.15	3.00	5.10	5.00	3.85	4.7	5.20	4.60
	ATS	7.20	6.60	5.80	5.60	5.55	4.75	5.30	12.05	8.60	7.15	6.90	7.4	6.45	6.20
	Koch	3.35	5.15	4.35	4.75	4.75	4.70	5.15	3.00	5.10	5.00	3.85	4.7	5.20	4.60
	Glmm Wald II	6.5	6.9	6.1	7.2	8.1	8.4	9.4	4.2	4.4	5.5	5.5	7.2	7.2	8.4
	Glmm Wald III	5.2	5.0	4.8	5.2	5.0	5.9	6.1	4.2	4.2	4.4	4.2	4.5	4.6	5.3
	Glmm Fan&Zhang	5.2	5.0	4.8	5.2	5.0	5.9	6.1	4.2	4.2	4.2	4.2	4.4	4.4	5.0
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.1	0.5	1.0		0.0	0.0	0.0	0.0	0.2	0.6
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.1	0.5	1.0		0.0	0.0	0.0	0.3	0.4	0.8
	Gee Gosho/Pan	6.7	3.9	3.6	1.2	0.8	0.7	1.2		0.0	0.7	0.0	0.6	0.8	1.1
	Gee Liang&Zeger	3.1	1.9	1.7	0.8	0.5	0.6	1.2		4.1	5.5	0.7	1.7	1.4	0.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.45	0.85	0.60	1.00	1.2	0.85	1.1	1.0	1.50	0.80	0.75	1.15	1.40	1.00
	par./ HF-corr.														
	multivariate	0.45	0.85	0.60	1.00	1.2	0.85	1.1	0.8	1.70	0.70	1.10	0.85	1.15	0.90
	Puri & Sen	0.15	0.85	0.80	0.95	1.2	0.45	0.8	0.2	0.75	0.65	0.75	0.90	1.35	1.20
	ATS	1.95	1.75	1.25	1.45	1.4	1.00	1.2	4.7	2.95	2.05	2.10	2.60	2.30	2.15
	Koch	0.15	0.85	0.80	0.95	1.2	0.45	0.8	0.2	0.75	0.65	0.75	0.90	1.35	1.20
	Glmm Wald II	5.4	5.4	4.9	5.3	4.9	5.7	5.7	4.2	4.2	4.2	4.4	4.5	4.7	4.7
	Glmm Wald III	5.2	5.0	4.8	5.0	4.7	5.1	4.8	4.2	4.2	4.2	4.2	4.2	4.2	4.3
	Glmm Fan&Zhang	5.2	5.0	4.8	5.0	4.7	5.1	4.8	4.2	4.2	4.2	4.2	4.2	4.2	4.3
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0
	Gee Gosho/Pan	6.7	3.9	3.6	1.2	0.8	0.7	1.2		0.0	0.0	0.0	0.0	0.0	0
	Gee Liang&Zeger	3.1	1.9	1.7	0.8	0.5	0.6	1.2		4.1	5.5	0.7	0.8	0.4	0

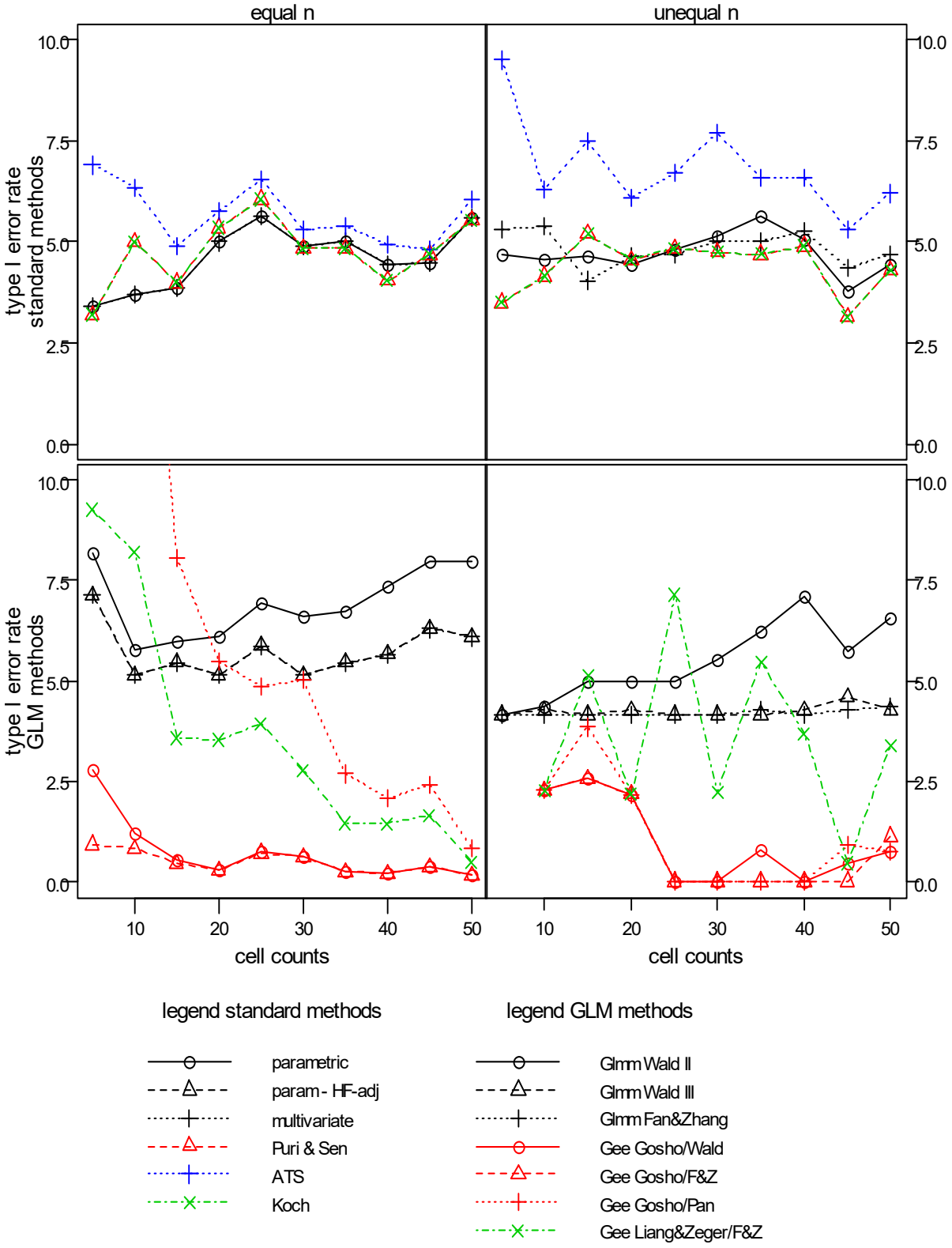
Graphic for α=0.05:



7. 2. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.4	3.70	3.85	5.00	4.90	4.45	5.60	4.7	4.55	4.65	4.45	5.15	5.05	4.45
	par./ HF-corr.														
	multivariate	3.4	3.70	3.85	5.00	4.90	4.45	5.60	5.3	5.40	4.05	4.65	5.00	5.25	4.70
	Puri & Sen	3.2	5.00	4.00	5.35	4.85	4.05	5.55	3.5	4.15	5.20	4.55	4.75	4.90	4.30
	ATS	6.9	6.35	4.90	5.75	5.30	4.95	6.05	9.5	6.30	7.50	6.10	7.70	6.60	6.20
	Koch	3.2	5.00	4.00	5.35	4.85	4.05	5.55	3.5	4.15	5.20	4.55	4.75	4.90	4.30
	Glmm Wald II	8.2	5.8	6.0	6.1	6.6	7.3	8.0	4.2	4.4	5.0	5.0	5.5	7.1	6.6
	Glmm Wald III	7.1	5.1	5.5	5.1	5.1	5.7	6.1	4.2	4.3	4.2	4.3	4.2	4.3	4.3
	Glmm Fan&Zhang	7.1	5.1	5.5	5.1	5.1	5.7	6.1	4.2	4.2	4.2	4.2	4.2	4.2	4.4
	Gee Gosho/Wald	2.8	1.2	0.5	0.3	0.6	0.2	0.2		2.3	2.6	2.2	0.0	0.0	0.8
	Gee Gosho/F&Z	0.9	0.8	0.4	0.3	0.6	0.2	0.2		2.3	2.6	2.2	0.0	0.0	1.1
	Gee Gosho/Pan	19.4	20.2	8.1	5.5	5.0	2.1	0.8		2.3	3.8	2.2	0.0	0.0	0.8
	Gee Liang&Zeger	9.3	8.2	3.6	3.5	2.8	1.4	0.5		2.3	5.1	2.2	2.2	3.7	3.4
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.40	0.75	0.35	0.95	1.0	0.70	0.90	1.20	1.30	1.1	0.85	1.00	1.30	0.80
	par./ HF-corr.														
	multivariate	0.40	0.75	0.35	0.95	1.0	0.70	0.90	0.80	1.25	0.9	1.15	0.95	1.40	0.85
	Puri & Sen	0.05	0.80	0.50	0.95	1.0	0.55	0.95	0.65	0.70	0.5	0.40	0.85	1.05	1.00
	ATS	1.30	1.10	0.80	1.25	1.2	0.75	1.10	3.15	1.75	1.5	1.50	2.10	1.80	2.00
	Koch	0.05	0.80	0.50	0.95	1.0	0.55	0.95	0.65	0.70	0.5	0.40	0.85	1.05	1.00
	Glmm Wald II	7.1	5.2	5.5	5.0	5.1	5.6	5.8	4.2	4.3	4.3	4.2	4.2	4.6	4.8
	Glmm Wald III	7.1	5.1	5.5	5.0	5.1	5.4	5.7	4.2	4.3	4.2	4.2	4.2	4.2	4.2
	Glmm Fan&Zhang	7.1	5.1	5.5	5.0	5.1	5.4	5.7	4.2	4.2	4.2	4.2	4.2	4.2	4.2
	Gee Gosho/Wald	2.8	1.2	0.5	0.3	0.3	0.2	0.2		2.3	2.6	2.2	0.0	0.0	0.0
	Gee Gosho/F&Z	0.9	0.8	0.4	0.3	0.3	0.2	0.2		2.3	2.6	2.2	0.0	0.0	0.0
	Gee Gosho/Pan	19.4	16.7	7.0	4.9	4.4	1.7	0.5		2.3	2.6	2.2	0.0	0.0	0.0
	Gee Liang&Zeger	9.3	7.4	3.6	3.3	2.8	1.4	0.5		2.3	2.6	2.2	2.2	3.1	1.9

Graphic for α=0.05:

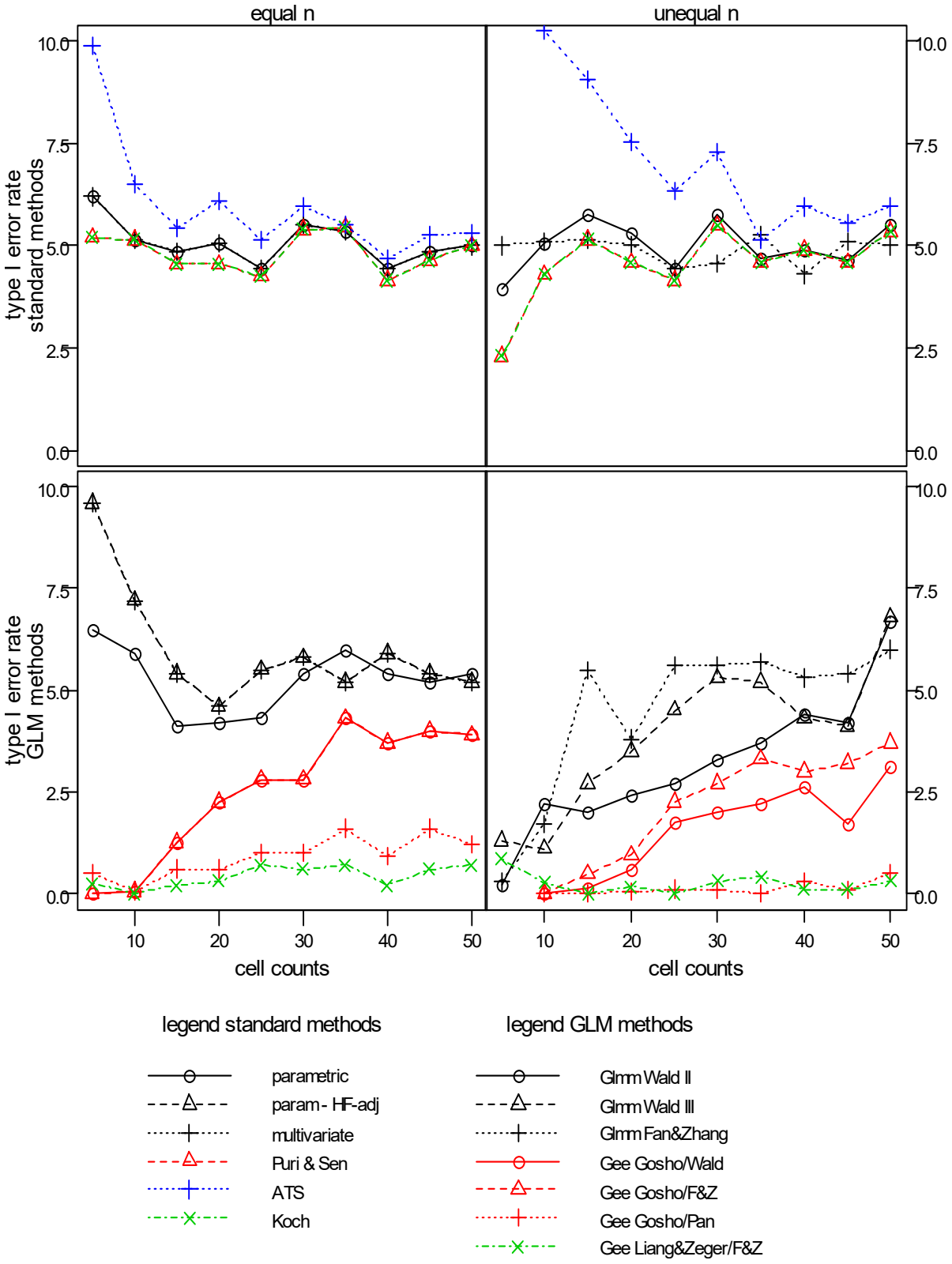


7. 2. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2) (effects b_i = 0.3*s)

7. 2. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	6.05	5.20	4.45	5.65	5.45	4.75	5.95	3.8	5.25	5.80	5.25	5.45	4.90	5.55
	par./ HF-corr.														
	multivariate	6.05	5.20	4.45	5.65	5.45	4.75	5.95	4.7	5.35	4.65	5.05	4.70	4.45	4.95
	Puri & Sen	5.35	4.95	4.55	5.05	5.30	4.50	5.80	2.6	4.20	5.05	4.80	5.35	4.65	5.30
	ATS	9.75	6.70	5.75	6.25	5.85	5.10	6.25	16.6	10.30	8.95	8.15	6.95	5.80	6.00
	Koch	5.35	4.95	4.55	5.05	5.30	4.50	5.80	2.6	4.20	5.05	4.80	5.35	4.65	5.30
	Glmm Wald II	6.1	6.6	3.4	4.4	4.6	5.1	6.1	0.2	1.5	2.1	2.3	3.2	4.0	5.8
	Glmm Wald III	10.6	8.2	4.3	5.0	5.6	4.9	5.7	1.2	1.2	2.8	2.4	5.1	3.2	4.7
	Glmm Fan&Zhang	10.6	8.2	4.3	5.0	5.6	4.9	5.7	0.2	1.4	5.0	3.9	4.6	5.0	5.3
	Gee Gosho/Wald	0.0	0.1	1.3	2.3	2.8	3.7	3.9		0.0	0.1	0.6	2.0	2.6	3.1
	Gee Gosho/F&Z	0.0	0.1	1.3	2.3	2.8	3.7	3.9		0.0	0.5	0.9	2.7	3.0	3.7
	Gee Gosho/Pan	0.5	0.1	0.6	0.6	1.0	0.9	1.2		0.0	0.0	0.1	0.1	0.3	0.5
	Gee Liang&Zeger	0.2	0.0	0.2	0.3	0.6	0.2	0.7	0.8	0.3	0.0	0.2	0.3	0.1	0.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.35	1.05	1.10	1.05	0.85	0.95	1.30	0.85	1.15	1.35	0.95	1.35	1.15	1.35
	par./ HF-corr.														
	multivariate	1.35	1.05	1.10	1.05	0.85	0.95	1.30	1.00	1.20	0.90	1.05	1.05	1.05	0.85
	Puri & Sen	0.35	0.60	0.90	0.95	0.85	0.95	1.15	0.15	0.65	1.15	0.55	1.00	1.05	1.00
	ATS	4.40	2.00	1.85	1.35	1.20	1.10	1.55	8.10	5.45	3.50	2.40	2.55	2.10	2.35
	Koch	0.35	0.60	0.90	0.95	0.85	0.95	1.15	0.15	0.65	1.15	0.55	1.00	1.05	1.00
	Glmm Wald II	2.0	3.7	1.2	1.4	0.8	1.0	1.2	0.1	0.1	0.5	0.4	0.7	0.7	1.3
	Glmm Wald III	2.1	6.0	1.6	1.5	1.0	0.9	0.8	0.2	0.4	0.4	0.4	0.7	0.6	1.4
	Glmm Fan&Zhang	2.1	6.0	1.6	1.5	1.0	0.9	0.8	0.1	0.2	0.3	0.4	1.2	1.0	1.2
	Gee Gosho/Wald	0.0	0.0	0.1	0.3	0.6	0.4	0.7		0.0	0.0	0.1	0.1	0.3	0.6
	Gee Gosho/F&Z	0.0	0.0	0.1	0.3	0.6	0.4	0.7		0.0	0.0	0.2	0.3	0.6	0.7
	Gee Gosho/Pan	0.5	0.0	0.0	0.1	0.3	0.0	0.3		0.0	0.0	0.1	0.0	0.0	0.0
	Gee Liang&Zeger	0.2	0.0	0.0	0.0	0.1	0.0	0.2	0.8	0.2	0.0	0.0	0.0	0.0	0.0

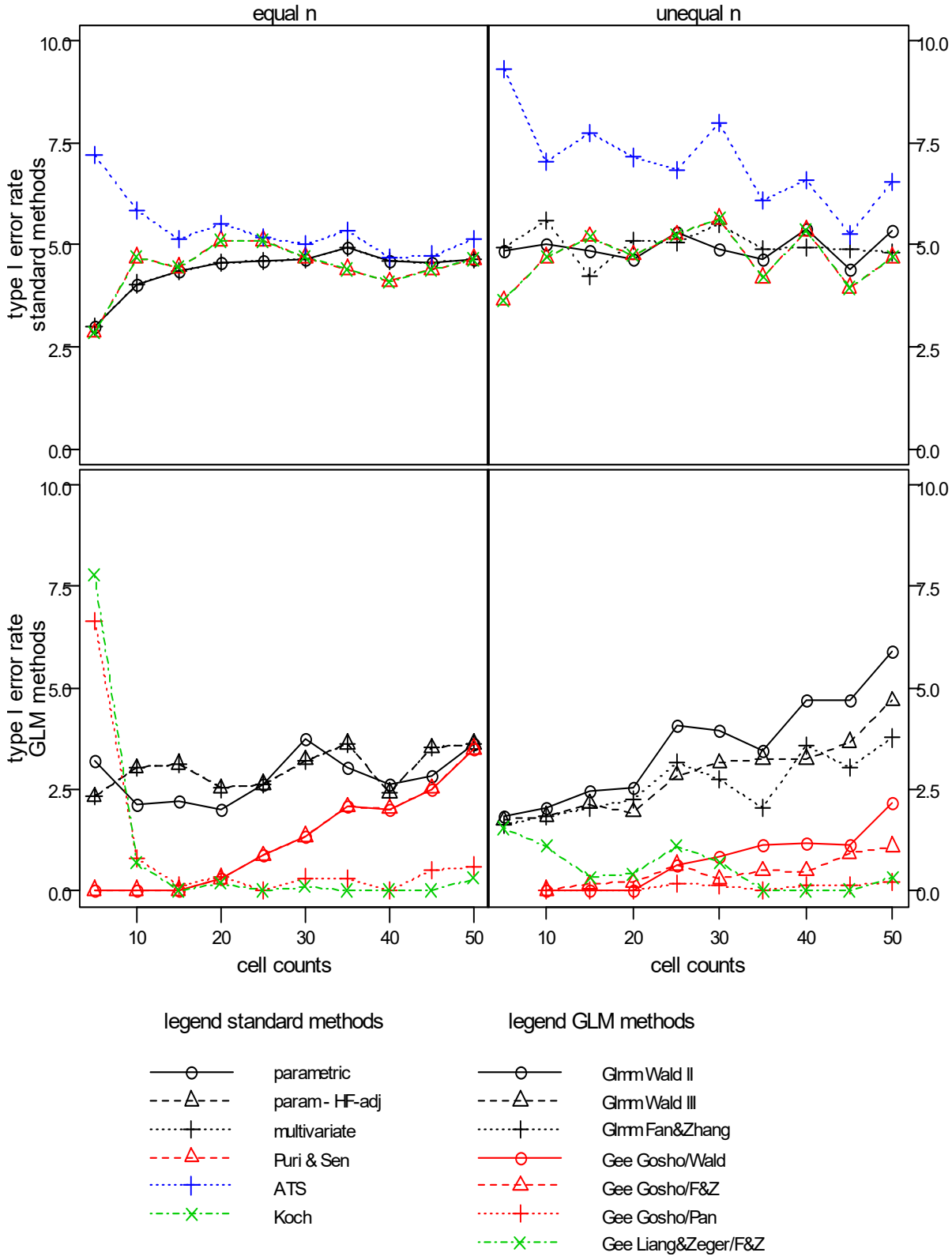
Graphic for α=0.05:



7. 2. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.0	4.60	4.45	4.75	4.45	4.30	4.70	5.05	5.15	5.10	4.60	4.95	4.85	4.95
	par./ HF-corr.														
	multivariate	3.0	4.60	4.45	4.75	4.45	4.30	4.70	5.00	5.60	4.25	4.95	5.45	4.65	4.85
	Puri & Sen	2.9	5.35	4.65	5.65	5.25	4.35	4.70	3.75	5.25	5.35	4.40	5.55	5.25	4.55
	ATS	6.9	6.25	5.25	5.80	5.05	4.65	5.15	9.70	7.50	7.95	7.30	8.10	5.90	6.50
	Koch	2.9	5.35	4.65	5.65	5.25	4.35	4.70	3.75	5.25	5.35	4.40	5.55	5.25	4.55
	Glmm Wald II	3.2	2.1	2.2	2.0	3.7	2.6	3.6	1.8	2.0	2.4	2.5	4.0	4.7	5.9
	Glmm Wald III	2.3	3.0	3.1	2.5	3.2	2.4	3.6	1.7	1.8	2.1	1.9	3.2	3.3	4.7
	Glmm Fan&Zhang	2.3	3.0	3.1	2.5	3.2	2.4	3.6	1.6	1.8	2.0	2.2	2.7	3.6	3.8
	Gee Gosho/Wald	0.0	0.0	0.0	0.3	1.3	2	3.5		0.0	0.0	0.0	0.8	1.2	2.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.3	1.3	2	3.5		0.0	0.2	0.2	0.3	0.5	1.1
	Gee Gosho/Pan	6.6	0.8	0.1	0.3	0.3	0.0	0.6		0.0	0.0	0.0	0.1	0.1	0.2
	Gee Liang&Zeger	7.8	0.7	0.0	0.2	0.1	0.0	0.3	1.5	1.1	0.3	0.4	0.7	0.0	0.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.35	0.9	0.60	0.85	1.55	0.7	1.05	1.75	1.25	0.80	0.85	1.10	1.05	1.00
	par./ HF-corr.														
	multivariate	0.35	0.9	0.60	0.85	1.55	0.7	1.05	0.60	1.55	0.65	1.00	1.10	0.95	1.00
	Puri & Sen	0.15	0.9	0.95	0.70	1.10	0.6	0.70	0.25	0.50	0.50	0.80	0.85	0.95	0.80
	ATS	1.30	1.4	1.25	1.20	1.85	0.8	1.25	3.50	1.80	1.90	2.15	2.80	2.00	2.25
	Koch	0.15	0.9	0.95	0.70	1.10	0.6	0.70	0.25	0.50	0.50	0.80	0.85	0.95	0.80
	Glmm Wald II	1.9	1.6	1.8	0.7	1.4	1.1	1.5	1.7	1.6	1.8	1.6	1.8	2.1	2.1
	Glmm Wald III	1.8	1.5	1.7	1.0	1.2	0.9	1.5	1.7	1.7	1.8	1.7	1.9	2.0	2.2
	Glmm Fan&Zhang	1.8	1.5	1.7	1.0	1.2	0.9	1.5	1.6	1.7	1.8	1.7	1.9	1.9	2.2
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0.0	0.4		0.0	0.0	0.0	0.1	0.1	0.3
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.4		0.0	0.0	0.0	0.1	0.0	0.1
	Gee Gosho/Pan	6.4	0.8	0.1	0.3	0.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	7.8	0.7	0.0	0.2	0.1	0.0	0.0	1.5	1.1	0.3	0.4	0.7	0.0	0.2

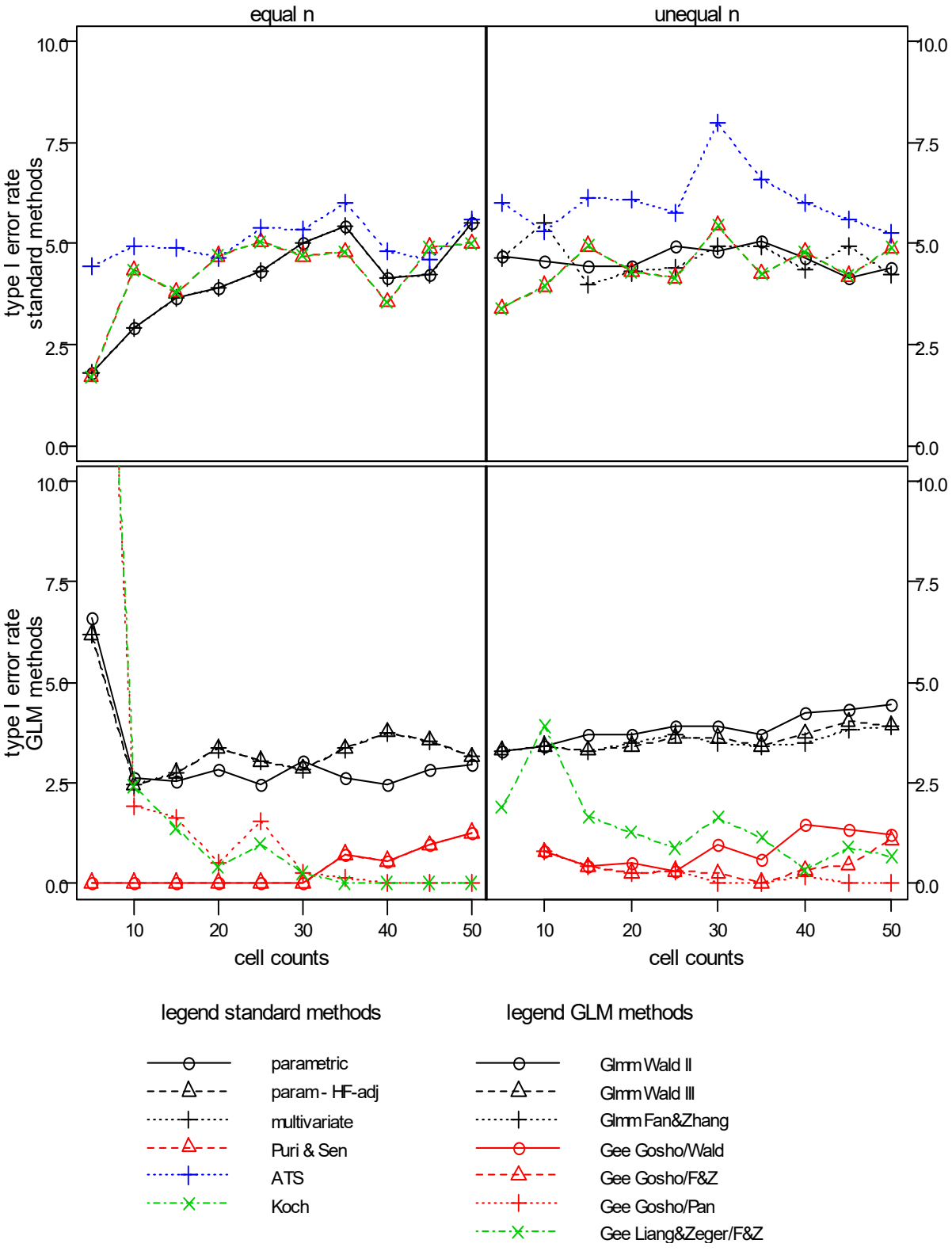
Graphic for α=0.05:



7. 2. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.0	2.95	3.20	4.15	4.50	4.55	5.10	4.45	4.60	4.55	4.55	4.35	4.25	4.55
	par./ HF-corr.														
	multivariate	2.0	2.95	3.20	4.15	4.50	4.55	5.10	4.90	5.65	4.25	4.25	4.85	4.70	4.80
	Puri & Sen	2.1	4.40	3.70	4.95	4.85	4.15	4.60	3.25	4.00	4.75	4.50	5.45	5.20	4.60
	ATS	4.9	4.50	4.45	5.00	5.05	5.00	5.15	6.20	5.60	6.25	6.25	7.85	6.55	5.85
	Koch	2.1	4.40	3.70	4.95	4.85	4.15	4.60	3.25	4.00	4.75	4.50	5.45	5.20	4.60
	Glmm Wald II	6.6	2.6	2.5	2.8	3.0	2.4	2.9	3.3	3.4	3.7	3.7	3.9	4.2	4.4
	Glmm Wald III	6.2	2.4	2.7	3.3	2.8	3.8	3.1	3.3	3.4	3.3	3.4	3.6	3.7	3.9
	Glmm Fan&Zhang	6.2	2.4	2.7	3.3	2.8	3.8	3.1	3.3	3.4	3.3	3.5	3.5	3.5	3.9
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0.5	1.2		0.8	0.4	0.5	0.9	1.5	1.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.5	1.2		0.8	0.4	0.3	0.2	0.3	1.1
	Gee Gosho/Pan	25.3	1.9	1.6	0.5	0.2	0.0	0.0		0.8	0.4	0.3	0.0	0.2	0.0
	Gee Liang&Zeger	25.3	2.4	1.4	0.4	0.2	0.0	0.0	1.9	3.9	1.6	1.3	1.6	0.3	0.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.15	0.40	0.30	0.55	0.80	0.80	0.75	1.65	1.30	0.85	0.80	1.05	1.30	1.25
	par./ HF-corr.														
	multivariate	0.15	0.40	0.30	0.55	0.80	0.80	0.75	0.45	1.20	0.55	1.05	0.95	1.05	1.05
	Puri & Sen	0.05	0.60	0.60	1.05	0.60	0.80	0.95	0.30	0.50	0.75	0.75	1.05	1.05	1.00
	ATS	0.50	1.05	0.65	0.80	1.15	1.05	0.90	1.85	0.85	1.20	1.00	1.65	1.30	2.00
	Koch	0.05	0.60	0.60	1.05	0.60	0.80	0.95	0.30	0.50	0.75	0.75	1.05	1.05	1.00
	Glmm Wald II	6.2	2.1	2.4	2.5	2.4	2.3	2.4	3.3	3.3	3.3	3.3	3.4	3.4	3.3
	Glmm Wald III	6.2	2.1	2.4	2.5	2.4	2.3	2.4	3.3	3.4	3.3	3.3	3.3	3.2	3.2
	Glmm Fan&Zhang	6.2	2.1	2.4	2.5	2.4	2.3	2.4	3.3	3.3	3.3	3.3	3.3	3.3	3.2
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.8	0.4	0.3	0.0	0.3	0.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.8	0.4	0.3	0.0	0.0	0.0
	Gee Gosho/Pan	24.1	1.3	1.3	0.5	0.2	0.0	0.0		0.8	0.4	0.3	0.0	0.0	0.0
	Gee Liang&Zeger	25.0	2.4	1.1	0.3	0.2	0.0	0.0	1.9	3.9	1.6	1.3	1.6	0.3	0.7

Graphic for α=0.05:



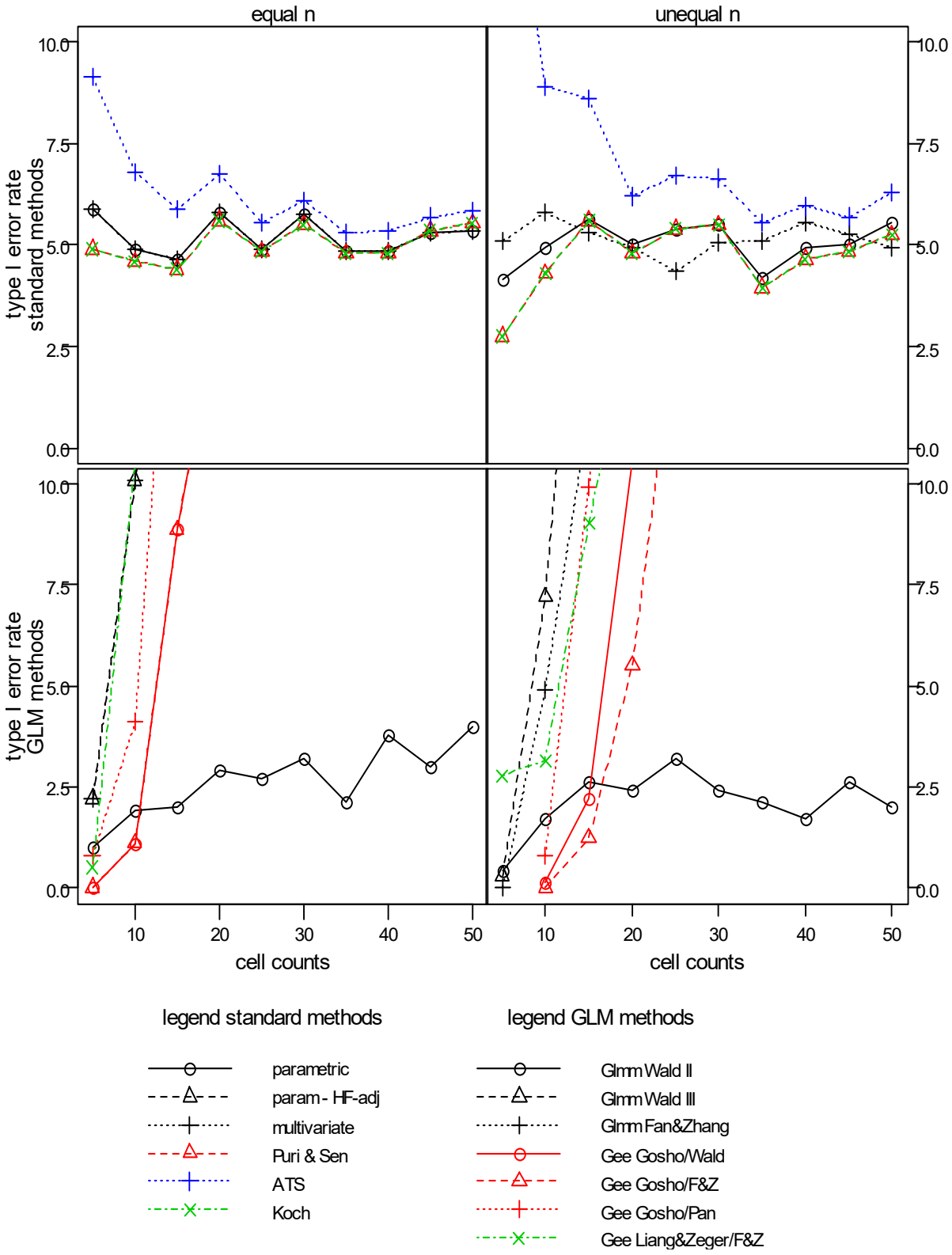
7. 3. Main effect A - Interaction significant (effects ab_{ij} = 0.4*s)

7. 3. 1. equal correlations on B (r=0.3)

7. 3. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.90	4.9	4.65	5.80	5.75	4.85	5.35	4.15	4.95	5.65	5.00	5.50	4.95	5.55
	par./ HF-corr.														
	multivariate	5.90	4.9	4.65	5.80	5.75	4.85	5.35	5.10	5.80	5.30	4.95	5.05	5.55	4.95
	Puri & Sen	4.90	4.6	4.40	5.60	5.50	4.80	5.55	2.75	4.30	5.60	4.80	5.50	4.65	5.25
	ATS	9.15	6.8	5.90	6.75	6.10	5.35	5.85	16.85	8.90	8.60	6.20	6.65	5.95	6.30
	Koch	5.90	4.9	4.65	5.80	5.75	4.85	5.35	2.75	4.30	5.60	4.80	5.50	4.65	5.25
	Glmm Wald II	1.0	1.9	2.0	2.9	3.2	3.8	4.0	0.4	1.7	2.6	2.4	2.4	1.7	2.0
	Glmm Wald III	2.2	10.1	17.2	22.3	37.3	44.2	55.2	0.3	7.2	19.2	27.0	39.5	53.9	68.9
	Glmm Fan&Zhang	2.2	10.1	17.2	22.3	37.3	44.2	55.2	0.0	4.9	11.7	17.1	24.6	33.2	42.3
	Gee Gosho/Wald	0.0	1.1	8.9	14.6	27.4	35.2	47.5		0.1	2.2	10.6	25.3	45.4	59.9
	Gee Gosho/F&Z	0.0	1.1	8.9	14.6	27.4	35.2	47.5		0.0	1.2	5.5	15.7	24.5	35.7
	Gee Gosho/Pan	0.8	4.1	18.1	21.1	36.6	40.0	50.8		0.8	9.9	19.3	34.0	49.8	64.9
	Gee Liang&Zeger	0.5	10.6	18.1	21.2	36.6	43.7	54.7	2.8	3.2	9.0	14.2	23.1	31.7	40.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.95	1.25	0.70	1.15	1.45	0.90	1.25	1.20	1.00	1.30	0.90	1.25	0.8	0.95
	par./ HF-corr.														
	multivariate	0.95	1.25	0.70	1.15	1.45	0.90	1.25	0.90	1.55	0.95	1.35	1.25	1.2	0.95
	Puri & Sen	0.25	0.75	0.75	0.90	1.25	0.75	0.95	0.25	0.50	0.80	0.70	1.00	0.7	0.95
	ATS	3.45	2.15	1.50	1.50	1.85	1.00	1.30	8.25	3.95	3.35	2.45	2.50	1.7	1.75
	Koch	0.25	0.75	0.75	0.90	1.25	0.75	0.95	0.25	0.50	0.80	0.70	1.00	0.7	0.95
	Glmm Wald II	0.2	0.4	0.8	1.2	1.4	1.5	1.9	0.3	0.8	1.3	1.4	0.4	0.4	0.4
	Glmm Wald III	0.6	1.5	3.4	6.9	14.0	21.1	33.8	0.3	1.6	4.9	10.7	17.3	31.9	41.1
	Glmm Fan&Zhang	0.6	1.5	3.4	6.9	14.0	21.1	33.8	0.0	0.9	2.8	4.6	8.3	13.4	20.1
	Gee Gosho/Wald	0.0	0.0	1.3	3.1	12.0	14.9	25.8		0.0	0.0	1.1	8.0	19.9	31.3
	Gee Gosho/F&Z	0.0	0.0	1.3	3.1	12.0	14.9	25.8		0.0	0.0	0.5	2.8	8.7	14.3
	Gee Gosho/Pan	0.8	0.0	1.4	6.3	12.0	17.0	25.8		0.0	0.5	3.6	11.5	24.3	35.5
	Gee Liang&Zeger	0.5	1.1	3.8	6.3	12.3	19.9	29.3	2.8	0.1	0.8	2.6	7.1	12.1	18.6

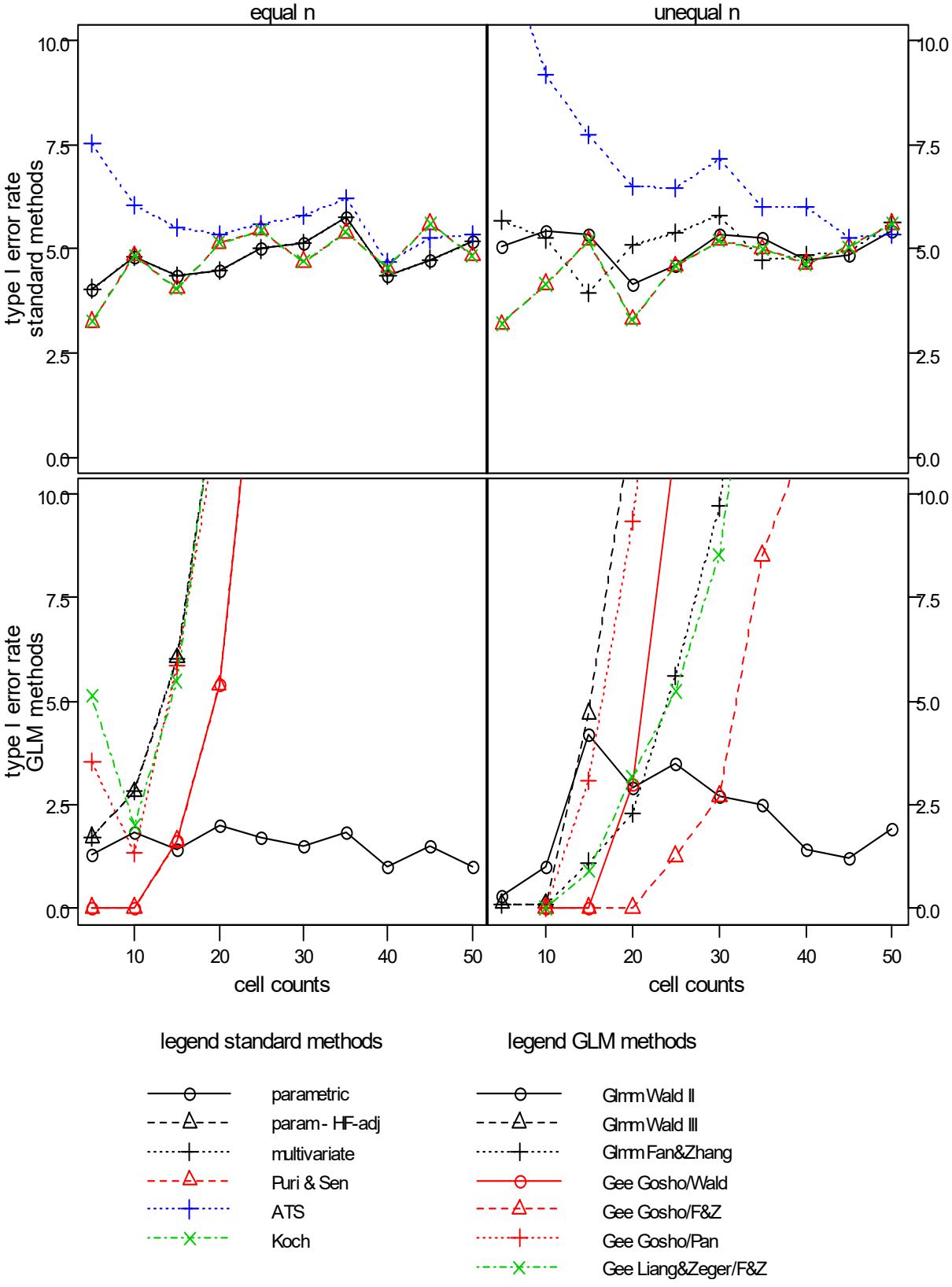
Graphic for α=0.05:



7. 3. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.05	4.80	4.35	4.50	5.15	4.35	5.20	5.05	5.45	5.35	4.15	5.35	4.75	5.45
	par./ HF-corr.														
	multivariate	4.05	4.80	4.35	4.50	5.15	4.35	5.20	5.70	5.25	3.95	5.10	5.80	4.85	5.65
	Puri & Sen	3.25	4.85	4.05	5.15	4.70	4.55	4.85	3.20	4.15	5.20	3.30	5.20	4.65	5.60
	ATS	7.55	6.05	5.50	5.35	5.80	4.70	5.35	12.50	9.20	7.75	6.50	7.15	6.00	5.35
	Koch	3.25	4.85	4.05	5.15	4.70	4.55	4.85	3.20	4.15	5.20	3.30	5.20	4.65	5.60
	Glmm Wald II	1.3	1.8	1.4	2.0	1.5	1.0	1.0	0.3	1.0	4.2	2.9	2.7	1.4	1.9
	Glmm Wald III	1.7	2.8	6.0	13.0	30.8	42.9	51.8	0.1	0.1	4.7	11.9	28.8	47.3	63.2
	Glmm Fan&Zhang	1.7	2.8	6.0	13.0	30.8	42.9	51.8	0.1	0.1	1.1	2.3	9.7	18.5	31.1
	Gee Gosho/Wald	0.0	0.0	1.6	5.4	23.0	36.9	45.9		0.0	0.0	3.0	19.4	37.3	54.2
	Gee Gosho/F&Z	0.0	0.0	1.6	5.4	23.0	36.9	45.9		0.0	0.0	0.0	2.7	11.4	22.5
	Gee Gosho/Pan	3.5	1.3	5.9	12.0	29.0	40.6	49.5		0.0	3.1	9.4	26.0	44.4	59.5
	Gee Liang&Zeger	5.1	2.0	5.5	13.3	29.8	40.9	50.0		0.0	0.9	3.2	8.5	18.0	28.8
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.50	1.35	0.65	1.30	1.05	0.80	0.65	1.15	0.95	0.85	0.75	0.85	0.95	1.30
	par./ HF-corr.														
	multivariate	0.50	1.35	0.65	1.30	1.05	0.80	0.65	0.90	0.85	0.90	0.85	1.10	0.70	0.85
	Puri & Sen	0.10	1.05	0.65	1.05	1.05	0.65	0.55	0.20	0.45	0.65	0.60	1.00	0.90	1.10
	ATS	1.75	2.00	1.00	1.75	1.20	0.95	0.75	4.95	3.00	2.40	1.75	2.00	1.65	1.90
	Koch	0.10	1.05	0.65	1.05	1.05	0.65	0.55	0.20	0.45	0.65	0.60	1.00	0.90	1.10
	Glmm Wald II	0.9	1.0	0.8	0.8	0.6	0.8	0.8	0.1	0.1	0.6	1.0	1.3	0.4	0.3
	Glmm Wald III	0.9	1.5	1.1	0.9	7.5	15.1	24.9	0.1	0.1	0.2	1.3	7.7	21.2	35.2
	Glmm Fan&Zhang	0.9	1.5	1.1	0.9	7.5	15.1	24.9	0.1	0.1	0.1	0.1	0.4	2.3	8.0
	Gee Gosho/Wald	0.0	0.0	0.0	0.2	2.4	9.9	18.6		0.0	0.0	0.2	2.3	11.7	24.6
	Gee Gosho/F&Z	0.0	0.0	0.0	0.2	2.4	9.9	18.6		0.0	0.0	0.0	0.0	0.3	2.4
	Gee Gosho/Pan	3.5	0.7	0.6	0.8	4.6	10.6	20.0		0.0	0.0	0.0	3.5	15.7	27.3
	Gee Liang&Zeger	4.5	0.7	0.6	1.0	6.4	13.4	21.6		0.0	0.0	1.2	0.2	0.8	4.6

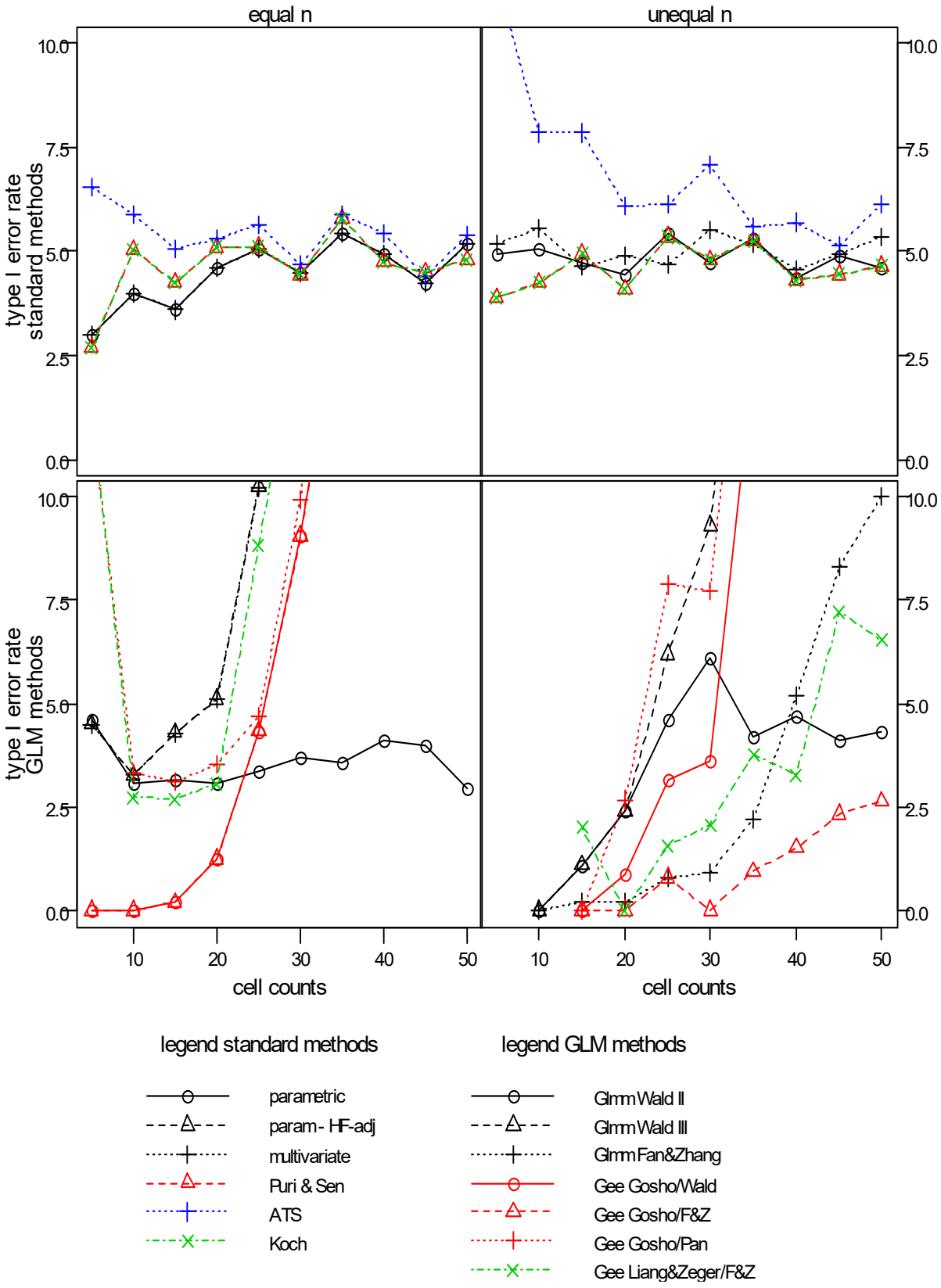
Graphic for α=0.05:



7. 3. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.0	4.10	3.65	4.60	4.50	4.95	5.25	4.95	5.05	4.75	4.45	4.75	4.35	4.60
	par./ HF-corr.														
	multivariate	3.0	4.10	3.65	4.60	4.50	4.95	5.25	5.20	5.55	4.65	4.90	5.50	4.55	5.35
	Puri & Sen	2.7	5.15	4.15	5.05	4.55	4.85	4.95	3.90	4.25	4.95	4.10	4.80	4.30	4.65
	ATS	6.6	5.95	5.05	5.25	4.85	5.50	5.60	11.60	7.85	7.85	6.10	7.10	5.70	6.15
	Koch	2.7	5.15	4.15	5.05	4.55	4.85	4.95	3.90	4.25	4.95	4.10	4.80	4.30	4.65
	Glmm Wald II	4.6	3.1	3.2	3.1	3.7	4.1	3.0		0.0	1.1	2.4	6.1	4.7	4.3
	Glmm Wald III	4.5	3.3	4.3	5.1	16.5	27.4	38.7		0.0	1.1	2.4	9.3	23.1	38.2
	Glmm Fan&Zhang	4.5	3.3	4.3	5.1	16.5	27.4	38.7		0.0	0.2	0.2	0.9	5.2	10.0
	Gee Gosho/Wald	0.0	0.0	0.2	1.3	9.1	17.5	28.2			0.0	0.9	3.6	15.6	25.4
	Gee Gosho/F&Z	0.0	0.0	0.2	1.2	9.1	17.5	28.2			0.0	0.0	0.0	1.5	2.7
	Gee Gosho/Pan	11.9	3.3	3.1	3.5	9.9	20.0	29.1			0.0	2.7	7.7	18.4	31.6
	Gee Liang&Zeger	12.1	2.7	2.7	3.1	14.1	20.0	31.9			2.0	0.0	2.1	3.3	6.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.35	0.80	0.70	0.85	0.8	0.55	1.05	1.80	1.00	1.10	1.15	1.15	1.30	0.85
	par./ HF-corr.														
	multivariate	0.35	0.80	0.70	0.85	0.8	0.55	1.05	0.95	0.85	0.70	1.10	0.95	0.85	0.90
	Puri & Sen	0.05	0.60	0.90	1.05	0.8	0.65	1.40	0.45	0.65	0.55	0.70	1.10	0.70	0.95
	ATS	1.15	1.45	0.95	1.10	1.0	0.70	1.20	4.60	2.30	1.60	1.40	2.15	2.05	1.80
	Koch	0.05	0.60	0.90	1.05	0.8	0.65	1.40	0.45	0.65	0.55	0.70	1.10	0.70	0.95
	Glmm Wald II	4.5	3.1	2.9	2.7	3.1	3.4	2.6		0.0	0.1	0.5	1.1	1.4	1.9
	Glmm Wald III	4.4	3.0	2.9	2.8	3.7	7.0	12.1		0.0	0.0	0.2	0.7	5.7	13.1
	Glmm Fan&Zhang	4.4	3.0	2.9	2.8	3.7	7.0	12.1		0.0	0.0	0.0	0.0	0.1	0.4
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.1	1.2	3.7			0.0	0.0	0.0	1.3	3.9
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.1	1.2	3.7			0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan	11.9	2.9	1.4	1.1	0.4	1.3	4.9			0.0	0.0	0.0	3.8	5.8
	Gee Liang&Zeger	12.1	2.7	1.3	0.7	0.6	2.9	5.5			2.0	0.0	1.5	0.0	0.4

Graphic for α=0.05:

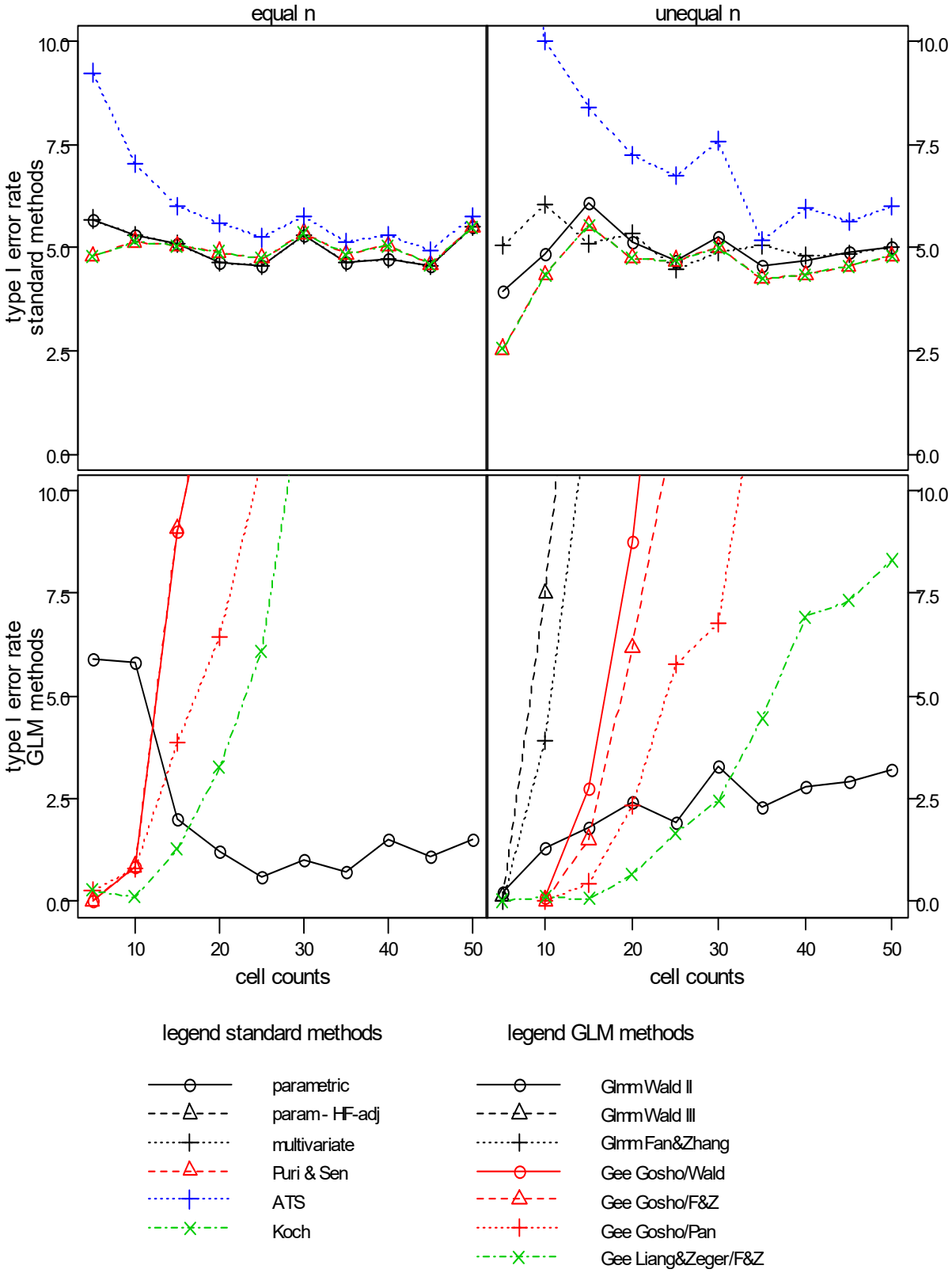


7. 3. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 3. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.70	5.30	5.10	4.65	5.30	4.75	5.50	3.95	4.85	6.10	5.15	5.25	4.70	5.0
	par./ HF-corr.														
	multivariate	5.70	5.30	5.10	4.65	5.30	4.75	5.50	5.05	6.05	5.10	5.35	4.90	4.80	5.0
	Puri & Sen	4.80	5.15	5.05	4.90	5.35	5.05	5.50	2.55	4.35	5.55	4.75	5.00	4.35	4.8
	ATS	9.25	7.05	6.00	5.60	5.75	5.30	5.75	16.20	10.00	8.40	7.25	7.60	5.95	6.0
	Koch	4.80	5.15	5.05	4.90	5.35	5.05	5.50	2.55	4.35	5.55	4.75	5.00	4.35	4.8
	Glmm Wald II	5.9	5.8	2.0	1.2	1.0	1.5	1.5	0.2	1.3	1.8	2.4	3.3	2.8	3.2
	Glmm Wald III	12.4	13.8	14.1	16.9	27.5	30.3	39.1	0.1	7.5	18.0	24.2	39.3	54.5	66.3
	Glmm Fan&Zhang	12.4	13.8	14.1	16.9	27.5	30.3	39.1	0.0	3.9	12.1	15.8	23.8	31.9	42.6
	Gee Gosho/Wald	0.0	0.8	9.0	13.9	28.0	34.4	46.6		0.1	2.7	8.8	25.6	44.6	58.6
	Gee Gosho/F&Z	0.0	0.8	9.1	13.9	28.0	34.4	46.6		0.0	1.5	6.2	14.3	24.2	35.6
	Gee Gosho/Pan	0.3	0.8	3.9	6.5	18.6	19.1	29.3		0.0	0.4	2.3	6.8	17.9	28.6
	Gee Liang&Zeger	0.3	0.1	1.3	3.3	12.6	13.9	19.8	0	0.1	0.1	0.6	2.4	6.9	8.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.50	0.95	0.90	1.05	1.10	0.70	0.90	0.95	0.95	1.30	0.95	1.25	1.00	1.20
	par./ HF-corr.														
	multivariate	1.50	0.95	0.90	1.05	1.10	0.70	0.90	0.85	1.25	1.05	0.90	1.10	1.05	1.00
	Puri & Sen	0.45	0.75	0.60	1.05	1.05	0.75	0.95	0.15	0.60	1.05	0.65	1.00	0.95	1.20
	ATS	3.65	1.90	1.55	1.35	1.35	0.75	1.00	8.15	4.05	3.90	2.25	2.60	1.85	1.75
	Koch	0.45	0.75	0.60	1.05	1.05	0.75	0.95	0.15	0.60	1.05	0.65	1.00	0.95	1.20
	Glmm Wald II	2.9	3.7	1.5	0.8	0.3	0.3	0.2	0.1	0.6	0.6	1.1	1.5	1.5	0.1
	Glmm Wald III	3.0	6.9	3.0	4.9	9.7	12.9	19.5	0.1	0.7	5.5	7.7	16.1	29.9	0.1
	Glmm Fan&Zhang	3.0	6.9	3.0	4.9	9.7	12.9	19.5	0.0	0.4	3.0	4.7	10.4	15.6	0.0
	Gee Gosho/Wald	0.0	0	1.1	3.3	12.6	14.0	24.2		0.1	0.1	1.5	6.4	18.9	30.8
	Gee Gosho/F&Z	0.0	0	1.1	3.3	12.6	14.0	24.2		0.0	0.0	0.3	3.9	9.8	14.3
	Gee Gosho/Pan	0.3	0	0.1	1.4	4.3	6.4	12.7		0.0	0.0	0.2	1.0	5.5	10.3
	Gee Liang&Zeger	0.3	0	0.0	0.2	1.1	1.7	3.6	0	0.1	0.0	0.0	0.1	0.5	1.1

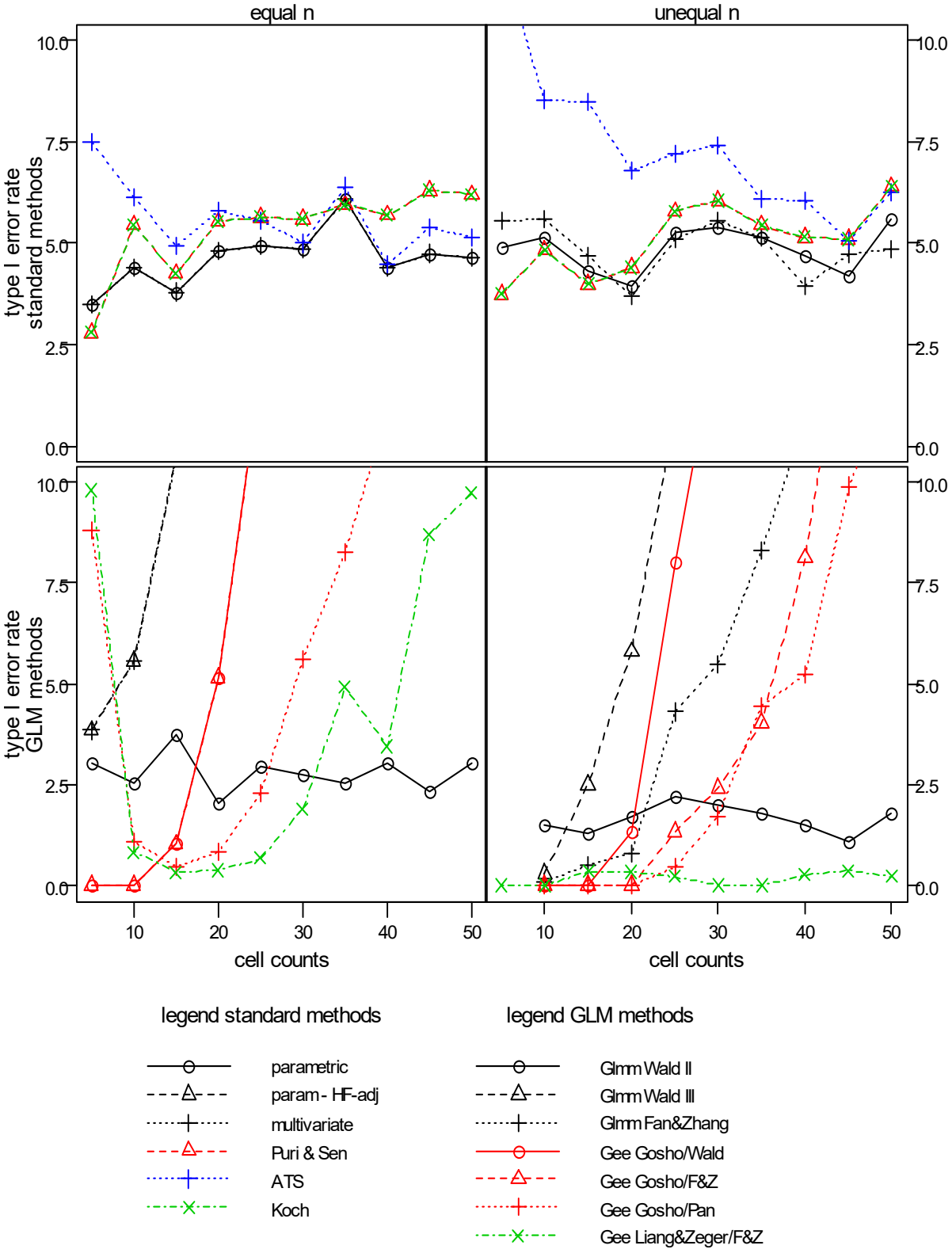
Graphic for α=0.05:



7. 3. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.5	4.40	3.80	4.80	4.85	4.4	4.65	4.90	5.15	4.3	3.95	5.40	4.70	5.60
	par./ HF-corr.														
	multivariate	3.5	4.40	3.80	4.80	4.85	4.4	4.65	5.55	5.60	4.7	3.70	5.55	3.95	4.85
	Puri & Sen	2.8	5.45	4.25	5.55	5.60	5.7	6.20	3.75	4.85	4.0	4.40	6.05	5.15	6.40
	ATS	7.5	6.15	4.95	5.80	5.00	4.5	5.15	12.10	8.55	8.5	6.80	7.40	6.05	6.25
	Koch	2.8	5.45	4.25	5.55	5.60	5.7	6.20	3.75	4.85	4.0	4.40	6.05	5.15	6.40
	Glmm Wald II	3.0	2.5	3.7	2.0	2.7	3.0	3.0		1.5	1.3	1.7	2.0	1.5	1.8
	Glmm Wald III	3.8	5.6	10.6	12.3	21.6	30.2	41.6		0.3	2.5	5.8	15.2	23.7	33.5
	Glmm Fan&Zhang	3.8	5.6	10.6	12.3	21.6	30.2	41.6		0.1	0.5	0.8	5.5	11.5	16.4
	Gee Gosho/Wald	0.0	0.0	1.0	5.2	19.9	29.6	38.0		0.0	0.0	1.3	13.8	27.8	40.8
	Gee Gosho/F&Z	0.0	0.0	1.0	5.1	19.9	29.6	38.0		0.0	0.0	0.0	2.4	8.1	17.7
	Gee Gosho/Pan	8.8	1.1	0.5	0.8	5.6	11.8	19.2		0.0	0.0	0.0	1.7	5.2	12.6
	Gee Liang&Zeger	9.8	0.8	0.3	0.4	1.9	3.4	9.7	0.0	0.0	0.3	0.3	0.0	0.3	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.50	0.85	0.50	1.15	1.25	0.50	1.10	1.85	1.15	0.95	0.75	1.05	1.10	1.40
	par./ HF-corr.														
	multivariate	0.50	0.85	0.50	1.15	1.25	0.50	1.10	1.00	1.00	0.70	0.80	1.05	0.75	0.60
	Puri & Sen	0.20	0.85	0.90	1.35	1.05	1.00	1.30	0.25	0.60	0.55	0.60	1.50	0.90	1.45
	ATS	1.45	1.75	1.05	1.55	1.30	0.65	1.25	4.95	3.10	2.55	1.85	2.65	2.00	2.25
	Koch	0.20	0.85	0.90	1.35	1.05	1.00	1.30	0.25	0.60	0.55	0.60	1.50	0.90	1.45
	Glmm Wald II	2.5	2.0	2.9	1.7	2.1	2.3	2.2		1.5	1.3	1.7	2.0	1.5	1.8
	Glmm Wald III	2.6	2.7	5.0	3.6	5.2	8.0	11.6		0.3	2.5	5.8	15.2	23.7	33.5
	Glmm Fan&Zhang	2.6	2.7	5.0	3.6	5.2	8.0	11.6		0.0	0.0	0.0	5.5	11.5	16.4
	Gee Gosho/Wald	0.0	0.0	0.0	0.1	1.9	6.9	13.0		0.0	0.0	0.0	1.7	6.0	14.8
	Gee Gosho/F&Z	0.0	0.0	0.0	0.1	1.9	6.9	13.0		0.0	0.0	0.0	0.0	0.3	1.1
	Gee Gosho/Pan	8.5	1.1	0.3	0.1	0.1	0.6	3.1		0.0	0.0	0.0	0.0	0.7	1.9
	Gee Liang&Zeger	9.8	0.8	0.3	0.0	0.0	0.1	0.2	0.0	0.0	0.3	0.2	0.0	0.0	0.0

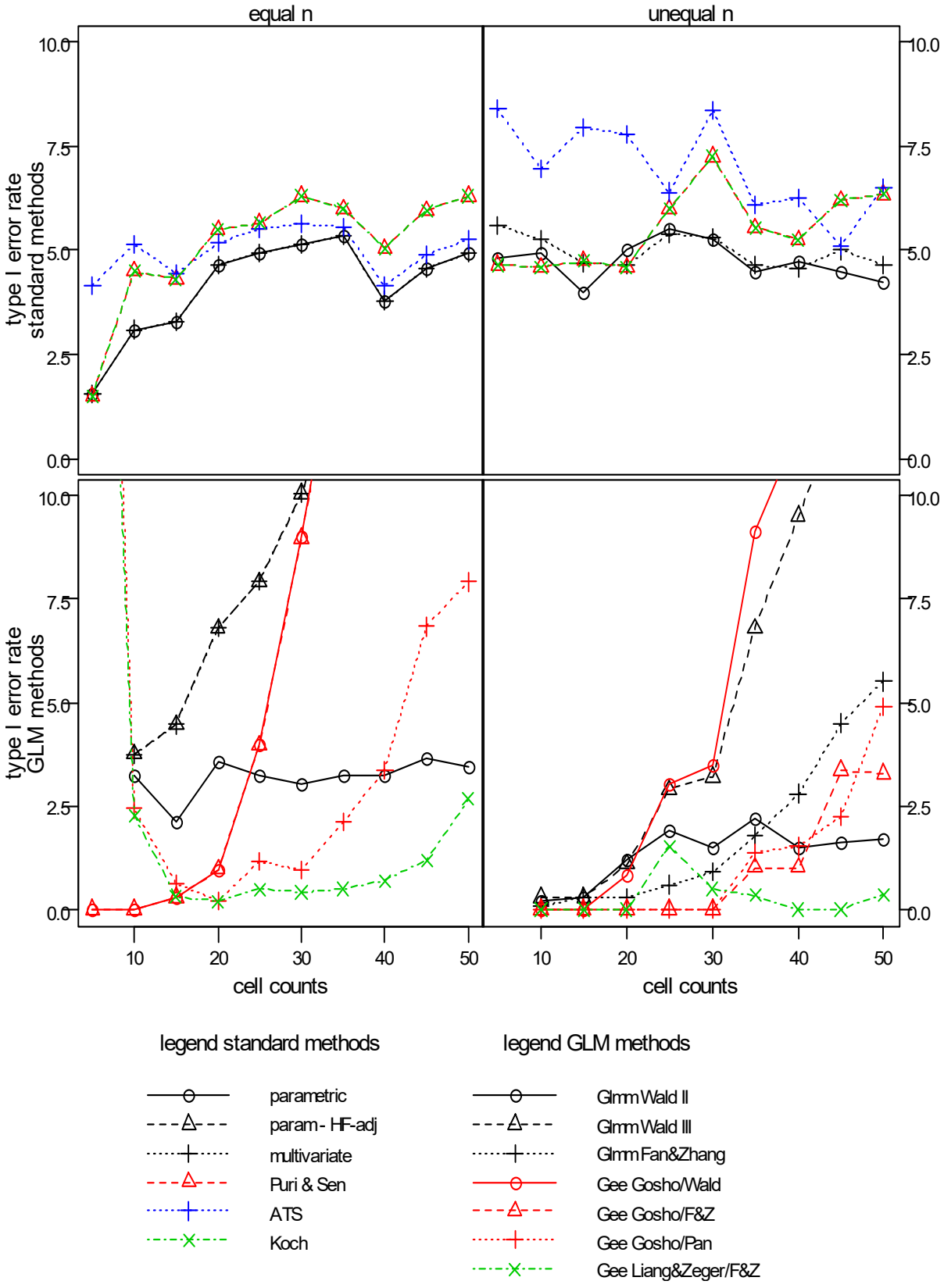
Graphic for α=0.05:



7. 3. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.55	3.10	3.30	4.65	5.15	3.80	4.95	5.00	4.85	3.90	4.85	5.50	4.65	4.50
	par./ HF-corr.														
	multivariate	1.55	3.10	3.30	4.65	5.15	3.80	4.95	5.80	5.40	4.55	4.75	5.15	4.45	4.80
	Puri & Sen	1.50	4.50	4.30	5.50	6.30	5.05	6.30	4.55	4.35	4.25	4.95	7.25	5.10	5.55
	ATS	4.15	5.15	4.45	5.20	5.65	4.15	5.25	8.80	7.75	7.65	7.65	8.05	6.25	6.50
	Koch	1.50	4.50	4.30	5.50	6.30	5.05	6.30	4.55	4.35	4.25	4.95	7.25	5.10	5.55
	Glmm Wald II		3.2	2.1	3.6	3.0	3.2	3.5		0.4	0.5	1.1	3.1	3.2	2.9
	Glmm Wald III		3.8	4.5	6.8	10.1	15.6	21.1		0.1	0.7	1.7	5.7	14.4	22.8
	Glmm Fan&Zhang		3.8	4.5	6.8	10.1	15.6	21.1		0.1	0.3	0.3	1.0	3.5	8.2
	Gee Gosho/Wald	0.0	0.0	0.3	1.0	9.0	18.5	27.5		0.0	0.0	0.6	3.8	11.6	23.1
	Gee Gosho/F&Z	0.0	0.0	0.3	1.0	9.0	18.5	27.5		0.0	0.0	0.0	0.4	1.1	3.6
	Gee Gosho/Pan	30.8	2.4	0.6	0.2	1.0	3.4	7.9		0.0	0.0	0.0	0.0	1.4	4.8
	Gee Liang&Zeger	26.6	2.3	0.3	0.2	0.4	0.7	2.7		0.0	0.0	0.6	0.4	0.0	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.15	0.35	0.60	0.60	1.20	0.8	0.85	2.40	1.25	1.30	1.0	1.30	0.85	1.30
	par./ HF-corr.														
	multivariate	0.15	0.35	0.60	0.60	1.20	0.8	0.85	0.90	1.25	0.80	0.8	1.10	0.90	0.55
	Puri & Sen	0.15	0.65	0.70	0.95	1.35	0.9	1.85	0.85	0.70	0.85	0.9	1.45	1.65	1.30
	ATS	0.55	0.95	0.85	0.80	1.45	0.9	0.90	3.75	1.70	1.90	1.9	2.70	1.80	2.45
	Koch	0.15	0.65	0.70	0.95	1.35	0.9	1.85	0.85	0.70	0.85	0.9	1.45	1.65	1.30
	Glmm Wald II		3.2	2.1	3.6	3.0	3.2	3.5		0.1	0.1	0.4	0.6	1.6	1.2
	Glmm Wald III		3.8	4.5	6.8	10.1	15.6	21.1		0.1	0.1	0.1	0.8	3.3	7.4
	Glmm Fan&Zhang		3.8	4.5	6.8	10.1	15.6	21.1		0.1	0.1	0.1	0.2	0.5	0.4
	Gee Gosho/Wald	0.0	0.0	0.0	0.0	0.1	0.9	3.7		0.0	0.0	0.0	0.0	1.4	5.9
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.1	0.9	3.7		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan	29.7	2.2	0.6	0.2	0.3	0.0	0.5		0.0	0.0	0.0	0.0	0.0	0.5
	Gee Liang&Zeger	26.2	2.3	0.3	0.2	0.3	0.0	0.0		0.0	0.0	0.6	0.4	0.0	0.2

Graphic for α=0.05:



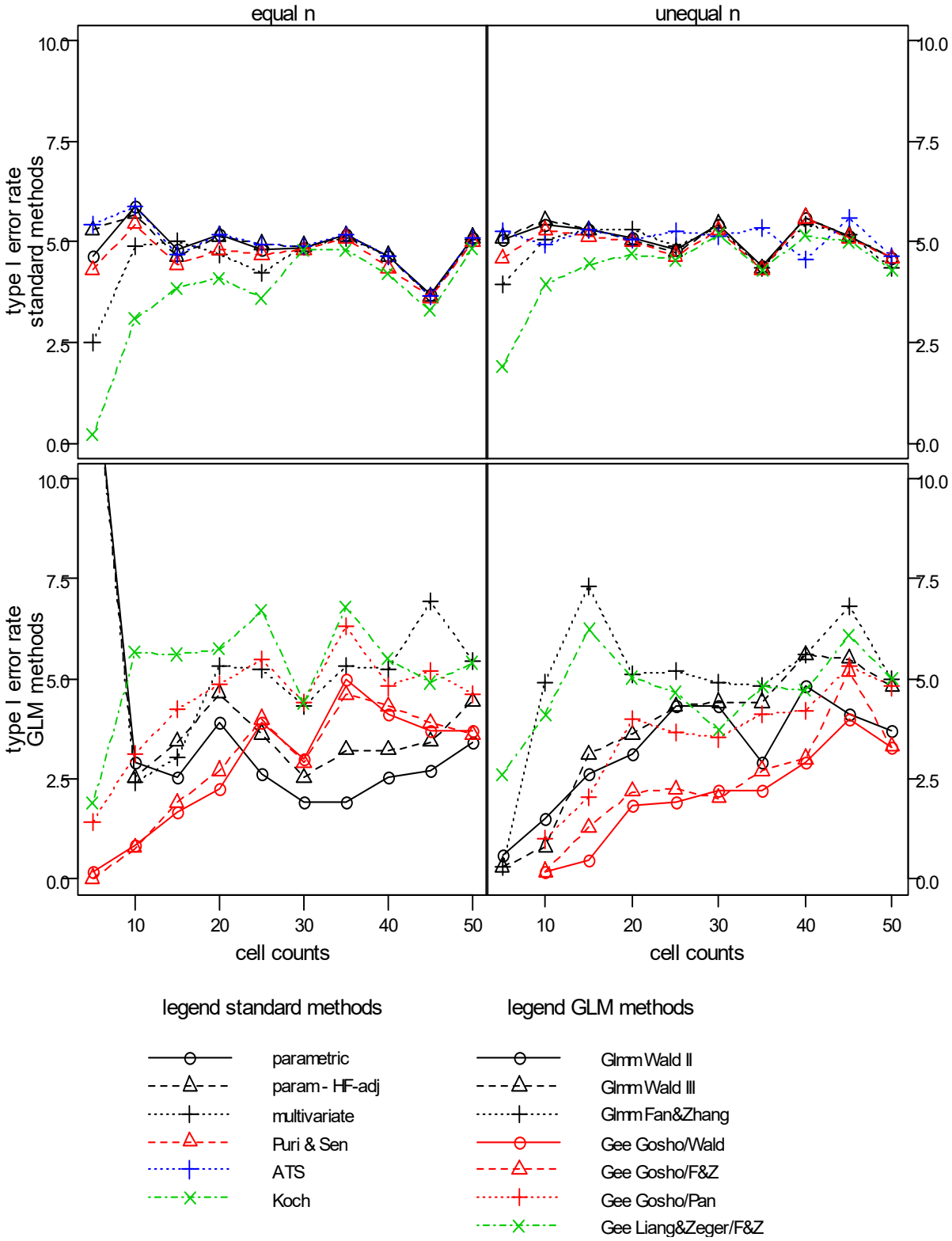
7. 4. Main effect B - null model

7. 4. 1. equal correlations on B (r=0.3)

7. 4. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.65	5.90	4.80	5.20	4.85	4.65	5.10	5.05	5.45	5.30	5.10	5.45	5.60	4.60
	par./ HF-corr.	5.30	5.70	4.65	5.15	4.90	4.65	5.10	5.10	5.55	5.30	5.05	5.45	5.60	4.60
	multivariate	2.50	4.90	5.00	4.70	4.90	4.65	5.05	3.95	5.05	5.30	5.30	5.35	5.45	4.35
	Puri & Sen	4.30	5.45	4.45	4.80	4.80	4.35	5.00	4.60	5.30	5.15	5.00	5.30	5.60	4.60
	ATS	5.45	5.90	4.70	5.20	4.90	4.65	5.10	5.25	4.95	5.30	5.05	5.15	4.55	4.65
	Koch	0.20	3.10	3.85	4.10	4.80	4.20	4.85	1.90	3.95	4.45	4.70	5.20	5.15	4.30
	Glmm Wald II	0.3	1.3	3.6	4.8	5.6	4.9	4.9	0.6	1.5	2.6	3.1	4.3	4.8	3.7
	Glmm Wald III	0.5	1.7	4.4	3.9	4.8	5.7	5.3	0.3	0.8	3.1	3.6	4.4	5.6	4.8
	Glmm Fan&Zhang	2.8	4.4	7.2	6.4	6.5	6.9	5.5	0.3	4.9	7.3	5.1	4.9	5.6	5.0
	Gee Gosho/Wald	0.2	0.8	1.7	2.2	3.0	4.1	3.7		0.2	0.5	1.8	2.2	2.9	3.3
	Gee Gosho/F&Z	0.0	0.8	1.9	2.7	2.9	4.3	3.6		0.2	1.3	2.2	2.0	3.0	3.3
	Gee Gosho/Pan	1.4	3.1	4.3	4.8	4.4	4.8	4.6		1.0	2.0	4.0	3.5	4.2	4.8
	Gee Liang&Zeger	1.9	5.7	5.6	5.8	4.4	5.5	5.4	2.6	4.1	6.2	5.0	3.7	4.7	5.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.40	1.40	0.95	1.20	0.95	0.95	0.90	1.15	0.80	1.15	1.20	0.95	1.05	0.65
	par./ HF-corr.	1.50	1.35	1.15	1.20	0.95	0.90	0.90	1.25	0.95	1.15	1.20	0.95	1.10	0.60
	multivariate	0.45	0.65	0.65	0.95	1.15	0.95	0.95	0.40	0.80	0.95	1.20	0.90	1.05	0.60
	Puri & Sen	0.45	1.00	0.85	1.20	0.90	0.80	0.85	0.90	0.75	0.95	1.20	0.95	1.05	0.60
	ATS	1.80	1.50	1.15	1.25	0.95	0.90	0.90	1.40	1.15	1.30	1.05	0.95	0.95	0.75
	Koch	0.05	0.05	0.15	0.50	0.75	0.75	0.90	0.05	0.45	0.60	1.00	0.70	0.90	0.60
	Glmm Wald II	0.3	0.9	1.9	1.6	2.7	1.8	1.4	0.2	0.5	1.4	0.9	1.4	1.0	0.6
	Glmm Wald III	0.2	0.9	2.0	1.7	2.5	2.1	0.9	0.2	0.4	1.2	0.8	1.2	0.3	0.9
	Glmm Fan&Zhang	0.6	1.1	2.8	2.1	3.2	2.4	1.6	0.1	0.6	2.2	1.5	1.6	1.5	1.1
	Gee Gosho/Wald	0.1	0.1	0.3	0.5	0.0	0.9	0.6		0.1	0.1	0.2	0.2	0.2	0.4
	Gee Gosho/F&Z	0.0	0.1	0.4	0.3	0.5	0.8	0.9		0.1	0.1	0.4	0.4	0.6	0.5
	Gee Gosho/Pan	0.3	0.4	0.5	0.6	0.1	1.1	0.9		0.1	0.1	0.4	0.3	0.4	0.6
	Gee Liang&Zeger	0.2	0.8	1.5	1.4	0.8	0.9	1.5	2.6	0.3	1.0	1.5	0.6	0.9	1.1

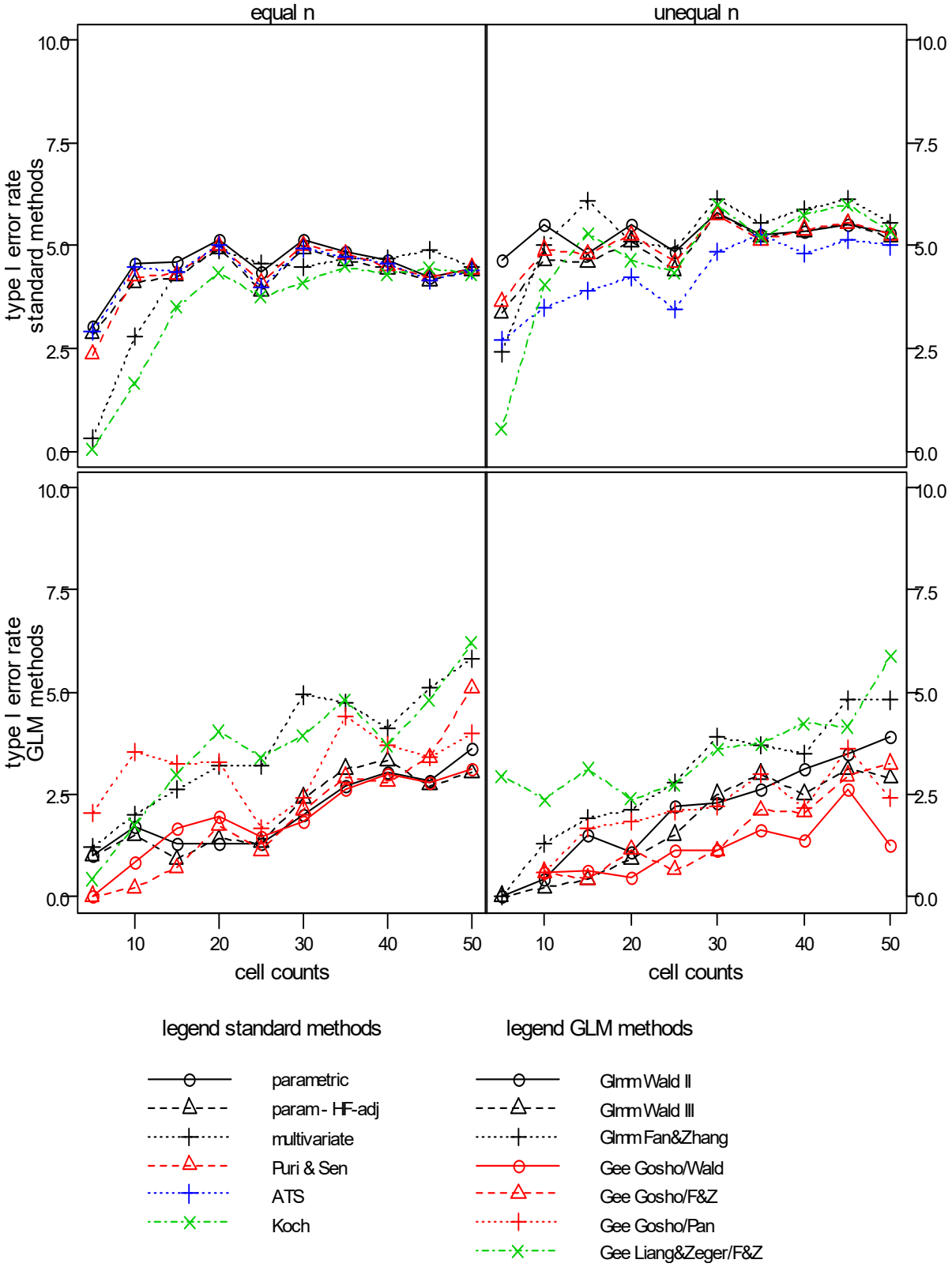
Graphic for α=0.05:



7. 4. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.05	4.55	4.60	5.15	5.15	4.65	4.45	4.65	5.50	4.8	5.50	5.80	5.35	5.30
	par./ HF-corr.	2.85	4.10	4.25	4.95	4.95	4.45	4.40	3.35	4.65	4.6	5.10	5.80	5.35	5.20
	multivariate	0.30	2.80	4.35	4.90	4.50	4.70	4.50	2.40	5.00	6.1	5.10	6.15	5.90	5.55
	Puri & Sen	2.35	4.25	4.30	5.00	5.00	4.50	4.45	3.65	4.90	4.8	5.25	5.75	5.40	5.25
	ATS	2.90	4.50	4.35	5.00	4.95	4.55	4.40	2.70	3.50	3.9	4.25	4.85	4.80	5.00
	Koch	0.05	1.65	3.50	4.35	4.10	4.30	4.30	0.55	4.05	5.3	4.65	6.00	5.75	5.35
	Glmm Wald II	1.0	1.7	1.3	1.3	2.0	3.0	3.6	0.0	0.4	1.5	1.1	2.3	3.1	3.9
	Glmm Wald III	1.0	1.5	0.9	1.4	2.4	3.3	3.0	0.0	0.2	0.4	0.9	2.5	2.5	2.9
	Glmm Fan&Zhang	1.2	2.0	2.6	3.2	4.9	4.1	5.8	0.0	1.3	1.9	2.1	3.9	3.5	4.8
	Gee Gosho/Wald	0.0	0.8	1.6	1.9	1.8	3.0	3.1		0.6	0.6	0.5	1.1	1.4	1.3
	Gee Gosho/F&Z	0.0	0.2	0.7	1.7	2.1	2.8	5.1		0.6	0.4	1.1	1.1	2.1	3.3
	Gee Gosho/Pan	2.0	3.5	3.2	3.3	2.4	3.7	4.0		0.6	1.7	1.8	2.2	2.2	2.4
	Gee Liang&Zeger	0.4	1.7	3.0	4.0	3.9	3.7	6.2	2.9	2.4	3.1	2.4	3.6	4.2	5.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.65	0.85	0.80	0.95	0.45	0.75	1.00	0.95	0.80	1.25	1.25	1.25	1.50	2.00
	par./ HF-corr.	0.75	0.50	0.70	0.85	0.40	0.60	1.00	0.80	0.70	1.15	1.15	1.15	1.35	1.95
	multivariate	0.15	0.15	0.55	0.80	0.70	0.75	0.85	0.05	0.55	1.25	1.05	1.45	1.25	1.85
	Puri & Sen	0.20	0.40	0.70	0.80	0.45	0.60	1.00	0.40	0.70	1.10	1.15	1.20	1.40	2.00
	ATS	0.75	0.70	0.75	0.95	0.45	0.70	1.00	1.10	0.45	0.25	0.70	1.20	1.00	1.05
	Koch	0.05	0.05	0.30	0.45	0.55	0.75	0.60	0.05	0.20	0.65	0.80	1.30	1.15	1.65
	Glmm Wald II	1.0	1.4	0.8	0.5	0.6	0.6	0.9	0.0	0.1	0.0	0.2	0.6	0.4	1.1
	Glmm Wald III	0.9	1.1	0.8	0.7	0.7	0.8	1.3	0.0	0.1	0.0	0.0	0.0	0.4	0.0
	Glmm Fan&Zhang	0.7	1.1	0.9	0.9	0.9	1.2	1.3	0.0	0.3	0.4	0.2	0.7	0.5	1.0
	Gee Gosho/Wald	0.0	0.0	0.1	0.4	0.4	0.5	0.7		0.6	0.2	0.1	0.0	0.3	0.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.2	0.1	0.5	0.8		0.6	0.2	0.1	0.1	0.3	0.4
	Gee Gosho/Pan	0.5	0.4	0.6	0.4	0.6	0.6	0.8		0.6	0.2	0.1	0.3	0.5	0.2
	Gee Liang&Zeger	0.0	0.4	0.1	0.5	0.1	0.8	1.1	2.9	2.4	1.5	0.5	0.7	0.6	1.0

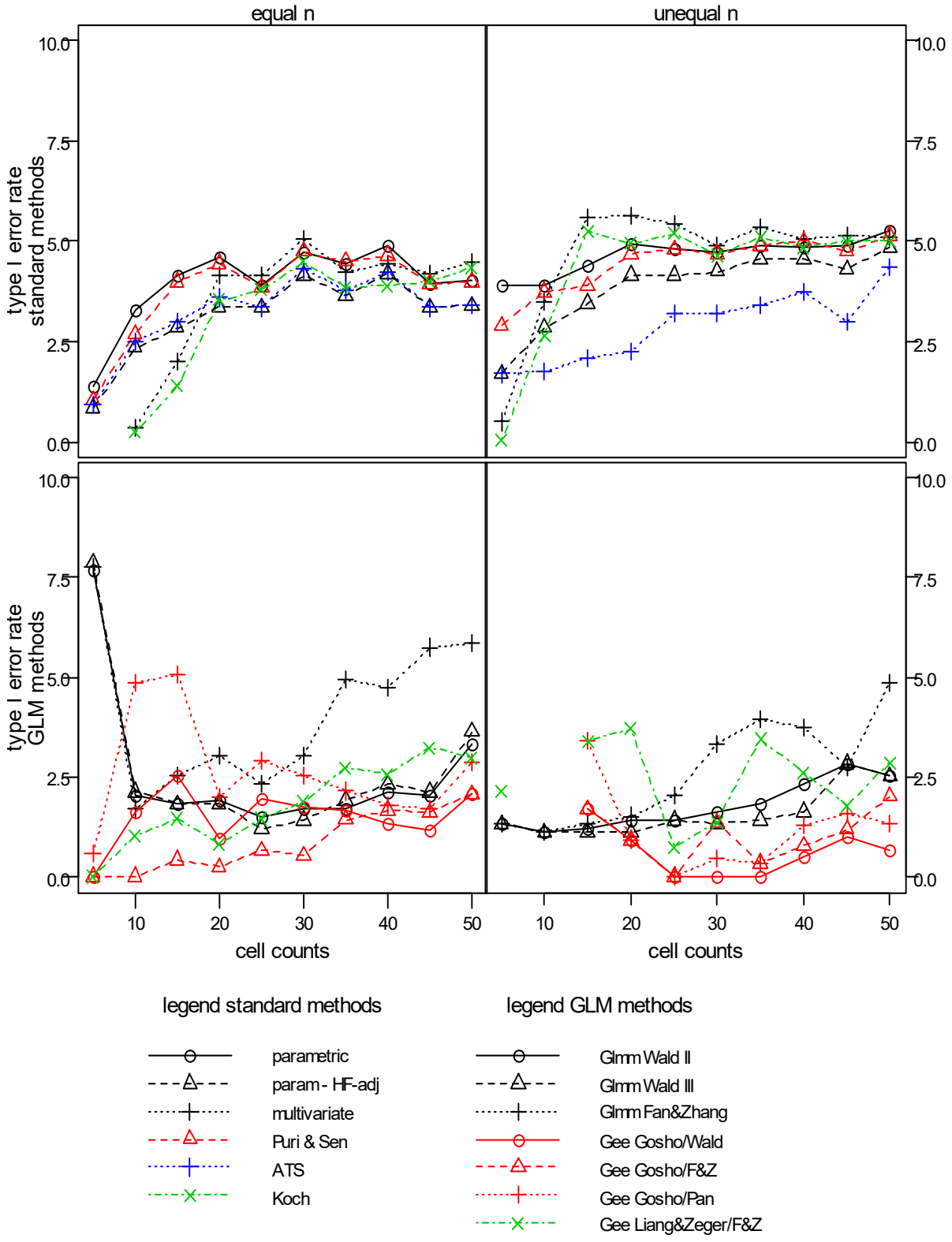
Graphic for α=0.05:



7. 4. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.40	3.30	4.15	4.60	4.75	4.90	4.05	3.90	3.90	4.40	4.95	4.75	4.85	5.25
	par./ HF-corr.	0.85	2.35	2.85	3.35	4.15	4.20	3.40	1.70	2.85	3.45	4.15	4.25	4.55	4.85
	multivariate		0.35	2.00	4.15	5.05	4.45	4.50	0.50	3.50	5.60	5.65	4.90	5.05	5.10
	Puri & Sen	1.05	2.70	4.00	4.45	4.75	4.65	4.00	2.90	3.75	3.90	4.70	4.70	5.00	5.15
	ATS	0.95	2.50	3.00	3.60	4.30	4.25	3.40	1.70	1.75	2.10	2.25	3.20	3.75	4.35
	Koch	0.05	0.25	1.40	3.55	4.50	3.90	4.35	0.05	2.65	5.25	4.95	4.65	4.85	5.00
	Glmm Wald II	7.7	2.0	1.8	1.9	1.7	2.1	3.3	1.3	1.1	1.2	1.4	1.6	2.3	2.5
	Glmm Wald III	7.9	2.1	1.8	1.8	1.4	2.3	3.6	1.3	1.1	1.1	1.1	1.3	1.6	2.5
	Glmm Fan&Zhang	7.8	1.7	2.5	3.0	3.0	4.7	5.9	1.3	1.1	1.3	1.5	3.3	3.7	4.9
	Gee Gosho/Wald	0.0	1.6	2.5	0.9	1.7	1.3	2.1			1.7	0.9	0.0	0.5	0.7
	Gee Gosho/F&Z	0.0	0.0	0.4	0.2	0.5	1.7	2.1			1.7	0.9	1.4	0.8	2.0
	Gee Gosho/Pan	0.6	4.9	5.1	2.0	2.5	1.8	2.9			3.4	0.9	0.5	1.3	1.3
	Gee Liang&Zeger	0.0	1.0	1.5	0.8	1.9	2.6	3.0	2.1	1.1	3.4	3.7	1.4	2.6	2.8
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.10	0.35	0.25	0.60	1.10	0.40	0.80	0.60	0.65	0.90	1.05	0.55	0.95	0.95
	par./ HF-corr.	0.05	0.05	0.05	0.40	0.60	0.35	0.60	0.25	0.10	0.55	0.65	0.45	0.70	0.80
	multivariate			0.05	0.20	0.70	0.60	0.85	0.05	0.05	0.90	0.75	0.90	1.00	0.85
	Puri & Sen	0.05	0.20	0.20	0.50	0.95	0.40	0.70	0.40	0.65	0.85	1.10	0.55	0.85	0.90
	ATS	0.05	0.10	0.10	0.45	0.65	0.40	0.65	0.50	0.20	0.20	0.25	0.30	0.60	0.65
	Koch	0.05	0.05	0.05	0.05	0.45	0.35	0.65	0.05	0.05	0.50	0.65	0.80	0.80	0.85
	Glmm Wald II	7.6	1.5	1.5	1.7	1.3	1.1	1.2	1.3	1.1	1.1	1.2	1.1	1.2	1.1
	Glmm Wald III	7.6	1.7	1.6	1.4	1.2	1.1	1.1	1.3	1.1	1.1	1.1	1.1	1.2	1.1
	Glmm Fan&Zhang	7.8	1.4	1.6	1.6	1.5	1.5	1.5	1.3	1.1	1.1	1.1	1.1	1.8	2.0
	Gee Gosho/Wald	0	0.5	0.4	0.2	0.0	0.2	0.3			1.7	0.9	0.0	0.0	0.2
	Gee Gosho/F&Z	0	0.0	0.0	0.0	0.0	0.2	0.2			1.7	0.9	0.0	0.5	0.0
	Gee Gosho/Pan	0	1.6	0.8	0.6	0.0	0.3	0.3			3.4	0.9	0.0	0.3	0.0
	Gee Liang&Zeger	0	0.5	0.4	0.2	0.3	0.3	0.5	2.1	1.1	3.4	2.8	0.0	0.8	0.3

Graphic for α=0.05:

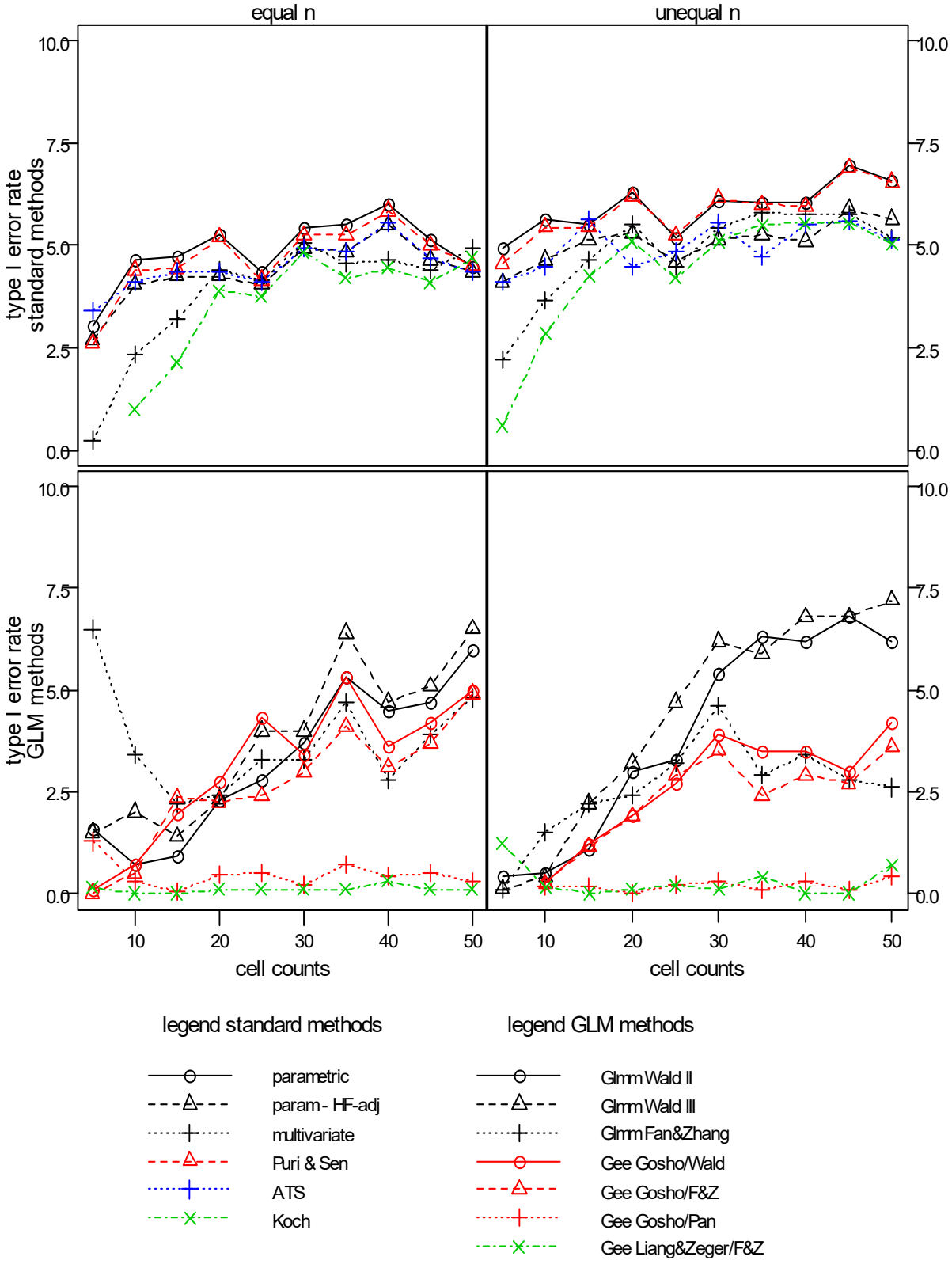


7. 4. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 4. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.05	4.65	4.75	5.25	5.45	6.00	4.50	4.95	5.65	5.50	6.3	6.10	6.05	6.60
	par./ HF-corr.	2.70	4.05	4.25	4.25	4.95	5.50	4.35	4.10	4.65	5.15	5.3	5.15	5.10	5.65
	multivariate	0.25	2.35	3.20	4.40	5.05	4.65	4.95	2.20	3.65	4.65	5.5	5.45	5.75	5.20
	Puri & Sen	2.60	4.40	4.45	5.20	5.25	5.85	4.50	4.55	5.45	5.45	6.2	6.15	5.95	6.55
	ATS	3.40	4.10	4.35	4.35	4.95	5.55	4.35	4.10	4.50	5.65	4.5	5.55	5.50	5.15
	Koch	0.05	1.00	2.15	3.90	4.85	4.45	4.70	0.60	2.85	4.25	5.1	5.10	5.55	5.05
	Glmm Wald II	1.6	0.7	0.9	2.3	3.7	4.5	6.0	0.4	0.5	1.1	3.0	5.4	6.2	6.2
	Glmm Wald III	1.5	2.0	1.4	2.3	4.0	4.7	6.5	0.1	0.4	2.2	3.2	6.2	6.8	7.2
	Glmm Fan&Zhang	6.5	3.4	2.2	2.4	3.3	2.8	4.8	0.1	1.5	2.2	2.4	4.6	3.4	2.6
	Gee Gosho/Wald	0.1	0.7	2.0	2.8	3.4	3.6	5.0		0.2	1.2	1.9	3.9	3.5	4.2
	Gee Gosho/F&Z	0.0	0.5	2.4	2.2	3.0	3.1	4.9		0.2	1.1	1.9	3.5	2.9	3.6
	Gee Gosho/Pan	1.3	0.3	0.1	0.4	0.2	0.4	0.3		0.2	0.2	0.0	0.3	0.3	0.4
	Gee Liang&Zeger	0.1	0.0	0.0	0.1	0.1	0.3	0.1	1.2	0.2	0.0	0.1	0.1	0.0	0.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.65	0.55	1.25	1.25	1.30	1.25	1.40	1.05	1.45	1.85	1.65	1.85	1.75	1.85
	par./ HF-corr.	0.35	0.50	1.00	0.95	1.05	1.00	1.00	0.70	1.15	1.30	1.15	1.70	1.30	1.60
	multivariate		0.30	0.20	0.65	0.80	1.00	0.75	0.20	0.65	0.75	0.95	1.15	1.25	0.95
	Puri & Sen	0.30	0.45	0.95	1.20	1.15	1.20	1.35	0.80	1.40	1.60	1.40	1.85	1.70	1.80
	ATS	0.60	0.80	1.05	1.05	1.10	1.10	1.00	1.35	1.00	0.95	1.10	1.50	1.25	1.45
	Koch	0.05	0.05	0.05	0.25	0.50	0.75	0.70		0.40	0.50	0.50	0.75	1.00	0.90
	Glmm Wald II	0.6	0.7	0.4	1.2	1.5	1.9	2.6	0.4	0.5	1.1	3.0	5.4	6.2	6.2
	Glmm Wald III	1.0	1.0	0.4	1.1	1.5	1.7	2.6	0.0	0.4	2.2	3.2	6.2	6.8	7.2
	Glmm Fan&Zhang	1.1	1.3	0.6	1.1	1.7	1.7	1.9	0.0	1.5	2.2	2.4	4.6	3.4	2.6
	Gee Gosho/Wald	0.0	0.1	0.1	0.4	0.4	0.3	0.9		0.0	0.1	0.2	0.5	0.4	0.8
	Gee Gosho/F&Z	0.0	0.0	0.3	0.2	0.7	0.6	0.8		0.0	0.1	0.3	0.6	0.6	1.3
	Gee Gosho/Pan	0.4	0.2	0.0	0.0	0.0	0.1	0.0		0.0	0.0	0.0	0.1	0.0	0.0
	Gee Liang&Zeger	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.2	0.0	0.0	0.0	0.0	0.1

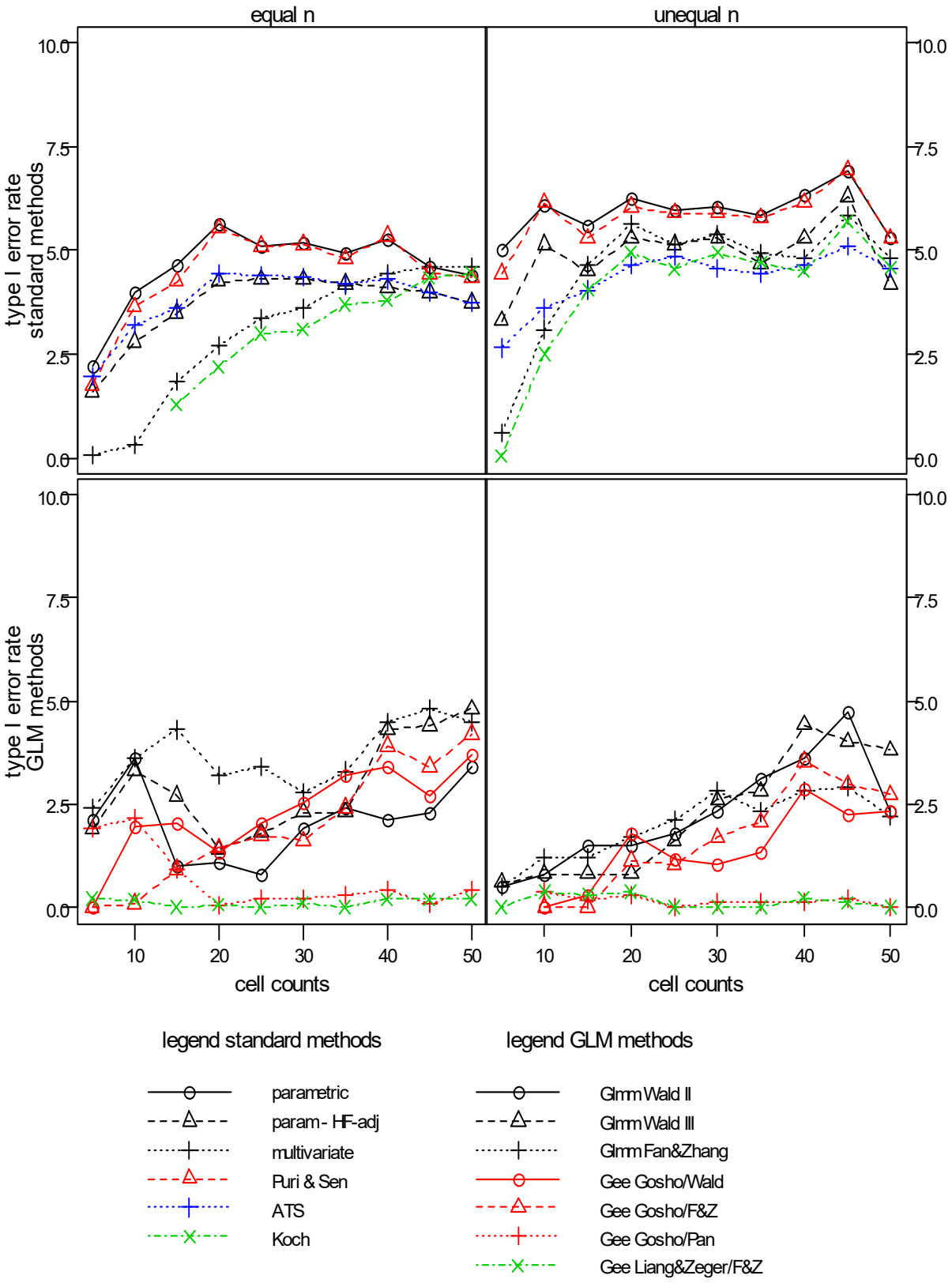
Graphic for α=0.05:



7. 4. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.20	4.00	4.65	5.65	5.20	5.25	4.40	5.00	6.10	5.60	6.25	6.05	6.35	5.30
	par./ HF-corr.	1.60	2.80	3.50	4.25	4.30	4.10	3.75	3.30	5.15	4.50	5.30	5.30	5.30	4.20
	multivariate	0.05	0.30	1.85	2.70	3.60	4.45	4.60	0.60	3.10	4.65	5.65	5.40	4.80	4.80
	Puri & Sen	1.75	3.65	4.25	5.55	5.15	5.35	4.35	4.45	6.15	5.30	6.05	5.90	6.15	5.30
	ATS	1.95	3.20	3.60	4.45	4.35	4.30	3.75	2.65	3.60	4.05	4.65	4.55	4.65	4.55
	Koch	0.05	0.05	1.30	2.20	3.10	3.80	4.45	0.05	2.50	4.05	4.95	4.95	4.50	4.60
	Glmm Wald II	2.1	3.6	1.0	1.1	1.9	2.1	3.4	0.5	0.8	1.5	1.5	2.3	3.6	2.3
	Glmm Wald III	1.9	3.3	2.7	1.4	2.3	4.3	4.8	0.6	0.8	0.8	0.8	2.6	4.4	3.8
	Glmm Fan&Zhang	2.4	3.6	4.3	3.2	2.8	4.5	4.5	0.5	1.2	1.2	1.7	2.8	2.8	2.2
	Gee Gosho/Wald	0.0	2.0	2.0	1.3	2.5	3.4	3.7		0.0	0.3	1.8	1.0	2.9	2.3
	Gee Gosho/F&Z	0.0	0.1	0.9	1.4	1.6	3.9	4.2		0.0	0.0	1.1	1.7	3.5	2.7
	Gee Gosho/Pan	1.9	2.1	0.9	0.1	0.2	0.4	0.4		0.4	0.2	0.3	0.1	0.1	0.0
	Gee Liang&Zeger	0.2	0.2	0.0	0.1	0.1	0.2	0.2	0.0	0.4	0.3	0.4	0.0	0.2	0.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.45	0.75	1.05	1.05	1.25	1.20	1.00	1.15	1.70	1.40	1.85	1.6	1.85	1.30
	par./ HF-corr.	0.15	0.25	0.90	0.75	0.90	0.95	0.75	0.65	0.90	1.20	1.75	1.1	1.45	0.85
	multivariate			0.10	0.10	0.45	0.50	0.60		0.25	0.75	0.80	0.8	0.80	0.85
	Puri & Sen	0.35	0.45	0.90	1.05	1.25	1.20	0.95	0.85	1.65	1.40	1.80	1.6	1.75	1.25
	ATS	0.20	0.45	1.00	0.80	0.90	0.95	0.75	1.15	0.70	0.45	1.10	1.1	0.75	0.95
	Koch	0.05	0.05	0.05	0.05	0.25	0.35	0.45	0.05	0.10	0.60	0.55	0.5	0.70	0.85
	Glmm Wald II	1.6	1.9	0.8	0.7	0.5	0.5	0.4	0.5	0.8	1.5	1.5	2.3	3.6	2.3
	Glmm Wald III	1.8	1.8	0.8	0.7	0.4	0.3	0.4	0.6	0.8	0.8	0.8	2.6	4.4	3.8
	Glmm Fan&Zhang	1.7	1.8	1.2	0.9	1.0	0.6	1.0	0.5	1.2	1.2	1.7	2.8	2.8	2.2
	Gee Gosho/Wald	0.0	0.7	0.5	0.2	0.5	0.7	0.4		0.0	0.0	0.1	0.1	0.4	0.2
	Gee Gosho/F&Z	0.0	0.0	0.1	0.2	0.3	0.5	0.6		0.0	0.0	0.1	0.4	0.8	0.4
	Gee Gosho/Pan	0.8	1.3	0.4	0.1	0.0	0.0	0.1		0.4	0.2	0.1	0.0	0.0	0.0
	Gee Liang&Zeger	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.4	0.0	0.0	0.0

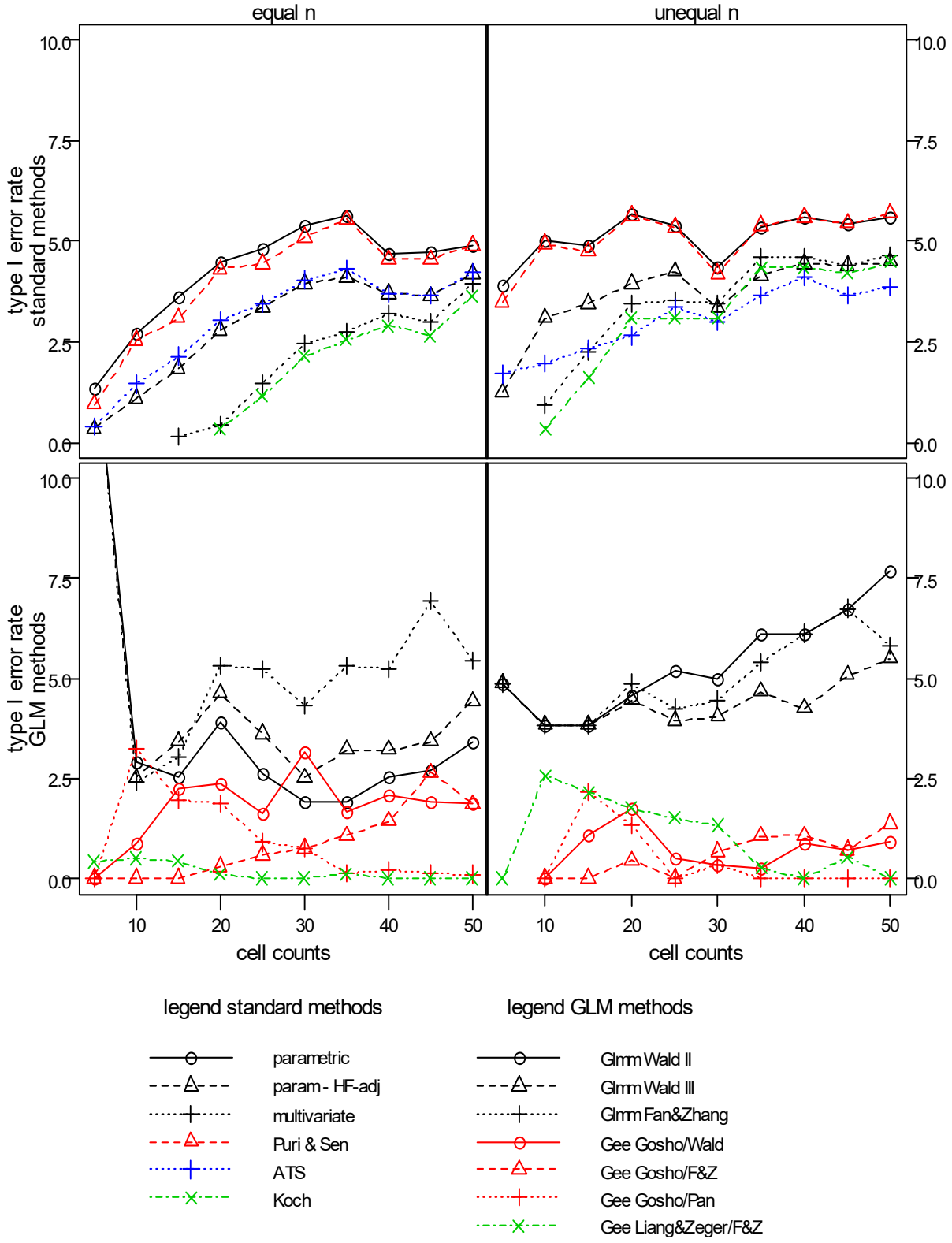
Graphic for α=0.05:



7. 4. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.35	2.70	3.60	4.50	5.40	4.70	4.90	3.90	5.00	4.90	5.70	4.35	5.60	5.60
	par./ HF-corr.	0.35	1.10	1.85	2.80	3.95	3.70	4.20	1.25	3.10	3.45	3.95	3.35	4.45	4.50
	multivariate		0.05	0.15	0.45	2.45	3.20	3.95		0.95	2.25	3.45	3.45	4.60	4.65
	Puri & Sen	0.95	2.55	3.10	4.30	5.10	4.55	4.90	3.50	4.95	4.75	5.65	4.20	5.60	5.70
	ATS	0.40	1.45	2.15	3.05	4.05	3.70	4.25	1.70	1.95	2.35	2.65	3.00	4.10	3.85
	Koch		0.05	0.05	0.35	2.15	2.90	3.65		0.35	1.60	3.10	3.10	4.35	4.50
	Glmm Wald II	13.4	2.9	2.5	3.9	1.9	2.5	3.4	4.9	3.8	3.8	4.6	5.0	6.1	7.7
	Glmm Wald III	13.3	2.5	3.4	4.6	2.5	3.2	4.4	4.9	3.8	3.8	4.5	4.0	4.3	5.5
	Glmm Fan&Zhang	13.3	2.4	3.0	5.3	4.3	5.2	5.4	4.9	3.8	3.8	4.9	4.5	6.1	5.8
	Gee Gosho/Wald	0.0	0.9	2.3	2.4	3.1	2.1	1.9		0.0	1.1	1.8	0.3	0.9	0.9
	Gee Gosho/F&Z	0.0	0.0	0.0	0.3	0.8	1.4	1.9		0.0	0.0	0.4	0.7	1.1	1.4
	Gee Gosho/Pan	0.0	3.2	2.0	1.9	0.8	0.2	0.1		0.0	2.2	1.3	0.3	0.0	0.0
	Gee Liang&Zeger	0.4	0.5	0.4	0.1	0.0	0.0	0.0	0.0	2.6	2.2	1.8	1.3	0.0	0.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.05	0.30	0.75	0.75	1.00	1.30	1.30	0.5	0.95	1.00	1.05	0.85	1.40	1.60
	par./ HF-corr.	0.05	0.05	0.20	0.20	0.35	0.80	0.80	0.05	0.20	0.45	0.75	0.40	0.90	0.95
	multivariate		0.05	0.05	0.05	0.05	0.20	0.45		0.05	0.15	0.25	0.60	0.75	1.00
	Puri & Sen	0.05	0.25	0.50	0.65	0.95	1.25	1.20	0.4	0.70	0.90	0.95	0.85	1.35	1.55
	ATS	0.05	0.05	0.35	0.20	0.40	0.85	0.80	0.3	0.15	0.30	0.30	0.15	0.55	0.45
	Koch		0.05	0.05	0.05	0.05	0.15	0.35			0.10	0.15	0.40	0.65	0.85
	Glmm Wald II	13.3	1.9	1.7	2.8	1.2	1.3	1.2	4.9	3.8	3.8	4.3	3.9	4.3	4.6
	Glmm Wald III	13.3	1.8	2.2	2.6	1.1	1.2	1.2	4.9	3.8	3.8	4.3	3.8	3.9	3.8
	Glmm Fan&Zhang	13.2	1.5	2.0	2.9	1.8	1.8	1.7	4.9	3.8	3.8	4.4	3.9	3.9	3.9
	Gee Gosho/Wald	0.0	0.6	1.2	1.2	0.6	0.1	0.4		0.0	0.0	0.4	0.0	0.0	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.1	0.3		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan	0.0	1.8	1.4	0.7	0.4	0.2	0.0		0.0	1.1	0.9	0.3	0.0	0.0
	Gee Liang&Zeger	0.4	0.5	0.4	0.1	0.0	0.0	0.0	0.0	2.6	2.2	1.8	1.3	0.0	0.0

Graphic for α=0.05:



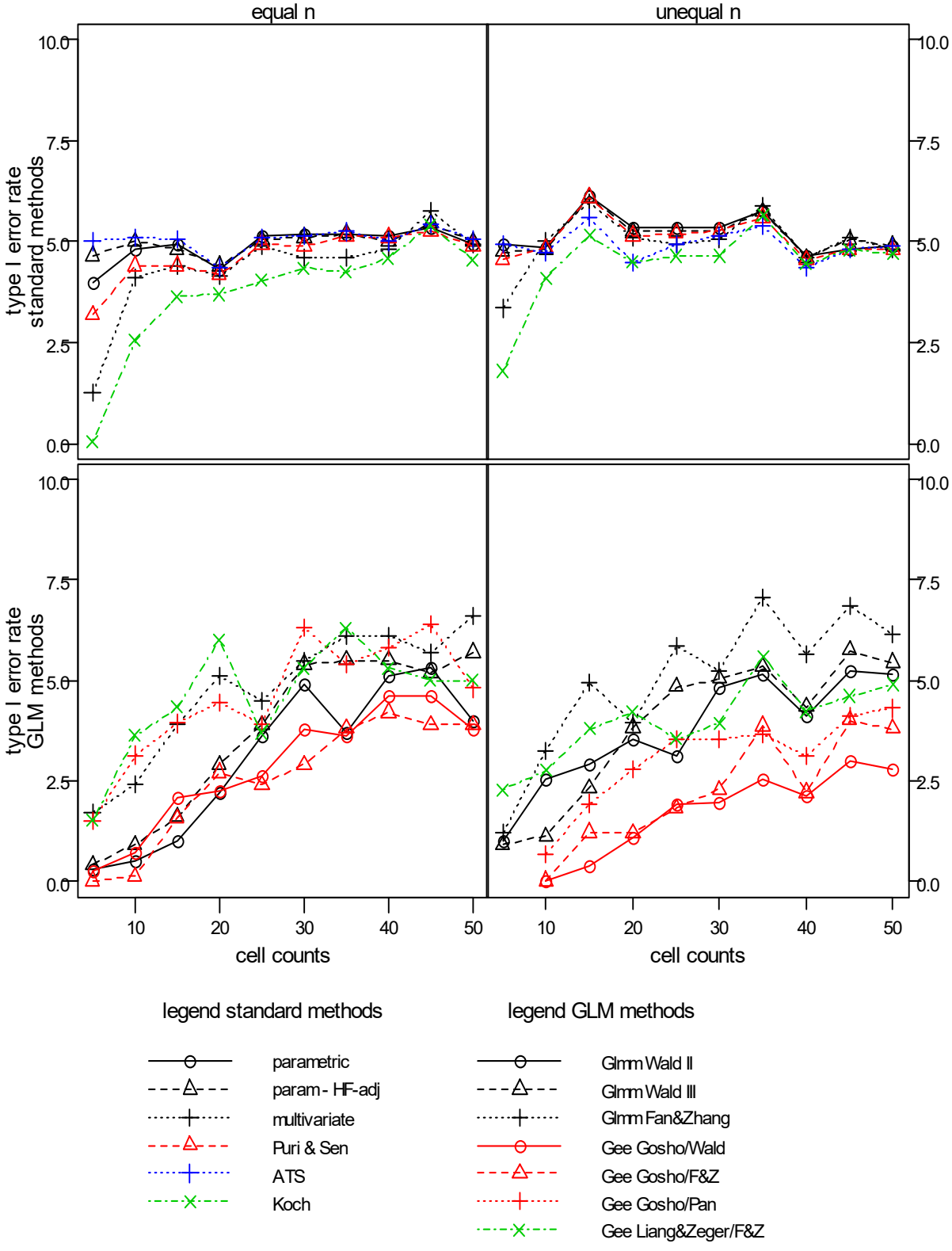
7. 5. Main effect B - A significant (effects a_i = 0.6*s) n_i and p_i independent

7. 5. 1. equal correlations on B (r=0.3)

7. 5. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.00	4.80	4.95	4.30	5.20	5.15	4.95	4.95	4.85	6.15	5.35	5.35	4.65	4.9
	par./ HF-corr.	4.65	5.00	4.80	4.40	5.10	5.00	5.00	4.75	4.80	6.10	5.25	5.25	4.60	4.9
	multivariate	1.25	4.10	4.40	4.15	4.60	4.80	4.95	3.35	5.00	5.95	5.10	5.05	4.60	4.8
	Puri & Sen	3.20	4.40	4.40	4.20	4.90	5.10	4.90	4.55	4.85	6.10	5.15	5.25	4.55	4.8
	ATS	5.00	5.10	5.05	4.35	5.15	5.00	5.05	4.95	4.75	5.60	4.50	5.15	4.35	4.9
	Koch	0.05	2.55	3.65	3.70	4.35	4.60	4.55	1.80	4.10	5.15	4.50	4.65	4.45	4.7
	Glmm Wald II	0.3	0.5	1.0	2.2	4.9	5.1	4.0	1.0	2.5	2.9	3.5	4.8	4.1	5.1
	Glmm Wald III	0.4	0.9	1.6	2.9	5.4	5.5	5.7	0.9	1.1	2.3	3.8	5.0	4.3	5.4
	Glmm Fan&Zhang	1.7	2.4	3.9	5.1	5.5	6.1	6.6	1.2	3.2	4.9	3.9	5.2	5.6	6.1
	Gee Gosho/Wald	0.2	0.7	2.1	2.3	3.8	4.6	3.8		0.0	0.4	1.1	2.0	2.1	2.8
	Gee Gosho/F&Z	0.0	0.1	1.6	2.7	2.9	4.2	3.9		0.0	1.2	1.2	2.3	2.2	3.8
	Gee Gosho/Pan	1.5	3.1	3.9	4.5	6.3	5.8	4.8		0.7	1.9	2.8	3.5	3.1	4.3
	Gee Liang&Zeger	1.5	3.6	4.3	6.0	5.3	5.3	5.0	2.3	2.7	3.8	4.2	3.9	4.2	4.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.6	1.15	0.70	0.95	1.30	1.00	1.00	0.80	0.85	1.40	0.75	1.25	0.75	1.00
	par./ HF-corr.	0.8	1.00	0.70	1.00	1.20	1.05	1.00	0.75	0.70	1.30	0.85	1.20	0.75	1.00
	multivariate	0.2	0.20	1.00	0.80	1.10	0.85	1.05	0.45	0.50	1.35	0.85	1.00	0.80	1.05
	Puri & Sen	0.3	0.80	0.65	0.75	1.10	0.90	1.00	0.60	0.65	1.35	0.55	1.10	0.65	1.00
	ATS	0.9	1.10	0.80	1.00	1.25	1.05	1.00	1.00	0.75	1.15	0.90	1.10	0.85	1.35
	Koch	0.05	0.05	0.20	0.45	0.85	0.70	0.85	0.05	0.35	0.70	0.60	0.90	0.60	1.05
	Glmm Wald II	0.2	0.4	0.4	0.8	1.6	1.9	2.0	0.9	1.1	1.5	1.2	1.7	1.9	2.1
	Glmm Wald III	0.3	0.4	0.4	0.7	1.7	2.1	1.8	0.9	1.1	1.1	1.4	1.4	1.8	2.3
	Glmm Fan&Zhang	0.4	0.6	0.7	1.2	2.4	2.7	2.7	0.9	1.3	2.0	1.7	1.9	2.1	3.3
	Gee Gosho/Wald	0.2	0.1	0.3	0.2	0.6	0.8	0.4		0.0	0.1	0.1	0.2	0.2	0.6
	Gee Gosho/F&Z	0.0	0.0	0.1	0.4	0.8	0.9	0.9		0.0	0.1	0.1	0.3	0.2	1.2
	Gee Gosho/Pan	0.6	0.2	0.6	0.6	0.9	1.0	0.8		0.0	0.1	0.3	0.6	0.5	0.8
	Gee Liang&Zeger	0.6	0.6	0.9	1.2	1.5	1.3	1.2	2.3	0.4	0.7	0.9	1.1	0.5	1.7

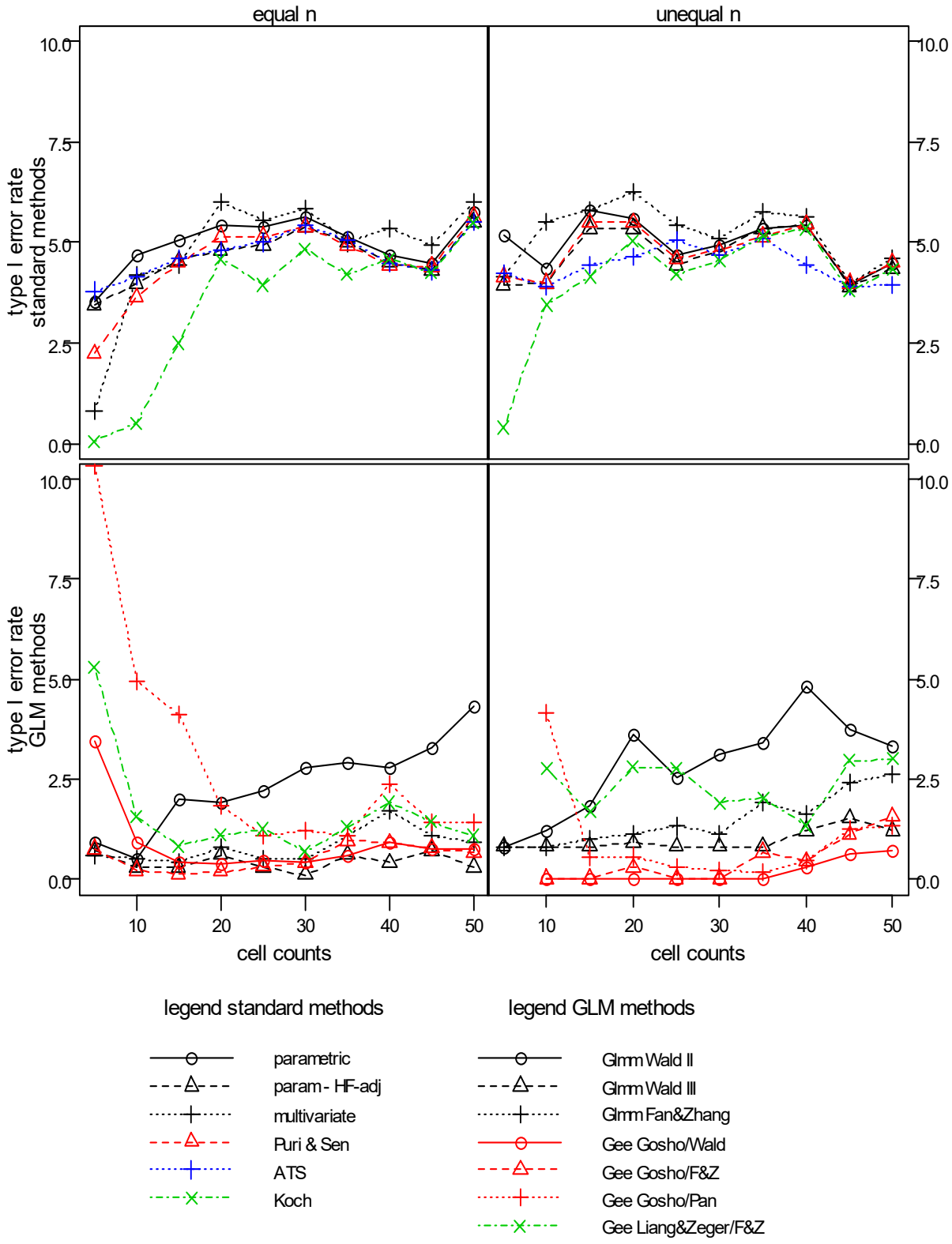
Graphic for α=0.05:



7. 5. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.55	4.70	5.05	5.45	5.65	4.70	5.75	5.20	4.35	5.80	5.60	4.95	5.45	4.50
	par./ HF-corr.	3.45	4.00	4.55	4.80	5.40	4.50	5.50	3.95	4.00	5.35	5.35	4.80	5.45	4.35
	multivariate	0.80	4.20	4.45	6.00	5.85	5.35	6.00	4.15	5.50	5.80	6.25	5.10	5.65	4.60
	Puri & Sen	2.25	3.65	4.50	5.15	5.40	4.45	5.65	4.15	4.00	5.50	5.50	4.80	5.45	4.50
	ATS	3.80	4.15	4.60	4.80	5.45	4.50	5.50	4.25	3.90	4.45	4.65	4.70	4.45	3.95
	Koch	0.05	0.50	2.50	4.60	4.85	4.60	5.50	0.40	3.45	4.15	5.05	4.55	5.35	4.35
	Glmm Wald II	0.9	0.5	2.0	1.9	2.8	2.8	4.3	0.8	1.2	1.8	3.6	3.1	4.8	3.3
	Glmm Wald III	0.7	0.3	0.3	0.6	0.1	0.4	0.3	0.8	0.8	0.8	0.9	0.8	1.2	1.2
	Glmm Fan&Zhang	0.6	0.5	0.4	0.8	0.5	1.7	0.9	0.8	0.8	1.0	1.1	1.1	1.6	2.6
	Gee Gosho/Wald	3.4	0.9	0.4	0.4	0.4	0.9	0.8		0.0	0.0	0.0	0.0	0.3	0.7
	Gee Gosho/F&Z	0.8	0.2	0.1	0.2	0.4	0.9	0.6		0.0	0.0	0.3	0.0	0.4	1.6
	Gee Gosho/Pan	10.3	4.9	4.1	1.8	1.2	2.4	1.4		4.2	0.6	0.6	0.2	0.4	1.3
	Gee Liang&Zeger	5.3	1.5	0.8	1.1	0.7	1.9	1.1		2.8	1.7	2.8	1.9	1.3	3.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.70	0.70	0.80	1.00	1.40	0.85	1.25	1.2	0.95	0.80	1.15	0.85	1.30	0.95
	par./ HF-corr.	0.75	0.50	0.70	0.90	1.15	0.75	1.25	0.8	0.70	0.70	1.00	0.85	1.30	0.90
	multivariate	0.30	0.55	0.45	0.90	1.00	1.00	1.30	0.5	1.05	0.90	1.10	0.75	1.55	0.90
	Puri & Sen	0.15	0.45	0.25	0.70	1.25	0.80	1.15	0.7	0.85	0.75	1.15	0.80	1.30	0.90
	ATS	0.85	0.60	0.80	1.05	1.15	0.80	1.25	1.3	0.70	0.50	1.00	0.90	1.10	0.45
	Koch	0.05	0.05	0.05	0.30	0.55	0.65	1.00	0.05	0.20	0.20	0.75	0.50	1.15	0.65
	Glmm Wald II	0.8	0.2	0.4	0.6	0.5	0.5	0.6	0.8	0.8	0.9	1.0	1.3	1.8	0.9
	Glmm Wald III	0.6	0.2	0.2	0.5	0.1	0.3	0.1	0.8	0.8	0.8	0.8	0.8	1.0	0.8
	Glmm Fan&Zhang	0.6	0.2	0.2	0.5	0.3	0.5	0.2	0.8	0.8	0.8	0.8	0.8	1.1	1.0
	Gee Gosho/Wald	3.4	0.4	0.1	0.1	0.0	0.1	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/F&Z	0.8	0.2	0.1	0.1	0.0	0.1	0.1		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan	8.6	2.9	2.2	0.5	0.1	0.1	0.0		4.2	0.6	0.3	0.0	0.0	0.0
	Gee Liang&Zeger	3.8	1.5	0.8	0.5	0.0	0.3	0.2		2.8	1.7	2.0	1.1	0.6	0.6

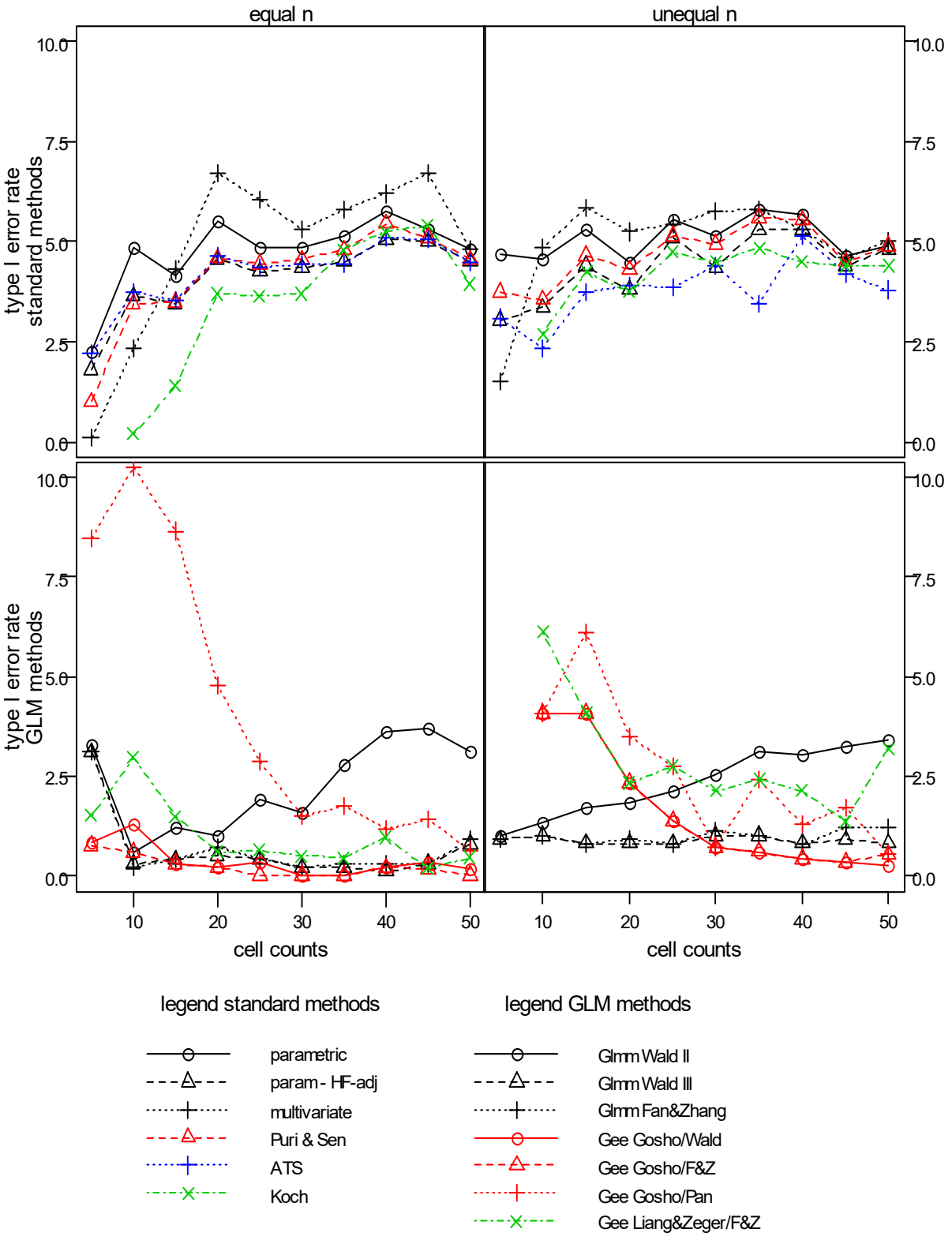
Graphic for α=0.05:



7. 5. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.25	4.85	4.15	5.50	4.85	5.75	4.80	4.70	4.55	5.30	4.50	5.15	5.70	4.9
	par./ HF-corr.	1.80	3.65	3.45	4.55	4.35	5.05	4.50	3.05	3.35	4.40	3.80	4.35	5.30	4.8
	multivariate	0.10	2.35	4.30	6.70	5.30	6.20	4.80	1.50	4.85	5.85	5.25	5.75	5.30	5.0
	Puri & Sen	1.00	3.45	3.50	4.60	4.55	5.45	4.55	3.75	3.55	4.65	4.30	4.95	5.55	4.9
	ATS	2.20	3.75	3.55	4.65	4.45	5.10	4.50	3.10	2.35	3.75	3.90	4.40	5.15	3.8
	Koch		0.20	1.40	3.70	3.70	5.25	3.95	0.05	2.70	4.25	3.75	4.50	4.50	4.4
	Glmm Wald II	3.3	0.6	1.2	1.0	1.6	3.6	3.1	1.0	1.3	1.7	1.8	2.5	3.0	3.4
	Glmm Wald III	3.1	0.3	0.4	0.5	0.2	0.1	0.8	0.9	1.0	0.8	0.8	1.0	0.8	0.8
	Glmm Fan&Zhang	3.1	0.2	0.4	0.7	0.2	0.3	0.9	0.9	1.0	0.8	0.9	1.1	0.8	1.2
	Gee Gosho/Wald	0.8	1.3	0.3	0.2	0.0	0.2	0.2		4.1	4.1	2.3	0.7	0.4	0.3
	Gee Gosho/F&Z	0.8	0.6	0.3	0.2	0.0	0.2	0.0		4.1	4.1	2.3	0.7	0.4	0.5
	Gee Gosho/Pan	8.5	10.3	8.7	4.8	1.5	1.1	0.6		4.1	6.1	3.5	0.7	1.3	0.5
	Gee Liang&Zeger	1.5	3.0	1.5	0.6	0.5	1.0	0.5		6.1	4.1	2.3	2.1	2.1	3.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.5	0.45	0.95	0.95	0.75	1.25	0.8	1.05	1.00	0.95	0.75	0.90	1.00	0.90
	par./ HF-corr.	0.3	0.10	0.40	0.50	0.55	1.15	0.8	0.45	0.60	0.70	0.65	0.90	0.90	0.70
	multivariate	0.1	0.25	0.35	0.70	1.25	1.55	1.2	0.05	0.50	0.95	0.90	1.00	1.55	0.95
	Puri & Sen	0.05	0.20	0.50	0.45	0.65	1.10	0.7	0.40	0.90	0.85	0.65	0.90	0.90	0.80
	ATS	0.4	0.25	0.60	0.65	0.65	1.15	0.8	1.05	0.55	0.30	0.50	0.70	0.80	0.75
	Koch		0.05	0.05	0.10	0.30	0.75	0.6	0.05	0.05	0.25	0.55	0.65	1.30	0.75
	Glmm Wald II	3.1	0.4	0.5	0.3	0.6	0.4	1.0	0.9	1.0	0.8	0.9	1.1	0.9	1.1
	Glmm Wald III	3.1	0.3	0.4	0.4	0.2	0.1	0.7	0.9	1.0	0.8	0.8	1.0	0.8	0.8
	Glmm Fan&Zhang	3.0	0.2	0.3	0.4	0.2	0.1	0.7	0.9	1.0	0.8	0.8	1.0	0.8	0.9
	Gee Gosho/Wald	0.8	1.3	0.3	0.2	0.0	0.0	0.0		4.1	4.1	2.3	0.7	0.4	0.3
	Gee Gosho/F&Z	0.8	0.6	0.3	0.2	0.0	0.0	0.0		4.1	4.1	2.3	0.7	0.4	0.3
	Gee Gosho/Pan	8.5	8.3	7.2	4.4	1.5	0.6	0.5		4.1	6.1	3.5	0.7	0.9	0.3
	Gee Liang&Zeger	1.5	3.0	1.5	0.6	0.5	0.2	0.5		4.1	4.1	2.3	2.1	1.7	2.4

Graphic for α=0.05:

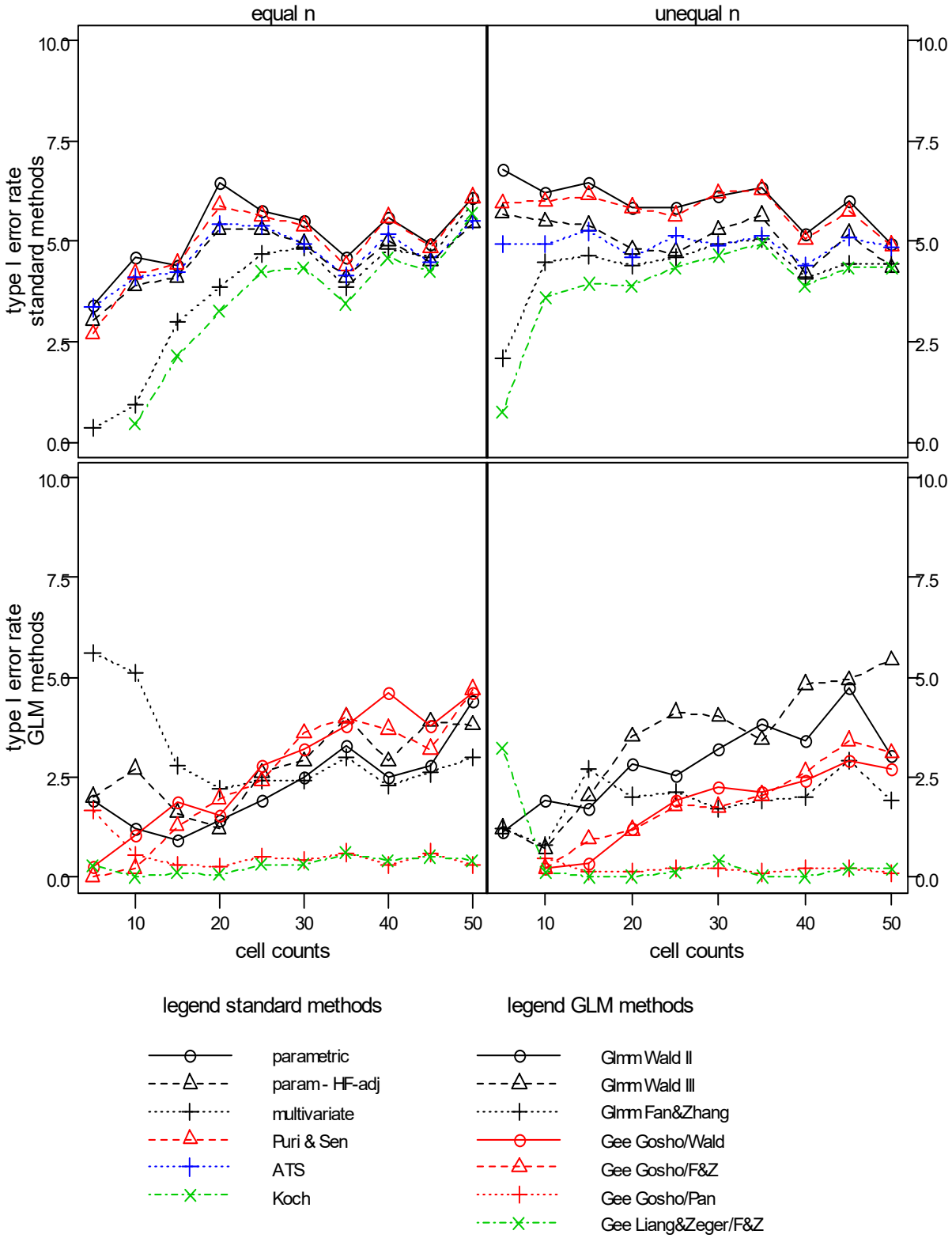


7. 5. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 5. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.40	4.60	4.40	6.45	5.50	5.6	6.10	6.80	6.20	6.45	5.85	6.15	5.20	4.95
	par./ HF-corr.	3.05	3.90	4.10	5.30	4.95	5.0	5.45	5.70	5.50	5.40	4.80	5.30	4.20	4.35
	multivariate	0.35	0.95	3.00	3.85	4.85	4.8	5.95	2.10	4.50	4.65	4.40	4.95	4.10	4.45
	Puri & Sen	2.70	4.20	4.45	5.90	5.40	5.6	6.10	5.95	6.00	6.15	5.85	6.20	5.05	4.90
	ATS	3.35	4.10	4.25	5.45	4.95	5.2	5.50	4.95	4.95	5.25	4.60	4.90	4.40	4.85
	Koch	0.05	0.45	2.15	3.25	4.35	4.6	5.70	0.75	3.60	3.95	3.90	4.65	3.90	4.35
	Glmm Wald II	1.9	1.2	0.9	1.4	2.5	2.5	4.4	1.1	1.9	1.7	2.8	3.2	3.4	3.0
	Glmm Wald III	2.0	2.7	1.6	1.2	2.9	2.9	3.8	1.2	0.7	2.0	3.5	4.0	4.8	5.4
	Glmm Fan&Zhang	5.6	5.1	2.8	2.2	2.4	2.3	3.0	1.2	0.8	2.7	2.0	1.7	2.0	1.9
	Gee Gosho/Wald	0.2	1.0	1.9	1.6	3.2	4.6	4.6		0.2	0.3	1.2	2.3	2.4	2.7
	Gee Gosho/F&Z	0.0	0.2	1.3	2.0	3.6	3.7	4.7		0.2	0.9	1.2	1.7	2.6	3.1
	Gee Gosho/Pan	1.7	0.6	0.3	0.3	0.4	0.3	0.3		0.4	0.1	0.1	0.2	0.2	0.1
	Gee Liang&Zeger	0.3	0.0	0.1	0.1	0.3	0.4	0.4	3.2	0.1	0.0	0.0	0.4	0.0	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.40	0.80	0.95	1.05	1.60	1.20	1.50	2.20	1.50	1.50	1.85	1.30	1.50	1.45
	par./ HF-corr.	0.35	0.55	0.75	0.80	1.25	0.85	1.05	1.70	1.10	1.00	1.25	0.80	1.25	0.95
	multivariate	0.05	0.05	0.25	0.50	1.00	0.70	1.35	0.15	0.65	0.90	0.90	0.60	0.95	0.95
	Puri & Sen	0.05	0.50	0.80	0.95	1.40	1.10	1.35	1.90	1.25	1.20	1.65	1.20	1.55	1.40
	ATS	0.35	0.65	0.85	0.90	1.35	0.95	1.05	1.40	0.65	1.30	0.95	1.30	0.95	0.90
	Koch	0.05	0.05	0.10	0.25	0.70	0.50	1.20	0.05	0.40	0.35	0.75	0.55	0.75	0.85
	Glmm Wald II	1.6	0.7	0.6	0.5	0.7	0.4	1.0	1.0	0.9	1.0	1.1	1.1	1.6	1.0
	Glmm Wald III	1.8	1.2	0.8	0.7	0.6	0.6	0.5	1.0	0.6	0.7	0.9	1.4	1.2	1.3
	Glmm Fan&Zhang	1.4	1.9	1.3	0.8	0.6	0.4	0.5	0.9	0.6	0.7	0.9	1.0	0.8	0.8
	Gee Gosho/Wald	0.1	0.1	0.5	0.2	0.3	0.8	0.7		0.0	0.1	0.2	0.4	0.2	0.6
	Gee Gosho/F&Z	0.0	0.0	0.3	0.3	0.4	0.8	1.0		0.0	0.0	0.3	0.3	0.6	0.6
	Gee Gosho/Pan	0.8	0.3	0.1	0.0	0.0	0.0	0.1		0.3	0.1	0.0	0.1	0.0	0.1
	Gee Liang&Zeger	0.3	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.1	0.0	0.0	0.0	0.0	0.0

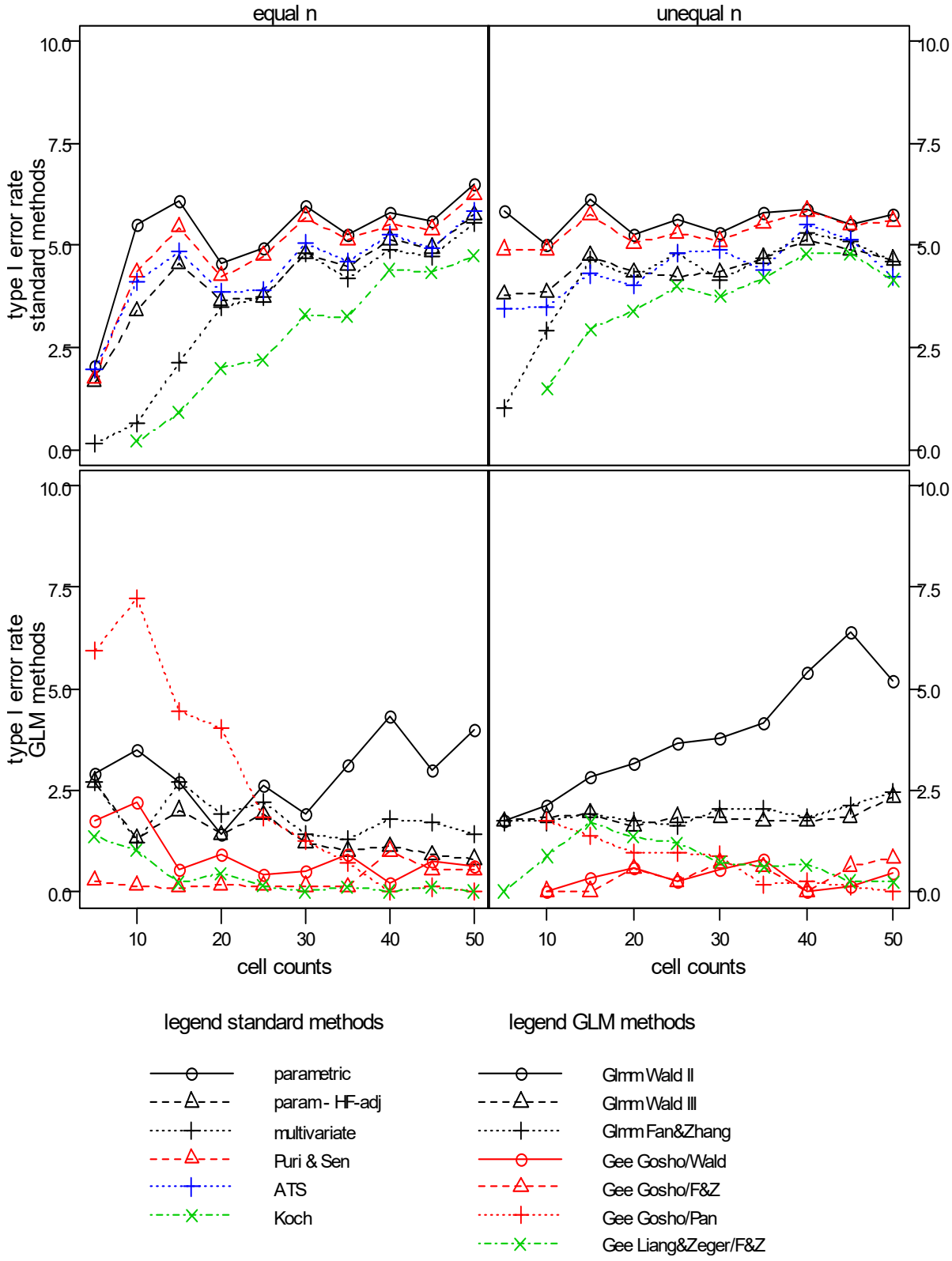
Graphic for α=0.05:



7. 5. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.05	5.50	6.10	4.55	5.95	5.80	6.50	5.85	5.00	6.15	5.25	5.30	5.90	5.75
	par./ HF-corr.	1.65	3.40	4.55	3.65	4.80	5.15	5.75	3.80	3.85	4.75	4.35	4.35	5.15	4.65
	multivariate	0.15	0.65	2.15	3.50	4.80	4.90	5.55	1.00	2.90	4.65	4.25	4.15	5.30	4.60
	Puri & Sen	1.75	4.35	5.45	4.25	5.70	5.50	6.25	4.90	4.90	5.75	5.05	5.10	5.85	5.60
	ATS	1.95	4.10	4.85	3.85	5.05	5.25	5.85	3.45	3.50	4.30	4.05	4.90	5.50	4.25
	Koch	0.05	0.20	0.90	2.00	3.30	4.40	4.75	0.05	1.50	2.95	3.40	3.75	4.80	4.15
	Glmm Wald II	2.9	3.5	2.7	1.4	1.9	4.3	4.0	1.7	2.1	2.8	3.2	3.8	5.4	5.2
	Glmm Wald III	2.7	1.3	2.0	1.4	1.2	1.1	0.8	1.7	1.8	1.9	1.6	1.8	1.7	2.3
	Glmm Fan&Zhang	2.7	1.2	2.7	1.9	1.4	1.8	1.4	1.7	1.7	1.9	1.7	2.0	1.8	2.4
	Gee Gosho/Wald	1.7	2.2	0.5	0.9	0.5	0.2	0.6		0.0	0.3	0.6	0.5	0.0	0.5
	Gee Gosho/F&Z	0.3	0.1	0.1	0.2	0.1	1.0	0.5		0.0	0.0	0.6	0.7	0.0	0.8
	Gee Gosho/Pan	5.9	7.2	4.4	4.0	1.3	0.0	0.0		1.7	1.4	1.0	0.9	0.3	0.0
	Gee Liang&Zeger	1.4	1.0	0.2	0.5	0.0	0.0	0.0	0.0	0.9	1.7	1.3	0.7	0.6	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.65	0.65	1.00	1.40	1.60	1.30	1.65	1.30	1.25	1.70	1.20	1.15	1.85	1.20
	par./ HF-corr.	0.25	0.20	0.50	0.90	1.10	0.95	1.15	0.55	0.65	1.10	0.95	0.60	1.45	0.85
	multivariate	0.05	0.05	0.25	0.15	0.55	0.85	1.20	0.05	0.35	0.50	1.00	0.55	0.90	0.75
	Puri & Sen	0.25	0.45	0.55	0.90	1.45	1.25	1.55	1.00	0.95	1.45	1.10	1.10	1.70	1.20
	ATS	0.50	0.35	0.65	0.95	1.20	1.00	1.25	1.45	0.50	0.95	0.80	1.00	1.20	0.85
	Koch	0.05	0.05	0.05	0.05	0.15	0.35	0.70	0.05	0.05	0.05	0.55	0.40	0.70	0.60
	Glmm Wald II	2.9	2.2	2.2	1.0	0.7	0.8	0.9	1.7	1.8	1.8	2.1	2.0	2.3	2.0
	Glmm Wald III	2.7	0.8	1.2	1.0	0.8	0.3	0.4	1.7	1.7	1.8	1.6	1.8	1.6	1.8
	Glmm Fan&Zhang	2.7	0.7	1.4	0.8	0.6	0.4	0.4	1.7	1.7	1.8	1.6	1.8	1.6	1.8
	Gee Gosho/Wald	1.7	1.4	0.3	0.2	0.1	0.0	0.0		0.0	0.0	0.0	0.2	0.0	0.0
	Gee Gosho/F&Z	0.3	0.1	0.1	0.1	0.0	0.0	0.0		0.0	0.0	0.2	0.0	0.0	0.2
	Gee Gosho/Pan	5.6	6.3	4.2	3.5	1.3	0.0	0.0		0.9	1.4	1.0	0.5	0.3	0.0
	Gee Liang&Zeger	1.4	1.0	0.2	0.4	0.0	0.0	0.0	0.0	0.9	1.7	1.3	0.7	0.6	0.2

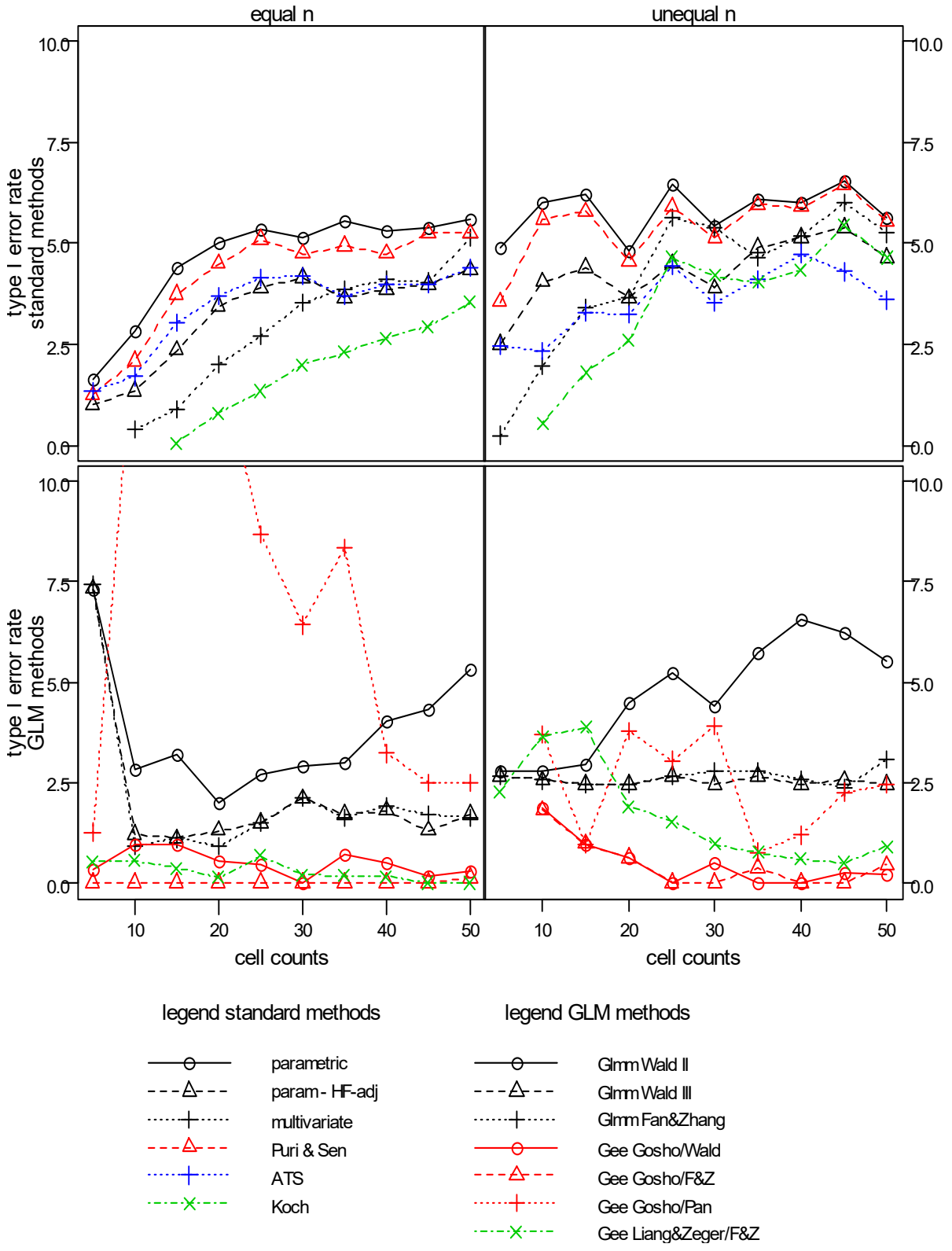
Graphic for α=0.05:



7. 5. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.65	2.85	4.40	5.00	5.15	5.30	5.60	4.90	6.00	6.2	4.80	5.45	6.00	5.65
	par./ HF-corr.	1.00	1.35	2.35	3.45	4.15	3.85	4.35	2.50	4.05	4.4	3.65	3.90	5.15	4.65
	multivariate		0.40	0.90	2.00	3.55	4.10	5.15	0.25	1.95	3.4	3.65	5.40	5.20	5.25
	Puri & Sen	1.25	2.10	3.75	4.50	4.75	4.75	5.25	3.55	5.60	5.8	4.55	5.15	5.90	5.55
	ATS	1.35	1.70	3.05	3.70	4.20	4.00	4.40	2.45	2.35	3.3	3.25	3.55	4.75	3.60
	Koch		0.05	0.05	0.80	2.00	2.65	3.55	0.05	0.55	1.8	2.60	4.20	4.35	4.65
	Glmm Wald II	7.3	2.8	3.2	2.0	2.9	4.0	5.3	2.8	2.8	3.0	4.5	4.4	6.6	5.5
	Glmm Wald III	7.3	1.2	1.1	1.3	2.1	1.8	1.7	2.7	2.6	2.5	2.5	2.5	2.5	2.5
	Glmm Fan&Zhang	7.4	0.9	1.1	0.9	2.1	1.9	1.6	2.7	2.6	2.5	2.5	2.8	2.6	3.1
	Gee Gosho/Wald	0.3	1.0	1.0	0.5	0.0	0.5	0.3		1.9	1.0	0.6	0.5	0.0	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.1		1.8	1.0	0.6	0.0	0.0	0.4
	Gee Gosho/Pan	1.3	14.0	12.4	13.2	6.4	3.2	2.5		3.7	1.0	3.8	3.9	1.2	2.5
	Gee Liang&Zeger	0.5	0.6	0.4	0.1	0.2	0.2	0.0	2.3	3.6	3.9	1.9	1.0	0.6	0.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.35	0.55	0.35	0.8	0.95	1.20	1.05	0.95	1.40	1.55	1.50	1.15	1.80	1.45
	par./ HF-corr.	0.05	0.10	0.15	0.2	0.55	0.80	0.80	0.25	0.70	0.85	0.80	0.65	1.05	1.15
	multivariate			0.05	0.1	0.35	0.35	0.35	0.05	0.05	0.20	0.45	0.40	1.15	1.05
	Puri & Sen	0.15	0.25	0.15	0.5	0.75	1.15	1.05	0.40	0.85	1.35	1.20	1.05	1.65	1.40
	ATS	0.05	0.20	0.15	0.4	0.55	0.85	0.90	1.00	0.20	0.50	0.50	0.50	1.10	0.65
	Koch		0.05	0.05	0.05	0.05	0.05	0.25	0.05	0.05	0.05	0.10	0.30	0.85	0.85
	Glmm Wald II	7.3	2.2	2.2	1.7	1.9	1.4	1.5	2.7	2.6	2.5	2.8	2.8	2.7	3.1
	Glmm Wald III	7.3	0.9	1.0	0.9	1.9	1.1	1.1	2.7	2.6	2.5	2.5	2.5	2.5	2.5
	Glmm Fan&Zhang	7.3	0.6	1.0	0.8	1.8	1.1	1.1	2.7	2.6	2.5	2.5	2.5	2.5	2.5
	Gee Gosho/Wald	0.3	0.6	0.4	0.1	0.0	0.3	0.0		1.9	1.0	0.6	0.0	0.0	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.8	1.0	0.6	0.0	0.0	0.0
	Gee Gosho/Pan	1.3	13.3	11.8	12.5	6.2	3.2	2.3		3.7	1.0	3.2	3.9	1.2	2.2
	Gee Liang&Zeger	0.5	0.3	0.4	0.1	0.2	0.2	0.0	2.3	1.8	3.9	1.9	1.0	0.6	0.9

Graphic for α=0.05:



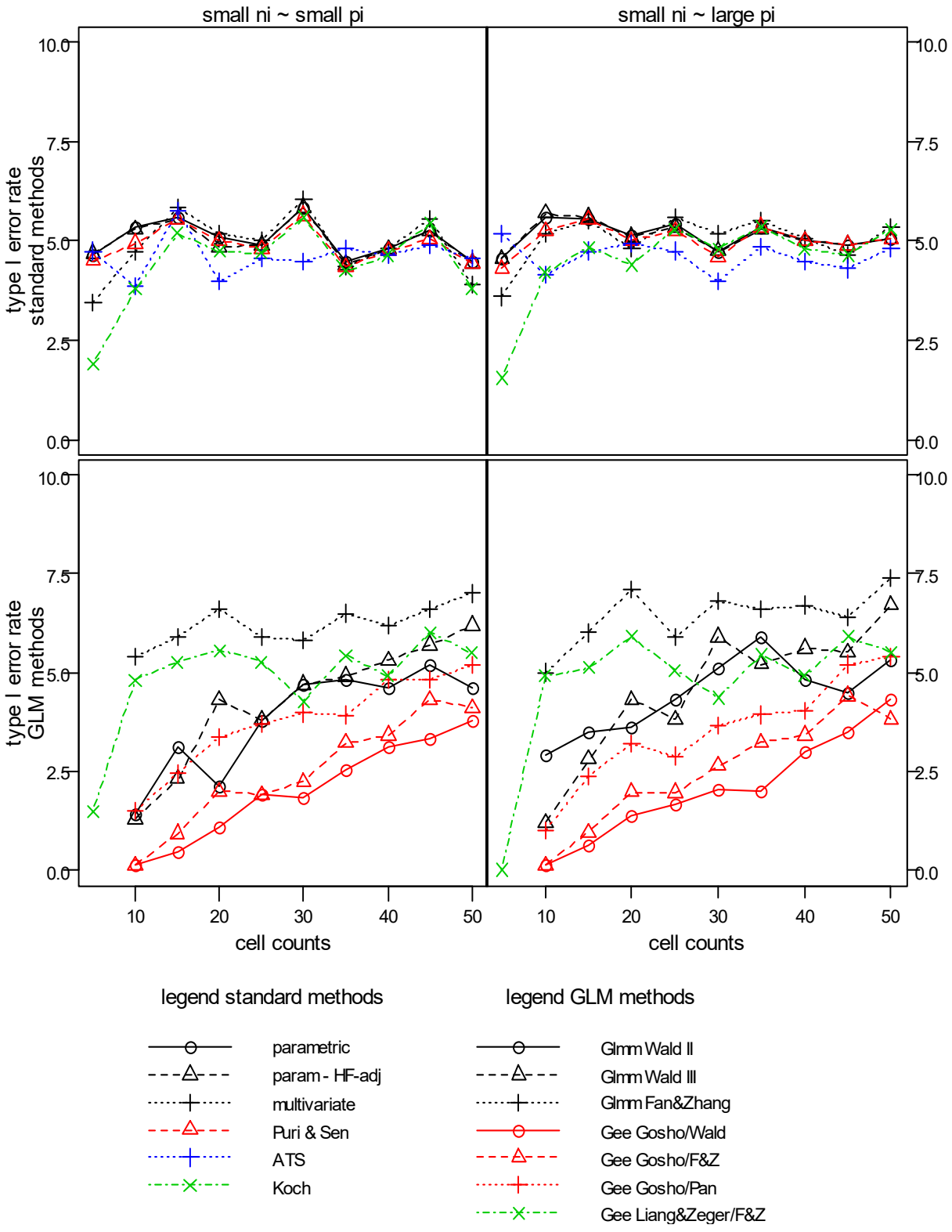
7. 6. Main effect B - A significant (effects a_i = 0.6*s) small n_i ~ small p_i and small n_i ~ large p_i

7. 6. 1. equal correlations on B (r=0.3)

7. 6. 1. 1 p = 0.6

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.65	5.35	5.60	5.10	5.85	4.80	4.50	4.55	5.60	5.55	5.15	4.75	5.00	5.05
	par./ HF-corr.	4.50	4.95	5.55	5.00	5.65	4.75	4.45	4.30	5.25	5.55	5.00	4.60	5.00	5.05
	multivariate	4.75	3.85	5.75	4.00	4.50	4.65	4.55	5.20	4.15	4.75	4.95	4.00	4.50	4.80
	Puri & Sen	4.70	5.30	5.55	4.85	5.85	4.80	4.45	4.55	5.70	5.60	5.10	4.75	5.00	5.05
	ATS	3.45	4.75	5.85	5.20	6.05	4.80	3.90	3.60	5.20	5.50	4.80	5.20	5.05	5.35
	Koch	1.90	3.80	5.20	4.75	5.60	4.65	3.80	1.55	4.20	4.85	4.40	4.80	4.80	5.30
	Glmm Wald II	0.05	1.4	3.1	2.1	4.7	4.6	4.6	0.05	2.9	3.5	3.6	5.1	4.8	5.3
	Glmm Wald III	0.05	1.3	2.3	4.3	4.7	5.3	6.2	0.05	1.2	2.8	4.3	5.9	5.6	6.7
	Glmm Fan&Zhang	0.05	5.4	5.9	6.6	5.8	6.2	7.0	0.05	5.0	6.0	7.1	6.8	6.7	7.4
	Gee Gosho/Wald	0.05	0.1	0.5	1.1	1.8	3.1	3.8	0.05	0.1	0.6	1.4	2.0	3.0	4.3
	Gee Gosho/F&Z	0.05	0.1	0.9	2.0	2.2	3.4	4.1	0.05	0.1	0.9	2.0	2.6	3.4	3.8
	Gee Gosho/Pan	0.05	1.5	2.4	3.4	4.0	4.8	5.2	0.05	1.0	2.4	3.2	3.7	4.0	5.4
	Gee Liang&Zeger	1.5	4.8	5.3	5.6	4.3	4.9	5.5	0	4.9	5.1	5.9	4.4	4.9	5.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.00	0.75	1.25	0.95	1.10	1.00	0.90	0.85	1.10	1.30	1.15	1.00	0.85	0.90
	par./ HF-corr.	0.70	0.55	1.15	0.90	1.05	0.95	0.90	0.70	0.95	1.10	1.05	0.95	0.85	0.85
	multivariate	1.35	0.95	1.25	0.65	1.00	0.70	1.00	1.20	1.00	0.85	1.00	0.65	0.75	0.55
	Puri & Sen	0.95	0.85	1.25	1.00	1.15	1.05	0.90	1.00	1.05	1.15	1.10	0.95	0.85	0.90
	ATS	0.40	1.00	1.10	0.80	1.30	1.00	0.85	0.50	1.05	1.50	1.05	0.95	0.90	0.95
	Koch	0.05	0.30	0.75	0.70	1.25	0.85	0.70	0.05	0.55	0.95	0.80	0.80	0.85	0.85
	Glmm Wald II	0.05	0.8	0.7	0.9	2.1	2.0	1.5	0.05	1.0	1.1	1.6	2.7	2.1	1.7
	Glmm Wald III	0.05	0.6	0.6	0.8	2.1	2.0	1.9	0.05	0.7	1.1	1.5	2.6	2.3	2.2
	Glmm Fan&Zhang	0.05	0.9	1.8	2.0	2.6	2.7	3.0	0.05	1.1	2.3	2.4	3.3	2.9	3.1
	Gee Gosho/Wald	0.05	0.1	0.1	0.2	0.3	0.5	0.7	0.05	0.0	0.0	0.2	0.3	0.6	0.9
	Gee Gosho/F&Z	0.05	0.1	0.1	0.2	0.4	0.4	1.3	0.05	0.0	0.2	0.3	0.7	0.7	1.2
	Gee Gosho/Pan	0.05	0.2	0.1	0.3	0.6	1.0	1.0	0.05	0.0	0.0	0.3	0.6	0.7	1.0
	Gee Liang&Zeger	1.5	0.4	0.9	1.4	0.9	1.2	1.7	0	0.3	0.9	1.5	1.0	1.2	1.7

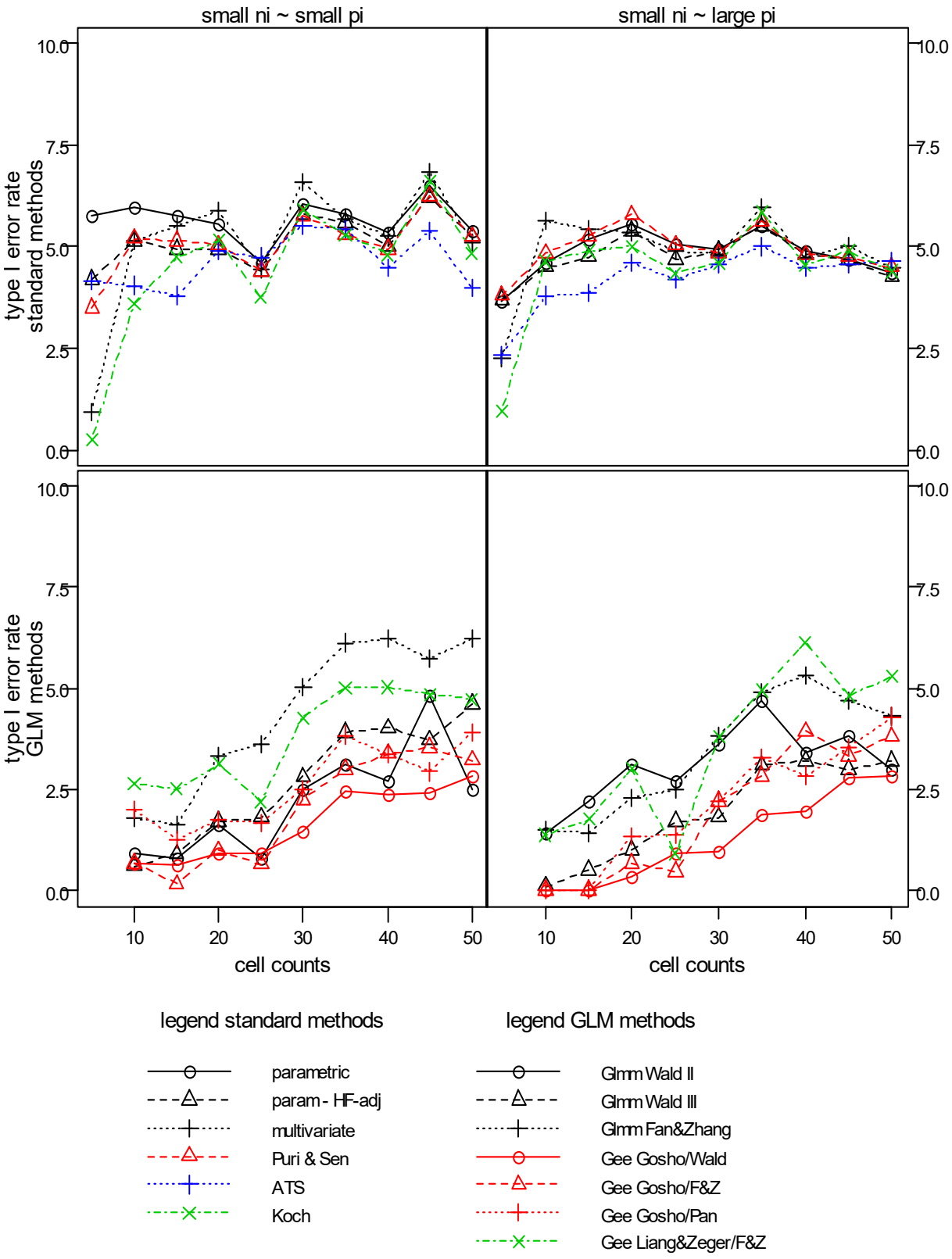
Graphic for α=0.05:



7. 6. 1. 2 p = 0.8

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.75	5.95	5.75	5.55	6.05	5.35	5.40	3.65	4.60	5.20	5.55	4.95	4.90	4.35
	par./ HF-corr.	3.50	5.20	5.15	5.05	5.75	4.95	5.25	3.80	4.85	5.25	5.80	4.85	4.80	4.50
	multivariate	4.15	4.05	3.80	4.90	5.50	4.50	4.00	2.35	3.80	3.85	4.60	4.55	4.50	4.65
	Puri & Sen	4.20	5.15	4.95	4.95	5.80	5.00	5.25	3.70	4.50	4.75	5.40	4.90	4.80	4.25
	ATS	0.95	5.15	5.50	5.90	6.60	5.25	5.10	2.25	5.65	5.45	5.35	4.80	4.75	4.50
	Koch	0.25	3.60	4.75	5.15	5.90	4.80	4.85	0.95	4.65	4.90	5.00	4.60	4.55	4.40
	Glmm Wald II	0.05	0.9	0.8	1.6	2.5	2.7	2.5		1.4	2.2	3.1	3.6	3.4	3.0
	Glmm Wald III	0.05	0.6	0.9	1.7	2.8	4.0	4.6		0.1	0.5	1.0	1.8	3.2	3.2
	Glmm Fan&Zhang	0.05	1.8	1.6	3.3	5.0	6.2	6.2		1.5	1.4	2.3	3.8	5.3	4.3
	Gee Gosho/Wald	0.05	0.7	0.6	0.9	1.5	2.4	2.8		0.0	0.0	0.3	0.9	2.0	2.8
	Gee Gosho/F&Z	0.05	0.7	0.2	1.0	2.2	3.4	3.2		0.0	0.0	0.7	2.2	3.9	3.8
	Gee Gosho/Pan	0.05	2.0	1.3	1.7	2.5	3.4	3.9		0.0	0.0	1.3	2.2	2.8	4.3
	Gee Liang&Zeger	0.05	2.6	2.5	3.1	4.3	5.0	4.7		1.4	1.8	3.0	3.8	6.1	5.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.75	1.25	1.35	1.30	1.40	1.25	0.85	0.55	0.85	1.25	1.20	0.95	0.80	1.05
	par./ HF-corr.	0.50	0.95	1.05	1.15	1.20	1.10	0.80	0.55	0.80	1.25	1.05	0.95	0.75	1.05
	multivariate	1.30	0.75	0.90	0.90	0.95	1.15	0.80	0.60	0.35	0.50	0.80	0.70	0.80	0.85
	Puri & Sen	0.45	0.80	1.15	1.15	1.10	1.05	0.75	0.45	0.70	1.20	1.05	0.95	0.70	1.05
	ATS	0.10	0.60	0.80	1.40	1.10	1.25	0.85	0.05	1.10	1.00	1.40	1.00	1.10	1.25
	Koch	0.05	0.05	0.35	1.05	1.00	1.00	0.75	0.05	0.30	0.50	1.10	0.85	0.85	1.15
	Glmm Wald II	0.05	0.6	0.6	0.7	0.7	0.7	0.7		0.2	0.5	0.3	0.6	0.6	0.6
	Glmm Wald III	0.05	0.6	0.6	0.5	0.6	1.0	0.9		0.1	0.2	0.2	0.2	0.5	0.5
	Glmm Fan&Zhang	0.05	0.7	0.8	1.0	0.8	1.8	1.2		0.3	0.4	0.7	0.6	1.2	0.8
	Gee Gosho/Wald	0.05	0.7	0.2	0.2	0.1	0.5	0.2		0.0	0.0	0.0	0.0	0.9	0.2
	Gee Gosho/F&Z	0.05	0.7	0.2	0.2	0.2	0.6	0.4		0.0	0.0	0.0	0.0	0.9	0.8
	Gee Gosho/Pan	0.05	0.7	0.2	0.3	0.2	0.5	0.3		0.0	0.0	0.0	0.0	0.9	0.3
	Gee Liang&Zeger	0.05	0.7	0.8	0.9	0.6	1.2	1.1		1.4	0.6	0.7	0.6	2.0	1.3

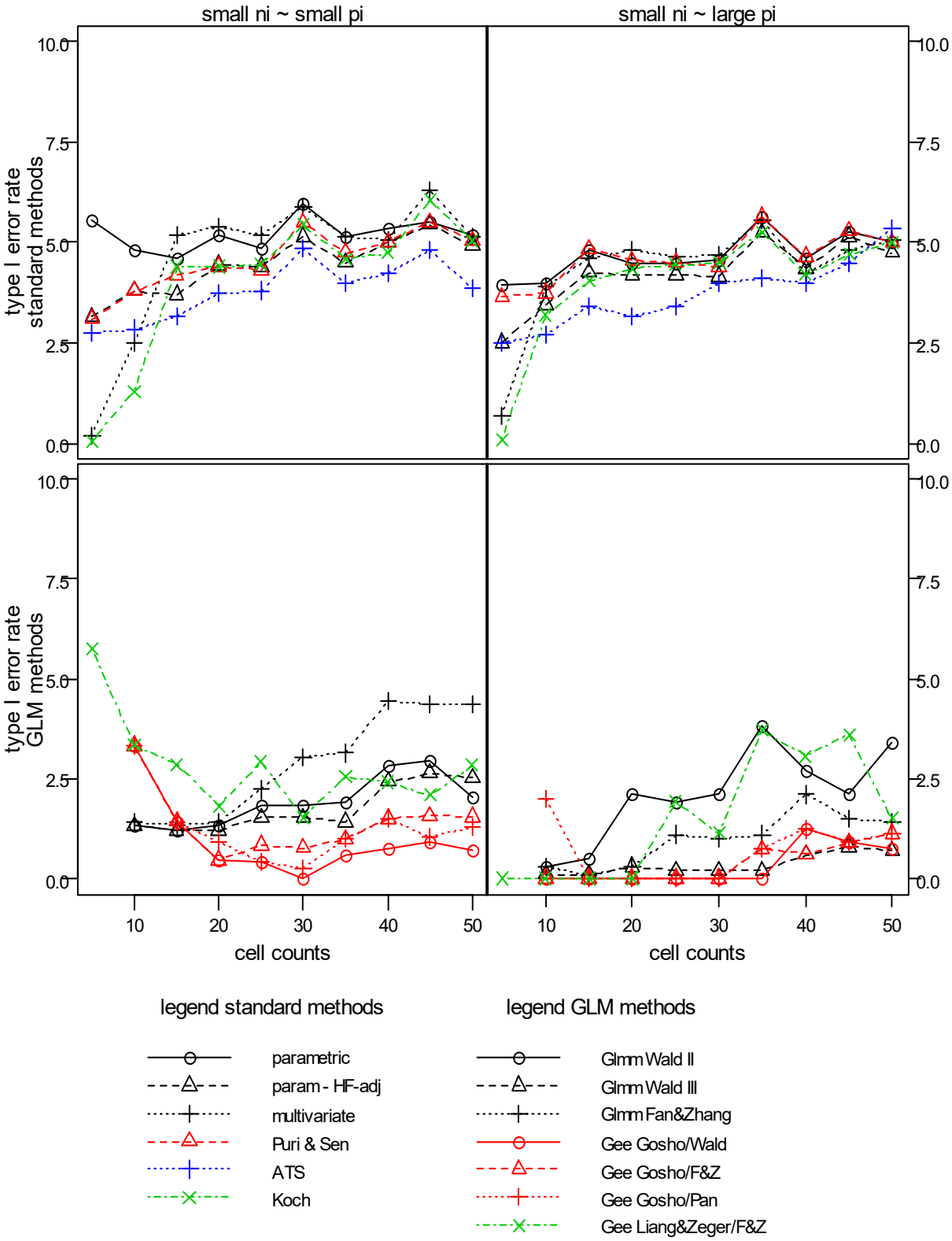
Graphic for α=0.05:



7. 6. 1. 3 p = 0.9

		small n_i ~ large p_i (levels = 4*5)							small n_i ~ small p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.55	4.80	4.60	5.20	5.95	5.35	5.20	3.95	4.00	4.80	4.50	4.55	4.60	5.00
	par./ HF-corr.	3.10	3.80	4.20	4.40	5.50	5.00	5.05	3.65	3.75	4.85	4.55	4.40	4.65	5.00
	multivariate	2.75	2.85	3.15	3.75	4.85	4.25	3.85	2.50	2.70	3.40	3.15	4.00	4.00	5.35
	Puri & Sen	3.15	3.80	3.70	4.45	5.15	5.00	4.95	2.50	3.45	4.25	4.20	4.15	4.35	4.75
	ATS	0.20	2.50	5.20	5.40	5.90	5.05	5.15	0.70	3.90	4.60	4.80	4.70	4.25	5.05
	Koch	0.05	1.30	4.40	4.40	5.45	4.75	5.05	0.10	3.20	4.05	4.35	4.50	4.20	5.00
	Glmm Wald II		1.3	1.2	1.3	1.8	2.8	2.0		0.3	0.5	2.1	2.1	2.7	3.4
	Glmm Wald III		1.3	1.2	1.2	1.5	2.4	2.5		0.1	0.1	0.3	0.2	0.6	0.7
	Glmm Fan&Zhang		1.4	1.3	1.4	3.0	4.5	4.4		0.3	0.1	0.3	1.0	2.1	1.4
	Gee Gosho/Wald		3.3	1.4	0.5	0.0	0.8	0.7		0.0	0.0	0.0	0.0	1.2	0.8
	Gee Gosho/F&Z		3.3	1.4	0.5	0.8	1.5	1.5		0.0	0.0	0.0	0.0	0.6	1.1
	Gee Gosho/Pan		3.3	1.4	0.9	0.3	1.5	1.3		2.0	0.0	0.0	0.0	1.2	1.1
	Gee Liang&Zeger	5.8	3.3	2.9	1.8	1.5	2.4	2.8	0	0.0	0.0	0.0	1.1	3.1	1.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.60	0.95	0.75	1.30	0.90	1.00	0.85	0.55	0.75	0.75	1.15	0.95	0.70	1.10
	par./ HF-corr.	0.45	0.70	0.65	1.00	0.85	0.95	0.75	0.35	0.65	0.70	1.05	0.95	0.65	1.05
	multivariate	0.75	0.20	0.30	0.65	0.60	0.90	0.70	0.45	0.15	0.20	0.40	0.65	0.55	0.90
	Puri & Sen	0.55	0.55	0.50	1.05	0.75	0.85	0.80	0.20	0.50	0.55	0.85	0.90	0.60	1.05
	ATS	0.05	0.10	0.40	0.80	1.10	1.10	0.90	0.05	0.35	0.70	1.10	0.80	0.60	0.95
	Koch	0.05	0.05	0.15	0.45	0.85	0.95	0.80	0.05	0.10	0.35	0.95	0.75	0.55	0.95
	Glmm Wald II		1.3	1.2	1.2	1.4	1.6	1.3		0.1	0.1	0.5	0.4	0.6	0.5
	Glmm Wald III		1.3	1.2	1.2	1.4	1.6	1.5		0.1	0.1	0.2	0.2	0.3	0.3
	Glmm Fan&Zhang		1.3	1.2	1.2	1.5	2.1	2.1		0.1	0.1	0.2	0.3	0.5	0.4
	Gee Gosho/Wald		3.3	1.4	0.5	0.0	0.3	0.4		0.0	0.0	0.0	0.0	0.6	0.0
	Gee Gosho/F&Z		3.3	1.4	0.5	0.0	0.3	0.4		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan		3.3	1.4	0.5	0.0	0.2	0.4		2.0	0.0	0.0	0.0	0.6	0.0
	Gee Liang&Zeger	3.8	3.3	2.9	1.4	0.8	0.8	0.2	0	0.0	0.0	0.0	0.0	1.2	0.0

Graphic for α=0.05:

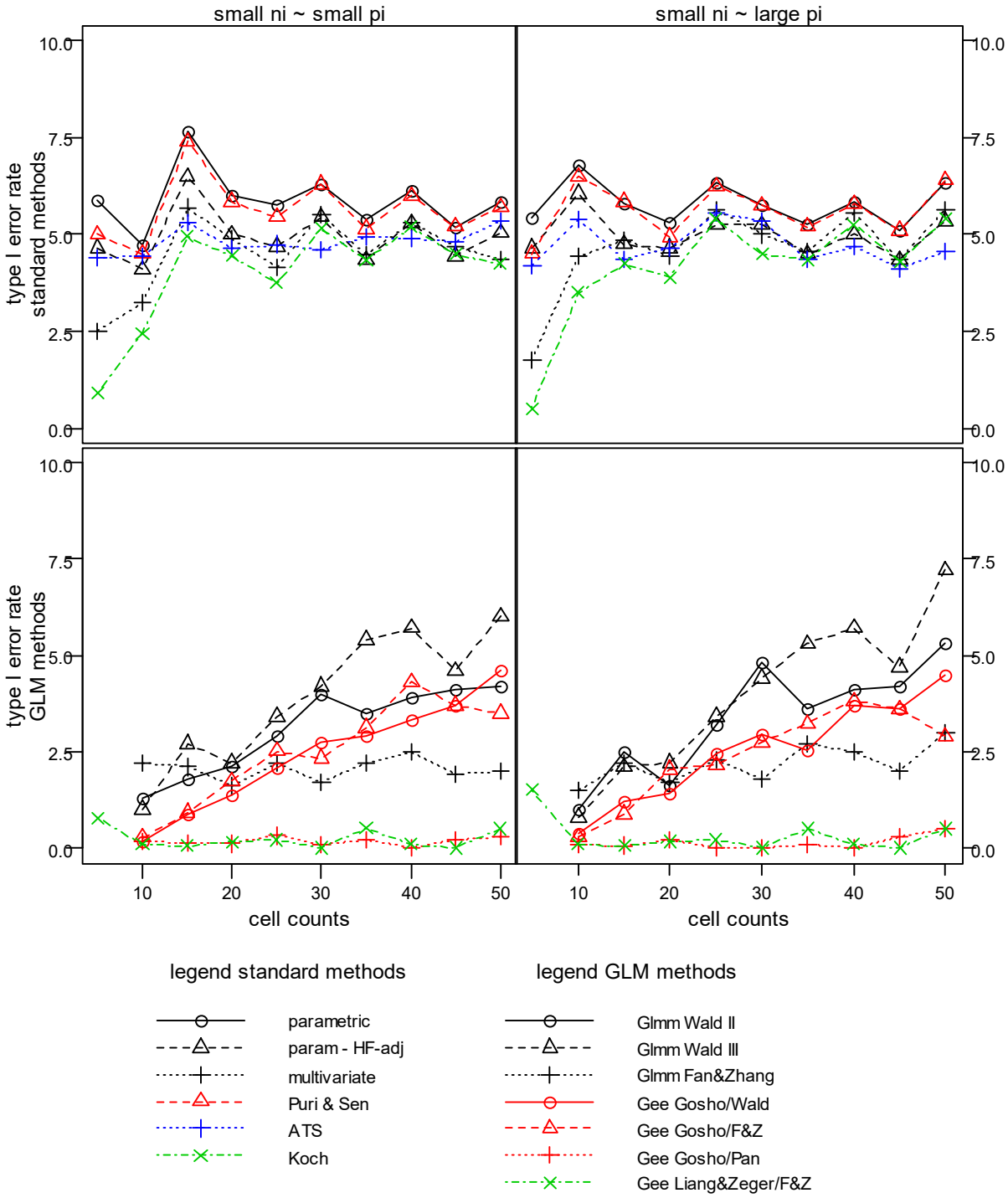


7. 6. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 6. 2. 1 p = 0.6

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.90	4.75	7.65	6.00	6.30	6.15	5.85	5.45	6.80	5.80	5.30	5.75	5.85	6.35
	par./ HF-corr.	5.00	4.50	7.40	5.85	6.30	6.00	5.70	4.50	6.50	5.85	4.95	5.75	5.80	6.40
	multivariate	4.40	4.45	5.30	4.65	4.60	4.90	5.35	4.20	5.40	4.35	4.65	5.35	4.70	4.55
	Puri & Sen	4.65	4.10	6.50	5.00	5.45	5.30	5.05	4.65	6.05	4.75	4.65	5.25	5.00	5.35
	ATS	2.50	3.25	5.70	4.90	5.50	5.30	4.35	1.75	4.45	4.85	4.45	5.00	5.55	5.65
	Koch	0.90	2.45	4.95	4.45	5.15	5.20	4.25	0.50	3.50	4.25	3.90	4.50	5.25	5.40
	Glmm Wald II	0.05	1.3	1.8	2.1	4.0	3.9	4.2		1.0	2.5	1.6	4.8	4.1	5.3
	Glmm Wald III	0.05	1.0	2.7	2.2	4.2	5.7	6.0		0.8	2.1	2.2	4.4	5.7	7.2
	Glmm Fan&Zhang	0.05	2.2	2.1	1.6	1.7	2.5	2.0		1.5	2.2	1.7	1.8	2.5	3.0
	Gee Gosho/Wald	0.05	0.2	0.9	1.4	2.7	3.3	4.6		0.4	1.2	1.4	2.9	3.7	4.5
	Gee Gosho/F&Z	0.05	0.3	0.9	1.7	2.3	4.3	3.5		0.3	0.9	2.0	2.7	3.8	2.9
	Gee Gosho/Pan	0.05	0.2	0.1	0.1	0.1	0.0	0.3		0.1	0.1	0.2	0.0	0.0	0.5
	Gee Liang&Zeger	0.8	0.1	0.1	0.2	0.0	0.1	0.5	1.5	0.1	0.1	0.2	0.0	0.1	0.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.70	1.15	1.80	1.65	1.65	1.35	1.55	1.15	1.85	1.90	1.00	1.50	1.30	2.00
	par./ HF-corr.	1.30	1.10	1.75	1.45	1.60	1.40	1.50	0.95	1.50	1.65	0.95	1.45	1.25	1.95
	multivariate	1.30	0.75	1.25	1.15	0.95	0.85	0.90	1.60	1.00	0.80	0.80	0.80	1.45	1.25
	Puri & Sen	1.20	0.90	1.30	1.25	1.25	1.05	1.05	0.70	1.10	1.45	0.75	0.95	0.85	1.45
	ATS	0.25	0.40	0.95	0.55	1.45	1.25	0.80	0.05	0.60	1.00	0.70	1.10	1.20	1.00
	Koch	0.05	0.15	0.55	0.35	1.10	1.10	0.75	0.05	0.25	0.45	0.40	0.95	1.00	0.90
	Glmm Wald II	0.05	0.4	0.5	0.4	1.4	1.8	1.6		0.3	0.6	0.4	1.5	1.2	2.3
	Glmm Wald III	0.05	0.3	0.6	0.5	0.8	1.3	2.0		0.1	0.3	0.4	0.9	1.8	2.9
	Glmm Fan&Zhang	0.05	0.7	0.5	0.6	0.5	0.9	0.8		0.4	0.3	0.5	0.6	1.0	1.7
	Gee Gosho/Wald	0.05	0.1	0.1	0.3	0.2	0.3	0.6		0.1	0.1	0.3	0.4	0.0	0.5
	Gee Gosho/F&Z	0.05	0.1	0.1	0.4	0.3	0.9	0.8		0.1	0.2	0.4	0.3	0.8	0.6
	Gee Gosho/Pan	0.05	0.2	0.1	0.1	0.0	0.0	0.0		0.1	0.1	0.1	0.0	0.0	0.1
	Gee Liang&Zeger	0.8	0.1	0.1	0.1	0.0	0.0	0.0	1.5	0.1	0.1	0.1	0.0	0.0	0.0

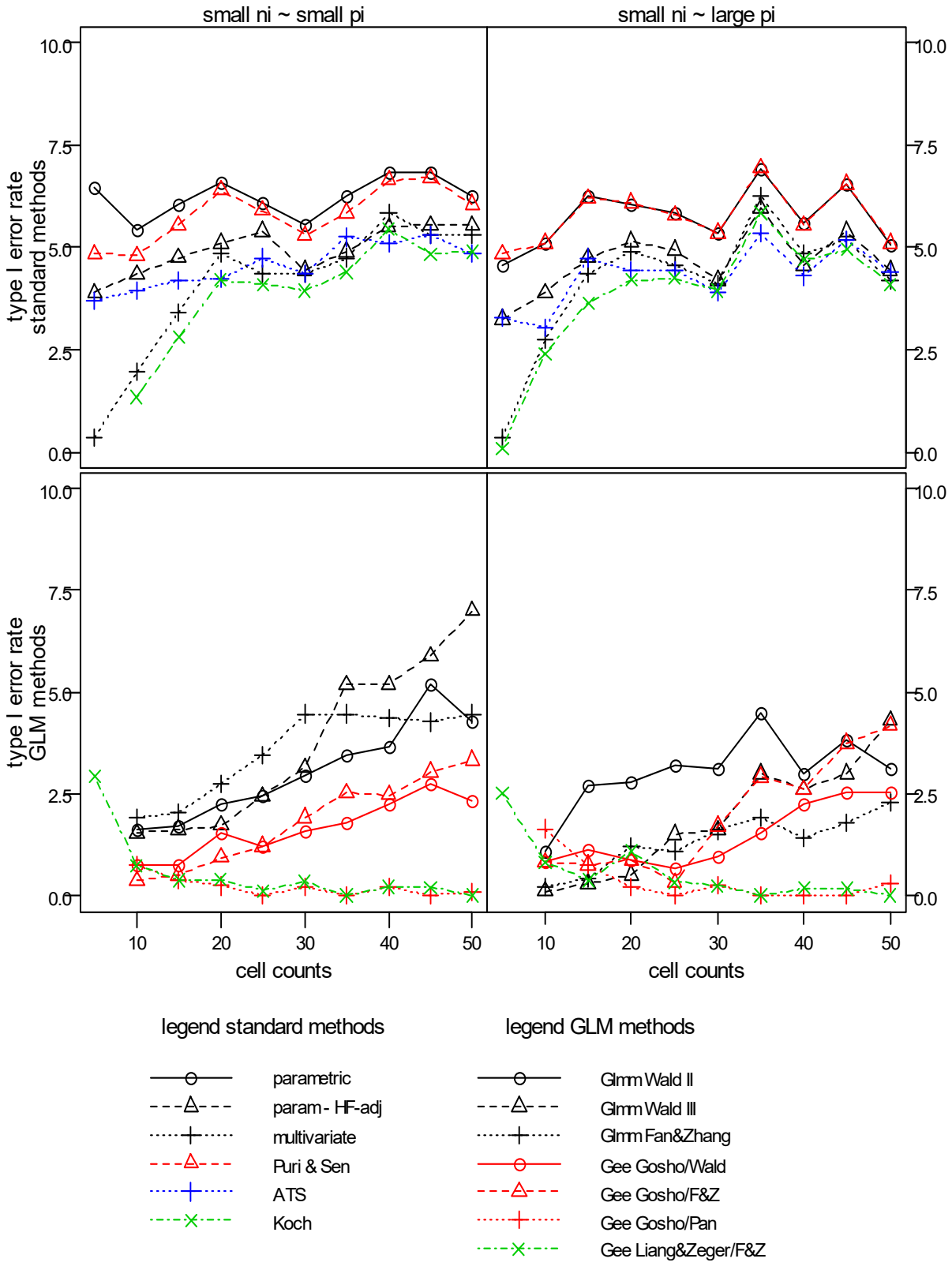
Graphic for α=0.05:



7. 6. 2. 2 p = 0.8

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	6.45	5.45	6.05	6.60	5.55	6.85	6.25	4.55	5.10	6.25	6.05	5.35	5.60	5.05
	par./ HF-corr.	3.90	4.35	4.75	5.10	4.45	5.50	5.55	3.25	3.90	4.75	5.15	4.20	4.55	4.45
	multivariate	0.35	1.95	3.40	4.85	4.35	5.85	5.30	0.35	2.75	4.35	4.90	4.10	4.85	4.20
	Puri & Sen	4.85	4.80	5.55	6.40	5.30	6.65	6.05	4.85	5.10	6.20	6.10	5.35	5.55	5.10
	ATS	3.70	3.95	4.20	4.25	4.35	5.10	4.85	3.30	3.05	4.75	4.45	3.90	4.30	4.40
	Koch	0.05	1.35	2.80	4.20	3.95	5.45	4.90	0.10	2.40	3.65	4.20	3.95	4.70	4.10
	Glmm Wald II		1.6	1.7	2.2	2.9	3.7	4.3		1.1	2.7	2.8	3.1	3.0	3.1
	Glmm Wald III		1.5	1.6	1.7	3.1	5.2	7.0		0.1	0.3	0.5	1.6	2.6	4.3
	Glmm Fan&Zhang		1.9	2.0	2.7	4.5	4.4	4.5		0.2	0.4	1.2	1.6	1.4	2.3
	Gee Gosho/Wald		0.7	0.7	1.5	1.6	2.3	2.3		0.8	1.1	0.9	1.0	2.2	2.5
	Gee Gosho/F&Z		0.4	0.5	0.9	1.9	2.5	3.3		0.8	0.8	0.9	1.7	2.6	4.2
	Gee Gosho/Pan		0.7	0.4	0.2	0.2	0.2	0.1		1.6	0.8	0.2	0.2	0.0	0.3
	Gee Liang&Zeger	2.9	0.7	0.4	0.4	0.3	0.2	0.0	2.5	0.8	0.4	1.1	0.2	0.2	0.0
α	method														
0.01	parametric	1.30	1.60	1.60	2.10	1.35	1.70	1.60	0.95	1.20	1.30	1.40	1.60	1.60	1.40
	par./ HF-corr.	0.45	0.80	0.95	1.30	1.10	1.20	1.05	0.50	0.45	1.00	0.80	1.05	1.00	0.80
	multivariate	0.05	0.10	0.55	0.45	0.80	1.10	0.95	0.05	0.35	0.75	1.00	0.65	0.80	0.95
	Puri & Sen	0.85	1.40	1.50	1.80	1.35	1.60	1.55	0.75	1.15	1.35	1.35	1.60	1.60	1.40
	ATS	1.30	0.65	0.70	1.20	0.90	1.30	1.00	0.50	0.25	0.65	0.85	0.90	1.00	1.15
	Koch	0.05	0.05	0.30	0.40	0.65	1.05	0.85	0.05	0.15	0.40	0.80	0.55	0.75	0.85
	Glmm Wald II		1.5	1.5	1.6	1.9	1.6	1.9		0.1	0.4	0.7	0.8	0.9	0.6
	Glmm Wald III		1.5	1.5	1.5	1.5	1.9	2.1		0.1	0.1	0.1	0.3	0.3	0.9
	Glmm Fan&Zhang		1.5	1.6	1.5	2.0	1.9	1.8		0.1	0.1	0.1	0.5	0.5	0.4
	Gee Gosho/Wald		0.4	0.5	0.2	0.6	0.6	0.2		0.8	0.4	0.4	0.2	0.4	0.3
	Gee Gosho/F&Z		0.4	0.2	0.2	0.3	0.5	0.5		0.8	0.4	0.4	0.2	0.4	0.6
	Gee Gosho/Pan		0.7	0.4	0.2	0.0	0.0	0.0		1.6	0.4	0.2	0.0	0.0	0.1
	Gee Liang&Zeger	2.9	0.7	0.2	0.3	0.0	0.0	0.0	2.5	0.8	0.4	0.9	0.0	0.0	0.0

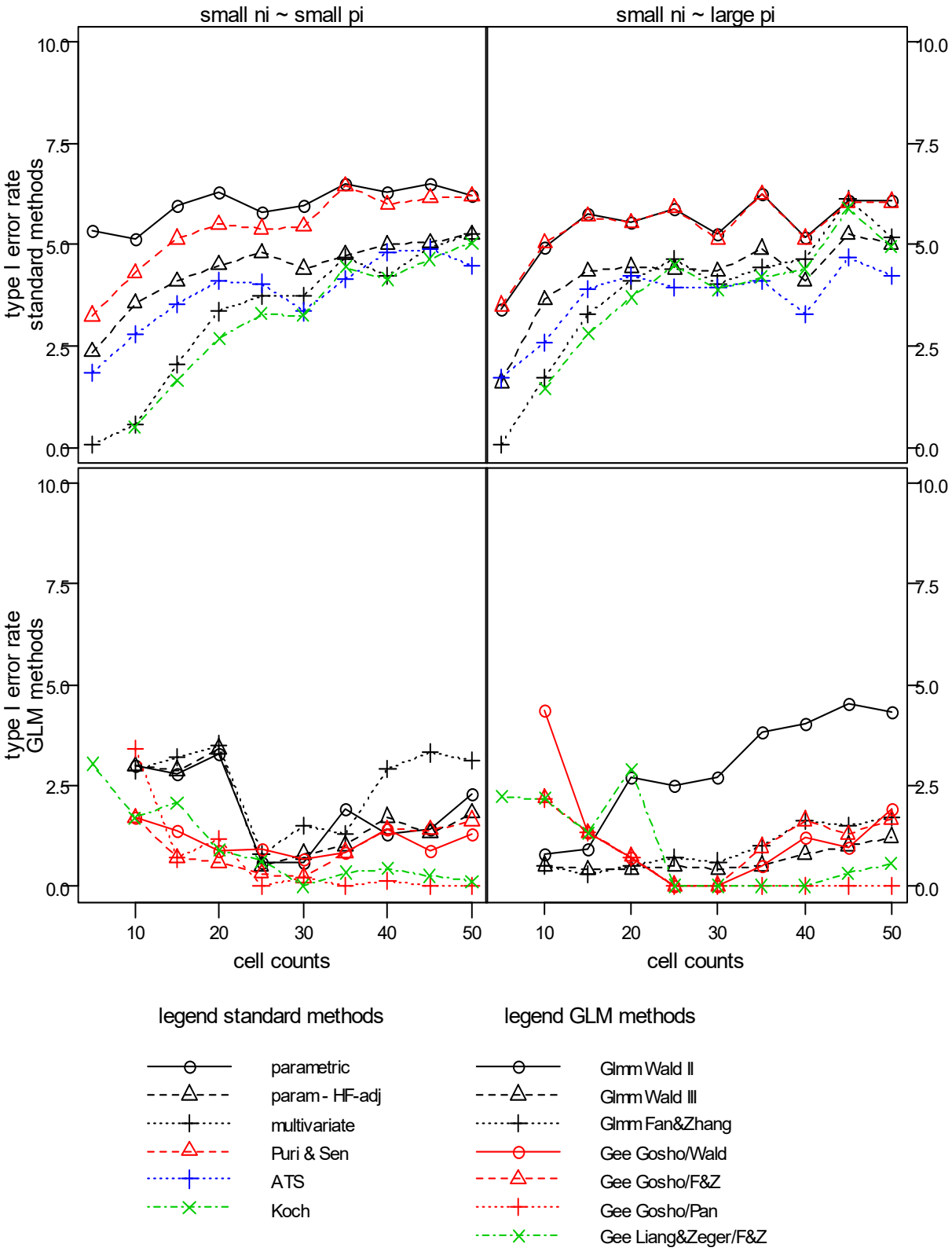
Graphic for α=0.05:



7. 6. 2. 3 p = 0.9

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.35	5.15	5.95	6.30	5.95	6.30	6.20	3.40	4.95	5.75	5.55	5.25	5.20	6.10
	par./ HF-corr.	2.35	3.55	4.10	4.50	4.40	5.00	5.25	1.60	3.65	4.35	4.45	4.35	4.10	5.00
	multivariate	0.05	0.55	2.05	3.35	3.75	4.25	5.25	0.05	1.70	3.30	4.10	4.05	4.65	5.20
	Puri & Sen	3.25	4.30	5.15	5.50	5.45	6.00	6.20	3.50	5.05	5.70	5.55	5.15	5.15	6.05
	ATS	1.85	2.80	3.55	4.10	3.35	4.80	4.50	1.70	2.60	3.90	4.25	3.95	3.30	4.25
	Koch	0.05	0.50	1.65	2.70	3.25	4.15	5.05	0.05	1.45	2.80	3.70	3.90	4.40	4.95
	Glmm Wald II		3.0	2.8	3.3	0.6	1.3	2.3		0.8	0.9	2.7	2.7	4.0	4.3
	Glmm Wald III		3.0	2.9	3.4	0.8	1.7	1.8		0.5	0.4	0.4	0.4	0.8	1.2
	Glmm Fan&Zhang		2.9	3.2	3.5	1.5	2.9	3.1		0.5	0.3	0.5	0.6	1.6	1.7
	Gee Gosho/Wald		1.7	1.4	0.9	0.7	1.4	1.3		4.3	1.3	0.7	0.0	1.2	1.9
	Gee Gosho/F&Z		1.7	0.7	0.6	0.2	1.4	1.6		2.2	1.3	0.7	0.0	1.6	1.7
	Gee Gosho/Pan		3.4	0.7	1.2	0.2	0.1	0.0		2.2	1.3	0.7	0.0	0.0	0.0
	Gee Liang&Zeger	3	1.7	2.1	0.9	0.0	0.4	0.1	2.2	2.2	1.3	2.9	0.0	0.0	0.6
α	method														
0.01	parametric	1.25	1.45	1.65	1.45	1.15	1.75	1.85	0.35	1.00	1.40	1.85	1.25	0.95	1.75
	par./ HF-corr.	0.55	0.70	0.80	0.75	0.55	1.10	0.95	0.05	0.50	0.80	1.10	0.95	0.65	1.40
	multivariate	0.05	0.05	0.15	0.15	0.55	0.80	0.90	0.05	0.15	0.45	0.55	0.80	0.85	1.10
	Puri & Sen	0.20	1.25	1.25	1.25	1.05	1.70	1.75	0.30	0.95	1.25	1.80	1.20	0.95	1.70
	ATS	0.75	0.50	0.65	0.55	0.65	1.15	0.70	0.05	0.35	0.30	1.10	0.85	0.45	1.25
	Koch	0.05	0.05	0.05	0.10	0.50	0.65	0.75	0.05	0.05	0.25	0.35	0.55	0.75	1.05
	Glmm Wald II		3.0	2.8	3.3	0.4	0.4	0.7		0.5	0.3	0.6	1.0	0.6	1.1
	Glmm Wald III		3.0	2.9	3.3	0.3	0.4	0.4		0.5	0.3	0.3	0.3	0.4	0.4
	Glmm Fan&Zhang		2.9	2.8	3.3	0.5	0.3	0.5		0.5	0.3	0.3	0.4	0.3	0.4
	Gee Gosho/Wald		1.7	1.4	0.3	0.2	0.1	0.1		2.2	1.3	0.7	0.0	0.4	0.0
	Gee Gosho/F&Z		1.7	0.7	0.3	0.2	0.0	0.2		2.2	1.3	0.7	0.0	0.0	0.0
	Gee Gosho/Pan		3.4	0.7	1.2	0.2	0.1	0.0		2.2	1.3	0.7	0.0	0.0	0.0
	Gee Liang&Zeger	3	1.7	1.4	0.6	0.0	0.4	0.1	2.2	2.2	1.3	2.9	0.0	0.0	0.6

Graphic for α=0.05:



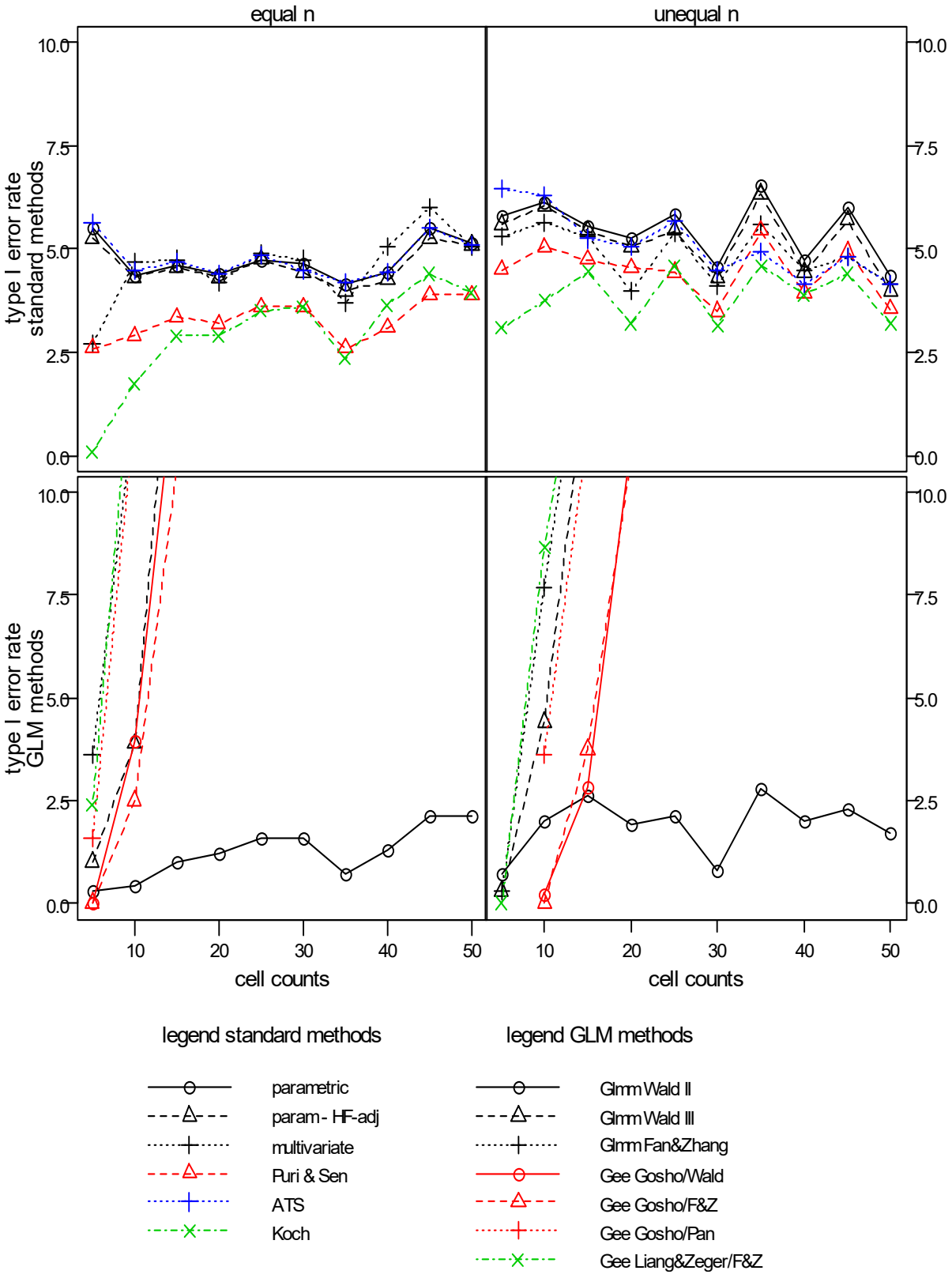
7. 7. Main effect B - Interaction significant (effects ab_{ij} = 0.6*s)

7. 7. 1. equal correlations on B (r=0.3)

7. 7. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.50	4.35	4.60	4.4	4.65	4.45	5.15	5.80	6.15	5.55	5.25	4.55	4.75	4.35
	par./ HF-corr.	5.25	4.30	4.55	4.3	4.45	4.25	5.10	5.60	6.05	5.45	5.05	4.30	4.45	4.00
	multivariate	2.70	4.70	4.75	4.2	4.75	5.05	5.05	5.30	5.65	5.30	4.00	4.10	4.50	4.15
	Puri & Sen	2.60	2.90	3.35	3.2	3.60	3.10	3.90	4.50	5.05	4.75	4.55	3.50	3.95	3.55
	ATS	5.65	4.50	4.70	4.4	4.50	4.45	5.10	6.45	6.30	5.25	5.05	4.50	4.15	4.15
	Koch	0.10	1.75	2.90	2.9	3.60	3.65	3.95	3.10	3.75	4.45	3.20	3.15	3.90	3.20
	Glmm Wald II	0.3	0.4	1.0	1.2	1.6	1.3	2.1	0.7	2.0	2.6	1.9	0.8	2.0	1.7
	Glmm Wald III	1.0	3.9	15.9	34.9	52.8	72.0	84.0	0.3	4.4	13.1	19.6	32.2	49.3	61.1
	Glmm Fan&Zhang	3.6	12.1	18.8	33.0	44.5	62.7	73.5	0.3	7.7	14.6	18.9	26.1	36.2	48.0
	Gee Gosho/Wald	0.0	4.0	13.2	26.9	48.6	68.0	80.7		0.2	2.8	11.2	27.4	47.0	62.3
	Gee Gosho/F&Z	0.0	2.5	10.6	19.0	37.0	55.0	67.2		0.0	3.7	10.9	20.7	33.5	46.2
	Gee Gosho/Pan	1.6	12.0	23.7	36.9	54.7	72.0	83.5		3.6	11.5	20.7	36.1	54.7	68.6
	Gee Liang&Zeger	2.4	14.2	21.4	29.9	44.8	61.2	72.5	0.0	8.7	14.9	21.0	28.7	41.0	52.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.95	0.75	1.10	0.85	1.30	0.70	1.05	1.25	1.05	1.60	1.15	0.70	1.20	1.0
	par./ HF-corr.	1.10	0.75	1.25	0.90	1.25	0.75	1.00	1.15	0.90	1.45	0.95	0.70	1.10	0.8
	multivariate	0.45	0.60	1.10	0.75	1.30	0.80	1.20	1.00	1.00	1.20	0.80	0.45	1.15	0.7
	Puri & Sen	0.20	0.45	0.80	0.40	0.50	0.40	0.75	0.90	0.55	1.35	0.75	0.60	0.85	0.7
	ATS	1.15	0.85	1.15	0.90	1.35	0.75	1.05	1.90	1.30	1.10	1.05	1.05	0.90	1.1
	Koch	0.05	0.05	0.50	0.35	0.50	0.40	0.85	0.15	0.20	0.70	0.45	0.40	0.75	0.6
	Glmm Wald II	0.3	0.3	0.7	1.0	1.1	1.1	1.6	0.3	0.9	1.1	1.4	0.1	0.3	0.0
	Glmm Wald III	0.2	0.5	2.8	10.0	24.9	44.1	60.3	0.3	0.8	2.4	5.1	10.4	21.7	32.6
	Glmm Fan&Zhang	0.6	1.6	5.4	11.6	23.1	33.9	47.3	0.3	1.4	2.6	6.3	8.4	16.9	22.6
	Gee Gosho/Wald	0.0	0.7	3.3	8.3	22.2	40.8	57.7		0.0	0.1	2.2	8.4	22.3	35.0
	Gee Gosho/F&Z	0.0	0.2	2.2	6.2	15.4	27.6	39.4		0.0	0.3	2.5	5.2	15.4	21.8
	Gee Gosho/Pan	0.2	1.9	5.9	13.1	27.1	44.9	60.7		0.1	1.0	4.7	12.6	27.7	40.0
	Gee Liang&Zeger	0.5	2.7	7.1	11.8	21.8	32.9	46.2	0.0	1.1	3.1	6.6	11.1	19.1	27.5

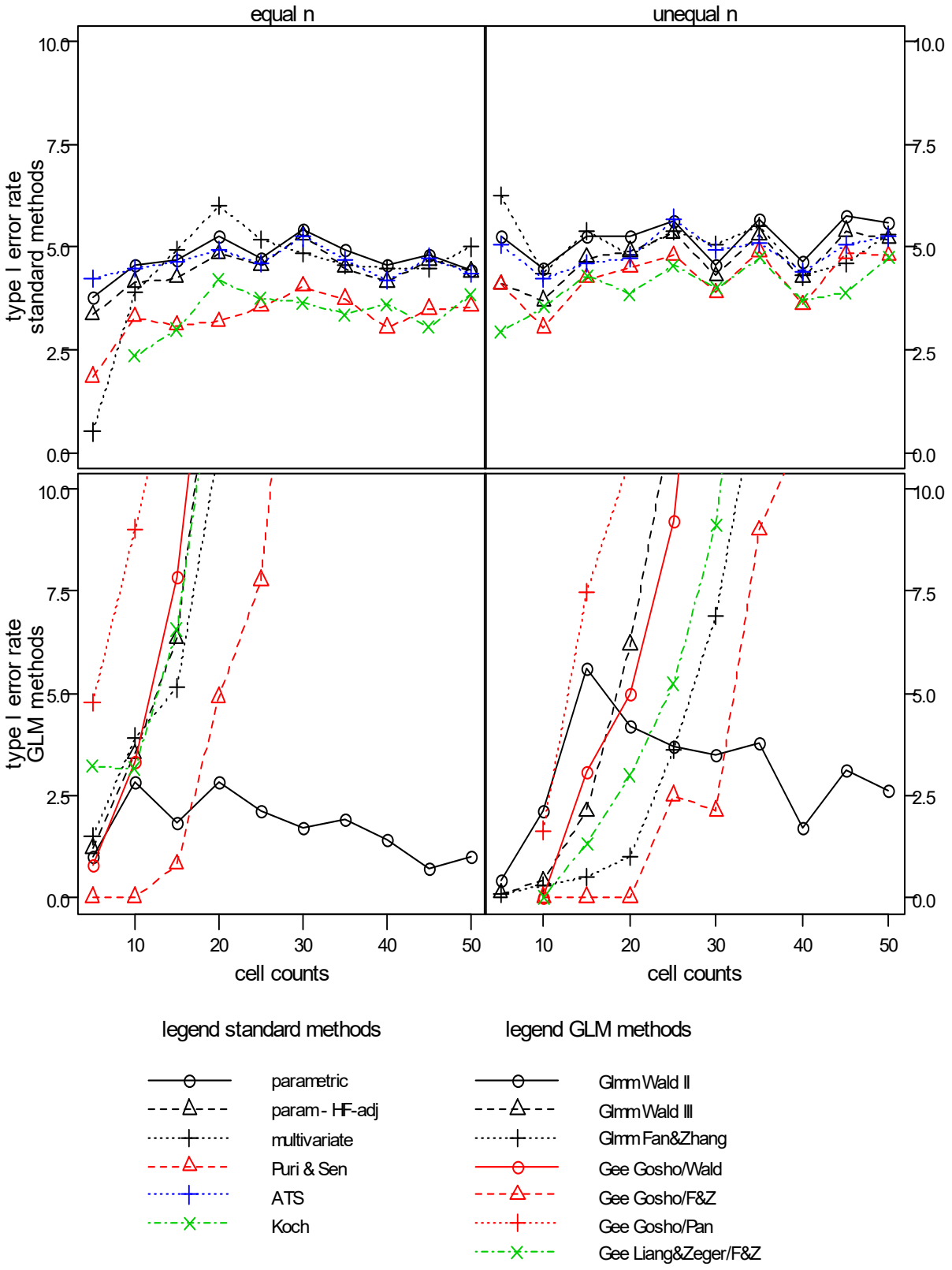
Graphic for α=0.05:



7. 7. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.80	4.55	4.70	5.25	5.45	4.55	4.45	5.25	4.50	5.25	5.25	4.55	4.65	5.60
	par./ HF-corr.	3.35	4.15	4.25	4.85	5.30	4.15	4.40	4.10	3.70	4.75	4.90	4.30	4.25	5.20
	multivariate	0.50	3.90	4.95	6.00	4.85	4.50	5.00	6.25	4.35	5.40	4.80	5.05	4.30	5.30
	Puri & Sen	1.85	3.30	3.10	3.20	4.05	3.05	3.55	4.10	3.05	4.25	4.50	3.90	3.60	4.80
	ATS	4.25	4.50	4.65	4.95	5.25	4.20	4.35	5.05	4.25	4.60	4.75	4.95	4.40	5.25
	Koch	0.05	2.35	3.00	4.20	3.65	3.60	3.85	2.95	3.55	4.30	3.85	4.00	3.70	4.75
	Glmm Wald II	1.0	2.8	1.8	2.8	1.7	1.4	1.0	0.4	2.1	5.6	4.2	3.5	1.7	2.6
	Glmm Wald III	1.2	3.5	6.3	15.0	39.3	67.5	81.5	0.1	0.4	2.1	6.2	20.2	32.5	51.7
	Glmm Fan&Zhang	1.5	3.9	5.1	11.1	29.9	49.5	64.0	0.1	0.3	0.5	1.0	6.9	15.8	33.1
	Gee Gosho/Wald	0.8	3.3	7.8	16.7	35.0	61.1	78.7		0.0	3.1	5.0	19.0	32.8	51.4
	Gee Gosho/F&Z	0.0	0.0	0.8	4.9	17.9	37.1	54.6		0.0	0.0	0.0	2.1	11.4	27.5
	Gee Gosho/Pan	4.8	9.0	13.3	25.0	45.7	68.2	81.7		1.6	7.5	10.8	28.7	39.4	56.2
	Gee Liang&Zeger	3.2	3.2	6.6	13.9	28.2	45.1	59.8		0.0	1.3	3.0	9.1	20.1	36.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.60	0.90	0.80	0.65	1.1	0.90	1.15	1.55	0.60	1.10	1.35	1.00	0.80	1.45
	par./ HF-corr.	0.50	0.70	0.55	0.35	0.9	0.80	0.85	1.25	0.55	0.85	1.10	0.95	0.70	1.30
	multivariate	0.15	0.75	0.70	0.95	1.2	0.95	1.15	0.90	1.00	1.15	1.15	0.90	1.00	1.10
	Puri & Sen	0.10	0.30	0.30	0.20	0.7	0.50	0.60	1.00	0.55	0.70	1.00	0.85	0.65	1.10
	ATS	0.60	0.75	0.80	0.40	1.0	0.80	0.95	1.45	0.90	1.05	1.05	1.00	0.75	0.95
	Koch	0.05	0.05	0.15	0.40	0.6	0.55	0.80	0.05	0.60	0.75	0.75	0.60	0.80	1.00
	Glmm Wald II	1.0	1.5	1.0	1.3	0.9	1.0	0.7	0.1	0.6	1.0	1.1	1.5	0.6	0.5
	Glmm Wald III	1.0	1.6	1.4	2.1	11.6	33.2	52.1	0.1	0.1	0.4	1.1	4.3	10.7	22.6
	Glmm Fan&Zhang	0.9	1.6	1.2	1.4	5.6	15.4	26.1	0.1	0.1	0.1	0.0	0.1	1.7	4.7
	Gee Gosho/Wald	0.8	0.5	1.6	3.4	11.9	32.3	48.4		0.0	0.0	0.6	6.0	11.5	24.4
	Gee Gosho/F&Z	0.0	0.0	0.1	0.3	1.3	7.2	16.5		0.0	0.0	0.0	0.0	0.3	2.7
	Gee Gosho/Pan	2.4	1.8	2.6	5.6	15.4	36.9	53.9		0.0	1.3	2.4	7.6	16.0	27.8
	Gee Liang&Zeger	3.2	0.5	0.9	1.5	5.4	12.7	24.6		0.0	0.4	0.8	0.4	1.5	5.7

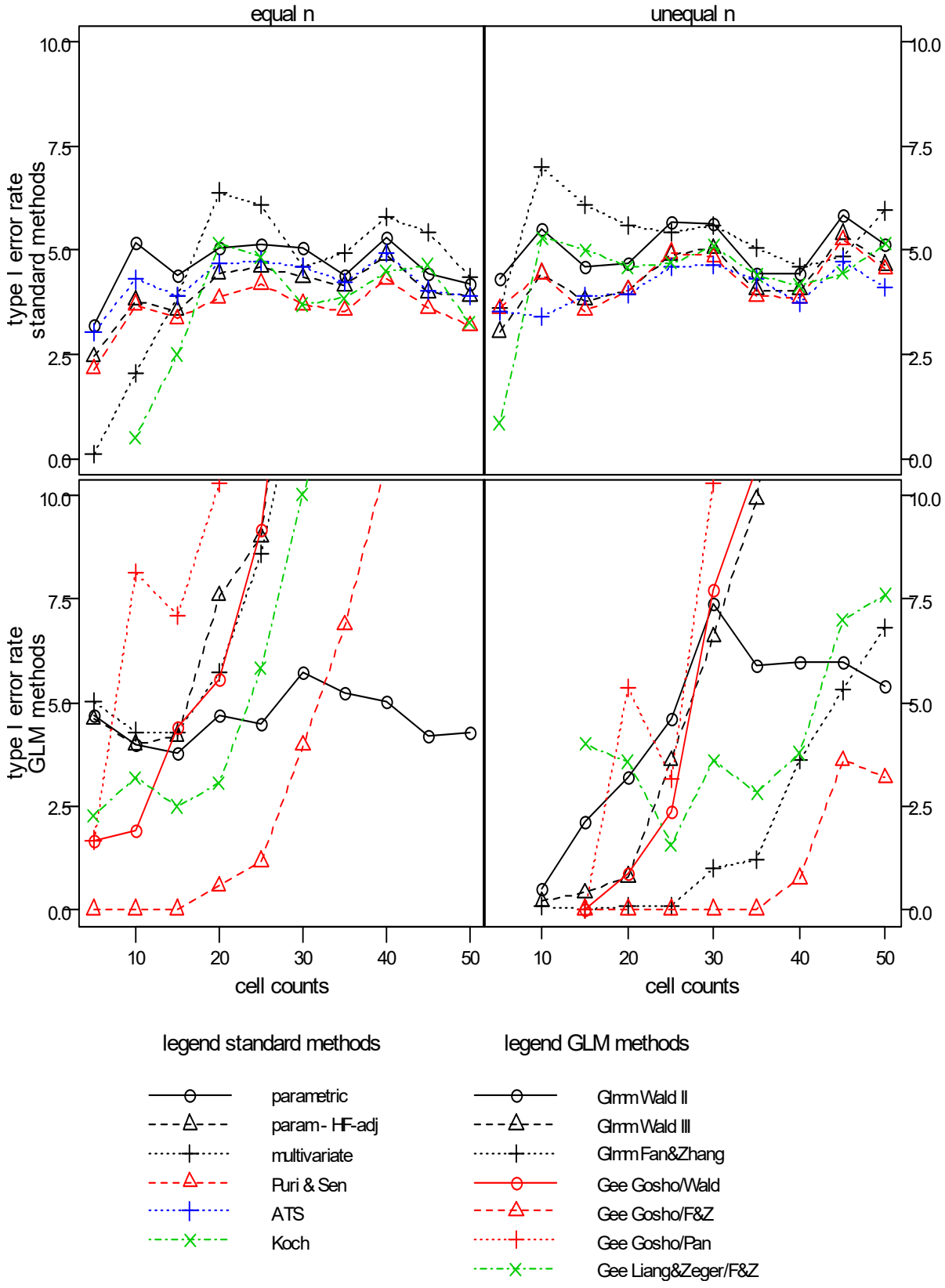
Graphic for α=0.05:



7. 7. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.20	5.25	4.50	5.05	4.90	5.25	4.25	4.30	5.50	4.60	4.70	5.65	4.45	5.15
	par./ HF-corr.	2.45	3.70	3.55	4.45	4.25	4.90	3.85	3.05	4.45	3.80	4.05	5.05	4.05	4.65
	multivariate	0.10	2.00	4.00	6.35	4.50	5.60	4.30	3.60	7.00	6.10	5.60	5.60	4.60	5.95
	Puri & Sen	2.15	3.60	3.50	3.80	3.50	4.25	3.00	3.60	4.45	3.55	4.05	4.85	3.85	4.55
	ATS	3.05	4.20	3.90	4.65	4.45	5.00	3.85	3.55	3.40	3.90	3.95	4.65	3.75	4.10
	Koch	3.20	5.25	4.50	5.05	4.90	5.25	4.25	0.85	5.30	5.00	4.60	5.10	4.15	5.15
	Glmm Wald II	4.7	4.0	3.8	4.7	5.7	5.0	4.3		0.5	2.1	3.2	7.4	6.0	5.4
	Glmm Wald III	4.6	4.0	4.2	7.6	17.2	41.9	61.1		0.2	0.4	0.8	6.6	15.6	26.2
	Glmm Fan&Zhang	5.0	4.3	4.3	5.7	13.2	29.9	45.8		0.1	0.0	0.1	1.0	3.6	6.8
	Gee Gosho/Wald	1.7	1.9	4.4	5.5	17.3	30.8	44.6			0.0	0.9	7.7	14.6	21.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.6	4.0	10.8	21.3			0.0	0.0	0.0	0.8	3.2
	Gee Gosho/Pan	1.7	8.1	7.1	10.3	21.4	37.1	49.5			0.0	5.4	10.3	20.4	25.4
	Gee Liang&Zeger	2.3	3.2	2.5	3.1	10.0	18.3	28.2			4.0	3.6	3.6	3.8	7.6
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.90	0.65	0.70	1.30	0.65	1.10	0.9	0.75	0.95	0.85	1.10	1.10	1.00	1.30
	par./ HF-corr.	0.25	0.30	0.30	0.70	0.55	0.90	0.8	0.25	0.25	0.50	0.90	0.85	0.55	1.15
	multivariate	0.05	0.35	0.35	0.95	0.80	1.20	0.6	0.05	1.60	1.45	1.55	1.50	0.90	1.35
	Puri & Sen	0.05	0.40	0.35	0.95	0.45	0.90	0.6	0.30	0.55	0.50	0.85	0.80	0.70	0.90
	ATS	0.35	0.55	0.50	0.80	0.60	0.95	0.8	1.55	0.55	0.50	0.65	0.60	0.65	1.05
	Koch	0.05	0.05	0.10	0.35	0.45	0.70	0.5	0.05	0.85	0.85	1.10	1.10	0.65	1.05
	Glmm Wald II	4.5	3.4	2.9	3.0	3.3	3.5	3.0		0.0	0.5	0.4	1.7	2.1	2.2
	Glmm Wald III	4.6	3.3	3.2	3.6	4.9	10.3	24.0		0.0	0.0	0.1	0.9	3.6	7.9
	Glmm Fan&Zhang	4.5	3.2	3.0	3.2	3.9	5.8	12.8		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Wald	1.7	0.5	1.0	1.1	3.0	8.4	16.6			0.0	0.0	1.5	4.8	7.1
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.1	0.2	1.8			0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan	0.8	1.4	1.0	1.8	4.8	11.4	19.9			0.0	0.9	1.0	5.8	9.2
	Gee Liang&Zeger	2.3	2.3	1.0	0.3	0.8	1.7	4.0			4.0	1.8	2.1	0.3	0.5

Graphic for α=0.05:

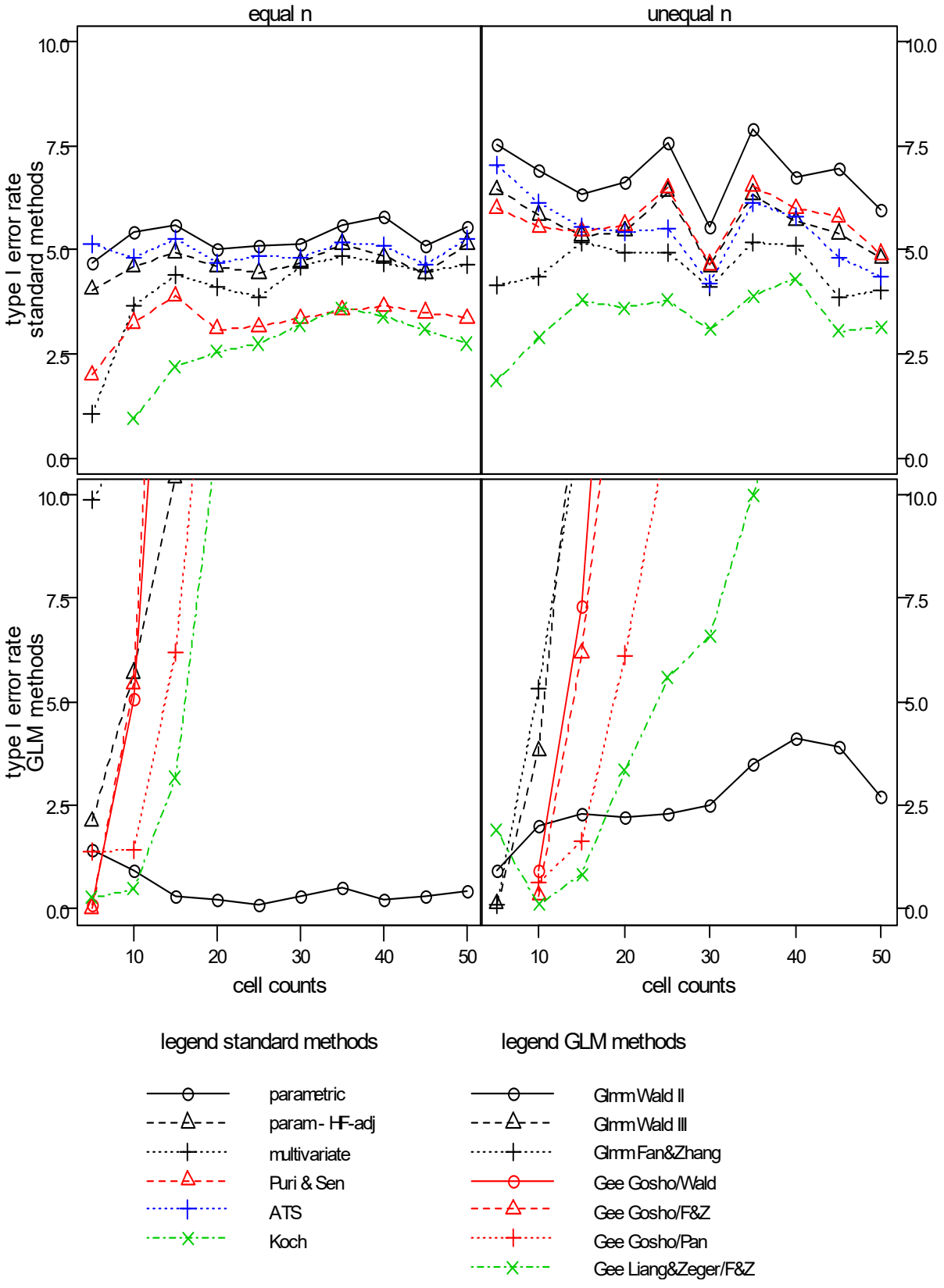


7. 7. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 7. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.70	5.45	5.60	5.00	5.15	5.80	5.55	7.55	6.90	6.35	6.65	5.55	6.75	5.95
	par./ HF-corr.	4.05	4.60	4.95	4.60	4.70	4.85	5.15	6.45	5.85	5.35	5.45	4.60	5.70	4.80
	multivariate	1.05	3.65	4.40	4.10	4.60	4.70	4.65	4.15	4.35	5.20	4.95	4.10	5.10	4.05
	Puri & Sen	2.00	3.25	3.90	3.10	3.35	3.65	3.35	6.00	5.55	5.45	5.60	4.65	6.00	4.90
	ATS	5.15	4.80	5.25	4.70	4.80	5.10	5.25	7.05	6.15	5.55	5.45	4.20	5.80	4.35
	Koch	0.05	0.95	2.20	2.55	3.20	3.40	2.75	1.85	2.90	3.80	3.60	3.10	4.30	3.15
	Glmm Wald II	1.4	0.9	0.3	0.2	0.3	0.2	0.4	0.9	2.0	2.3	2.2	2.5	4.1	2.7
	Glmm Wald III	2.1	5.7	10.4	31.2	62.5	81.0	89.9	0.1	3.8	13.8	19.3	35.0	54.5	68.6
	Glmm Fan&Zhang	9.9	11.5	19.2	34.8	56.5	73.8	84.2	0.1	5.3	11.9	16.8	28.1	41.7	54.6
	Gee Gosho/Wald	0.1	5.1	20.2	40.3	72.7	89.2	96.0		0.9	7.3	21.3	46.5	70.1	82.6
	Gee Gosho/F&Z	0.0	5.4	23.9	42.6	73.5	88.2	95.3		0.3	6.2	15.9	31.2	50.7	63.5
	Gee Gosho/Pan	1.4	1.4	6.2	16.3	44.4	67.9	83.3		0.6	1.6	6.1	18.2	36.0	55.7
	Gee Liang&Zeger	0.3	0.5	3.2	11.4	33.5	52.9	72.5	1.9	0.1	0.8	3.3	6.6	12.8	21.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.50	1.05	1.45	0.75	1.20	1.25	1.20	2.4	1.90	2.30	2.25	1.55	2.25	1.45
	par./ HF-corr.	0.50	0.80	1.30	0.60	0.90	0.90	0.90	1.5	1.25	1.40	1.80	1.10	1.25	1.00
	multivariate	0.30	0.45	0.70	0.55	0.55	0.90	0.75	0.7	0.95	0.90	0.95	0.80	1.05	0.60
	Puri & Sen	0.05	0.30	0.75	0.55	0.50	0.35	0.70	1.8	1.10	1.85	1.90	1.20	1.65	1.15
	ATS	0.70	1.05	1.35	0.65	0.95	1.10	0.90	2.5	1.65	1.50	2.00	1.25	1.50	1.15
	Koch	0.05	0.05	0.20	0.05	0.20	0.45	0.35		0.40	0.50	0.65	0.40	0.50	0.40
	Glmm Wald II	0.8	0.6	0.2	0.1	0.3	0.2	0.2	0.1	0.5	0.6	1.3	1.4	1.6	1.7
	Glmm Wald III	0.8	2.6	1.0	4.7	26.9	48.7	68.0	0.1	0.3	3.1	5.9	13.6	25.8	39.7
	Glmm Fan&Zhang	1.4	3.9	2.9	8.8	25.7	40.3	56.1	0.1	0.6	1.5	4.7	9.1	16.7	25.1
	Gee Gosho/Wald	0.1	0.8	4.9	15.0	44.8	70.2	84.3		0.0	1.1	6.0	21.2	42.0	61.7
	Gee Gosho/F&Z	0.0	0.7	6.8	17.6	46.1	67.2	82.9		0.0	0.4	3.6	10.8	23.6	36.0
	Gee Gosho/Pan	0.6	0.6	1.0	3.2	15.4	40.0	58.0		0.0	0.2	0.6	4.5	13.9	30.5
	Gee Liang&Zeger	0.3	0.0	0.0	0.6	7.0	17.7	31.9	1.9	0.1	0.0	0.1	0.2	1.9	3.5

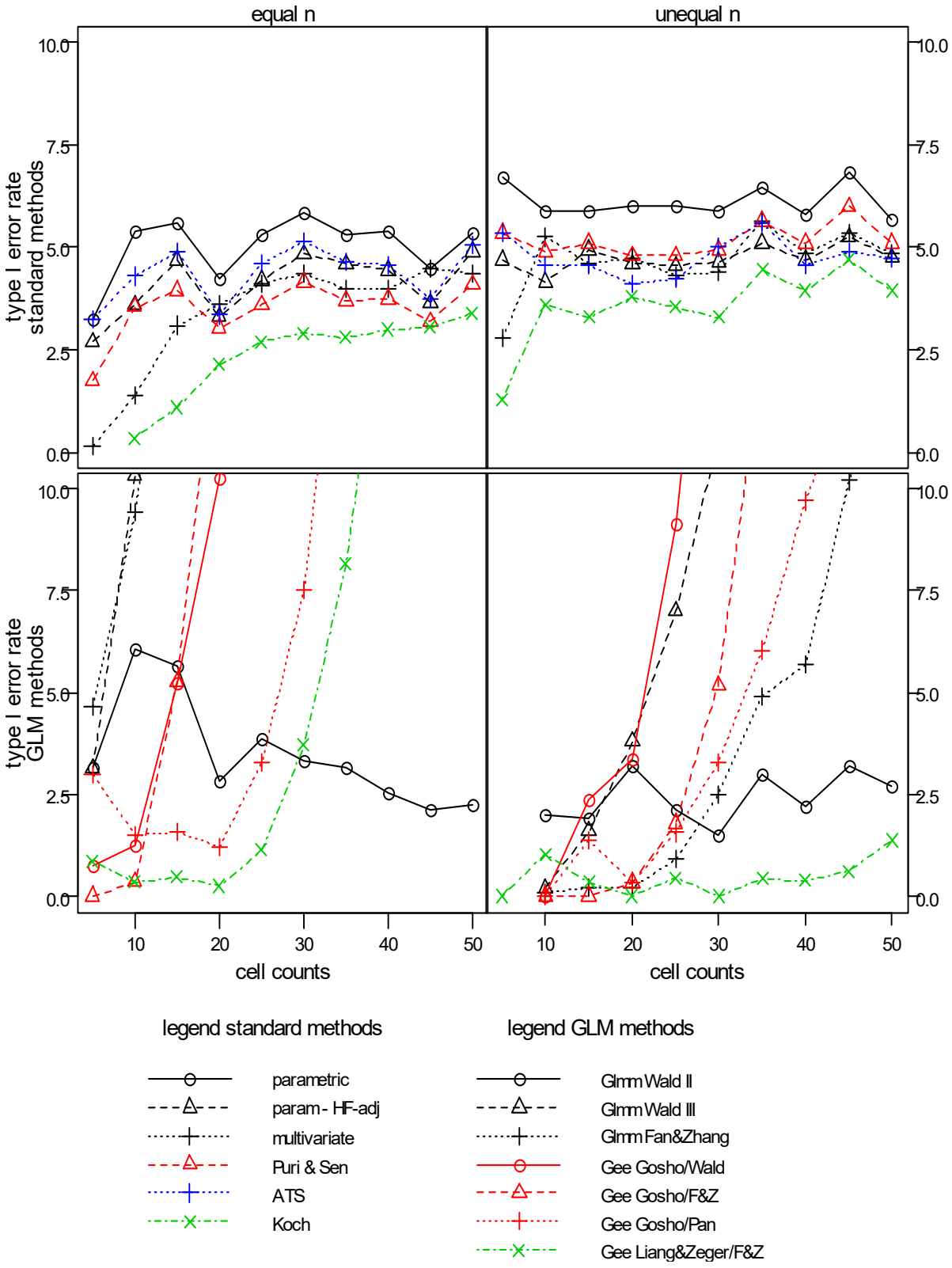
Graphic for α=0.05:



7. 7. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.25	5.40	5.60	4.25	5.85	5.40	5.35	6.70	5.90	5.90	6.00	5.90	5.80	5.70
	par./ HF-corr.	2.70	3.60	4.70	3.30	4.85	4.45	4.90	4.70	4.15	4.95	4.60	4.65	4.70	4.75
	multivariate	0.15	1.40	3.10	3.60	4.35	4.00	4.35	2.80	5.25	4.60	4.75	4.40	4.85	4.85
	Puri & Sen	1.75	3.55	3.95	3.05	4.15	3.75	4.10	5.35	4.90	5.10	4.80	4.95	5.10	5.10
	ATS	3.25	4.30	4.90	3.35	5.15	4.55	5.05	5.35	4.55	4.55	4.10	5.00	4.55	4.75
	Koch	0.05	0.35	1.10	2.15	2.90	3.00	3.40	1.30	3.60	3.30	3.80	3.30	3.95	3.95
	Glmm Wald II	3.1	6.1	5.7	2.8	3.3	2.5	2.2		2.0	1.9	3.2	1.5	2.2	2.7
	Glmm Wald III	3.1	10.3	13.6	15.9	37.9	73.7	92.8		0.2	1.6	3.8	11.2	21.7	32.6
	Glmm Fan&Zhang	4.7	9.4	17.1	19.6	41.4	74.7	90.5		0.1	0.2	0.2	2.5	5.7	13.3
	Gee Gosho/Wald	0.7	1.2	5.2	10.2	33.2	65.1	83.9		0.0	2.4	3.4	19.1	33.7	55.8
	Gee Gosho/F&Z	0.0	0.4	5.3	14.6	43.8	69.3	84.6		0.0	0.0	0.3	5.2	18.3	32.7
	Gee Gosho/Pan	3.0	1.5	1.6	1.2	7.5	24.0	44.8		0.0	1.4	0.3	3.3	9.7	20.1
	Gee Liang&Zeger	0.9	0.4	0.5	0.3	3.7	15.7	37.0	0.0	1.0	0.3	0.0	0.0	0.4	1.4
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.10	1.05	1.25	0.85	1.20	1.10	1.20	1.85	1.85	2.05	1.85	1.55	1.45	1.80
	par./ HF-corr.	0.50	0.55	0.80	0.40	0.70	0.75	1.00	1.00	1.40	0.95	1.15	1.00	0.95	1.30
	multivariate	0.05	0.15	0.20	0.15	0.45	0.85	0.95	0.25	1.00	0.55	0.95	0.85	1.00	0.90
	Puri & Sen	0.15	0.35	0.85	0.25	0.55	0.80	0.85	1.25	1.50	1.30	1.40	1.25	1.25	1.35
	ATS	0.70	0.70	1.00	0.50	0.70	0.85	1.05	2.20	0.70	0.75	0.80	1.05	0.90	1.00
	Koch	0.05	0.05	0.05	0.05	0.15	0.55	0.55	0.05	0.30	0.15	0.55	0.65	0.65	0.75
	Glmm Wald II	2.6	3.7	3.7	2.1	2.7	2.4	1.9		2.0	1.9	3.2	1.5	2.2	2.7
	Glmm Wald III	2.4	5.1	7.1	4.9	9.3	27.5	59.5		0.2	0.0	3.8	11.2	21.7	32.6
	Glmm Fan&Zhang	2.3	4.1	7.5	6.8	8.7	25.4	50.6		0.1	0.0	0.0	0.0	5.7	13.3
	Gee Gosho/Wald	0.7	0.5	0.6	1.3	10.7	27.9	48.7		0.0	0.7	0.0	3.8	12.7	25.5
	Gee Gosho/F&Z	0.0	0.0	0.3	1.3	10.3	31.0	55.5		0.0	0.0	0.0	0.0	1.3	5.4
	Gee Gosho/Pan	2.6	0.7	0.6	0.0	0.8	3.9	12.6		0.0	0.0	0.0	0.5	2.2	4.6
	Gee Liang&Zeger	0.9	0.4	0.3	0.0	0.0	0.4	2.7	0.0	1.0	0.3	0.0	0.0	0.0	0.0

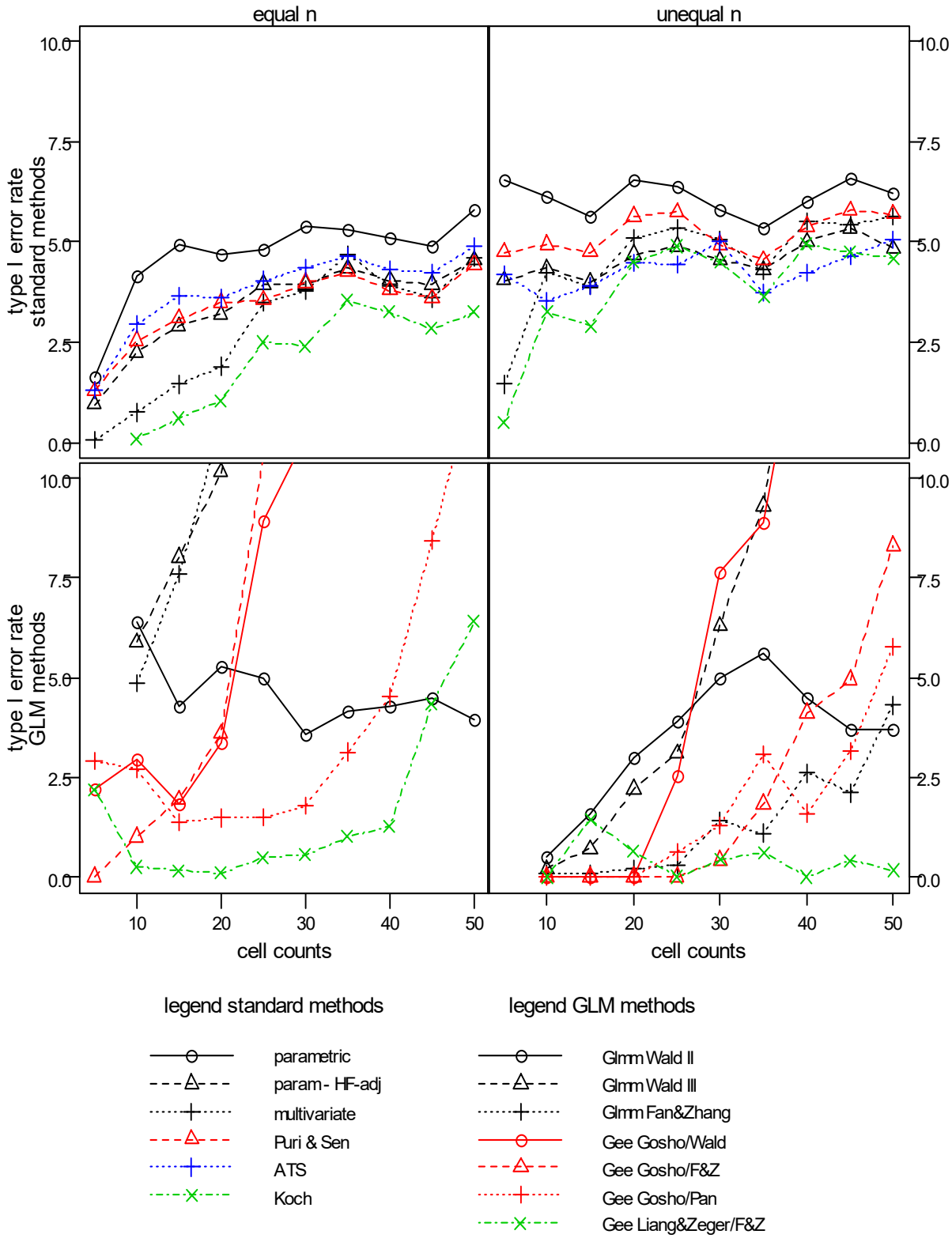
Graphic for α=0.05:



7. 7. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.65	4.25	4.90	4.50	5.45	5.10	5.85	6.55	6.15	5.65	6.55	5.80	6.00	6.20
	par./ HF-corr.	0.95	2.25	2.85	2.95	4.00	4.00	4.55	4.05	4.35	4.00	4.70	4.55	5.00	4.85
	multivariate	0.05	0.75	1.45	1.90	3.70	3.85	4.60	1.45	4.25	3.90	5.10	5.05	5.50	5.65
	Puri & Sen	1.30	2.60	3.05	3.25	3.95	3.75	4.45	4.75	4.95	4.75	5.65	4.95	5.40	5.70
	ATS	1.30	3.00	3.60	3.30	4.40	4.30	4.90	4.20	3.55	3.90	4.50	5.00	4.25	5.05
	Koch		0.10	0.60	1.00	2.40	3.25	3.20	0.50	3.25	2.90	4.50	4.50	4.95	4.60
	Glmm Wald II		6.4	4.3	5.3	3.6	4.3	4.0		0.5	1.6	3.0	5.0	4.5	3.7
	Glmm Wald III		5.9	8.0	10.2	13.9	35.0	55.0		0.2	0.7	2.2	6.3	16.4	26.1
	Glmm Fan&Zhang		4.9	7.6	11.4	15.9	32.3	51.0		0.1	0.1	0.2	1.4	2.6	4.3
	Gee Gosho/Wald	2.2	3.0	1.8	3.4	11.0	33.2	52.7		0.0	0.0	0.0	7.7	14.8	28.0
	Gee Gosho/F&Z	0.0	1.0	1.9	3.6	17.1	39.3	59.8		0.0	0.0	0.0	0.4	4.1	8.3
	Gee Gosho/Pan	2.9	2.7	1.4	1.5	1.8	4.5	12.5		0.0	0.0	0.0	1.3	1.6	5.8
	Gee Liang&Zeger	2.2	0.3	0.1	0.1	0.6	1.3	6.4		0.0	1.4	0.6	0.4	0.0	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.30	0.30	0.95	0.75	1.05	1.30	0.95	1.85	1.65	1.45	2.00	2.05	1.20	1.65
	par./ HF-corr.	0.10	0.05	0.35	0.30	0.55	0.95	0.55	0.45	0.80	0.65	1.05	1.15	0.75	1.40
	multivariate	0.05	0.10	0.05	0.10	0.45	0.35	0.70	0.15	0.45	0.75	1.05	0.85	0.85	0.80
	Puri & Sen	0.05	0.05	0.25	0.50	0.45	0.95	0.65	0.90	1.25	1.10	1.55	1.65	0.95	1.50
	ATS	0.10	0.05	0.60	0.40	0.60	1.00	0.70	1.15	0.80	0.30	0.90	0.70	0.80	1.35
	Koch	0.05	0.05	0.05	0.05	0.25	0.25	0.35		0.25	0.35	0.50	0.60	0.65	0.60
	Glmm Wald II		6.4	4.3	5.3	3.6	4.3	4.0		0.1	0.1	0.6	1.2	1.8	1.3
	Glmm Wald III		5.9	8.0	10.2	13.9	35.0	55.0		0.1	0.2	0.2	0.7	3.4	5.9
	Glmm Fan&Zhang		4.9	7.6	11.4	15.9	32.3	51.0		0.1	0.1	0.1	0.2	0.4	0.0
	Gee Gosho/Wald	2.2	0.8	0.5	0.7	2.8	6.3	15.3		0.0	0.0	0.0	0.9	3.0	8.7
	Gee Gosho/F&Z	0.0	0.0	0.0	0.2	2.1	5.7	17.2		0.0	0.0	0.0	0.0	0.0	0.2
	Gee Gosho/Pan	2.9	1.3	0.6	0.7	0.6	0.3	1.4		0.0	0.0	0.0	0.0	0.5	1.4
	Gee Liang&Zeger	2.2	0.3	0.1	0.1	0.1	0.0	0.0		0.0	1.4	0.6	0.4	0.0	0.2

Graphic for α=0.05:



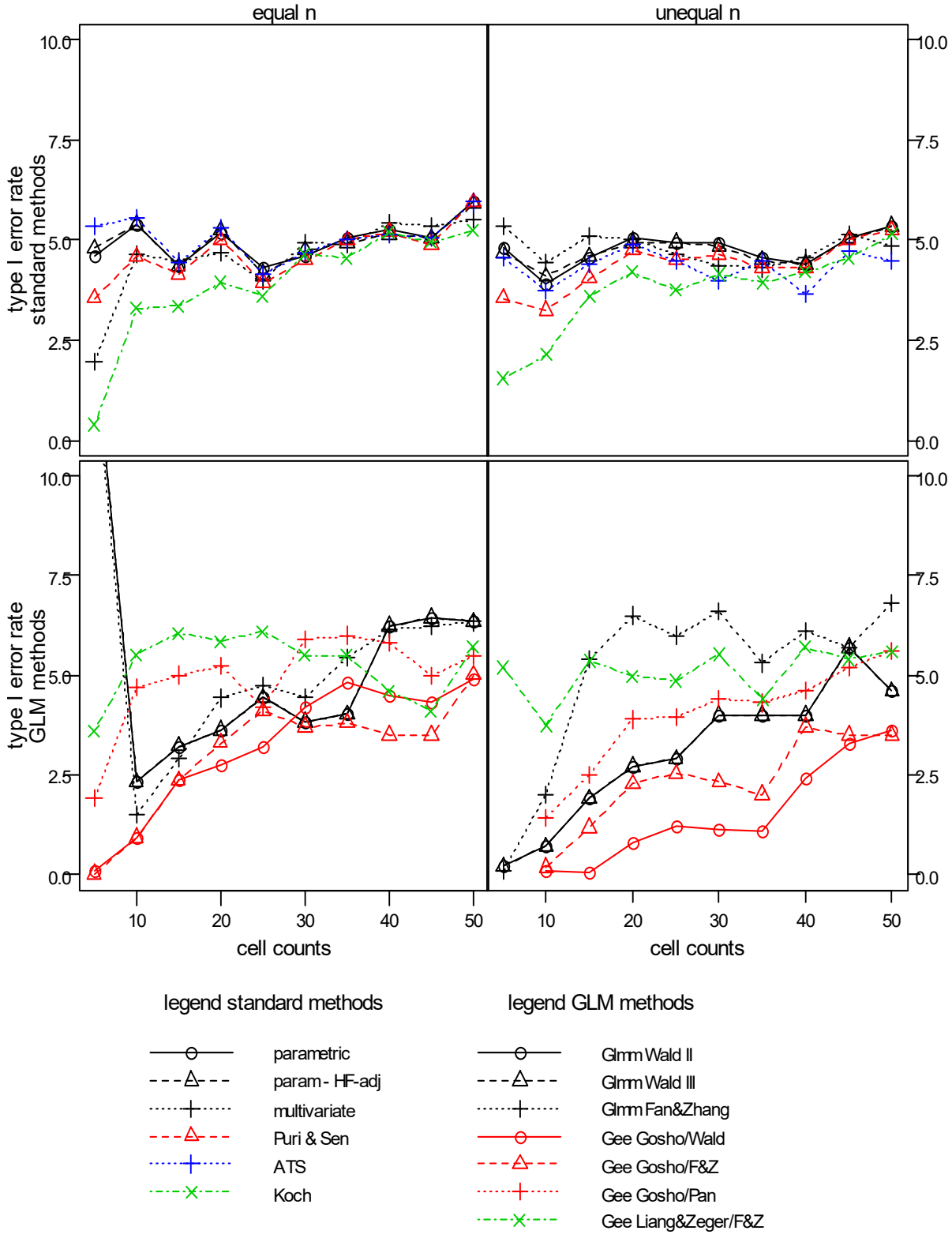
7. 8. Interaction AB - null model

7. 8. 1. equal correlations on B (r=0.3)

7. 8. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.60	5.40	4.35	5.20	4.60	5.25	5.95	4.80	3.90	4.55	5.05	4.95	4.40	5.35
	par./ HF-corr.	4.80	5.40	4.35	5.25	4.75	5.15	5.90	4.70	4.10	4.60	4.95	4.85	4.40	5.35
	multivariate	1.95	4.65	4.50	4.70	4.95	5.45	5.50	5.35	4.45	5.10	5.00	4.35	4.55	4.85
	Puri & Sen	3.55	4.60	4.15	5.00	4.50	5.20	5.95	3.55	3.25	4.05	4.75	4.65	4.30	5.25
	ATS	5.35	5.55	4.45	5.30	4.70	5.15	5.95	4.55	3.75	4.40	4.90	4.00	3.65	4.50
	Koch	0.40	3.30	3.35	3.95	4.65	5.20	5.25	1.55	2.15	3.60	4.20	4.15	4.20	5.15
	Glmm Wald II	1.3	2.4	4.2	5.2	6.3	6.5	7.0	0.2	0.7	1.9	2.7	4.0	4.0	4.6
	Glmm Wald III	1.3	2.4	4.2	5.2	6.3	6.5	7.0	0.2	0.7	1.9	2.7	4.0	4.0	4.6
	Glmm Fan&Zhang	2.4	4.9	7.4	7.9	7.1	5.4	6.7	0.1	2.0	5.4	6.5	6.6	6.1	6.8
	Gee Gosho/Wald	0.1	0.9	2.4	2.8	4.2	4.5	4.9		0.1	0.1	0.8	1.1	2.4	3.6
	Gee Gosho/F&Z	0.0	0.9	2.4	3.3	3.7	3.5	5.0		0.2	1.2	2.3	2.3	3.7	3.5
	Gee Gosho/Pan	1.9	4.7	5.0	5.2	5.9	5.8	5.5		1.4	2.5	3.9	4.4	4.6	5.6
	Gee Liang&Zeger	3.6	5.5	6.1	5.8	5.5	4.6	5.7	5.2	3.7	5.4	5.0	5.5	5.7	5.6
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.00	1.50	1.3	0.90	0.8	1.35	1.00	1.05	0.85	0.85	1.1	0.85	1.20	1.20
	par./ HF-corr.	0.70	1.50	1.3	0.95	0.8	1.30	1.10	0.90	0.75	0.75	1.1	0.85	1.20	1.25
	multivariate	0.40	0.90	1.3	0.75	1.2	1.35	0.90	1.20	0.90	1.00	0.9	0.90	0.85	1.25
	Puri & Sen	0.50	1.20	1.1	0.80	0.7	1.20	0.95	0.50	0.65	0.50	1.0	0.70	1.10	1.05
	ATS	1.45	1.55	1.4	0.95	0.8	1.30	1.15	1.45	0.80	0.65	1.0	0.60	0.75	1.20
	Koch	0.20	0.20	0.7	0.45	0.9	1.10	0.70	0.05	0.25	0.35	0.9	0.55	0.90	0.75
	Glmm Wald II	0.5	0.7	2.2	1.5	2.9	2.5	1.6	0.2	0.4	1.2	0.7	0.7	0.9	1.1
	Glmm Wald III	0.5	0.7	2.2	1.5	2.9	2.5	1.6	0.2	0.4	1.2	0.7	0.7	0.9	1.1
	Glmm Fan&Zhang	0.9	1.4	2.7	2.5	3.9	3.0	2.5	0.0	0.6	2.4	1.9	1.9	1.7	2.0
	Gee Gosho/Wald	0.1	0.1	0.7	0.5	1.0	1.1	0.7		0.1	0.1	0.1	0.0	0.5	0.3
	Gee Gosho/F&Z	0.0	0.0	0.4	0.7	1.2	1.2	1.5		0.1	0.2	0.7	0.5	0.6	1.1
	Gee Gosho/Pan	0.3	0.5	1.3	0.8	1.4	1.5	0.8		0.1	0.2	0.7	0.2	0.8	0.7
	Gee Liang&Zeger	0.4	1.4	1.2	1.6	1.8	1.9	1.8	3.9	0.5	1.7	1.9	1.2	1.0	1.9

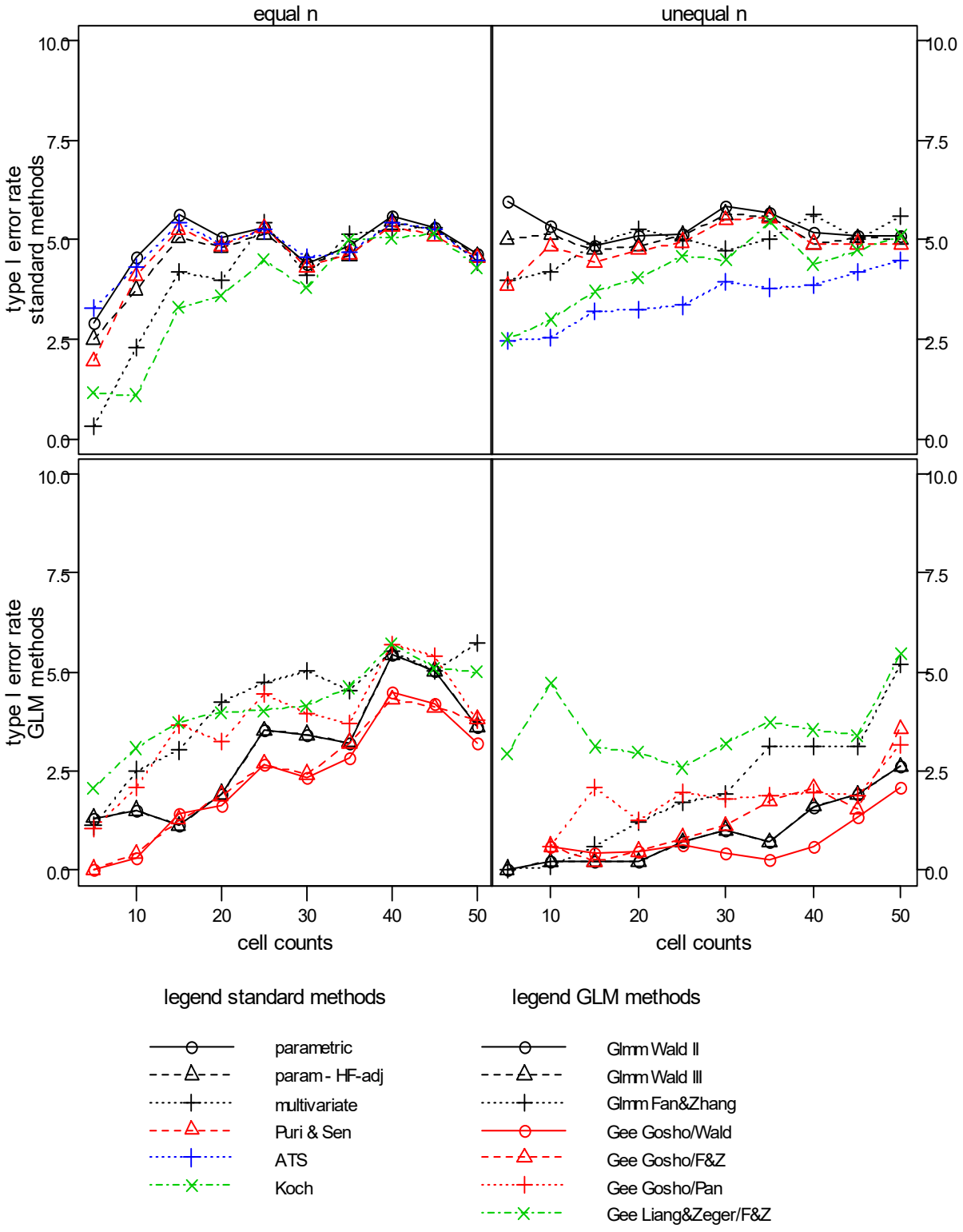
Graphic for α=0.05:



7. 8. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.90	4.55	5.65	5.05	4.40	5.60	4.65	5.95	5.35	4.85	5.10	5.85	5.20	5.1
	par./ HF-corr.	2.50	3.75	5.05	4.80	4.45	5.45	4.60	5.00	5.15	4.75	4.85	5.65	4.90	5.0
	multivariate	0.30	2.30	4.20	4.00	4.10	5.25	4.45	4.00	4.20	4.90	5.25	4.75	5.65	5.6
	Puri & Sen	1.95	4.10	5.25	4.85	4.30	5.35	4.55	3.85	4.85	4.45	4.75	5.50	4.90	4.9
	ATS	3.30	4.30	5.45	4.90	4.55	5.45	4.50	2.45	2.55	3.20	3.25	3.95	3.85	4.5
	Koch	1.15	1.10	3.30	3.60	3.80	5.05	4.30	2.50	3.00	3.70	4.05	4.50	4.40	5.1
	Glmm Wald II	1.3	1.5	1.1	1.9	3.4	5.4	3.6	0.0	0.2	0.2	0.2	1.0	1.6	2.6
	Glmm Wald III	1.3	1.5	1.1	1.9	3.4	5.4	3.6	0.0	0.2	0.2	0.2	1.0	1.6	2.6
	Glmm Fan&Zhang	1.1	2.5	3.0	4.2	5.0	5.5	5.7	0.0	0.1	0.6	1.2	1.9	3.1	5.2
	Gee Gosho/Wald	0.0	0.3	1.4	1.6	2.3	4.5	3.2		0.6	0.4	0.5	0.4	0.6	2.1
	Gee Gosho/F&Z	0.0	0.4	1.3	1.9	2.4	4.3	3.8		0.6	0.2	0.5	1.1	2.1	3.6
	Gee Gosho/Pan	1.0	2.1	3.7	3.2	3.9	5.7	3.8		0.6	2.1	1.3	1.8	1.9	3.1
	Gee Liang&Zeger	2.1	3.1	3.7	4.0	4.1	5.7	5.0	2.9	4.7	3.1	3.0	3.2	3.5	5.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.20	0.80	0.85	0.80	0.75	1.00	0.75	0.95	0.95	1.10	1.30	1.20	0.90	1.15
	par./ HF-corr.	0.10	0.35	0.55	0.75	0.70	0.95	0.75	0.85	0.80	1.00	1.25	1.10	0.85	1.10
	multivariate	0.15	0.15	0.45	0.55	0.55	0.95	0.55	0.75	0.70	1.05	0.70	0.75	1.15	1.35
	Puri & Sen	0.05	0.35	0.70	0.70	0.75	0.90	0.65	0.50	0.80	0.95	1.20	1.05	0.90	1.10
	ATS	0.35	0.85	0.80	0.80	0.75	0.95	0.75	0.85	0.60	0.50	0.50	0.75	0.65	0.80
	Koch	1.10	0.05	0.20	0.15	0.40	0.70	0.45	0.70	0.45	0.45	0.70	0.90	0.90	0.95
	Glmm Wald II	0.7	1.1	0.8	0.6	0.8	0.9	0.9	0.0	0.1	0.0	0.1	0.0	0.0	0.2
	Glmm Wald III	0.7	1.1	0.8	0.6	0.8	0.9	0.9	0.0	0.1	0.0	0.1	0.0	0.0	0.2
	Glmm Fan&Zhang	0.8	1.1	1.0	1.1	1.0	1.6	1.6	0.0	0.1	0.1	0.3	0.4	0.6	1.0
	Gee Gosho/Wald	0.0	0.0	0.2	0.2	0.3	0.2	0.4		0.6	0.2	0.2	0.1	0.0	0.1
	Gee Gosho/F&Z	0.0	0.0	0.1	0.2	0.2	0.8	0.8		0.6	0.2	0.1	0.0	0.3	0.5
	Gee Gosho/Pan	0.5	0.3	0.4	0.5	0.5	0.5	0.4		0.6	0.4	0.2	0.0	0.1	0.6
	Gee Liang&Zeger	0.0	1.2	0.9	0.6	0.6	1.2	1.1	2.9	2.9	2.1	0.5	0.7	0.9	1.2

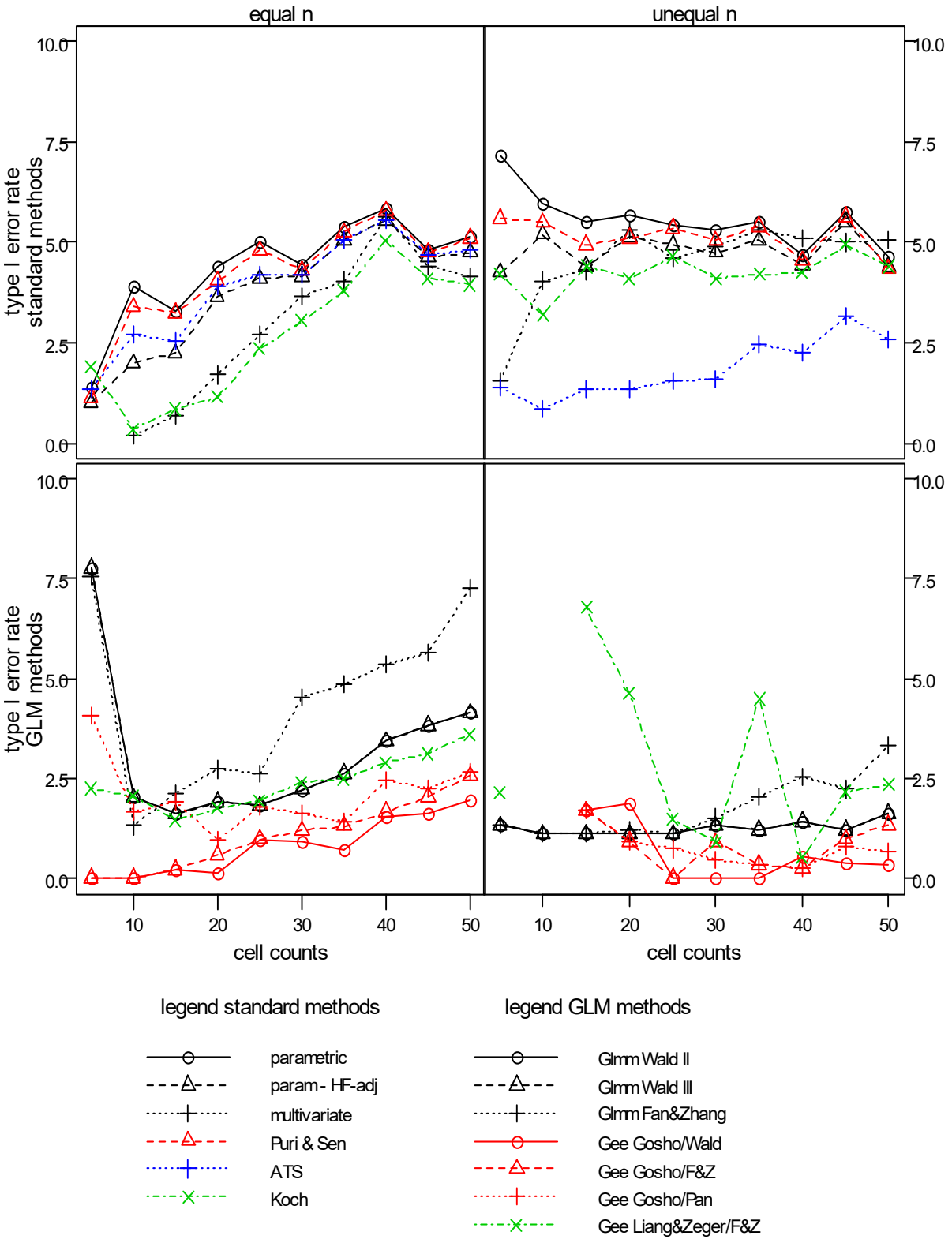
Graphic for α=0.05:



7. 8. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.40	3.90	3.30	4.40	4.45	5.85	5.15	7.15	5.95	5.50	5.70	5.30	4.70	4.65
	par./ HF-corr.	1.00	2.00	2.25	3.65	4.15	5.55	4.75	4.25	5.20	4.40	5.15	4.75	4.45	4.40
	multivariate		0.20	0.70	1.70	3.65	5.65	4.15	1.55	4.05	4.30	5.30	4.90	5.10	5.05
	Puri & Sen	1.15	3.40	3.25	4.05	4.30	5.80	5.10	5.60	5.50	4.95	5.10	5.05	4.55	4.35
	ATS	1.35	2.70	2.55	3.90	4.20	5.55	4.80	1.40	0.85	1.35	1.35	1.60	2.25	2.60
	Koch	1.90	0.35	0.85	1.15	3.05	5.05	3.95	4.20	3.20	4.40	4.10	4.10	4.25	4.40
	Glmm Wald II	7.8	2.0	1.6	1.9	2.2	3.4	4.1	1.3	1.1	1.1	1.1	1.3	1.4	1.6
	Glmm Wald III	7.8	2.0	1.6	1.9	2.2	3.4	4.1	1.3	1.1	1.1	1.1	1.3	1.4	1.6
	Glmm Fan&Zhang	7.6	1.3	2.1	2.7	4.5	5.3	7.3	1.3	1.1	1.1	1.2	1.5	2.5	3.3
	Gee Gosho/Wald	0.0	0.0	0.2	0.1	0.9	1.6	2.0			1.7	1.9	0.0	0.5	0.3
	Gee Gosho/F&Z	0.0	0.0	0.2	0.6	1.2	1.7	2.6			1.7	0.9	0.9	0.3	1.3
	Gee Gosho/Pan	4.1	1.6	1.9	0.9	1.6	2.4	2.7			1.7	0.9	0.5	0.3	0.7
	Gee Liang&Zeger	2.2	2.1	1.5	1.8	2.4	2.9	3.6	2.1	1.0	6.8	4.6	0.9	0.5	2.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.25	0.35	0.55	0.65	0.95	1.35	1.2	2.35	1.60	1.55	1.25	1.30	1.25	1.15
	par./ HF-corr.	0.05	0.05	0.25	0.30	0.70	0.90	1.0	1.25	0.85	0.95	1.10	1.05	1.05	1.00
	multivariate		0.05	0.10	0.05	0.10	0.50	0.8	0.15	0.55	0.75	0.80	1.20	0.65	0.95
	Puri & Sen	0.05	0.15	0.45	0.50	0.95	1.25	1.1	1.60	1.15	1.20	1.15	1.15	1.15	1.10
	ATS	0.15	0.20	0.35	0.35	0.80	1.05	1.0	0.50	0.10	0.05	0.10	0.05	0.15	0.20
	Koch	1.90	0.30	0.50	0.05	0.05	0.35	0.6	2.55	0.55	0.40	0.55	1.00	1.00	0.60
	Glmm Wald II	7.7	1.7	1.5	1.4	1.2	1.1	1.5	1.3	1.1	1.1	1.1	1.1	1.2	1.1
	Glmm Wald III	7.7	1.7	1.5	1.4	1.2	1.1	1.5	1.3	1.1	1.1	1.1	1.1	1.2	1.1
	Glmm Fan&Zhang	7.6	1.3	1.4	1.6	1.5	1.7	2.1	1.3	1.1	1.1	1.1	1.1	1.3	1.4
	Gee Gosho/Wald	0.0	0.0	0	0.0	0.0	0.0	0.3			1.7	1.9	0.0	0.3	0.0
	Gee Gosho/F&Z	0.0	0.0	0	0.0	0.0	0.0	0.6			1.7	0.9	0.0	0.0	0.2
	Gee Gosho/Pan	4.1	0.5	0	0.0	0.0	0.0	0.3			1.7	0.9	0.0	0.0	0.0
	Gee Liang&Zeger	0.0	2.1	1	0.5	0.5	0.2	0.9	2.1	0.1	5.1	3.7	0.5	0.5	0.7

Graphic for α=0.05:

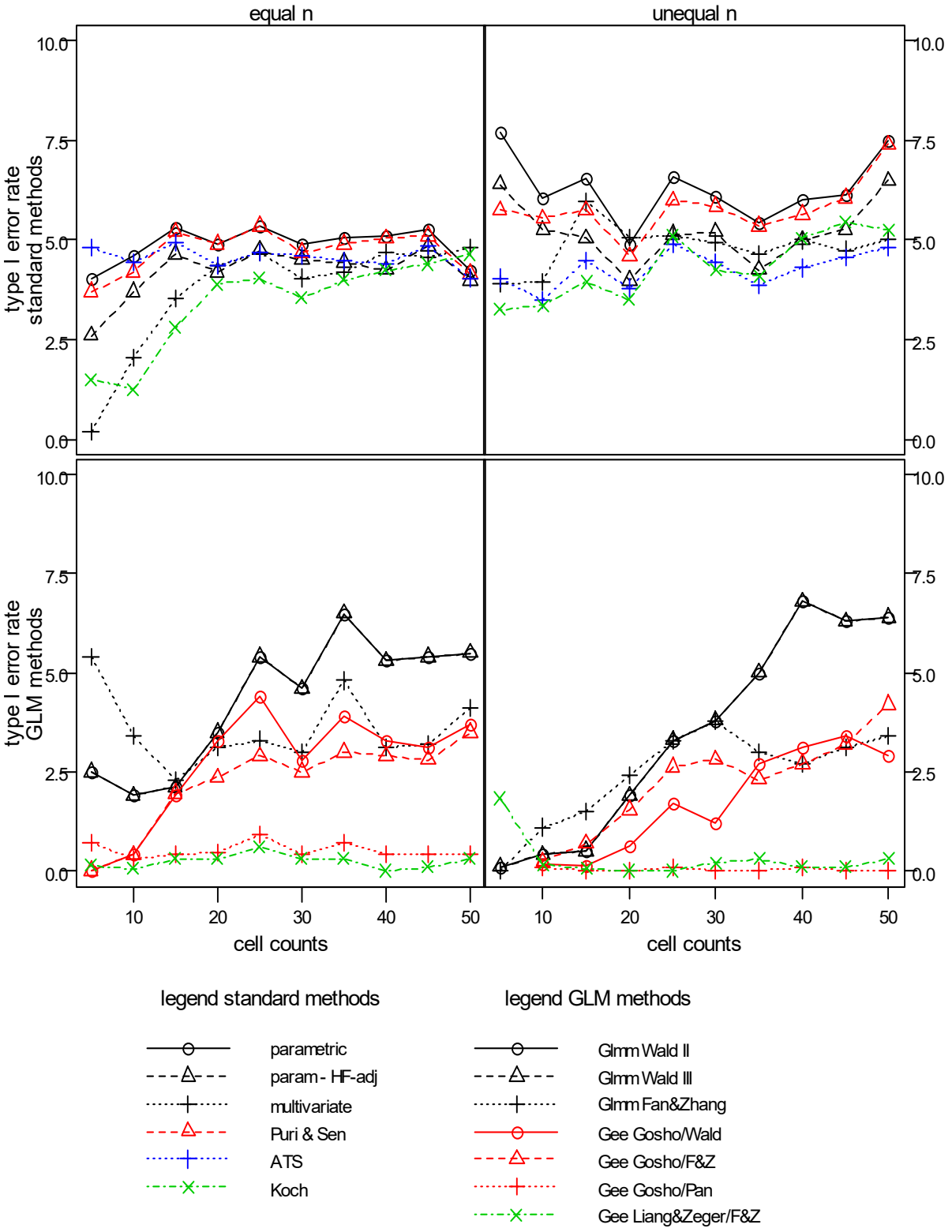


7. 8. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 8. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.05	4.60	5.30	4.90	4.90	5.10	4.25	7.70	6.05	6.55	4.90	6.10	6.00	7.50
	par./ HF-corr.	2.60	3.70	4.65	4.20	4.50	4.25	4.00	6.40	5.25	5.05	4.00	5.20	5.00	6.50
	multivariate	0.20	2.05	3.55	4.35	4.05	4.70	4.80	3.90	3.95	5.95	5.05	4.95	5.00	5.00
	Puri & Sen	3.70	4.20	5.20	4.90	4.70	5.05	4.15	5.75	5.55	5.75	4.60	5.85	5.65	7.40
	ATS	4.80	4.45	4.95	4.35	4.60	4.40	4.05	4.05	3.50	4.50	3.80	4.45	4.30	4.80
	Koch	1.50	1.25	2.80	3.90	3.55	4.25	4.65	3.25	3.35	3.95	3.50	4.25	5.05	5.25
	Glmm Wald II	2.3	3.0	3.3	3.6	4.3	5.4	6.7	0.5	0.8	0.7	0.7	1.2	2.0	3.4
	Glmm Wald III	2.3	3.0	3.3	3.6	4.3	5.4	6.7	0.5	0.8	0.7	0.7	1.2	2.0	3.4
	Glmm Fan&Zhang	2.0	3.7	4.3	4.9	4.5	5.8	5.4	0.4	0.7	0.9	1.1	2.0	2.3	3.3
	Gee Gosho/Wald	0.0	0.4	1.9	3.3	2.8	3.3	3.7		0.2	0.1	0.6	1.2	3.1	2.9
	Gee Gosho/F&Z	0.0	0.4	2.0	2.4	2.5	2.9	3.5		0.2	0.7	1.5	2.8	2.7	4.2
	Gee Gosho/Pan	0.7	0.3	0.4	0.4	0.4	0.4	0.4		0.1	0.0	0.0	0.0	0.1	0.0
	Gee Liang&Zeger	0.1	0.1	0.3	0.3	0.3	0.0	0.3	1.8	0.2	0.1	0.0	0.2	0.1	0.3
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.50	0.65	1.25	0.85	1.05	1.35	1.05	1.95	1.75	1.70	1.35	1.60	1.70	1.85
	par./ HF-corr.	0.15	0.40	0.85	0.70	0.90	0.85	0.95	1.00	1.25	1.25	0.85	1.20	1.20	1.10
	multivariate	0.05	0.05	0.40	0.70	0.55	0.85	0.95	1.00	0.80	1.15	0.95	0.80	0.75	0.75
	Puri & Sen	0.15	0.45	0.95	0.70	0.90	1.25	1.00	0.75	1.15	1.40	1.05	1.50	1.55	1.70
	ATS	1.40	0.55	1.15	0.80	1.05	1.10	0.95	1.30	1.10	1.00	0.75	1.05	0.95	1.25
	Koch	1.40	0.25	0.25	0.30	0.30	0.60	0.60	0.95	0.60	0.50	0.45	0.70	1.20	0.90
	Glmm Wald II	1.8	1.7	1.1	0.8	0.8	1.0	1.6	0.5	0.8	0.7	0.7	1.2	2.0	3.4
	Glmm Wald III	1.8	1.7	1.1	0.8	0.8	1.0	1.6	0.5	0.8	0.7	0.7	1.2	2.0	3.4
	Glmm Fan&Zhang	1.7	1.3	1.2	1.6	1.2	0.8	1.1	0.4	0.7	0.9	1.1	2.0	2.3	3.3
	Gee Gosho/Wald	0.0	0.0	0.2	0.3	0.4	0.7	0.7		0.0	0.0	0.0	0.1	0.7	0.4
	Gee Gosho/F&Z	0.0	0.0	0.3	0.4	0.4	0.3	0.6		0.0	0.1	0.2	1.2	0.4	1.5
	Gee Gosho/Pan	0.2	0.1	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.1	0.0	0.0	0.0	0.1	0.0	0.0	1.2	0.2	0.0	0.0	0.0	0.0	0.0

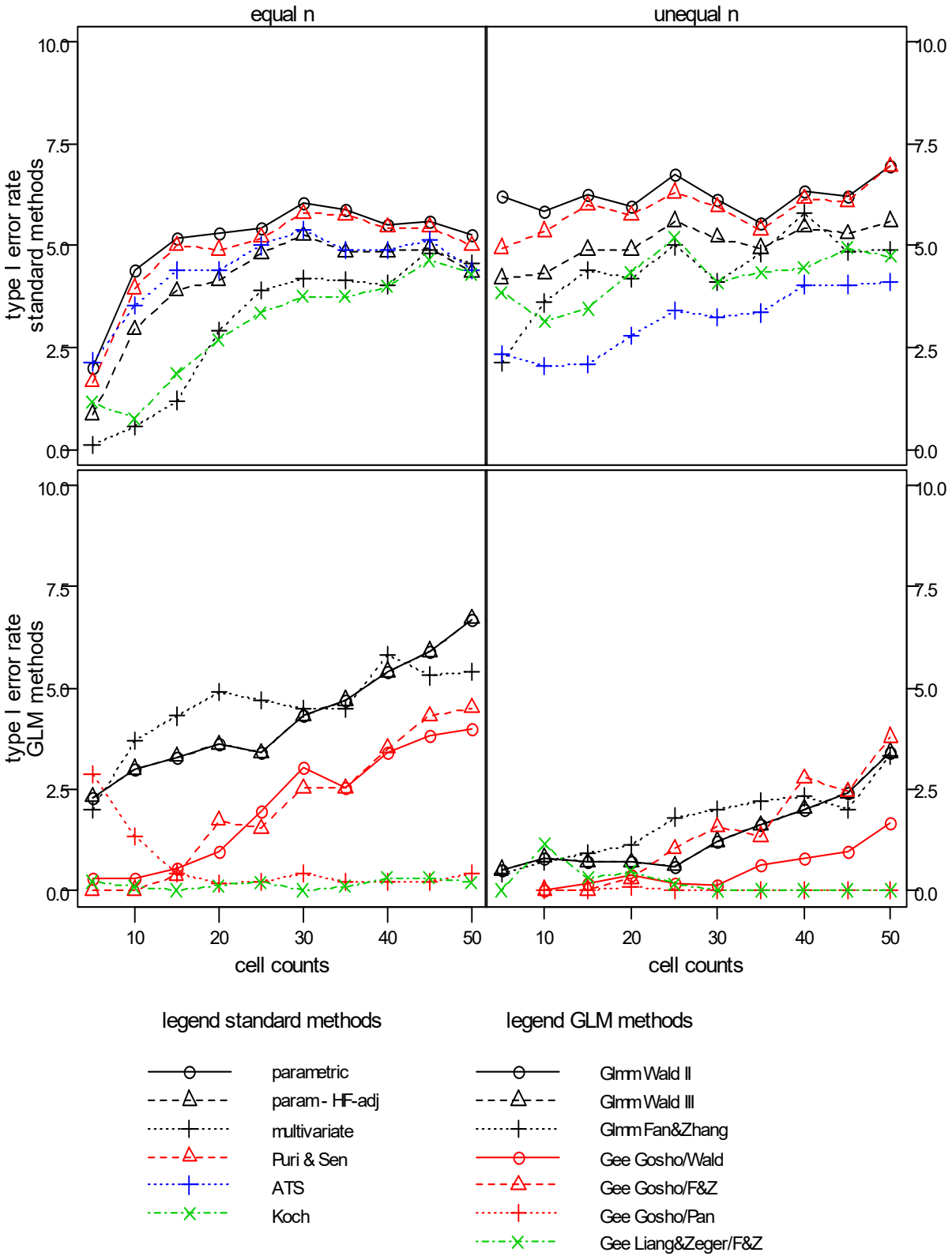
Graphic for α=0.05:



7. 8. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.00	4.40	5.20	5.30	6.05	5.50	5.25	6.20	5.85	6.25	5.95	6.15	6.35	6.95
	par./ HF-corr.	0.85	2.95	3.90	4.15	5.25	4.85	4.35	4.20	4.30	4.90	4.90	5.20	5.45	5.60
	multivariate	0.10	0.55	1.20	2.90	4.20	4.05	4.55	2.15	3.60	4.40	4.20	4.10	5.80	4.90
	Puri & Sen	1.65	3.95	5.00	4.90	5.80	5.45	5.00	4.95	5.35	6.00	5.75	5.95	6.15	6.95
	ATS	2.15	3.55	4.40	4.40	5.40	4.90	4.40	2.35	2.05	2.10	2.80	3.25	4.05	4.10
	Koch	1.15	0.75	1.85	2.70	3.75	4.00	4.30	3.85	3.15	3.45	4.35	4.10	4.45	4.75
	Glmm Wald II	2.5	1.9	2.1	3.5	4.6	5.3	5.5	0.2	0.7	1.9	2.7	4.0	4.0	4.6
	Glmm Wald III	2.5	1.9	2.1	3.5	4.6	5.3	5.5	0.2	0.7	1.9	2.7	4.0	4.0	4.6
	Glmm Fan&Zhang	5.4	3.4	2.3	3.1	3.0	3.1	4.1	0.1	2.0	5.4	6.5	6.6	6.1	6.8
	Gee Gosho/Wald	0.3	0.3	0.6	1.0	3.0	3.4	4.0		0.0	0.2	0.4	0.1	0.8	1.7
	Gee Gosho/F&Z	0.0	0.0	0.4	1.7	2.5	3.5	4.5		0.0	0.0	0.3	1.6	2.8	3.8
	Gee Gosho/Pan	2.9	1.3	0.4	0.2	0.4	0.2	0.4		0.0	0.0	0.1	0.0	0.0	0.0
	Gee Liang&Zeger	0.2	0.1	0.0	0.1	0.0	0.3	0.2	0.0	1.1	0.3	0.5	0.0	0.0	0.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.15	0.80	0.80	0.80	1.20	1.25	1.15	2.35	1.85	1.55	1.65	1.60	1.40	1.75
	par./ HF-corr.	0.05	0.25	0.10	0.45	0.65	1.00	0.85	1.00	1.05	1.00	0.95	1.00	1.00	1.35
	multivariate	0.05	0.05	0.15	0.10	0.35	0.70	0.70	0.30	0.60	1.05	1.20	0.80	1.10	1.05
	Puri & Sen	0.05	0.55	0.45	0.70	1.20	1.15	1.05	1.40	1.25	1.40	1.45	1.45	1.35	1.70
	ATS	0.45	0.65	0.35	0.65	0.75	1.05	0.95	0.90	0.20	0.55	0.25	0.50	0.55	0.70
	Koch	1.10	0.40	0.90	0.45	0.25	0.55	0.50	3.00	0.90	0.60	0.75	0.35	0.85	0.85
	Glmm Wald II	0.7	0.9	0.6	1.4	1.8	2.0	1.9	0.2	0.4	1.2	0.7	0.7	0.9	1.1
	Glmm Wald III	0.7	0.9	0.6	1.4	1.8	2.0	1.9	0.2	0.4	1.2	0.7	0.7	0.9	1.1
	Glmm Fan&Zhang	1.8	1.2	0.7	1.1	1.4	1.4	2.0	0.0	0.6	2.4	1.9	1.9	1.7	2.0
	Gee Gosho/Wald	0.0	0.0	0.1	0.1	0.4	0.5	0.7		0.0	0.2	0.2	0.0	0.0	0.4
	Gee Gosho/F&Z	0.0	0.0	0.0	0.2	0.3	0.5	0.6		0.0	0.0	0.1	0.0	0.2	0.4
	Gee Gosho/Pan	2.0	0.2	0.1	0.0	0.0	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.3	0.5	0.0	0.0	0.0

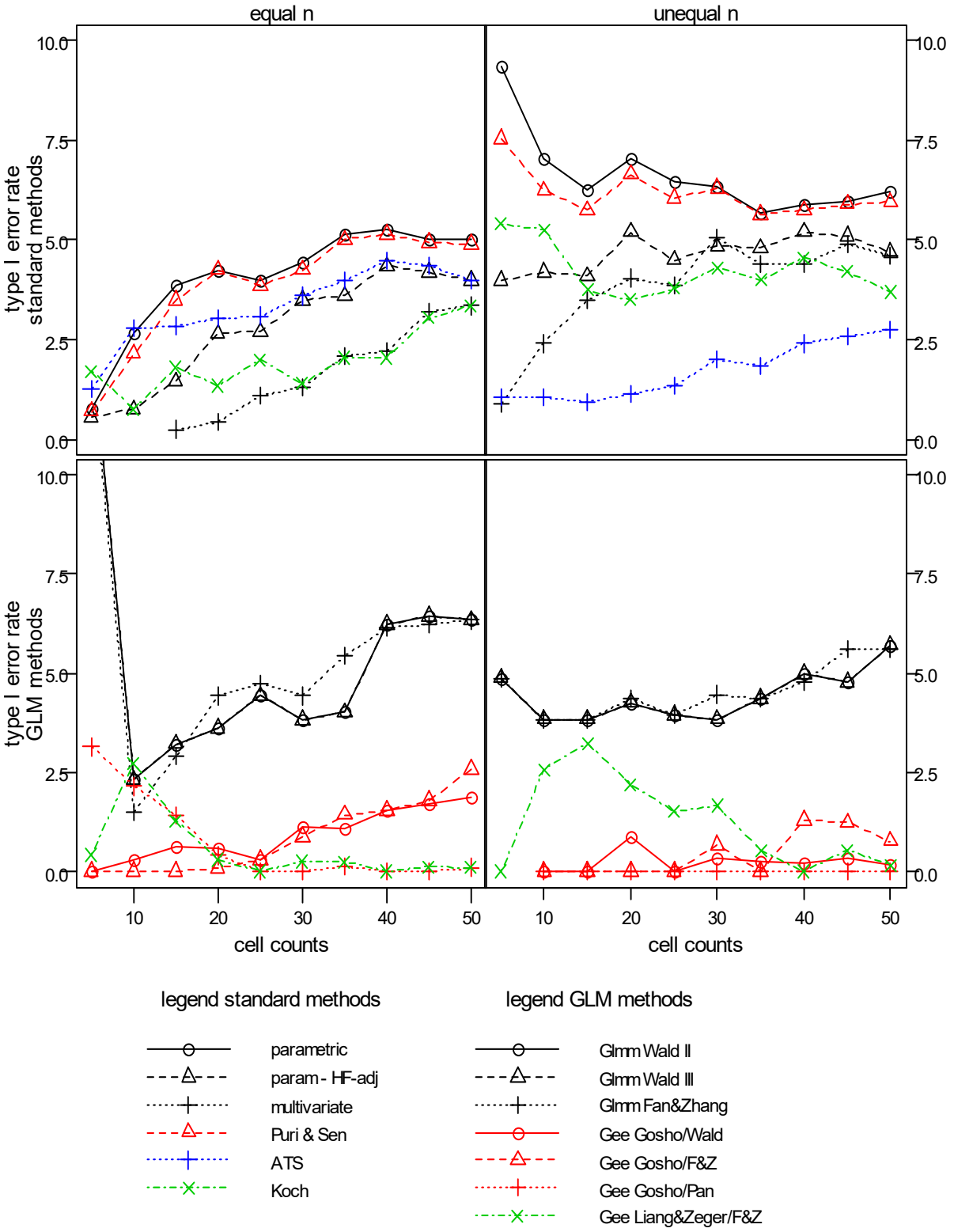
Graphic for α=0.05:



7. 8. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	0.75	2.65	3.85	4.25	4.45	5.25	5.00	9.35	7.05	6.25	7.05	6.35	5.90	6.20
	par./ HF-corr.	0.55	0.75	1.45	2.65	3.50	4.35	4.00	4.00	4.20	4.10	5.20	4.85	5.20	4.70
	multivariate	0.05	0.05	0.25	0.45	1.30	2.20	3.35	0.90	2.40	3.50	4.05	5.05	4.40	4.60
	Puri & Sen	0.70	2.15	3.50	4.25	4.25	5.15	4.90	7.55	6.25	5.75	6.65	6.30	5.75	5.95
	ATS	1.25	2.80	2.85	3.05	3.60	4.50	4.00	1.05	1.05	0.95	1.15	2.00	2.40	2.75
	Koch	1.70	0.75	1.80	1.35	1.40	2.05	3.35	5.40	5.25	3.75	3.50	4.30	4.55	3.70
	Glmm Wald II	13.4	2.3	3.2	3.6	3.8	6.2	6.3	4.9	3.8	3.8	4.3	3.8	5.0	5.7
	Glmm Wald III	13.4	2.3	3.2	3.6	3.8	6.2	6.3	4.9	3.8	3.8	4.3	3.8	5.0	5.7
	Glmm Fan&Zhang	13.0	1.5	2.9	4.4	4.4	6.1	6.3	4.9	3.8	3.8	4.4	4.5	4.8	5.6
	Gee Gosho/Wald	0.0	0.3	0.6	0.6	1.1	1.5	1.9		0.0	0.0	0.9	0.3	0.2	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.1	0.9	1.5	2.6		0.0	0.0	0.0	0.7	1.3	0.8
	Gee Gosho/Pan	3.1	2.1	1.4	0.4	0.0	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.4	2.7	1.3	0.3	0.3	0.0	0.1	0.0	2.6	3.2	2.2	1.7	0.0	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.20	0.20	0.50	0.45	0.90	0.90	0.70	3.30	2.25	1.75	1.40	1.95	1.65	1.90
	par./ HF-corr.	0.05	0.05	0.15	0.15	0.40	0.45	0.30	0.65	1.15	1.00	0.85	1.30	1.00	1.25
	multivariate		0.05	0.05	0.05	0.05	0.10	0.20		0.30	0.45	0.45	0.70	1.00	0.80
	Puri & Sen	0.10	0.10	0.50	0.35	0.90	0.90	0.70	1.80	1.95	1.35	1.15	1.80	1.50	1.85
	ATS	0.65	1.40	0.75	0.30	0.40	0.55	0.35	0.65	0.05	0.15	0.05	0.05	0.35	0.35
	Koch	1.70	0.75	1.60	1.10	0.40	0.15	0.20	4.55	3.10	0.90	0.75	0.55	0.75	0.80
	Glmm Wald II	13.4	1.9	2.1	2.8	1.4	1.4	1.9	4.9	3.8	3.8	4.3	3.8	4.2	4.0
	Glmm Wald III	13.4	1.9	2.1	2.8	1.4	1.4	1.9	4.9	3.8	3.8	4.3	3.8	4.2	4.0
	Glmm Fan&Zhang	13.0	1.4	1.5	2.2	2.1	1.9	1.7	4.9	3.8	3.8	4.2	3.8	3.9	3.9
	Gee Gosho/Wald	0.0	0.3	0.3	0.2	0.0	0	0.1		0.0	0.0	0.4	0.3	0.2	0.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0	0.3		0.0	0.0	0.0	0.0	0.2	0.0
	Gee Gosho/Pan	3.1	1.8	0.6	0.2	0.0	0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.4	0.7	1.3	0.3	0.3	0	0.0	0.0	2.6	3.2	2.2	1.7	0.0	0.2

Graphic for α=0.05:



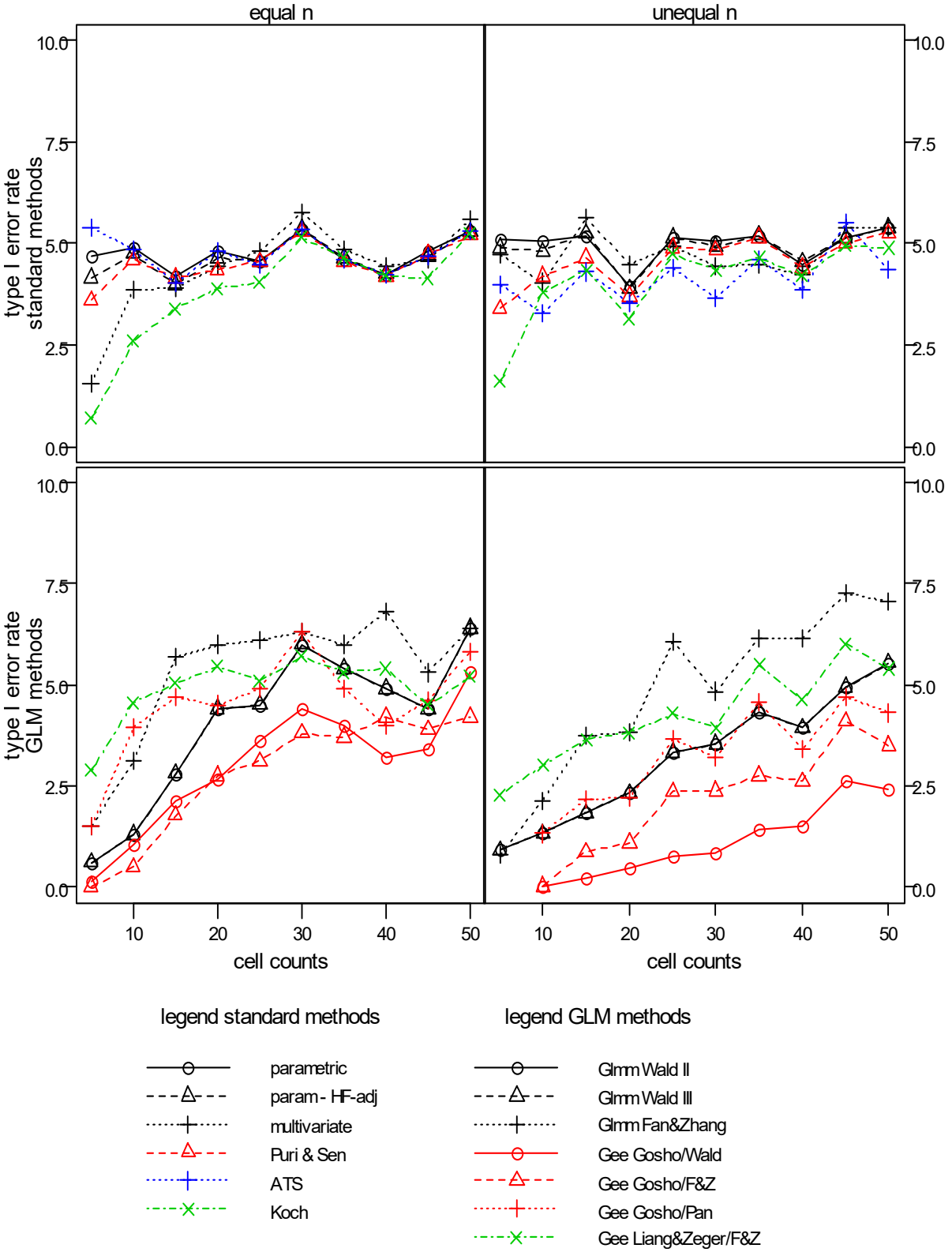
7. 9. Interaction AB - A significant (effects a_i = 0.6*s) n_i and p_i independent

7. 9. 1. equal correlations on B (r=0.3)

7. 9. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.70	4.90	4.20	4.80	5.35	4.25	5.30	5.10	5.05	5.20	3.95	5.05	4.50	5.40
	par./ HF-corr.	4.15	4.75	4.00	4.65	5.35	4.25	5.30	4.90	4.80	5.25	3.90	4.95	4.55	5.40
	multivariate	1.55	3.85	3.90	4.45	5.75	4.45	5.60	4.75	4.05	5.65	4.50	4.45	4.25	5.40
	Puri & Sen	3.60	4.60	4.15	4.35	5.30	4.20	5.20	3.40	4.20	4.65	3.70	4.85	4.40	5.25
	ATS	5.40	4.85	4.05	4.80	5.35	4.25	5.30	4.00	3.30	4.30	3.55	3.65	3.85	4.35
	Koch	0.70	2.60	3.40	3.90	5.15	4.20	5.25	1.60	3.80	4.35	3.15	4.35	4.20	4.90
	Glmm Wald II	0.6	1.3	2.8	4.4	6.0	4.9	6.4	0.9	1.3	1.8	2.3	3.5	3.9	5.5
	Glmm Wald III	0.6	1.3	2.8	4.4	6.0	4.9	6.4	0.9	1.3	1.8	2.3	3.5	3.9	5.5
	Glmm Fan&Zhang	1.5	3.1	5.7	6.0	6.3	6.8	6.4	0.8	2.1	3.7	3.8	4.8	6.1	7.1
	Gee Gosho/Wald	0.1	1.0	2.1	2.7	4.4	3.2	5.3		0.0	0.2	0.5	0.8	1.5	2.4
	Gee Gosho/F&Z	0.0	0.5	1.8	2.8	3.8	4.2	4.2		0.0	0.9	1.1	2.4	2.6	3.5
	Gee Gosho/Pan	1.5	4.0	4.7	4.5	6.3	4.0	5.8		1.3	2.1	2.2	3.2	3.4	4.3
	Gee Liang&Zeger	2.9	4.6	5.0	5.5	5.7	5.4	5.2	2.3	3.0	3.6	3.8	3.9	4.6	5.4
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.75	0.80	0.85	0.75	1.30	0.65	1.50	0.65	1.40	1.00	0.65	0.85	0.85	1.00
	par./ HF-corr.	0.50	0.50	0.95	0.75	1.25	0.65	1.50	0.70	1.30	0.95	0.65	0.80	0.85	0.95
	multivariate	0.30	0.45	0.70	0.65	1.25	0.75	1.15	0.80	1.05	1.20	0.75	0.80	0.80	1.35
	Puri & Sen	0.35	0.50	0.70	0.70	1.30	0.60	1.45	0.25	1.00	0.80	0.65	0.75	0.80	0.90
	ATS	0.95	0.80	0.90	0.75	1.30	0.65	1.55	0.90	0.80	0.75	0.60	1.10	0.95	0.80
	Koch	0.35	0.05	0.40	0.25	0.85	0.60	0.95	0.10	0.50	0.70	0.65	0.70	0.75	0.80
	Glmm Wald II	0.4	0.6	0.5	1.0	2.0	2.0	2.4	0.9	1.1	1.1	1.3	1.3	1.8	2.4
	Glmm Wald III	0.4	0.6	0.5	1.0	2.0	2.0	2.4	0.9	1.1	1.1	1.3	1.3	1.8	2.4
	Glmm Fan&Zhang	0.6	0.6	1.3	2.1	2.6	2.4	3.1	0.8	1.1	1.9	1.6	2.4	2.1	3.3
	Gee Gosho/Wald	0.1	0.0	0.2	0.4	1.0	0.6	0.8		0.0	0.1	0.1	0.0	0.1	0.7
	Gee Gosho/F&Z	0.0	0.0	0.5	0.7	1.3	0.7	1.2		0.0	0.2	0.1	0.6	0.2	1.2
	Gee Gosho/Pan	0.4	0.6	0.6	0.6	1.8	0.7	0.8		0.0	0.3	0.4	0.3	0.7	0.9
	Gee Liang&Zeger	0.9	0.9	1.2	1.5	1.7	0.8	1.4	2.3	0.9	1.2	0.5	1.3	0.8	1.8

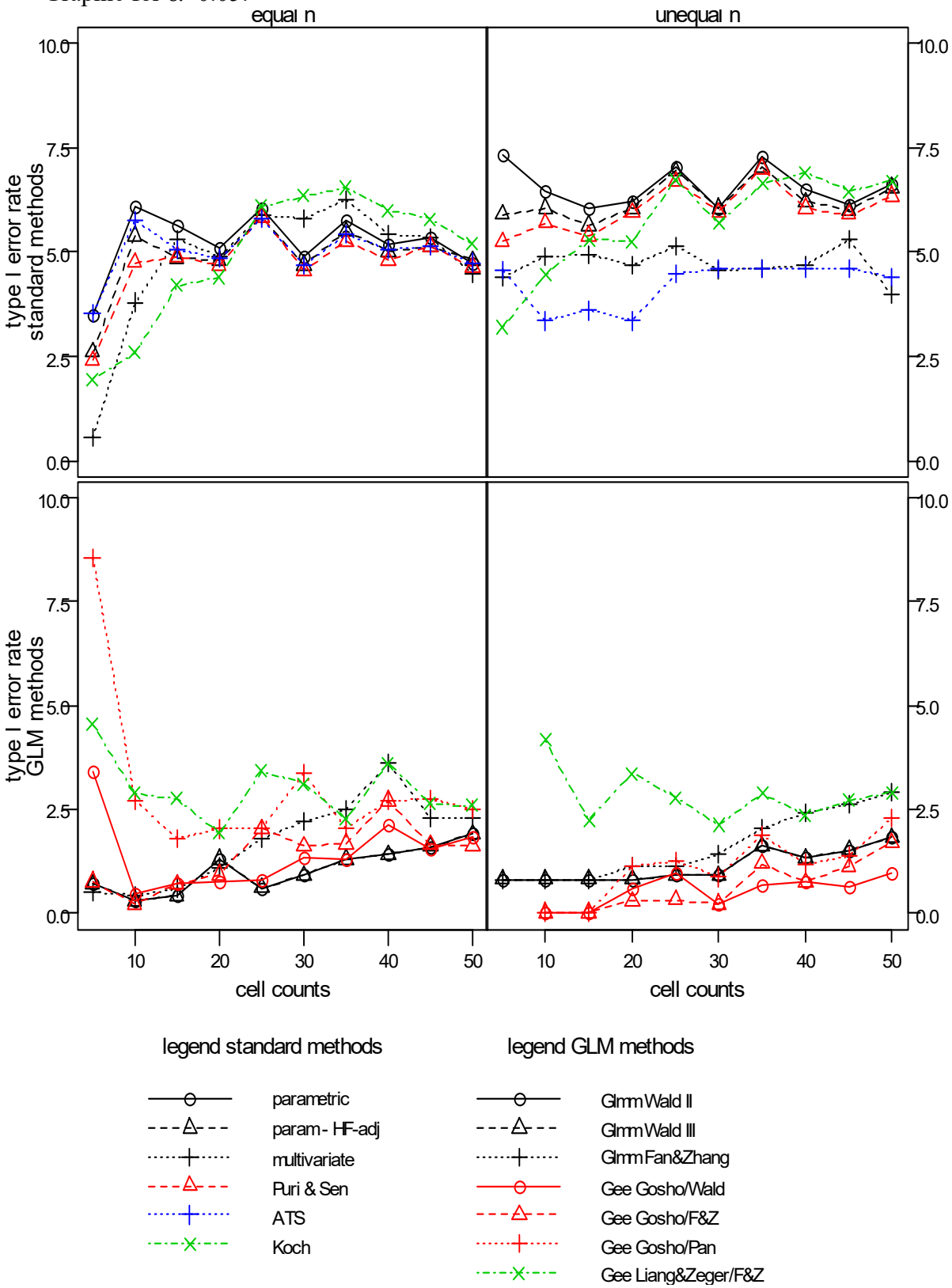
Graphic for α=0.05:



7. 9. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.50	6.10	5.65	5.10	4.90	5.20	4.75	7.35	6.45	6.05	6.20	6.05	6.50	6.65
	par./ HF-corr.	2.60	5.40	4.85	4.80	4.70	5.00	4.80	5.90	6.05	5.65	6.05	6.05	6.20	6.55
	multivariate	0.55	3.80	5.30	4.90	5.80	5.45	4.50	4.40	4.90	4.95	4.70	4.55	4.70	4.00
	Puri & Sen	2.40	4.75	4.90	4.70	4.55	4.80	4.65	5.25	5.70	5.40	5.95	5.95	6.05	6.35
	ATS	3.55	5.75	5.05	4.85	4.70	5.05	4.75	4.55	3.35	3.60	3.35	4.60	4.60	4.40
	Koch	1.95	2.60	4.20	4.40	6.35	6.00	5.20	3.20	4.45	5.30	5.25	5.70	6.90	6.70
	Glmm Wald II	0.7	0.3	0.4	1.3	0.9	1.4	1.9	0.8	1.2	1.8	3.6	3.1	4.8	3.3
	Glmm Wald III	0.7	0.3	0.4	1.3	0.9	1.4	1.9	0.8	0.8	0.8	0.9	0.8	1.2	1.2
	Glmm Fan&Zhang	0.5	0.4	0.6	1.1	2.2	3.6	2.3	0.8	0.8	1.0	1.1	1.1	1.6	2.6
	Gee Gosho/Wald	3.4	0.5	0.7	0.7	1.3	2.1	1.8		0.0	0.0	0.6	0.2	0.7	1.0
	Gee Gosho/F&Z	0.8	0.2	0.7	0.9	1.6	2.7	1.6		0.0	0.0	0.3	0.2	0.7	1.7
	Gee Gosho/Pan	8.5	2.7	1.8	2.0	3.4	2.7	2.5		0.0	0.0	1.1	0.9	1.2	2.3
	Gee Liang&Zeger	4.5	2.9	2.8	1.9	3.1	3.6	2.6		4.2	2.2	3.4	2.1	2.4	2.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.70	0.75	1.55	1.00	1.15	1.00	1.00	2.10	1.60	1.75	1.90	1.25	1.80	2.20
	par./ HF-corr.	0.50	0.35	1.00	0.75	0.95	0.95	0.95	1.40	1.35	1.50	1.60	1.10	1.75	2.15
	multivariate	0.35	0.40	0.55	0.75	0.95	0.95	0.90	0.50	0.95	1.05	0.85	0.40	0.90	0.55
	Puri & Sen	0.10	0.40	1.00	0.70	1.05	0.90	0.80	1.10	1.00	1.25	1.65	1.15	1.75	2.15
	ATS	0.95	0.55	1.25	0.85	1.05	1.00	1.00	1.25	0.60	0.90	0.65	1.00	0.85	0.95
	Koch	1.30	0.15	0.30	0.35	0.95	1.10	0.95	1.10	0.95	1.20	1.50	1.50	1.80	2.05
	Glmm Wald II	0.6	0.2	0.2	0.5	0.1	0.5	0.1	0.8	0.8	0.9	1.0	1.3	1.8	0.9
	Glmm Wald III	0.6	0.2	0.2	0.5	0.1	0.5	0.1	0.8	0.8	0.8	0.8	0.8	1.0	0.8
	Glmm Fan&Zhang	0.5	0.2	0.3	0.5	0.5	0.8	0.4	0.8	0.8	0.8	0.8	0.8	1.1	1.0
	Gee Gosho/Wald	3.4	0.2	0.1	0.3	0.1	0.3	0.0		0.0	0.0	0.6	0.0	0.3	0.2
	Gee Gosho/F&Z	0.8	0.2	0.3	0.1	0.4	0.2	0.2		0.0	0.0	0.0	0.2	0.1	0.4
	Gee Gosho/Pan	3.4	0.9	0.3	0.5	0.5	0.3	0.2		0.0	0.0	0.3	0.0	0.1	0.4
	Gee Liang&Zeger	3.8	1.3	1.4	0.9	0.9	0.7	0.3		2.8	1.7	2.0	1.1	0.7	1.2

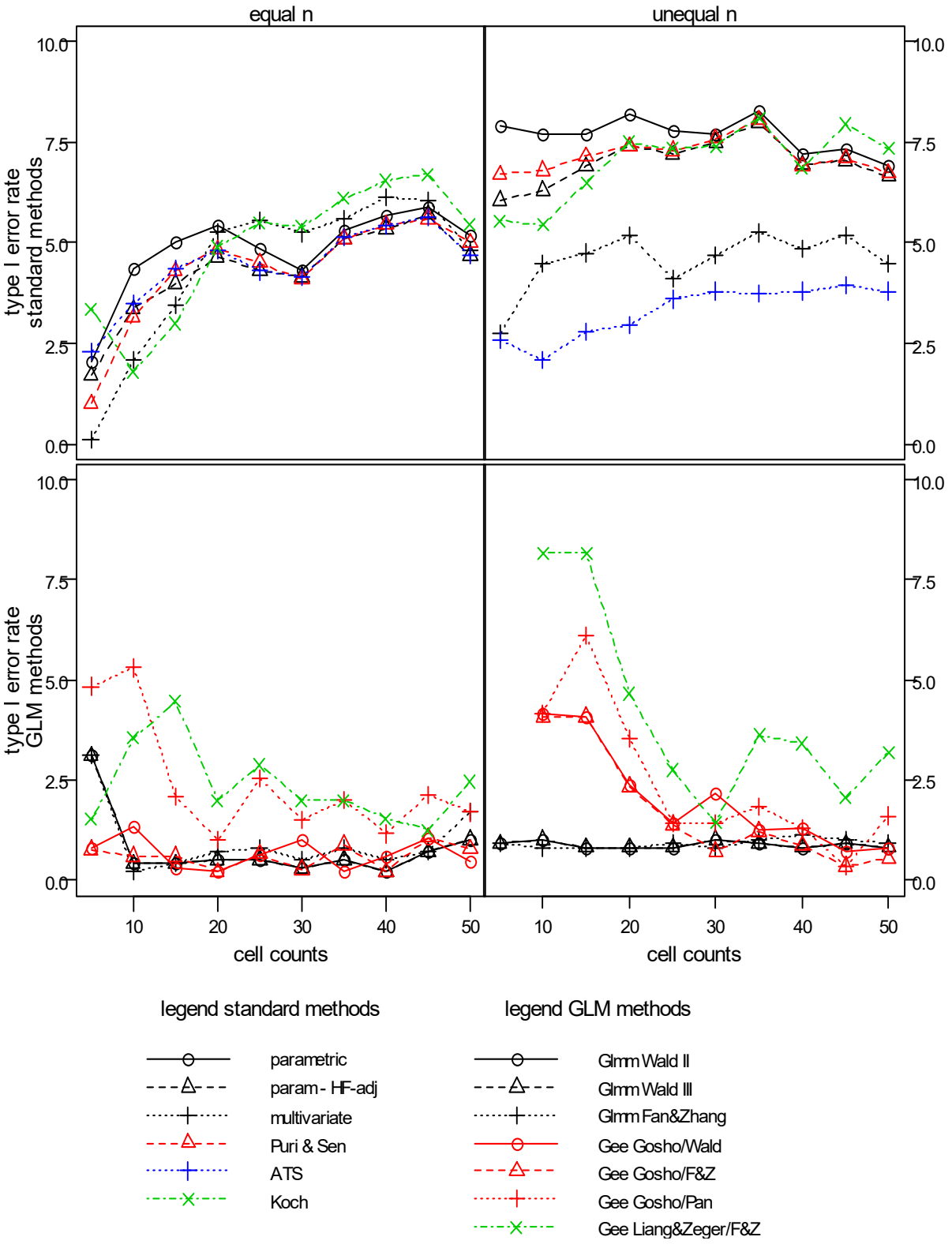
Graphic for α=0.05:



7. 9. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.05	4.35	5.00	5.45	4.30	5.70	5.20	7.90	7.70	7.70	8.20	7.7	7.20	6.90
	par./ HF-corr.	1.70	3.35	4.00	4.65	4.15	5.35	4.70	6.05	6.30	6.90	7.40	7.5	6.95	6.65
	multivariate	0.10	2.10	3.45	5.25	5.25	6.15	4.80	2.75	4.50	4.75	5.20	4.7	4.85	4.50
	Puri & Sen	1.00	3.15	4.30	4.85	4.10	5.45	5.00	6.70	6.80	7.15	7.40	7.6	6.90	6.75
	ATS	2.30	3.50	4.35	4.80	4.15	5.45	4.70	2.60	2.10	2.80	2.95	3.8	3.80	3.80
	Koch	3.35	1.80	3.00	4.90	5.40	6.55	5.45	5.55	5.45	6.50	7.50	7.4	6.85	7.35
	Glmm Wald II	3.1	0.4	0.4	0.5	0.3	0.2	1.0	0.9	1.0	0.8	0.8	1.0	0.8	0.8
	Glmm Wald III	3.1	0.4	0.4	0.5	0.3	0.2	1.0	0.9	1.0	0.8	0.8	1.0	0.8	0.8
	Glmm Fan&Zhang	3.1	0.2	0.4	0.7	0.5	0.5	1.7	0.9	0.8	0.8	0.8	0.8	1.1	0.9
	Gee Gosho/Wald	0.8	1.3	0.3	0.2	1.0	0.6	0.5		4.2	4.1	2.4	2.1	1.3	0.8
	Gee Gosho/F&Z	0.8	0.6	0.6	0.2	0.2	0.2	0.8		4.1	4.1	2.3	0.7	0.9	0.5
	Gee Gosho/Pan	4.8	5.3	2.1	1.0	1.5	1.1	1.7		4.2	6.1	3.5	1.4	1.3	1.6
	Gee Liang&Zeger	1.5	3.6	4.5	2.0	2.0	1.5	2.5		8.2	8.2	4.7	1.4	3.4	3.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.5	0.55	0.90	1.10	0.65	0.90	0.75	3.45	2.40	2.60	2.75	2.65	2.10	2.35
	par./ HF-corr.	0.3	0.35	0.45	0.55	0.55	0.90	0.60	2.15	1.70	2.05	2.45	2.40	1.75	2.20
	multivariate	0.1	0.15	0.40	0.50	0.75	1.20	0.80	0.10	0.90	0.90	0.95	0.55	0.60	0.85
	Puri & Sen	0.1	0.25	0.55	0.50	0.55	0.90	0.55	2.40	1.70	2.20	2.30	2.20	1.65	2.20
	ATS	0.5	0.60	0.75	0.70	0.55	0.90	0.65	0.85	0.30	0.55	0.85	0.75	0.60	0.95
	Koch	3.1	0.30	0.35	0.35	0.70	1.15	1.00	3.15	0.75	1.75	1.80	2.30	1.50	2.25
	Glmm Wald II	3.1	0.3	0.4	0.4	0.2	0.1	0.7	0.9	1.0	0.8	0.8	1.0	0.8	0.8
	Glmm Wald III	3.1	0.3	0.4	0.4	0.2	0.1	0.7	0.9	1.0	0.8	0.8	1.0	0.8	0.8
	Glmm Fan&Zhang	3.0	0.1	0.4	0.4	0.2	0.2	0.7	0.9	0.8	0.8	0.8	0.8	0.8	0.8
	Gee Gosho/Wald	0.8	1.3	0.3	0.2	0.0	0.0	0.0		4.2	4.1	2.4	2.1	0.9	0.8
	Gee Gosho/F&Z	0.8	0.6	0.3	0.2	0.0	0.2	0.0		4.1	4.1	2.3	0.7	0.4	0.3
	Gee Gosho/Pan	0.8	2.0	0.3	0.2	0.2	0.2	0.0		4.2	4.1	2.4	0.7	0.4	0.3
	Gee Liang&Zeger	1.5	3.6	1.8	0.6	0.7	0.4	0.6		6.1	6.1	4.7	1.4	2.6	2.4

Graphic for α=0.05:

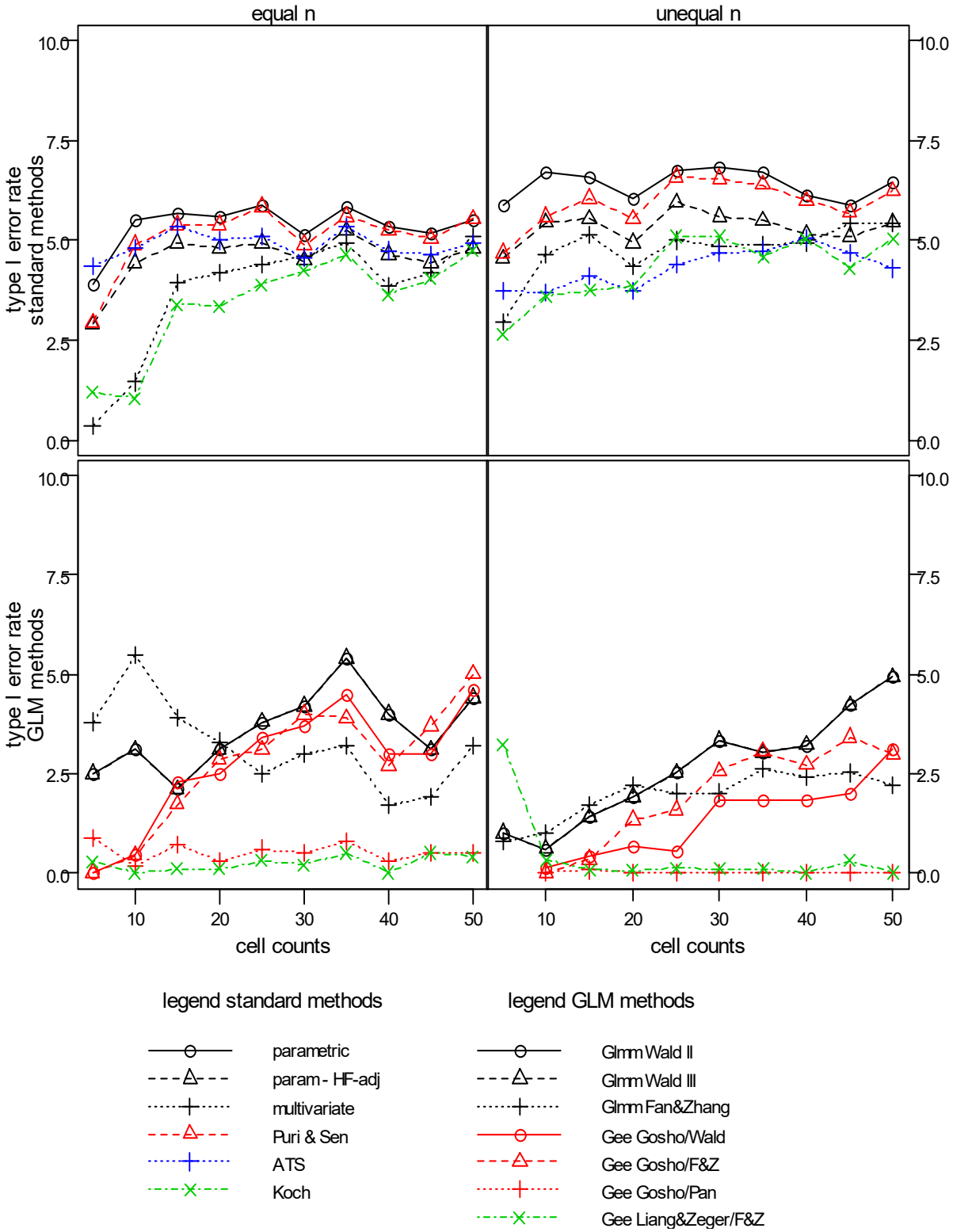


7. 9. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 9. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.90	5.50	5.70	5.60	5.15	5.35	5.50	5.90	6.70	6.60	6.05	6.85	6.15	6.45
	par./ HF-corr.	2.90	4.45	4.95	4.80	4.50	4.65	4.80	4.55	5.45	5.55	4.95	5.60	5.15	5.45
	multivariate	0.35	1.45	3.95	4.20	4.60	3.85	5.10	2.95	4.65	5.15	4.35	4.85	4.95	5.45
	Puri & Sen	2.95	4.90	5.40	5.40	4.90	5.25	5.55	4.70	5.60	6.05	5.55	6.55	6.00	6.25
	ATS	4.35	4.80	5.35	5.00	4.55	4.75	4.95	3.75	3.70	4.10	3.75	4.70	5.05	4.30
	Koch	1.20	1.05	3.40	3.35	4.25	3.65	4.75	2.65	3.60	3.75	3.85	5.10	5.05	5.05
	Glmm Wald II	2.5	3.1	2.1	3.1	4.2	4.0	4.4	1.0	0.6	1.4	1.9	3.3	3.2	4.9
	Glmm Wald III	2.5	3.1	2.1	3.1	4.2	4.0	4.4	1.0	0.6	1.4	1.9	3.3	3.2	4.9
	Glmm Fan&Zhang	3.8	5.5	3.9	3.3	3.0	1.7	3.2	0.8	1.0	1.7	2.2	2.0	2.4	2.2
	Gee Gosho/Wald	0.0	0.4	2.3	2.5	3.7	3.0	4.6		0.1	0.4	0.7	1.8	1.8	3.1
	Gee Gosho/F&Z	0.0	0.4	1.7	2.9	4.0	2.7	5.0		0.0	0.3	1.3	2.6	2.7	3.0
	Gee Gosho/Pan	0.9	0.2	0.7	0.3	0.5	0.3	0.5		0.0	0.1	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.3	0.0	0.1	0.1	0.2	0.0	0.4	3.2	0.3	0.1	0.1	0.1	0.0	0.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.60	0.80	1.30	1.20	1.40	1.15	1.35	1.75	1.85	1.85	1.35	1.95	1.55	2.00
	par./ HF-corr.	0.30	0.50	1.05	0.80	1.20	1.00	0.90	0.75	1.05	1.35	0.80	1.30	1.30	1.40
	multivariate	0.10	0.10	0.15	0.35	0.60	0.60	1.00	0.60	1.00	0.95	1.10	0.70	1.05	1.10
	Puri & Sen	0.20	0.60	1.15	0.95	1.35	1.15	1.20	0.60	1.30	1.60	1.10	1.85	1.40	1.90
	ATS	0.75	0.75	1.15	0.85	1.25	1.05	1.00	1.60	0.65	1.20	0.70	0.80	1.45	1.35
	Koch	1.05	0.40	0.25	0.20	0.40	0.50	1.00	1.30	0.45	0.85	0.75	1.05	1.05	0.95
	Glmm Wald II	1.7	1.3	0.7	0.8	1.1	0.7	0.9	1.0	0.6	0.7	0.7	1.3	1.1	1.4
	Glmm Wald III	1.7	1.3	0.7	0.8	1.1	0.7	0.9	1.0	0.6	0.7	0.7	1.3	1.1	1.4
	Glmm Fan&Zhang	1.2	2.0	1.2	0.9	0.8	0.3	0.9	0.8	0.6	0.6	0.9	0.8	0.7	0.8
	Gee Gosho/Wald	0.0	0	0.3	0.2	0.5	0.4	0.6		0.1	0.1	0.0	0.2	0.3	0.2
	Gee Gosho/F&Z	0.0	0	0.1	0.2	0.7	0.3	1.3		0.0	0.0	0.2	0.4	0.8	1.1
	Gee Gosho/Pan	0.4	0	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.3	0	0.0	0.0	0.0	0.0	0.0	2.2	0.3	0.1	0.0	0.0	0.0	0.0

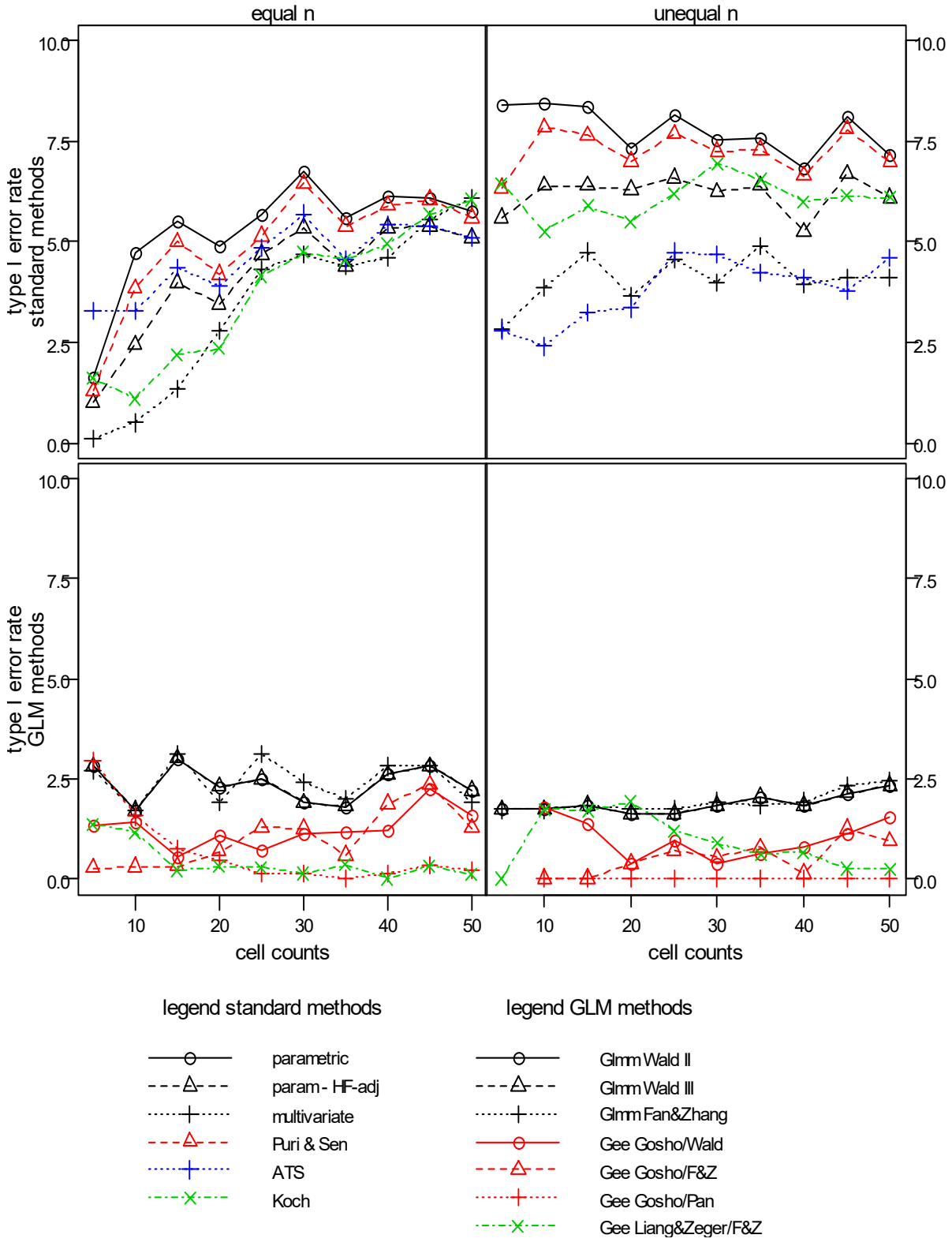
Graphic for α=0.05:



7. 9. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.65	4.75	5.50	4.90	6.75	6.15	5.75	8.40	8.45	8.35	7.35	7.55	6.85	7.15
	par./ HF-corr.	1.00	2.45	4.00	3.45	5.35	5.35	5.10	5.60	6.40	6.40	6.30	6.25	5.25	6.10
	multivariate	0.10	0.50	1.35	2.80	4.70	4.60	6.10	2.85	3.85	4.75	3.65	4.00	3.95	4.10
	Puri & Sen	1.30	3.85	5.00	4.20	6.45	5.90	5.60	6.35	7.85	7.65	7.00	7.25	6.65	7.00
	ATS	3.30	3.30	4.35	3.90	5.70	5.45	5.10	2.80	2.40	3.25	3.35	4.70	4.10	4.60
	Koch	1.60	1.10	2.20	2.35	4.75	4.95	6.05	6.45	5.25	5.90	5.50	6.95	6.00	6.10
	Glmm Wald II	2.8	1.7	3.0	2.3	1.9	2.6	2.2	1.7	1.7	1.8	1.6	1.8	1.8	2.3
	Glmm Wald III	2.8	1.7	3.0	2.3	1.9	2.6	2.2	1.7	1.7	1.8	1.6	1.8	1.8	2.3
	Glmm Fan&Zhang	2.7	1.7	3.1	1.9	2.4	2.8	1.9	1.7	1.7	1.8	1.7	1.9	1.9	2.4
	Gee Gosho/Wald	1.3	1.4	0.5	1.1	1.1	1.2	1.6		1.8	1.4	0.4	0.4	0.8	1.5
	Gee Gosho/F&Z	0.3	0.3	0.3	0.7	1.3	1.9	1.3		0.0	0.0	0.4	0.5	0.1	0.9
	Gee Gosho/Pan	3.0	1.6	0.7	0.5	0.1	0.1	0.2		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	1.4	1.2	0.2	0.3	0.1	0.0	0.1	0.0	1.7	1.7	1.9	0.9	0.6	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.35	0.60	0.90	0.70	1.55	1.35	1.55	3.35	2.85	2.45	2.45	2.25	2.00	2.30
	par./ HF-corr.	0.15	0.25	0.35	0.40	1.10	0.85	0.95	1.90	1.60	1.65	1.50	1.40	1.80	1.80
	multivariate	0.10	0.05	0.25	0.15	0.50	0.60	0.80	0.20	0.45	0.75	0.35	0.60	0.60	0.90
	Puri & Sen	0.05	0.40	0.55	0.45	1.30	1.10	1.45	2.00	2.15	1.95	2.10	2.00	1.95	2.05
	ATS	2.10	0.35	0.55	0.45	1.10	0.80	1.10	1.45	0.60	0.45	0.80	1.10	1.20	1.05
	Koch	1.55	0.90	1.50	0.45	0.40	0.65	0.80	4.15	1.40	1.55	1.55	1.85	1.75	2.10
	Glmm Wald II	2.7	1.3	1.5	1.4	0.8	0.4	0.8	1.7	1.7	1.8	1.6	1.8	1.6	1.7
	Glmm Wald III	2.7	1.3	1.5	1.4	0.8	0.4	0.8	1.7	1.7	1.8	1.6	1.8	1.6	1.7
	Glmm Fan&Zhang	2.5	0.9	1.7	1.2	1.0	0.4	0.6	1.7	1.7	1.7	1.6	1.7	1.6	1.8
	Gee Gosho/Wald	1.3	0.8	0.1	0.2	0.0	0.1	0.1		1.8	1.0	0.4	0.2	0.3	0.7
	Gee Gosho/F&Z	0.3	0.1	0.1	0.1	0.3	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.1
	Gee Gosho/Pan	2.6	0.5	0.2	0.2	0.0	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.8	1.2	0.2	0.3	0.0	0.0	0.1	0.0	1.7	1.7	1.9	0.9	0.6	0.2

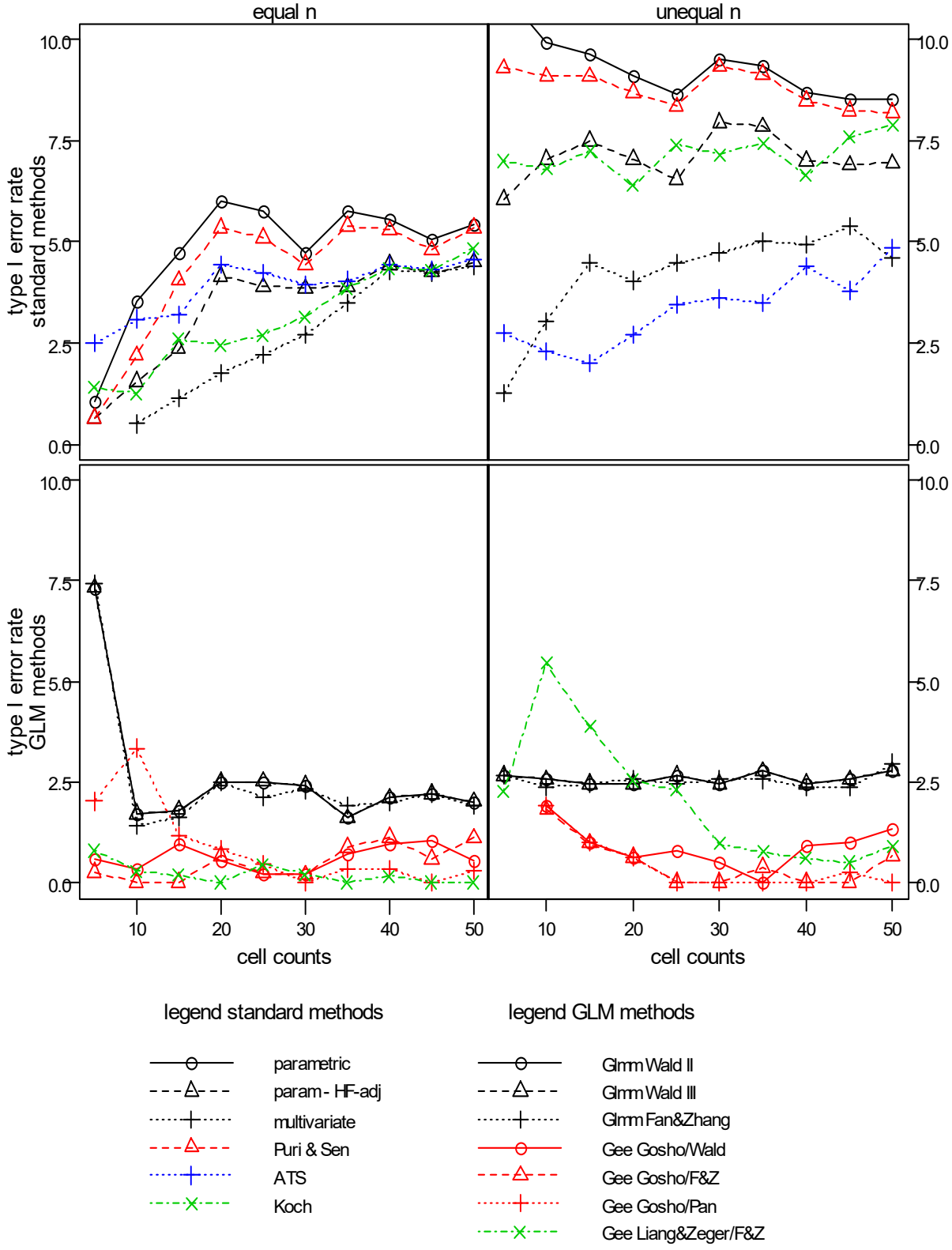
Graphic for α=0.05:



7. 9. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	1.05	3.55	4.75	6.00	4.75	5.55	5.45	11.20	9.95	9.65	9.10	9.50	8.70	8.55
	par./ HF-corr.	0.65	1.55	2.35	4.15	3.85	4.45	4.50	6.05	7.05	7.50	7.05	7.95	7.00	6.95
	multivariate	0.05	0.50	1.15	1.75	2.70	4.30	4.40	1.25	3.05	4.50	4.05	4.75	4.95	4.60
	Puri & Sen	0.65	2.20	4.05	5.35	4.45	5.30	5.35	9.30	9.10	9.10	8.70	9.35	8.50	8.20
	ATS	2.50	3.10	3.20	4.45	3.95	4.45	4.55	2.75	2.30	2.00	2.70	3.60	4.40	4.85
	Koch	1.40	1.25	2.60	2.45	3.15	4.35	4.85	7.00	6.80	7.25	6.40	7.15	6.65	7.90
	Glmm Wald II	7.3	1.7	1.8	2.5	2.4	2.1	2.0	2.7	2.6	2.5	2.5	2.5	2.5	2.8
	Glmm Wald III	7.3	1.7	1.8	2.5	2.4	2.1	2.0	2.7	2.6	2.5	2.5	2.5	2.5	2.8
	Glmm Fan&Zhang	7.4	1.4	1.6	2.5	2.3	2.0	1.9	2.7	2.4	2.5	2.6	2.6	2.4	3.0
	Gee Gosho/Wald	0.6	0.3	1.0	0.5	0.2	1.0	0.6		1.9	1.0	0.6	0.5	0.9	1.3
	Gee Gosho/F&Z	0.3	0.0	0.0	0.7	0.2	1.1	1.1		1.8	1.0	0.6	0.0	0.0	0.7
	Gee Gosho/Pan	2.0	3.3	1.1	0.8	0.0	0.3	0.3		1.9	1.0	0.6	0.0	0.0	0.0
	Gee Liang&Zeger	0.8	0.3	0.2	0.0	0.2	0.2	0.0	2.3	5.5	3.9	2.5	1.0	0.6	0.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.25	0.45	0.50	1.20	1.00	1.65	1.50	5.00	3.80	3.85	3.45	3.45	3.80	2.95
	par./ HF-corr.	0.05	0.05	0.10	0.25	0.30	1.05	0.85	2.90	2.30	2.50	2.05	2.60	2.60	2.40
	multivariate	0.05	0.05	0.05	0.15	0.15	0.25	0.30	0.05	0.50	0.80	0.55	0.90	1.20	0.90
	Puri & Sen	0.05	0.20	0.15	0.75	0.75	1.30	1.30	3.75	3.05	3.35	3.10	3.25	3.65	2.90
	ATS	1.50	1.25	0.20	0.50	0.40	1.10	0.90	1.10	0.40	0.60	0.20	0.60	0.70	1.00
	Koch	1.35	0.95	1.95	0.95	0.60	0.35	0.25	5.20	3.15	2.25	1.65	1.90	2.15	2.25
	Glmm Wald II	7.3	1.5	1.4	1.8	1.9	1.4	1.2	2.7	2.6	2.5	2.5	2.5	2.5	2.5
	Glmm Wald III	7.3	1.5	1.4	1.8	1.9	1.4	1.2	2.7	2.6	2.5	2.5	2.5	2.5	2.5
	Glmm Fan&Zhang	7.3	0.9	1.2	1.3	2.0	1.4	1.1	2.7	2.4	2.5	2.4	2.4	2.4	2.5
	Gee Gosho/Wald	0.6	0.3	0.4	0.1	0.0	0.3	0.1		1.9	1.0	0.6	0.5	0.0	0.4
	Gee Gosho/F&Z	0.3	0.0	0.0	0.0	0.0	0.0	0.1		1.8	1.0	0.6	0.0	0.0	0.0
	Gee Gosho/Pan	1.7	2.7	0.8	0.0	0.0	0.2	0.0		1.9	1.0	0.6	0.0	0.0	0.0
	Gee Liang&Zeger	0.8	0.3	0.2	0.0	0.2	0.2	0.0	2.3	3.6	3.9	2.5	1.0	0.6	0.9

Graphic for α=0.05:



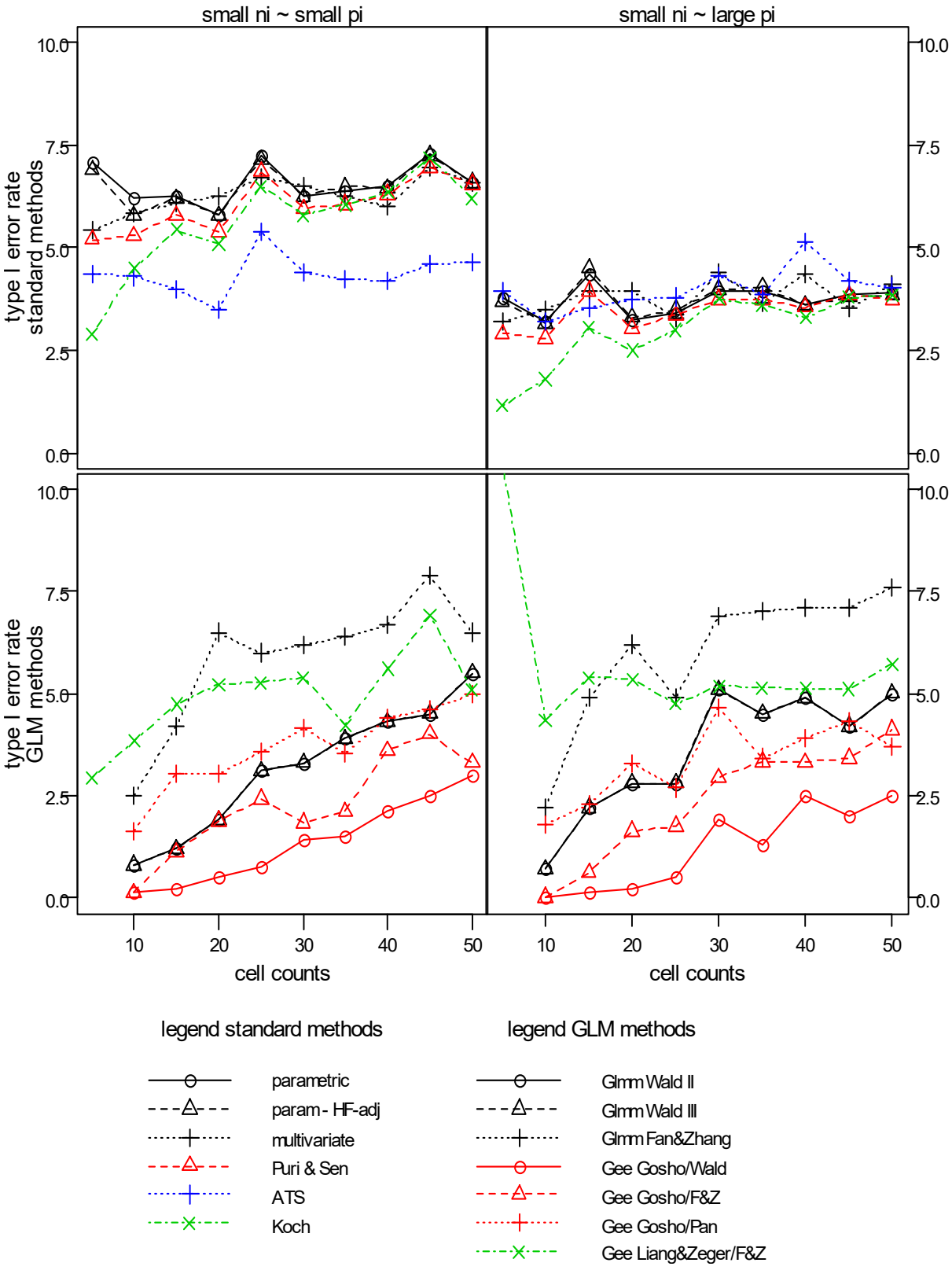
7. 10. Interaction AB - A significant (effects a_i = 0.6*s) small n_i ~ small p_i and small n_i ~ large p_i

7. 10. 1. equal correlations on B (r=0.3)

7. 10. 1. 1 p = 0.6

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	7.10	6.20	6.25	5.80	6.25	6.50	6.60	3.80	3.20	4.35	3.25	3.95	3.60	3.90
	par./ HF-corr.	6.90	5.80	6.20	5.80	6.25	6.45	6.60	3.70	3.15	4.50	3.30	4.00	3.60	3.85
	multivariate	5.45	5.85	6.10	6.25	6.50	6.00	6.60	3.20	3.50	3.95	3.95	4.40	4.35	4.10
	Puri & Sen	5.20	5.30	5.80	5.40	5.95	6.30	6.55	2.90	2.80	3.95	3.05	3.75	3.55	3.75
	ATS	4.35	4.30	4.00	3.50	4.40	4.20	4.65	3.95	3.20	3.55	3.75	4.30	5.15	4.05
	Koch	2.90	4.50	5.45	5.10	5.80	6.35	6.20	1.15	1.80	3.05	2.50	3.75	3.30	3.85
	Glmm Wald II	0.05	0.8	1.2	1.9	3.3	4.3	5.5		0.7	2.2	2.8	5.1	4.9	5.0
	Glmm Wald III	0.05	0.8	1.2	1.9	3.3	4.3	5.5		0.7	2.2	2.8	5.1	4.9	5.0
	Glmm Fan&Zhang	0.05	2.5	4.2	6.5	6.2	6.7	6.5		2.2	4.9	6.2	6.9	7.1	7.6
	Gee Gosho/Wald	0.05	0.1	0.2	0.5	1.4	2.1	3.0		0.0	0.1	0.2	1.9	2.5	2.5
	Gee Gosho/F&Z	0.05	0.1	1.1	1.9	1.8	3.6	3.3		0.0	0.6	1.6	2.9	3.3	4.1
	Gee Gosho/Pan	0.05	1.6	3.0	3.0	4.2	4.4	5.0		1.8	2.3	3.3	4.7	3.9	3.7
	Gee Liang&Zeger	2.9	3.8	4.7	5.2	5.4	5.6	5.1	10.6	4.4	5.4	5.3	5.2	5.1	5.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.20	1.50	1.25	1.10	1.80	1.25	1.45	0.90	0.40	0.95	0.40	0.30	1.20	0.55
	par./ HF-corr.	0.95	1.45	1.20	1.15	1.65	1.20	1.40	0.80	0.45	0.95	0.40	0.30	1.20	0.55
	multivariate	0.85	1.25	1.35	1.35	1.90	1.15	1.25	0.55	0.80	0.85	0.45	0.75	0.45	0.55
	Puri & Sen	0.50	1.10	0.95	0.90	1.50	1.05	1.40	0.20	0.15	0.70	0.30	0.25	1.05	0.55
	ATS	1.15	1.15	1.30	0.75	1.05	0.70	1.00	1.25	0.40	0.80	0.55	0.70	0.95	0.75
	Koch	0.15	0.50	0.80	0.70	1.45	1.00	1.05	0.10	0.15	0.35	0.15	0.35	1.00	0.45
	Glmm Wald II	0.05	0.6	0.5	0.8	1.7	1.5	1.8		0.7	1.1	1.4	2.9	2.3	1.5
	Glmm Wald III	0.05	0.6	0.5	0.8	1.7	1.5	1.8		0.7	1.1	1.4	2.9	2.3	1.5
	Glmm Fan&Zhang	0.05	0.8	1.2	2.0	2.1	2.7	2.7		0.6	1.9	2.7	3.6	3.2	2.6
	Gee Gosho/Wald	0.05	0.1	0.1	0.1	0.1	0.2	0.9		0.0	0.1	0.0	0.2	0.6	0.1
	Gee Gosho/F&Z	0.05	0.1	0.1	0.3	0.5	0.8	1.2		0.0	0.1	0.3	0.4	0.5	1.1
	Gee Gosho/Pan	0.05	0.1	0.3	0.4	0.4	0.8	1.1		0.0	0.4	0.2	1.0	0.9	0.5
	Gee Liang&Zeger	1.5	1.1	1.3	1.3	0.8	2.0	1.2	6.1	0.9	1.1	1.3	1.0	1.2	1.8

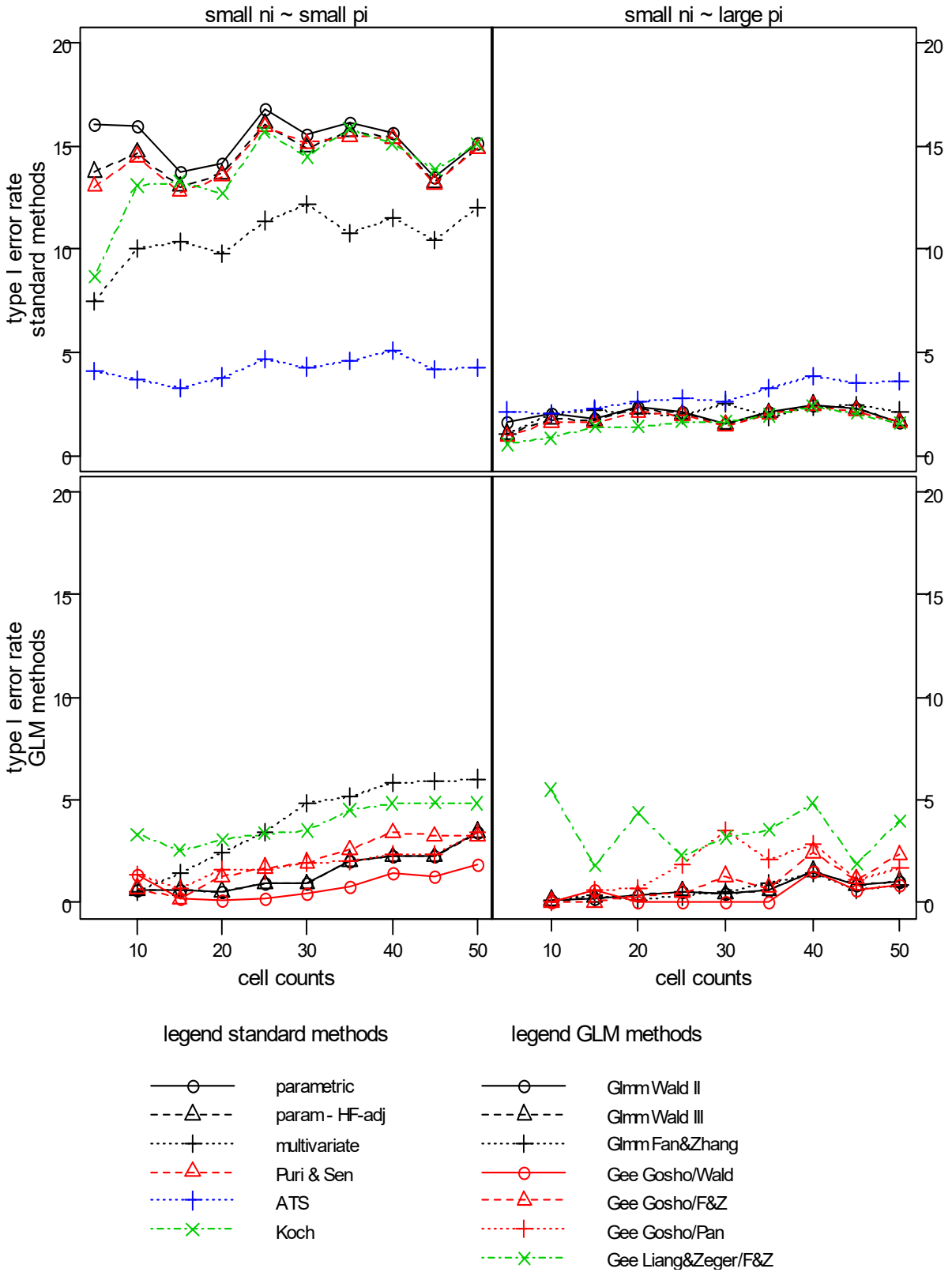
Graphic for α=0.05:



7. 10. 1. 2 p = 0.8

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	16.10	15.95	13.75	14.15	15.60	15.65	15.20	1.65	2.05	1.8	2.35	1.50	2.45	1.60
	par./ HF-corr.	13.75	14.70	13.05	13.65	14.95	15.40	14.90	1.05	1.80	1.7	2.25	1.50	2.45	1.65
	multivariate	7.45	10.05	10.35	9.80	12.20	11.55	12.05	1.00	2.00	2.2	2.00	2.50	2.35	2.15
	Puri & Sen	13.05	14.50	12.80	13.55	15.15	15.40	14.90	0.95	1.60	1.6	2.10	1.45	2.40	1.60
	ATS	4.10	3.70	3.30	3.80	4.30	5.10	4.25	2.15	2.00	2.3	2.65	2.65	3.85	3.60
	Koch	8.65	13.10	13.30	12.70	14.50	15.15	15.15	0.55	0.85	1.4	1.40	1.65	2.40	1.55
	Glmm Wald II	0.05	0.6	0.6	0.5	0.9	2.2	3.4		0.1	0.2	0.3	0.4	1.5	1.0
	Glmm Wald III	0.05	0.6	0.6	0.5	0.9	2.2	3.4		0.1	0.2	0.3	0.4	1.5	1.0
	Glmm Fan&Zhang	0.05	0.5	1.4	2.4	4.8	5.8	6.0		0.1	0.3	0.1	0.5	1.4	0.8
	Gee Gosho/Wald	0.05	1.3	0.2	0.1	0.4	1.4	1.8		0.0	0.6	0.0	0.0	1.5	0.8
	Gee Gosho/F&Z	0.05	0.7	0.2	1.2	1.9	3.4	3.2		0.0	0.0	0.3	1.3	2.4	2.3
	Gee Gosho/Pan	0.05	1.3	0.6	1.6	1.9	2.4	3.4		0.0	0.6	0.7	3.5	2.8	1.7
	Gee Liang&Zeger	0.05	3.3	2.5	3.0	3.5	4.8	4.8		5.5	1.8	4.3	3.2	4.8	4.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	6.50	6.25	5.15	4.70	5.65	5.35	4.80	0.30	0.40	0.30	0.35	0.2	0.5	0.45
	par./ HF-corr.	4.45	5.25	4.65	4.35	5.45	5.30	4.65	0.15	0.30	0.30	0.30	0.2	0.5	0.45
	multivariate	1.10	2.90	3.30	3.20	3.05	3.75	2.95	0.15	0.25	0.35	0.25	0.4	0.4	0.20
	Puri & Sen	4.00	4.85	4.50	4.30	5.25	5.20	4.65	0.10	0.20	0.25	0.30	0.2	0.5	0.40
	ATS	0.95	0.60	0.90	0.75	1.10	1.15	1.05	0.45	0.35	0.15	0.30	0.4	0.5	0.50
	Koch	2.35	2.75	3.80	3.10	4.45	4.85	4.80	0.25	0.05	0.10	0.20	0.1	0.4	0.40
	Glmm Wald II	0.05	0.6	0.6	0.5	0.5	0.6	1.1		0.1	0.2	0.1	0.2	0.2	0.4
	Glmm Wald III	0.05	0.6	0.6	0.5	0.5	0.6	1.1		0.1	0.2	0.1	0.2	0.2	0.4
	Glmm Fan&Zhang	0.05	0.4	0.7	1.0	1.5	1.4	1.9		0.1	0.1	0.1	0.3	0.3	0.2
	Gee Gosho/Wald	0.05	0.7	0.2	0.1	0.0	0.0	0.5		0.0	0.6	0.0	0.0	0.0	0.2
	Gee Gosho/F&Z	0.05	0.7	0.2	0.3	0.3	0.7	0.9		0.0	0.0	0.0	0.6	0.2	0.3
	Gee Gosho/Pan	0.05	1.3	0.2	0.1	0.2	0.3	0.5		0.0	0.0	0.0	0.0	0.9	0.2
	Gee Liang&Zeger	0.05	1.3	1.3	1.3	0.7	1.1	1.3	0.05	1.4	0.6	2.0	0.9	1.1	0.8

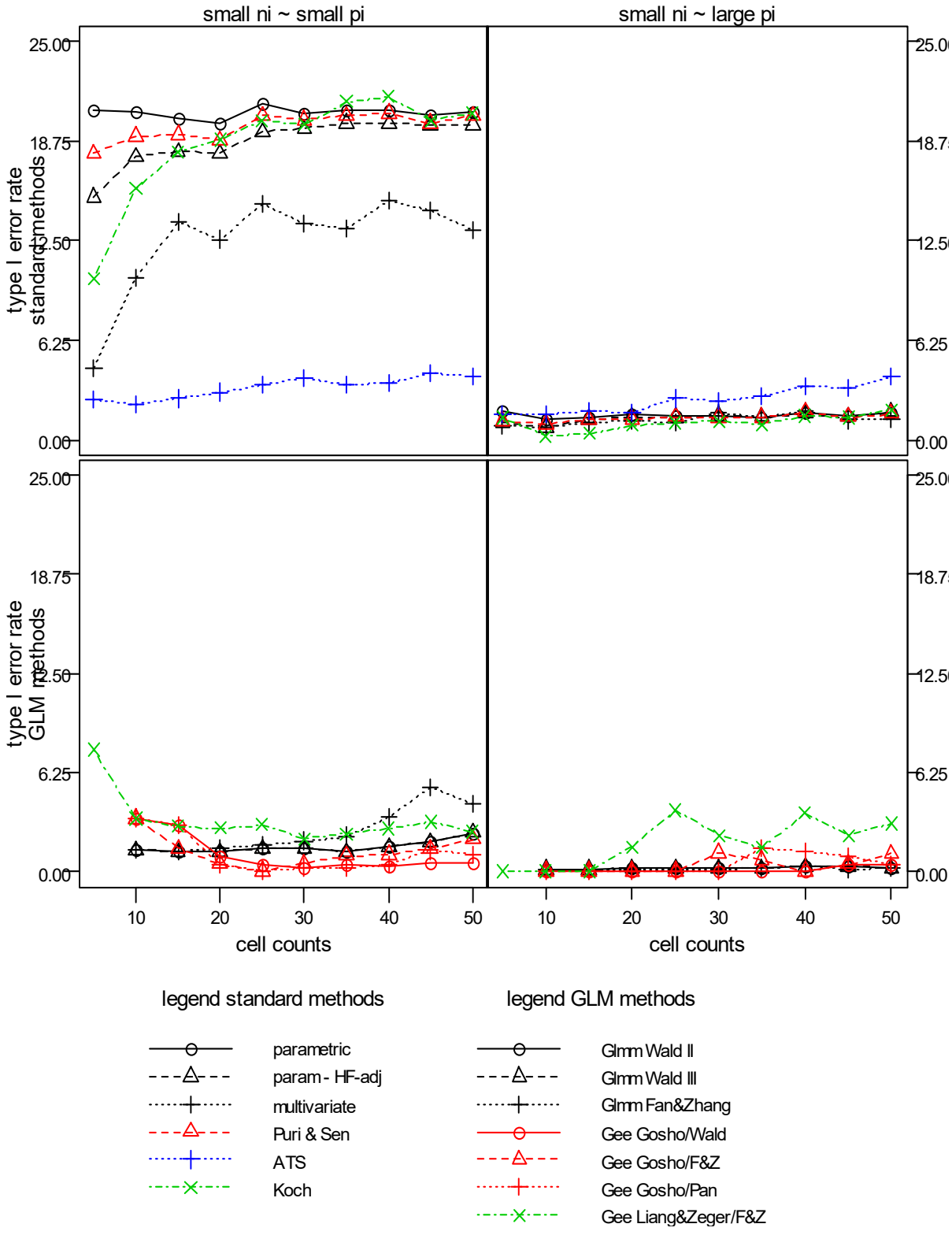
Graphic for α=0.05:



7. 10. 1. 3 p = 0.9

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	20.70	20.65	20.15	19.85	20.50	20.70	20.65	1.85	1.25	1.40	1.60	1.55	1.75	1.75
	par./ HF-corr.	15.25	17.80	18.10	18.00	19.55	19.85	19.80	1.10	0.80	1.30	1.45	1.50	1.65	1.75
	multivariate	4.50	10.20	13.65	12.60	13.55	15.05	13.20	0.90	0.80	1.10	1.20	1.70	1.80	1.30
	Puri & Sen	18.00	19.05	19.15	18.80	20.10	20.50	20.35	1.20	1.00	1.25	1.30	1.40	1.75	1.65
	ATS	2.55	2.25	2.60	3.00	3.85	3.55	3.95	1.60	1.65	1.85	1.70	2.45	3.40	4.00
	Koch	10.10	15.80	18.10	18.85	19.80	21.55	20.50	1.40	0.25	0.40	0.90	1.15	1.50	1.90
	Glmm Wald II		1.3	1.2	1.2	1.4	1.5	2.4		0.1	0.1	0.2	0.2	0.3	0.2
	Glmm Wald III		1.3	1.2	1.2	1.4	1.5	2.4		0.1	0.1	0.2	0.2	0.3	0.2
	Glmm Fan&Zhang		1.3	1.2	1.4	1.9	3.4	4.3		0.1	0.1	0.1	0.1	0.3	0.2
	Gee Gosho/Wald		3.3	2.9	0.9	0.3	0.3	0.5		0.0	0.0	0.0	0.0	0.0	0.4
	Gee Gosho/F&Z		3.3	1.4	0.5	0.5	1.1	2.0		0.0	0.0	0.0	1.1	0.0	1.1
	Gee Gosho/Pan		3.3	2.9	0.5	0.3	0.5	1.1		0.0	0.0	0.0	0.0	1.2	0.4
	Gee Liang&Zeger	7.7	3.3	2.9	2.7	2.0	2.7	2.5	0	0.0	0.0	1.5	2.3	3.7	3.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	9.65	8.60	8.30	7.45	8.40	8.15	8.20	0.35	0.15	0.05	0.20	0.10	0.20	0.15
	par./ HF-corr.	6.45	6.90	7.15	6.65	7.50	7.95	7.95	0.25	0.05	0.05	0.15	0.05	0.20	0.10
	multivariate	0.70	0.45	0.45	0.80	0.75	0.55	0.65	0.45	0.05	0.10	0.30	0.20	0.50	0.45
	Puri & Sen	5.05	6.45	6.80	6.50	7.10	7.70	7.80	0.25	0.10	0.05	0.15	0.05	0.25	0.15
	ATS	0.45	2.40	3.55	3.40	4.35	5.20	4.55	0.05	0.10	0.05	0.15	0.15	0.25	0.15
	Koch	4.00	4.60	6.55	6.00	6.45	6.90	8.00	1.15	0.05	0.10	0.05	0.05	0.15	0.20
	Glmm Wald II		1.3	1.2	1.2	1.4	1.5	1.4		0.1	0.1	0.2	0.2	0.2	0.1
	Glmm Wald III		1.3	1.2	1.2	1.4	1.5	1.4		0.1	0.1	0.2	0.2	0.2	0.1
	Glmm Fan&Zhang		1.2	1.2	1.3	1.5	2.0	2.2		0.1	0.1	0.1	0.1	0.1	0.2
	Gee Gosho/Wald		3.3	2.9	0.9	0.0	0.2	0.0		0.0	0.0	0.0	0.0	0.0	0.4
	Gee Gosho/F&Z		3.3	1.4	0.5	0.3	0.3	0.4		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Gosho/Pan		3.3	1.4	0.5	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	7.7	3.3	2.9	1.8	1.5	0.8	0.6	0	0.0	0.0	1.5	0.0	2.5	1.1

Graphic for α=0.05:

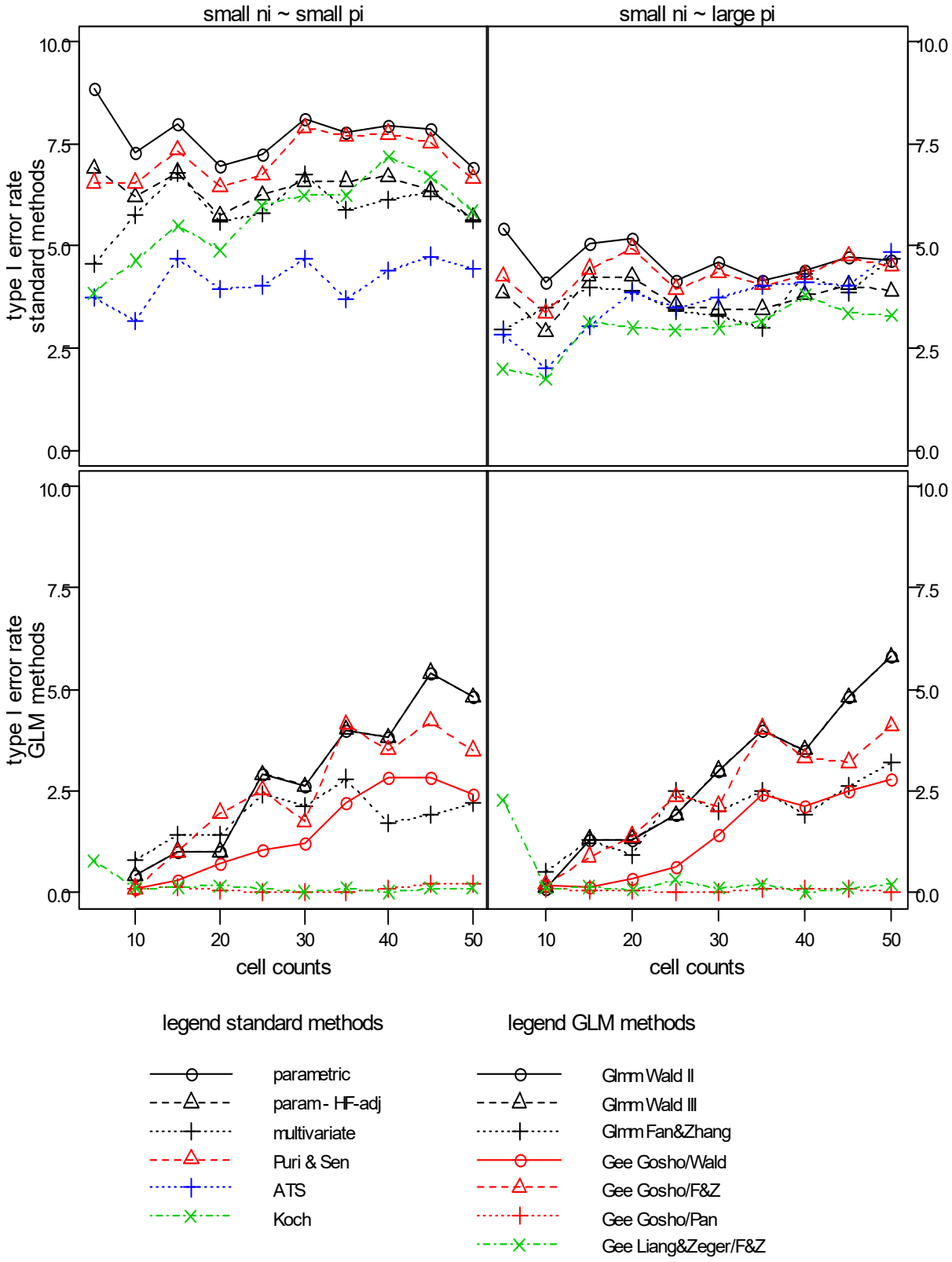


7. 10. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2)

7. 10. 2. 1 p = 0.6

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	8.85	7.30	8.00	6.95	8.10	7.95	6.90	5.45	4.10	5.05	5.20	4.60	4.4	4.65
	par./ HF-corr.	6.90	6.20	6.80	5.75	6.60	6.70	5.70	3.85	2.90	4.25	4.25	3.45	3.8	3.90
	multivariate	4.55	5.75	6.80	5.60	6.75	6.15	5.65	2.95	3.50	4.00	3.90	3.30	4.3	4.70
	Puri & Sen	6.55	6.55	7.35	6.45	7.90	7.75	6.65	4.25	3.35	4.45	4.95	4.35	4.3	4.50
	ATS	3.75	3.15	4.70	3.95	4.70	4.40	4.45	2.85	2.00	3.05	3.85	3.75	4.1	4.85
	Koch	3.85	4.65	5.50	4.90	6.25	7.20	5.85	2.00	1.75	3.15	3.00	3.00	3.8	3.30
	Glmm Wald II	0.05	0.4	1.0	1.0	2.6	3.8	4.8		0.1	1.3	1.3	3.0	3.5	5.8
	Glmm Wald III	0.05	0.4	1.0	1.0	2.6	3.8	4.8		0.1	1.3	1.3	3.0	3.5	5.8
	Glmm Fan&Zhang	0.05	0.8	1.4	1.4	2.1	1.7	2.2		0.5	1.3	0.9	2.0	1.9	3.2
	Gee Gosho/Wald	0.05	0.1	0.3	0.7	1.2	2.8	2.4		0.2	0.1	0.3	1.4	2.1	2.8
	Gee Gosho/F&Z	0.05	0.1	1.0	2.0	1.7	3.5	3.5		0.2	0.9	1.4	2.1	3.3	4.1
	Gee Gosho/Pan	0.05	0.1	0.1	0.1	0.0	0.1	0.2		0.1	0.1	0.1	0.0	0.1	0.0
	Gee Liang&Zeger	0.8	0.1	0.1	0.2	0.0	0.0	0.1	2.3	0.1	0.1	0.1	0.1	0.0	0.2
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	2.45	2.40	2.15	2.00	2.60	2.85	1.90	1.30	0.60	1.10	1.40	1.35	1.20	1.25
	par./ HF-corr.	1.50	1.70	1.65	1.50	1.75	2.25	1.45	0.70	0.35	0.85	1.10	0.90	0.85	0.90
	multivariate	1.00	1.20	1.50	0.85	1.40	1.55	1.20	0.20	0.30	0.65	0.85	0.80	0.80	0.60
	Puri & Sen	1.45	1.90	1.90	1.80	2.45	2.70	1.80	0.55	0.45	1.00	1.25	1.20	1.10	1.15
	ATS	0.75	0.65	0.95	0.85	1.05	1.10	1.10	1.05	0.50	0.70	0.85	0.90	0.85	0.90
	Koch	1.60	0.70	0.85	0.80	1.15	1.55	0.80	0.90	0.15	0.30	0.60	0.30	0.65	0.75
	Glmm Wald II	0.05	0.3	0.5	0.3	0.6	1.1	1.1		0.1	0.2	0.3	0.8	1.1	1.8
	Glmm Wald III	0.05	0.3	0.5	0.3	0.6	1.1	1.1		0.1	0.2	0.3	0.8	1.1	1.8
	Glmm Fan&Zhang	0.05	0.4	0.5	0.3	0.7	0.7	0.7		0.2	0.3	0.3	0.8	1.0	1.5
	Gee Gosho/Wald	0.05	0.1	0.1	0.1	0.1	0.5	0.6		0.1	0.1	0.1	0.1	0.8	0.6
	Gee Gosho/F&Z	0.05	0.1	0.1	0.4	0.4	0.3	0.7		0.1	0.1	0.2	0.3	0.5	1.1
	Gee Gosho/Pan	0.05	0.1	0.1	0.1	0.0	0.0	0.0		0.1	0.1	0.1	0.0	0.0	0.0
	Gee Liang&Zeger	0.8	0.1	0.1	0.1	0.0	0.0	0.0	2.3	0.1	0.1	0.1	0.0	0.0	0.0

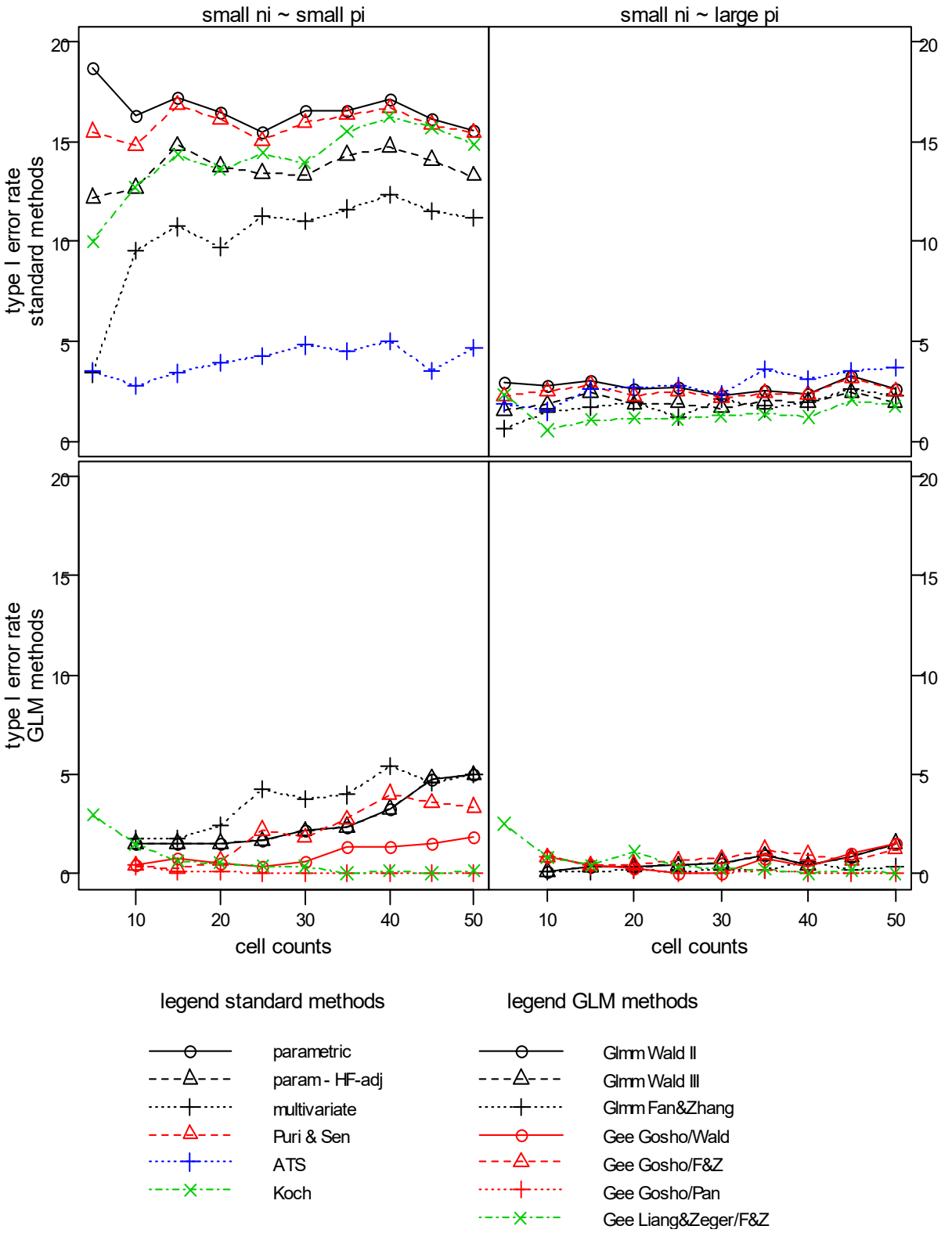
Graphic for α=0.05:



7. 10. 2. 2 p = 0.8

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	18.7	16.30	17.25	16.50	16.55	17.15	15.60	2.90	2.75	3.05	2.60	2.30	2.40	2.60
	par./ HF-corr.	12.2	12.70	14.80	13.75	13.35	14.75	13.30	1.55	1.85	2.45	1.85	1.65	1.95	1.95
	multivariate	3.4	9.55	10.75	9.75	11.00	12.35	11.20	0.60	1.45	1.70	1.95	2.10	1.95	2.25
	Puri & Sen	15.5	14.80	16.85	16.15	15.95	16.70	15.45	2.25	2.50	2.80	2.30	2.20	2.35	2.50
	ATS	3.5	2.75	3.40	3.90	4.80	5.00	4.70	1.90	1.50	2.60	2.70	2.35	3.10	3.65
	Koch	10.0	12.75	14.35	13.60	13.95	16.25	14.90	2.35	0.55	1.05	1.15	1.25	1.20	1.75
	Glmm Wald II		1.5	1.5	1.5	2.1	3.2	5.0		0.1	0.3	0.3	0.5	0.4	1.5
	Glmm Wald III		1.5	1.5	1.5	2.1	3.2	5.0		0.1	0.3	0.3	0.5	0.4	1.5
	Glmm Fan&Zhang		1.7	1.7	2.4	3.8	5.4	5.0		0.1	0.1	0.2	0.2	0.6	0.3
	Gee Gosho/Wald		0.4	0.8	0.5	0.6	1.3	1.8		0.8	0.4	0.2	0.0	0.4	1.5
	Gee Gosho/F&Z		0.4	0.2	0.6	1.8	4.0	3.3		0.8	0.4	0.4	0.7	0.9	1.2
	Gee Gosho/Pan		0.4	0.1	0.1	0.0	0.0	0.0		0.8	0.4	0.2	0.0	0.0	0.0
	Gee Liang&Zeger	2.9	1.5	0.6	0.5	0.3	0.1	0.1	2.5	0.8	0.4	1.1	0.2	0.0	0.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	8.55	6.35	7.00	6.45	5.90	7.15	6.40	0.75	0.65	0.60	0.60	0.50	0.45	0.55
	par./ HF-corr.	4.15	3.70	4.40	4.60	4.55	5.50	4.70	0.35	0.25	0.40	0.30	0.30	0.25	0.35
	multivariate	0.45	2.00	3.25	2.60	3.05	3.40	3.10	0.05	0.05	0.20	0.25	0.10	0.30	0.30
	Puri & Sen	5.45	4.90	5.90	5.85	5.55	6.80	6.10	0.30	0.40	0.55	0.50	0.40	0.45	0.55
	ATS	1.35	0.45	0.55	0.55	1.05	1.50	1.05	0.25	0.15	0.20	0.45	0.25	0.45	0.90
	Koch	5.25	2.85	4.10	3.00	4.50	5.85	4.95	2.25	0.15	0.15	0.05	0.05	0.20	0.25
	Glmm Wald II		1.5	1.5	1.5	1.5	1.5	1.7		0.1	0.1	0.1	0.1	0.2	0.4
	Glmm Wald III		1.5	1.5	1.5	1.5	1.5	1.7		0.1	0.1	0.1	0.1	0.2	0.4
	Glmm Fan&Zhang		1.5	1.6	1.5	1.9	2.2	1.8		0.1	0.1	0.1	0.2	0.1	0.2
	Gee Gosho/Wald		0.4	0.5	0.2	0.1	0.3	0.2		0.8	0.4	0.2	0.0	0.2	0.0
	Gee Gosho/F&Z		0.4	0.2	0.2	0.3	1.1	0.9		0.8	0.4	0.4	0.2	0.4	0.0
	Gee Gosho/Pan		0.4	0.1	0.1	0.0	0.0	0.0		0.8	0.4	0.2	0.0	0.0	0.0
	Gee Liang&Zeger	2.9	1.5	0.5	0.5	0.1	0.0	0.0	2.5	0.8	0.4	1.1	0.2	0.0	0.0

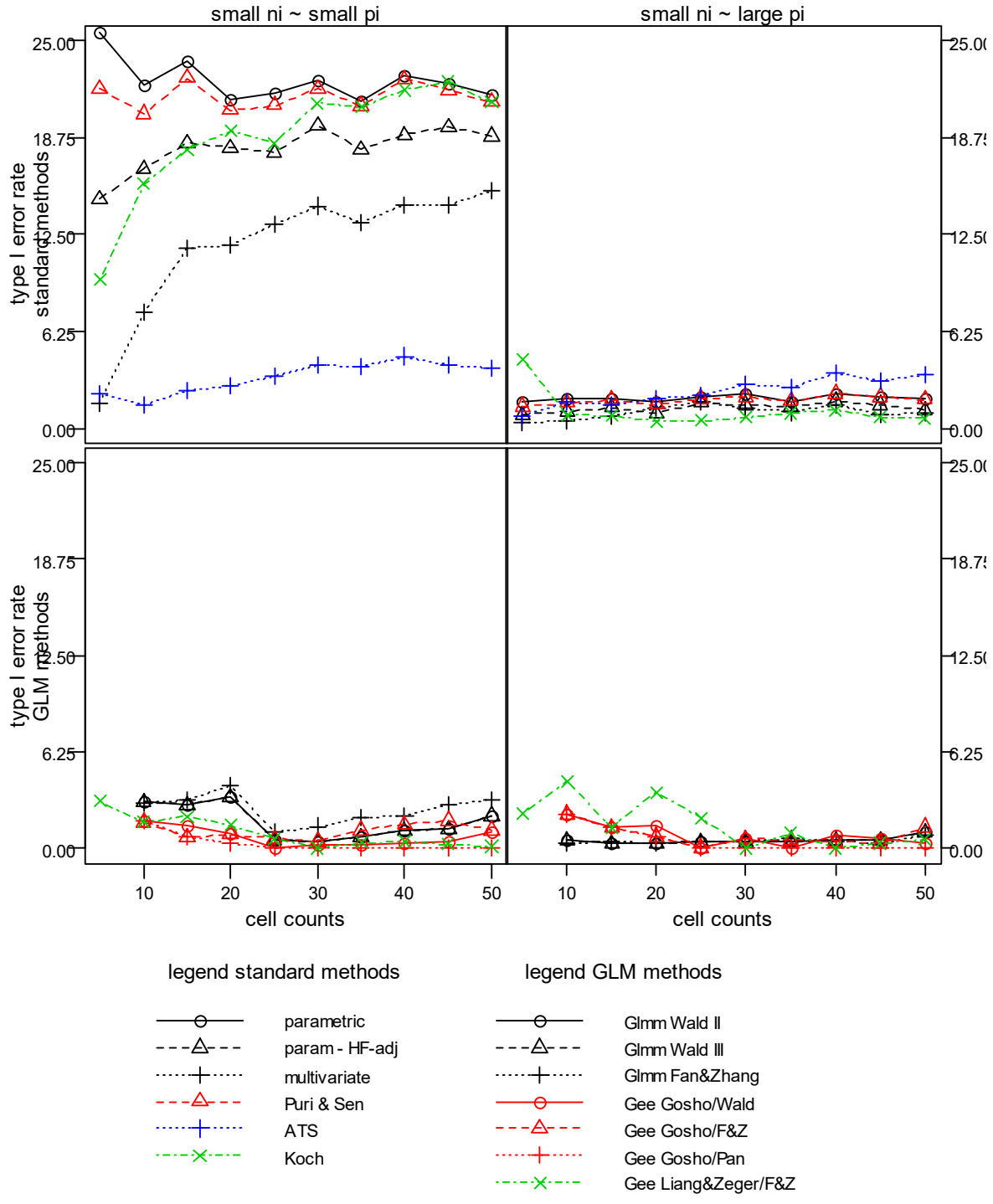
Graphic for α=0.05:



7. 10. 2. 3 p = 0.9

		small n_i ~ small p_i (levels = 4*5)							small n_i ~ large p_i (levels = 4*5)						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	25.55	22.10	23.70	21.25	22.45	22.75	21.50	1.75	1.90	1.95	1.70	2.20	2.25	1.90
	par./ HF-corr.	14.80	16.75	18.40	18.10	19.55	18.90	18.85	0.85	1.10	1.35	0.95	1.50	1.75	1.15
	multivariate	1.65	7.50	11.65	11.80	14.35	14.45	15.35	0.35	0.50	0.80	1.35	1.25	1.50	1.00
	Puri & Sen	21.90	20.30	22.60	20.55	21.90	22.55	21.05	1.40	1.65	1.85	1.55	2.05	2.25	1.85
	ATS	2.20	1.50	2.45	2.75	4.05	4.65	3.90	0.80	1.70	1.55	1.90	2.80	3.55	3.45
	Koch	9.60	15.80	18.00	19.20	21.00	21.85	21.05	4.45	0.85	0.80	0.45	0.70	1.15	0.65
	Glmm Wald II		3.0	2.8	3.3	0.4	1.1	2.1		0.5	0.3	0.3	0.4	0.5	1.0
	Glmm Wald III		3.0	2.8	3.3	0.4	1.1	2.1		0.5	0.3	0.3	0.4	0.5	1.0
	Glmm Fan&Zhang		2.9	3.1	4.0	1.4	2.1	3.1		0.3	0.4	0.3	0.4	0.4	0.8
	Gee Gosho/Wald		1.8	1.4	0.9	0.2	0.3	1.0		2.2	1.4	1.5	0.6	0.8	0.3
	Gee Gosho/F&Z		1.7	0.7	0.9	0.4	1.5	1.2		2.2	1.3	0.7	0.6	0.4	1.4
	Gee Gosho/Pan		1.8	0.7	0.3	0.0	0.0	0.0		2.2	1.4	0.7	0.0	0.0	0.0
	Gee Liang&Zeger	3	1.7	2.1	1.5	0.0	0.4	0.1	2.2	4.3	1.3	3.6	0.0	0.0	0.6
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	12.05	10.60	10.65	10.45	10.50	10.60	9.55	0.50	0.35	0.50	0.20	0.30	0.45	0.40
	par./ HF-corr.	4.70	6.25	6.30	7.05	7.65	7.60	7.15	0.05	0.20	0.15	0.10	0.25	0.30	0.20
	multivariate	0.30	1.05	2.35	3.50	4.00	4.85	4.55	0.05	0.05	0.05	0.30	0.30	0.20	0.10
	Puri & Sen	8.50	9.00	9.00	9.95	10.00	10.15	9.45	0.25	0.25	0.45	0.20	0.30	0.40	0.30
	ATS	1.25	0.30	0.45	0.25	0.85	0.90	0.90	0.05	0.25	0.25	0.15	0.15	0.70	0.40
	Koch	6.45	7.00	7.00	6.55	7.80	8.10	8.50	4.35	0.70	0.25	0.05	0.05	0.15	0.05
	Glmm Wald II		3.0	2.8	3.3	0.3	0.2	0.3		0.5	0.3	0.3	0.3	0.3	0.6
	Glmm Wald III		3.0	2.8	3.3	0.3	0.2	0.3		0.5	0.3	0.3	0.3	0.3	0.6
	Glmm Fan&Zhang		2.9	2.9	3.2	0.5	0.5	0.3		0.3	0.3	0.3	0.3	0.3	0.4
	Gee Gosho/Wald		1.8	1.4	0.9	0.0	0.0	0.3		2.2	1.4	1.5	0.0	0.0	0.0
	Gee Gosho/F&Z		1.7	0.7	0.6	0.0	0.1	0.1		2.2	1.3	0.7	0.0	0.0	0.0
	Gee Gosho/Pan		1.8	0.7	0.3	0.0	0.0	0.0		2.2	1.4	0.7	0.0	0.0	0.0
	Gee Liang&Zeger	3	1.7	1.4	1.2	0.0	0.4	0.1	2.2	4.3	1.3	3.6	0.0	0.0	0.6

Graphic for α=0.05:



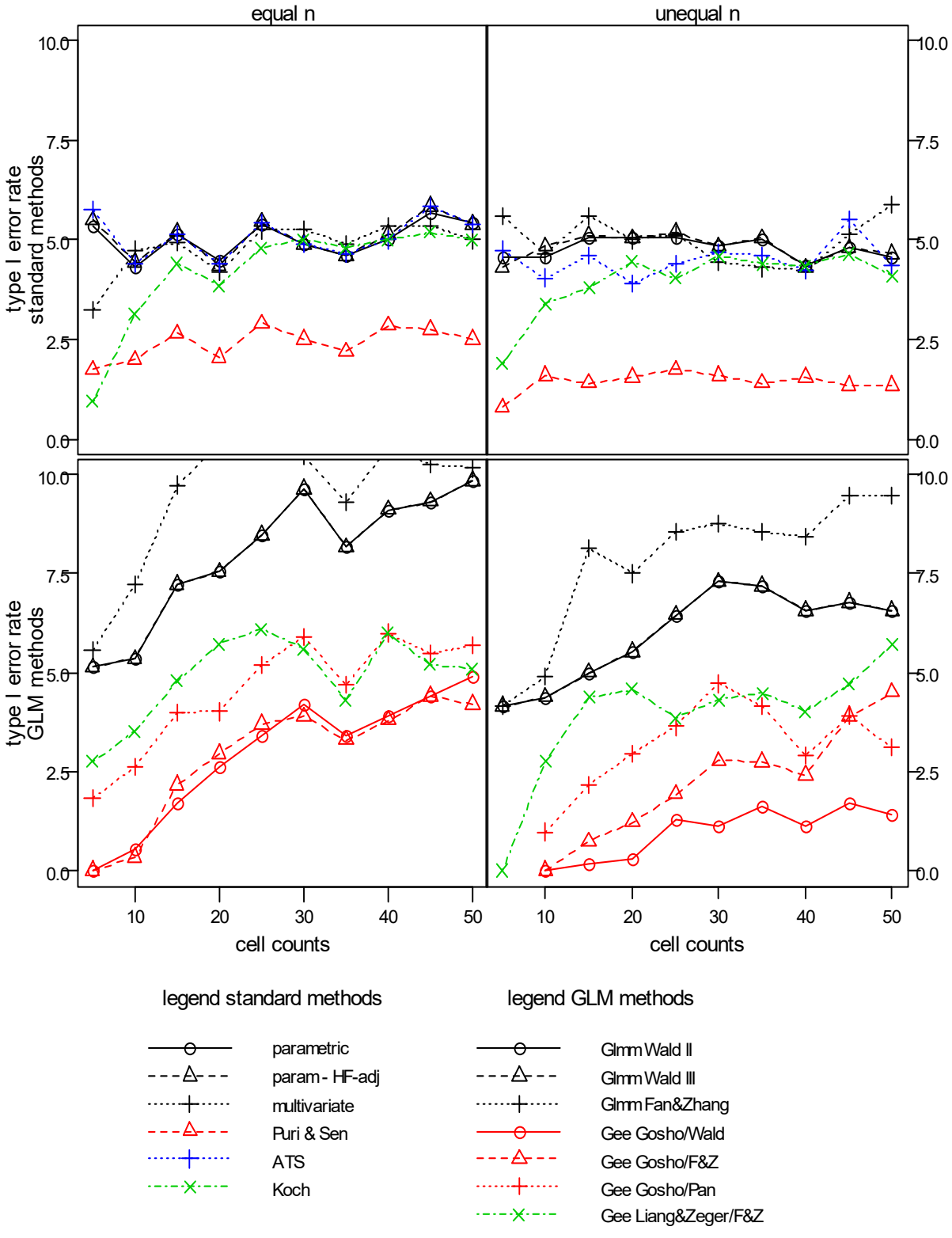
7. 11. Interaction AB - B significant (effects b_i = 0.6*s)

7. 11. 1. equal correlations on B (r=0.3)

7. 11. 1. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	5.35	4.30	5.15	4.50	4.90	5.00	5.45	4.55	4.55	5.05	5.05	4.85	4.35	4.55
	par./ HF-corr.	5.50	4.45	5.20	4.35	4.90	5.15	5.40	4.30	4.85	5.10	5.05	4.85	4.30	4.65
	multivariate	3.25	4.75	4.95	4.20	5.25	5.35	5.00	5.60	4.65	5.60	5.00	4.45	4.25	5.90
	Puri & Sen	1.75	2.00	2.65	2.05	2.50	2.85	2.50	0.80	1.60	1.40	1.55	1.60	1.55	1.35
	ATS	5.75	4.40	5.15	4.40	4.90	5.00	5.40	4.75	4.05	4.60	3.90	4.70	4.25	4.35
	Koch	0.95	3.15	4.40	3.85	5.00	5.00	5.00	1.90	3.40	3.80	4.45	4.60	4.35	4.10
	Glmm Wald II	5.1	5.3	7.2	7.5	9.6	9.1	9.8	4.2	4.4	5.0	5.5	7.3	6.6	6.6
	Glmm Wald III	5.1	5.3	7.2	7.5	9.6	9.1	9.8	4.2	4.4	5.0	5.5	7.3	6.6	6.6
	Glmm Fan&Zhang	5.5	7.2	9.7	10.8	10.5	10.7	10.2	4.2	4.9	8.1	7.5	8.8	8.4	9.5
	Gee Gosho/Wald	0.0	0.6	1.7	2.6	4.2	3.9	4.9		0.0	0.1	0.3	1.1	1.1	1.4
	Gee Gosho/F&Z	0.0	0.3	2.2	3.0	3.9	3.8	4.2		0.0	0.7	1.2	2.8	2.4	4.5
	Gee Gosho/Pan	1.8	2.6	4.0	4.0	5.9	6.0	5.7		1.0	2.2	3.0	4.7	2.9	3.1
	Gee Liang&Zeger	2.8	3.5	4.8	5.7	5.6	6.0	5.1	0.0	2.8	4.4	4.6	4.3	4.0	5.7
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.75	0.65	1.05	1.05	0.80	1.25	0.85	0.75	1.00	0.80	1.00	1.10	0.55	0.70
	par./ HF-corr.	0.80	0.70	1.10	1.05	0.85	1.30	0.85	0.85	0.95	0.85	1.00	1.05	0.60	0.75
	multivariate	0.45	0.75	1.40	0.95	1.05	1.50	0.90	1.05	0.80	1.00	1.25	0.95	0.85	1.00
	Puri & Sen	0.10	0.25	0.55	0.45	0.25	0.55	0.35		0.15	0.30	0.15	0.25	0.05	0.15
	ATS	1.05	0.80	1.20	1.10	0.90	1.30	0.85	1.70	1.20	1.10	0.80	1.25	0.90	0.95
	Koch	0.25	0.25	0.60	0.55	0.70	0.95	0.80	0.05	0.45	0.65	0.60	0.55	0.45	0.50
	Glmm Wald II	4.9	4.8	4.9	5.1	5.4	6.0	5.7	4.2	4.2	4.3	4.3	4.5	4.2	4.4
	Glmm Wald III	4.9	4.8	4.9	5.1	5.4	6.0	5.7	4.2	4.2	4.3	4.3	4.5	4.2	4.4
	Glmm Fan&Zhang	4.9	5.1	5.9	5.5	6.1	6.1	6.4	4.2	4.2	4.9	4.7	5.4	5.2	5.6
	Gee Gosho/Wald	0.0	0.6	1.7	2.6	4.2	3.9	4.9		0.0	0.1	0.1	0.1	0.0	0.2
	Gee Gosho/F&Z	0.0	0.3	2.2	3.0	3.9	3.8	4.2		0.0	0.1	0.1	0.6	0.8	1.2
	Gee Gosho/Pan	1.8	2.6	4.0	4.0	5.9	6.0	5.7		0.0	0.2	0.3	0.5	0.1	0.2
	Gee Liang&Zeger	2.8	3.5	4.8	5.7	5.6	6.0	5.1	0.0	0.6	1.2	0.6	1.2	1.2	1.4

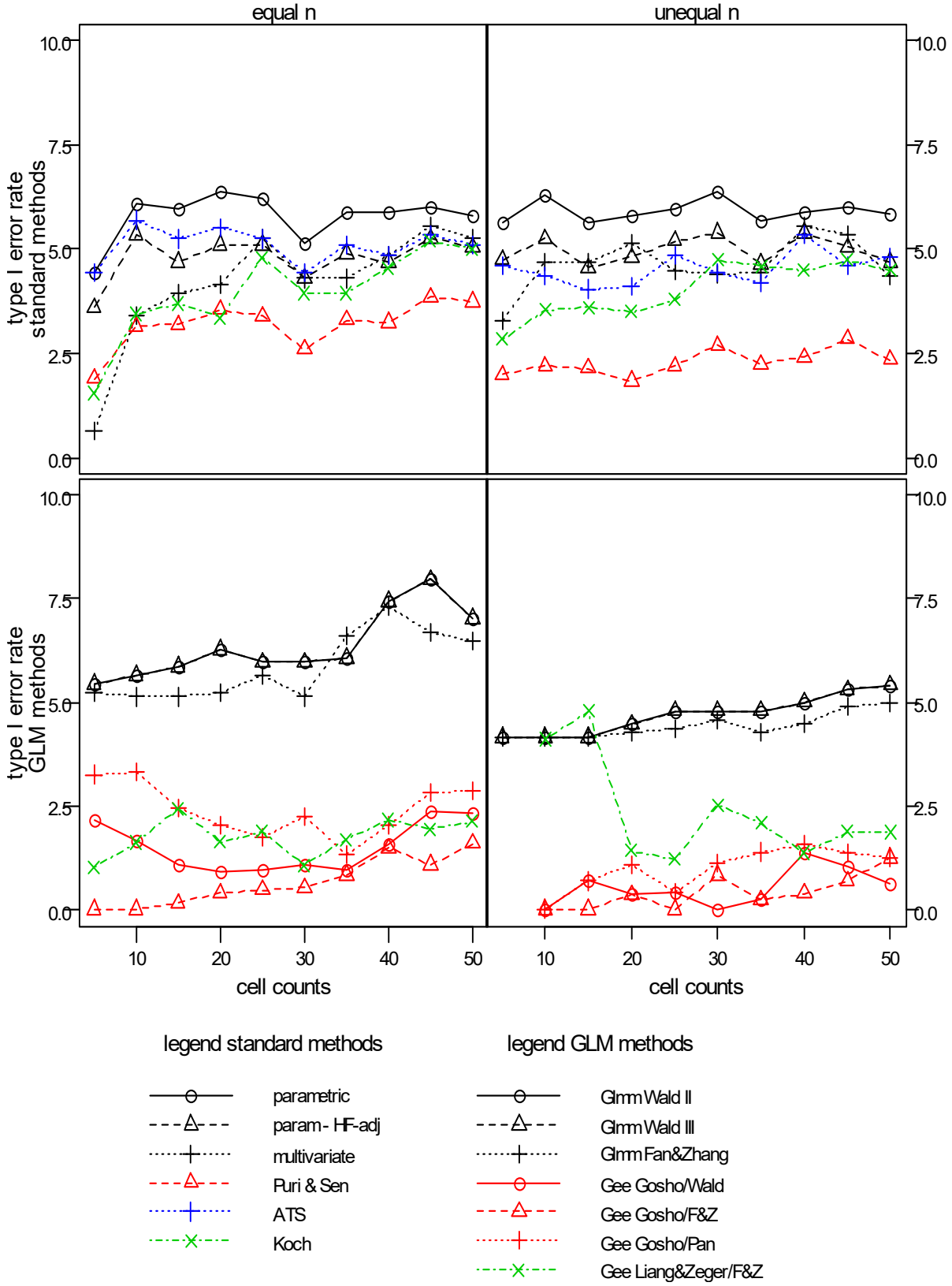
Graphic for α=0.05:



7. 11. 1. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.45	6.10	5.95	6.40	5.15	5.90	5.80	5.65	6.30	5.65	5.80	6.40	5.90	5.85
	par./ HF-corr.	3.60	5.35	4.70	5.10	4.30	4.70	5.05	4.75	5.25	4.55	4.80	5.40	5.40	4.70
	multivariate	0.65	3.40	3.95	4.15	4.30	4.85	5.25	3.30	4.70	4.70	5.15	4.40	5.55	4.35
	Puri & Sen	1.90	3.15	3.20	3.55	2.60	3.25	3.75	2.00	2.20	2.15	1.85	2.70	2.40	2.35
	ATS	4.45	5.70	5.25	5.50	4.45	4.85	5.10	4.60	4.35	4.05	4.10	4.45	5.35	4.80
	Koch	1.55	3.45	3.70	3.35	3.95	4.55	5.00	2.85	3.55	3.60	3.50	4.75	4.50	4.50
	Glmm Wald II	5.4	5.7	5.9	6.3	6.0	7.4	7.0	4.2	4.2	4.2	4.5	4.8	5.0	5.4
	Glmm Wald III	5.4	5.7	5.9	6.3	6.0	7.4	7.0	4.2	4.2	4.2	4.5	4.8	5.0	5.4
	Glmm Fan&Zhang	5.2	5.1	5.1	5.2	5.1	7.3	6.5	4.2	4.2	4.2	4.3	4.6	4.5	5.0
	Gee Gosho/Wald	2.2	1.7	1.1	0.9	1.1	1.6	2.3		0.0	0.7	0.4	0.0	1.4	0.6
	Gee Gosho/F&Z	0.0	0.0	0.2	0.4	0.5	1.5	1.6		0.0	0.0	0.4	0.8	0.4	1.2
	Gee Gosho/Pan	3.3	3.3	2.5	2.0	2.3	2.0	2.9		0.0	0.7	1.1	1.1	1.6	1.2
	Gee Liang&Zeger	1.0	1.6	2.4	1.6	1.1	2.2	2.1		4.1	4.8	1.4	2.5	1.4	1.9
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.25	1.45	1.85	1.75	1.05	1.05	1.80	1.70	1.70	1.60	1.05	1.65	1.45	1.30
	par./ HF-corr.	0.55	0.95	1.15	1.20	0.85	0.85	1.10	1.05	1.25	1.00	0.85	1.35	1.10	1.05
	multivariate	0.15	0.55	0.75	0.60	0.70	0.75	1.10	0.80	1.10	0.85	1.10	1.05	1.10	0.90
	Puri & Sen	0.20	0.40	0.60	0.65	0.50	0.60	0.85	0.35	0.50	0.50	0.15	0.45	0.45	0.55
	ATS	1.10	1.55	1.40	1.30	1.00	0.90	1.15	2.60	0.80	1.05	0.50	1.30	1.20	1.10
	Koch	1.35	1.45	0.80	0.30	0.50	0.70	0.90	1.35	0.75	0.55	0.40	0.55	0.55	1.05
	Glmm Wald II	5.3	5.1	5.3	5.3	4.9	5.5	5.1	4.2	4.2	4.2	4.2	4.3	4.3	4.5
	Glmm Wald III	5.3	5.1	5.3	5.3	4.9	5.5	5.1	4.2	4.2	4.2	4.2	4.3	4.3	4.5
	Glmm Fan&Zhang	5.2	5.0	4.9	5.1	4.7	5.3	5.1	4.2	4.2	4.2	4.2	4.4	4.2	4.4
	Gee Gosho/Wald	2.2	1.7	1.1	0.9	1.1	1.6	2.3		0.0	0.7	0.4	0.0	0.4	0.0
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	1.5	0.0		0.0	0.0	0.0	0.3	0.0	0.3
	Gee Gosho/Pan	3.3	3.3	2.5	2.0	2.3	2.0	2.9		0.0	0.0	0.0	0.0	0.8	0.3
	Gee Liang&Zeger	1.0	1.6	2.4	1.6	1.1	2.2	2.1		2.7	4.8	1.4	1.7	0.6	0.3

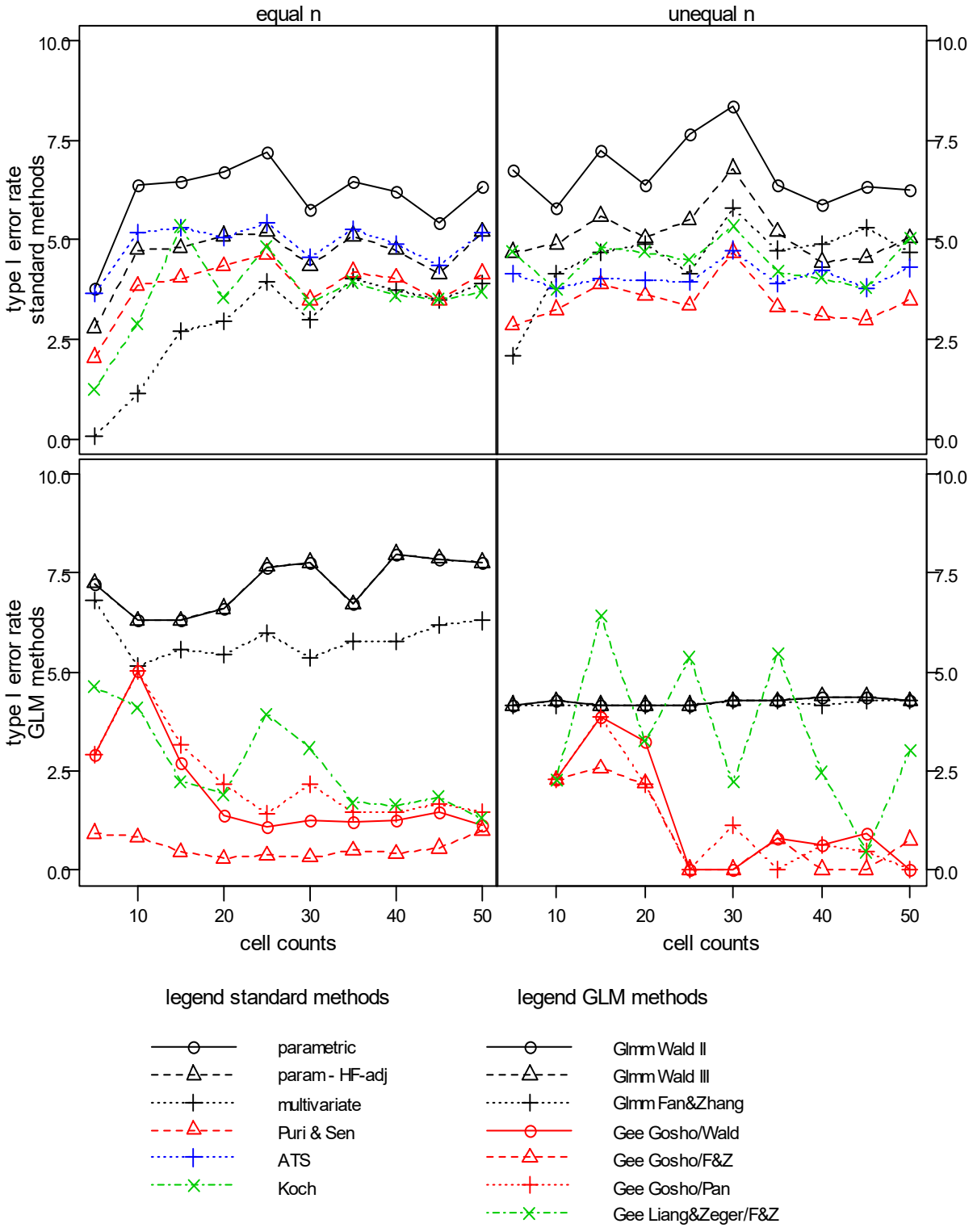
Graphic for α=0.05:



7. 11. 1. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.80	6.40	6.45	6.70	5.75	6.20	6.35	6.75	5.80	7.25	6.40	8.35	5.90	6.25
	par./ HF-corr.	2.80	4.75	4.80	5.10	4.35	4.75	5.20	4.70	4.90	5.60	5.05	6.80	4.45	5.05
	multivariate	0.05	1.15	2.70	2.95	3.00	3.75	3.90	2.10	4.15	4.70	4.90	5.80	4.90	4.70
	Puri & Sen	2.05	3.85	4.05	4.35	3.50	4.05	4.15	2.85	3.25	3.90	3.60	4.70	3.10	3.50
	ATS	3.65	5.20	5.30	5.05	4.55	4.90	5.20	4.15	3.80	4.05	4.00	4.75	4.25	4.30
	Koch	1.25	2.90	5.35	3.55	3.40	3.60	3.70	4.70	3.75	4.80	4.70	5.35	4.05	5.05
	Glmm Wald II	7.2	6.3	6.3	6.6	7.8	8.0	7.8	4.2	4.3	4.2	4.2	4.3	4.4	4.3
	Glmm Wald III	7.2	6.3	6.3	6.6	7.8	8.0	7.8	4.2	4.3	4.2	4.2	4.3	4.4	4.3
	Glmm Fan&Zhang	6.8	5.1	5.6	5.5	5.4	5.8	6.3	4.2	4.2	4.2	4.2	4.3	4.2	4.3
	Gee Gosho/Wald	2.9	5.0	2.7	1.4	1.2	1.2	1.1		2.3	3.8	3.3	0.0	0.6	0.0
	Gee Gosho/F&Z	0.9	0.8	0.4	0.3	0.3	0.4	1.0		2.3	2.6	2.2	0.0	0.0	0.8
	Gee Gosho/Pan	2.9	5.0	3.2	2.2	2.2	1.4	1.5		2.3	3.8	2.2	1.1	0.6	0.0
	Gee Liang&Zeger	4.6	4.1	2.2	1.9	3.1	1.6	1.3		2.3	6.4	3.3	2.2	2.5	3.0
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.65	1.35	2.15	1.95	1.45	1.35	1.70	2.20	1.90	2.15	1.75	2.35	1.45	1.4
	par./ HF-corr.	0.55	0.50	1.25	0.90	0.80	0.70	1.00	1.35	1.00	1.10	1.20	1.40	0.95	0.9
	multivariate	0.05	0.15	0.20	0.30	0.50	0.35	0.45	0.35	0.65	0.90	0.55	1.15	1.00	1.1
	Puri & Sen	0.05	0.45	1.00	0.85	0.75	0.75	0.95	0.65	0.45	0.90	1.00	0.95	0.60	0.6
	ATS	0.95	0.65	1.55	1.20	0.90	0.80	1.20	2.25	0.85	0.75	0.45	0.80	0.50	0.7
	Koch	1.25	2.10	3.25	1.20	0.85	0.50	0.50	3.45	1.45	1.35	1.20	1.25	0.55	0.9
	Glmm Wald II	7.1	5.6	5.7	5.5	5.9	6.2	5.9	4.2	4.3	4.2	4.2	4.2	4.2	4.2
	Glmm Wald III	7.1	5.6	5.7	5.5	5.9	6.2	5.9	4.2	4.3	4.2	4.2	4.2	4.2	4.2
	Glmm Fan&Zhang	6.8	5.1	5.4	5.2	5.1	5.4	5.8	4.2	4.2	4.2	4.2	4.2	4.2	4.2
	Gee Gosho/Wald	1.0	4.2	1.8	1.1	0.6	0.2	0.5		2.3	3.8	3.3	0.0	0.6	0.0
	Gee Gosho/F&Z	0.9	0.8	0.4	0.3	0.3	0.2	0.2		2.3	2.6	2.2	0.0	0.0	0.0
	Gee Gosho/Pan	2.9	4.2	1.4	1.1	0.6	0.2	0.5		2.3	3.8	2.2	0.0	0.0	0.0
	Gee Liang&Zeger	1.9	4.1	1.8	1.9	2.5	1.2	0.5		2.3	5.1	3.3	1.1	2.5	2.6

Graphic for α=0.05:

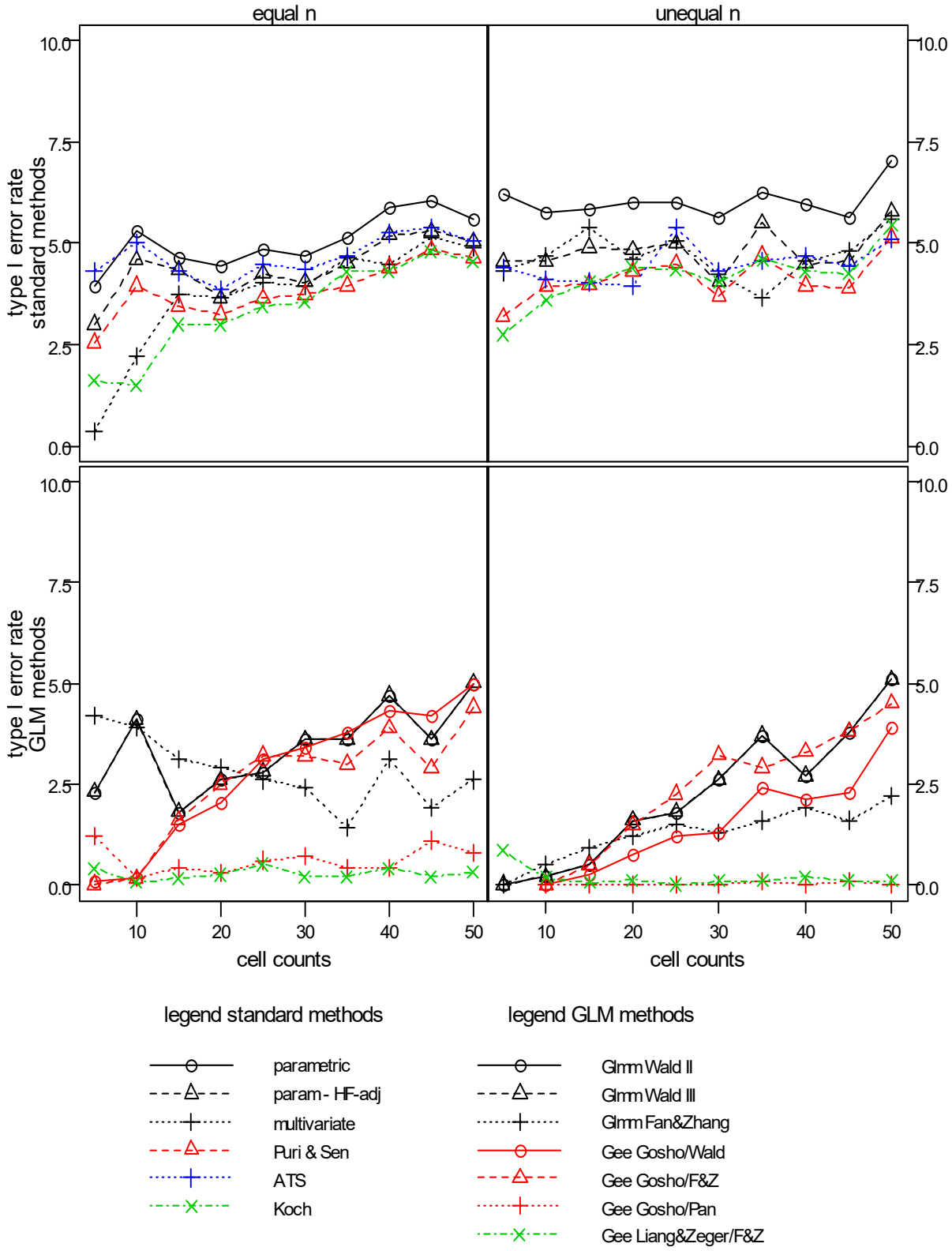


7. 11. 2. unequal correlations on B (r = 0.7, 0.5, 0.4, 0.2) (effects b_i = 0.3*s)

7. 11. 2. 1 p = 0.5

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	4.10	6.35	4.15	5.10	5.25	5.20	5.65	6.40	5.70	5.60	6.15	5.50	5.55	6.30
	par./ HF-corr.	3.45	5.50	3.90	4.45	4.80	4.65	5.40	5.20	4.60	4.55	5.30	4.70	4.90	5.30
	multivariate	0.50	2.90	3.35	4.05	3.90	4.50	4.95	4.00	4.80	5.40	5.40	4.30	4.40	5.40
	Puri & Sen	1.90	3.95	2.35	3.00	3.50	3.25	3.80	2.90	3.15	3.05	3.75	3.95	3.25	4.15
	ATS	4.80	5.95	4.10	4.55	4.95	4.75	5.40	4.55	4.35	4.15	4.10	4.40	4.70	5.35
	Koch	1.35	2.75	2.65	3.20	3.45	4.40	4.80	2.95	2.95	4.00	3.50	3.70	3.45	4.80
	Glmm Wald II	2.1	5.7	1.9	2.4	3.9	3.7	4.3	0.1	0.4	0.9	1.0	2.9	2.4	4.5
	Glmm Wald III	2.1	5.7	1.9	2.4	3.9	3.7	4.3	0.1	0.4	0.9	1.0	2.9	2.4	4.5
	Glmm Fan&Zhang	3.5	6.7	2.4	1.8	2.1	1.5	2.3	0.0	0.3	0.5	1.4	1.2	1.1	1.1
	Gee Gosho/Wald	0.1	0.2	1.5	2.1	3.4	4.3	5.0		0.0	0.2	0.7	1.3	2.1	3.9
	Gee Gosho/F&Z	0.0	0.2	1.6	2.5	3.2	3.9	4.4		0.0	0.5	1.5	3.2	3.3	4.5
	Gee Gosho/Pan	1.2	0.2	0.4	0.3	0.7	0.4	0.8		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.4	0.1	0.2	0.3	0.2	0.4	0.3	0.8	0.2	0.1	0.1	0.1	0.2	0.1
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.90	1.30	0.95	1.10	0.95	1.20	1.05	1.60	1.85	1.50	1.45	1.45	1.3	2.15
	par./ HF-corr.	0.45	0.90	0.65	0.70	0.65	0.90	0.85	1.15	1.30	1.05	1.00	1.05	0.8	1.55
	multivariate	0.10	0.25	0.25	0.45	0.55	0.60	0.55	0.45	1.00	1.00	0.80	0.65	0.8	1.25
	Puri & Sen	0.25	0.55	0.35	0.50	0.45	0.55	0.50	0.30	0.95	0.65	0.75	0.90	0.6	1.20
	ATS	1.10	1.30	0.85	0.90	0.80	0.90	0.90	1.85	0.65	1.10	1.05	1.10	0.8	1.65
	Koch	1.15	0.85	0.20	0.30	0.50	0.40	0.55	0.95	0.60	0.60	0.50	0.95	0.6	1.05
	Glmm Wald II	0.7	2.5	0.9	0.4	0.3	0.5	0.7	0.1	0.0	0.1	0.0	0.5	0.5	0.1
	Glmm Wald III	0.7	2.5	0.9	0.4	0.3	0.5	0.7	0.1	0.0	0.1	0.0	0.5	0.5	0.1
	Glmm Fan&Zhang	0.9	2.8	0.8	0.3	0.4	0.2	0.5	0.0	0.0	0.0	0.0	0.2	0.1	0.0
	Gee Gosho/Wald	0.1	0.0	0.3	0.1	0.7	0.8	0.8		0.0	0.0	0.2	0.1	0.4	0.2
	Gee Gosho/F&Z	0.0	0.0	0.2	0.3	0.4	1.2	1.0		0.0	0.1	0.3	0.3	0.8	1.2
	Gee Gosho/Pan	0.4	0.1	0.0	0.0	0.0	0.0	0.1		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.2	0.1	0.0	0.0	0.0	0.0

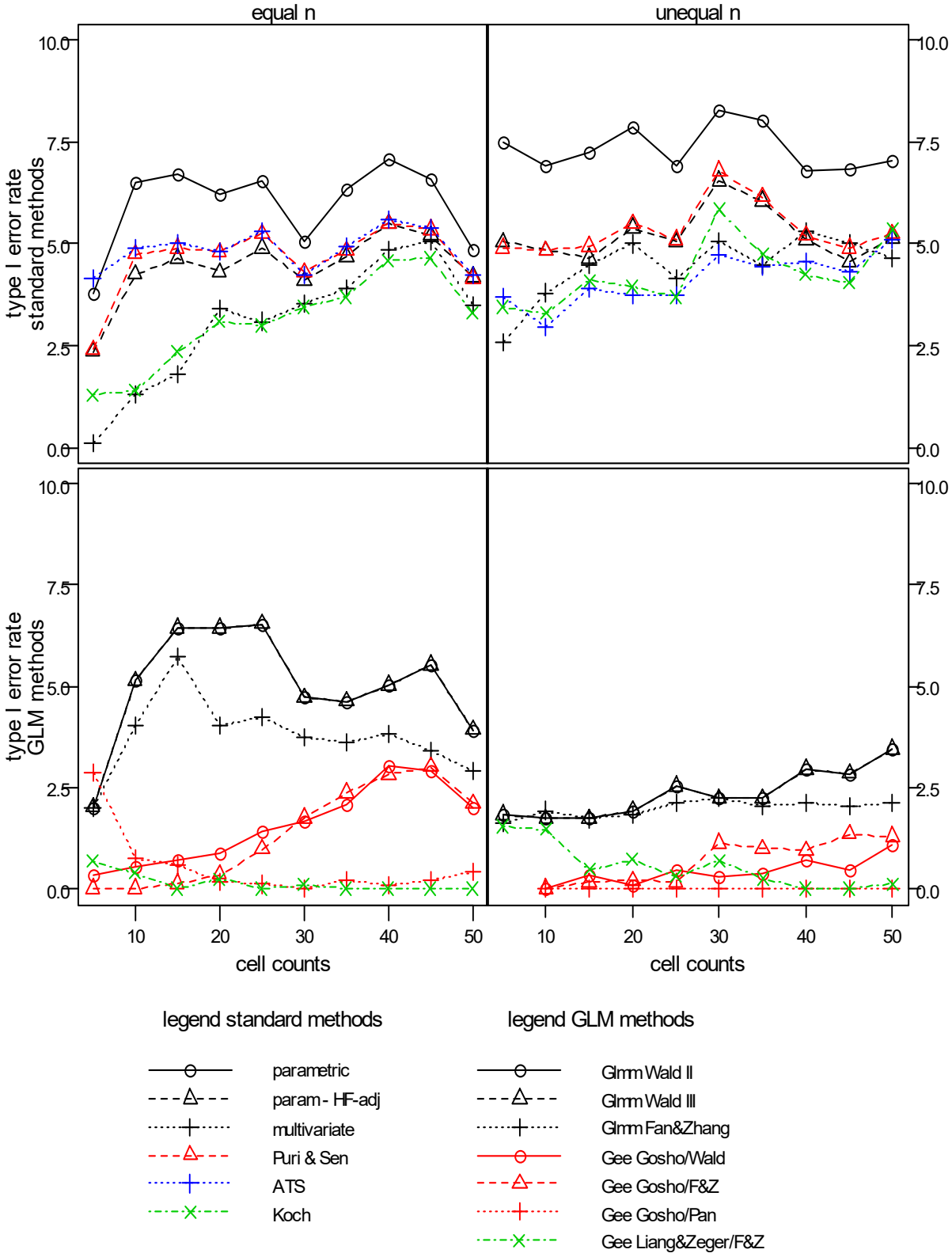
Graphic for α=0.05:



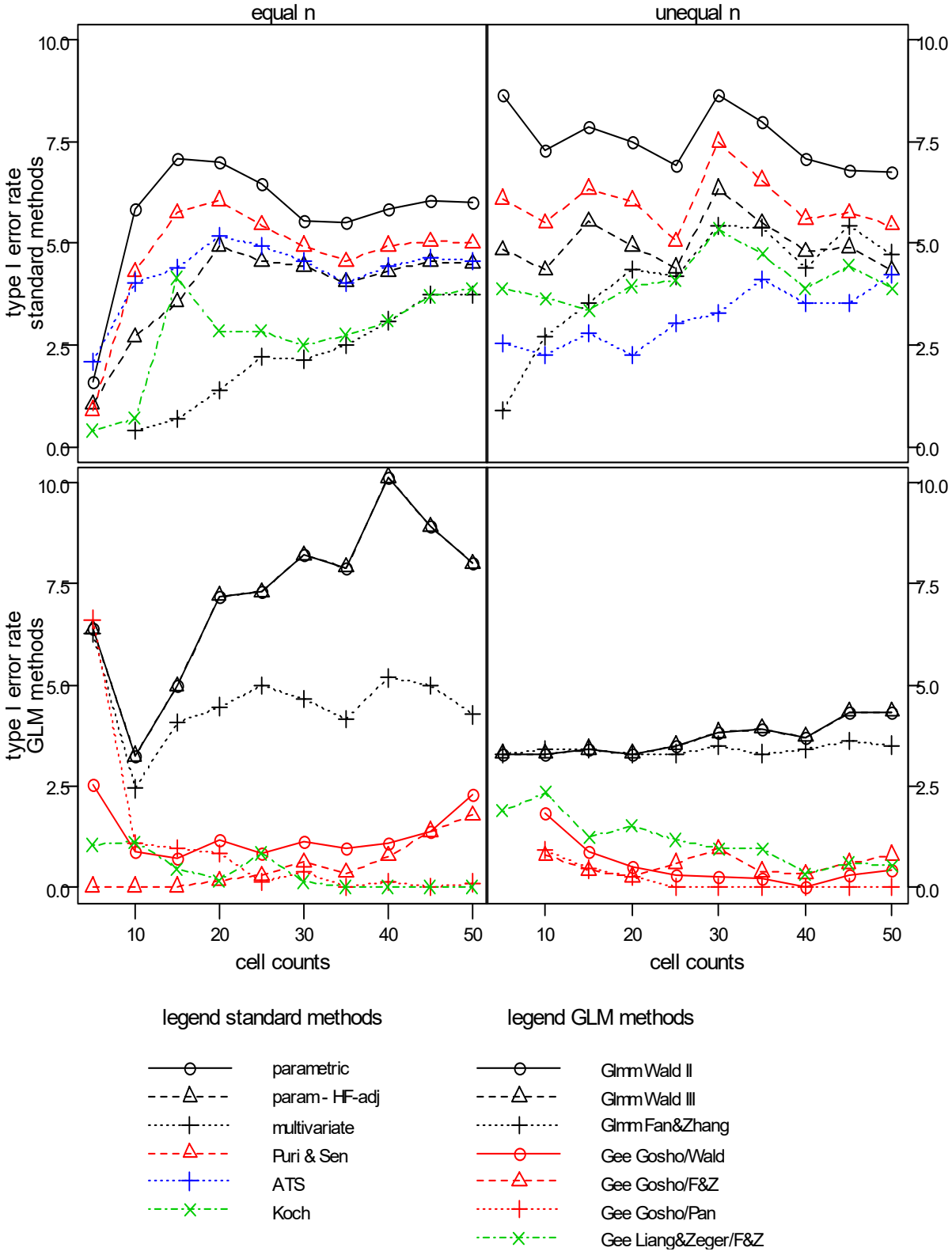
7. 11. 2. 2 p = 0.8

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	3.80	6.15	6.55	5.85	5.90	6.65	4.55	7.60	6.60	7.55	7.70	7.65	6.75	7.00
	par./ HF-corr.	2.40	3.80	4.55	4.20	4.60	5.50	3.70	5.35	4.70	5.05	5.55	5.55	5.10	5.20
	multivariate	0.05	1.00	2.20	2.60	3.85	5.15	3.60	2.30	4.20	4.85	4.85	4.15	4.80	4.90
	Puri & Sen	2.30	4.25	4.70	4.00	4.30	5.35	3.55	4.75	4.35	4.75	5.55	5.60	5.10	4.90
	ATS	3.95	4.95	5.20	4.50	4.80	5.70	3.70	4.30	3.00	4.00	3.95	4.10	4.45	4.55
	Koch	0.95	1.60	3.50	2.80	3.25	4.90	3.45	3.65	3.20	4.05	4.00	5.30	5.05	4.70
	Glmm Wald II	2.0	5.1	6.4	6.4	4.7	5.0	3.9	1.8	1.7	1.7	1.9	2.2	2.9	3.5
	Glmm Wald III	2.0	5.1	6.4	6.4	4.7	5.0	3.9	1.8	1.7	1.7	1.9	2.2	2.9	3.5
	Glmm Fan&Zhang	2.0	4.0	5.7	4.0	3.7	3.8	2.9	1.6	1.9	1.7	1.8	2.2	2.1	2.1
	Gee Gosho/Wald	0.3	0.5	0.7	0.9	1.7	3.0	2.0		0.0	0.3	0.1	0.3	0.7	1.1
	Gee Gosho/F&Z	0.0	0.0	0.1	0.3	1.8	2.8	2.1		0.0	0.2	0.2	1.1	0.9	1.3
	Gee Gosho/Pan	2.9	0.7	0.6	0.2	0.0	0.1	0.4		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.7	0.4	0.0	0.2	0.1	0.0	0.0	1.5	1.5	0.5	0.7	0.7	0.0	0.1
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	1.10	1.40	1.90	1.05	1.35	1.95	1.70	3.00	2.05	2.45	2.30	2.00	2.20	2.00
	par./ HF-corr.	0.35	0.35	0.85	0.65	0.65	1.15	1.00	1.35	1.05	1.15	0.95	1.05	1.50	1.05
	multivariate	0.05	0.10	0.20	0.45	0.35	0.75	0.75	0.35	1.00	1.00	0.95	0.85	0.65	1.00
	Puri & Sen	0.25	0.60	0.90	0.75	0.85	1.10	1.00	1.10	1.15	1.20	0.95	1.10	1.50	1.20
	ATS	1.00	0.90	1.30	0.85	0.75	1.30	1.05	2.25	0.45	0.65	0.50	0.85	0.85	1.05
	Koch	0.95	1.05	1.75	0.90	0.30	0.65	0.70	2.05	0.70	0.90	0.70	0.75	0.95	0.85
	Glmm Wald II	1.7	2.9	3.0	1.9	1.8	1.4	1.7	1.7	1.6	1.7	1.6	1.7	2.1	2.1
	Glmm Wald III	1.7	2.9	3.0	1.9	1.8	1.4	1.7	1.7	1.6	1.7	1.6	1.7	2.1	2.1
	Glmm Fan&Zhang	1.6	2.1	2.6	1.7	1.3	1.2	1.3	1.6	1.6	1.7	1.7	1.7	1.8	1.9
	Gee Gosho/Wald	0.3	0.2	0.1	0.0	0.1	0.1	0.4		0.0	0.3	0.1	0.0	0.0	0.2
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.1	0.1	0.3		0.0	0.0	0.0	0.1	0.1	0.0
	Gee Gosho/Pan	2.2	0.3	0.4	0.1	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
	Gee Liang&Zeger	0.7	0.4	0.0	0.2	0.1	0.0	0.0	1.5	1.5	0.5	0.6	0.7	0.0	0.1

Graphic for α=0.05:



7. 11. 2. 3 p = 0.9

		equal cell counts							unequal cell counts						
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.05	parametric	2.20	5.35	6.90	6.85	5.60	6.10	5.20	8.10	7.50	8.50	7.70	9.10	7.00	7.25
	par./ HF-corr.	1.30	3.00	4.25	4.60	4.05	4.80	4.15	4.65	4.85	5.85	5.15	6.90	4.90	5.20
	multivariate	0.05	0.55	1.05	1.55	2.35	3.55	3.50	1.05	2.85	3.75	4.90	5.15	3.55	4.80
	Puri & Sen	1.50	3.85	5.45	5.25	4.65	5.15	4.50	5.75	5.65	6.10	5.90	7.65	5.30	5.65
	ATS	2.70	3.65	5.15	4.75	4.50	4.85	4.25	2.75	2.75	3.35	2.50	4.25	3.15	4.15
	Koch	0.75	0.85	4.15	2.20	3.15	3.75	3.35	3.60	3.85	4.75	4.65	5.15	4.20	4.50
	Glmm Wald II	6.4	3.2	5.0	7.2	8.2	10.1	8.0	3.3	3.3	3.4	3.3	3.8	3.7	4.3
	Glmm Wald III	6.4	3.2	5.0	7.2	8.2	10.1	8.0	3.3	3.3	3.4	3.3	3.8	3.7	4.3
	Glmm Fan&Zhang	6.3	2.4	4.1	4.5	4.7	5.2	4.3	3.3	3.4	3.4	3.3	3.5	3.4	3.5
	Gee Gosho/Wald	2.5	0.9	0.7	1.2	1.1	1.1	2.3		1.8	0.9	0.5	0.2	0.0	0.4
	Gee Gosho/F&Z	0.0	0.0	0.0	0.2	0.6	0.8	1.8		0.8	0.4	0.3	0.9	0.3	0.8
	Gee Gosho/Pan	6.6	1.1	0.9	0.8	0.4	0.1	0.1		0.9	0.4	0.3	0.0	0.0	0.0
	Gee Liang&Zeger	1.0	1.1	0.5	0.2	0.1	0.0	0.0	1.9	2.3	1.2	1.5	0.9	0.3	0.5
α	method	5	10	15	20	30	40	50	5	10	15	20	30	40	50
0.01	parametric	0.85	0.90	1.25	1.55	1.25	1.85	1.55	2.90	2.35	3.25	2.50	3.10	2.10	2.40
	par./ HF-corr.	0.05	0.15	0.60	0.60	0.70	0.85	0.80	1.35	1.25	1.35	1.10	1.70	0.90	1.15
	multivariate	0.05	0.05	0.15	0.05	0.35	0.35	0.40	0.05	0.55	0.50	0.75	0.70	0.75	0.95
	Puri & Sen	0.05	0.35	0.70	1.05	0.90	1.30	1.20	1.45	1.50	1.85	1.50	2.30	1.40	1.50
	ATS	0.65	0.60	0.80	0.80	0.75	1.05	0.95	1.50	0.35	0.50	0.10	0.75	0.60	0.30
	Koch	0.75	0.60	3.55	1.25	1.15	0.95	0.40	3.15	1.60	1.25	1.25	1.20	0.75	0.75
	Glmm Wald II	6.3	2.5	2.8	3.9	3.7	4.4	4.3	3.3	3.3	3.3	3.3	3.3	3.3	3.4
	Glmm Wald III	6.3	2.5	2.8	3.9	3.7	4.4	4.3	3.3	3.3	3.3	3.3	3.3	3.3	3.4
	Glmm Fan&Zhang	6.1	1.9	2.4	3.1	2.7	2.6	2.6	3.3	3.3	3.3	3.3	3.3	3.2	3.3
	Gee Gosho/Wald	1.9	0.9	0.4	0.2	0.1	0.0	0.1		1.8	0.9	0.3	0.0	0.0	0.1
	Gee Gosho/F&Z	0.0	0.0	0.0	0.0	0.0	0.0	0.1		0.8	0.4	0.3	0.0	0.0	0.1
	Gee Gosho/Pan	6.6	0.4	0.2	0.3	0.0	0.0	0.0		0.9	0.4	0.3	0.0	0.0	0.0
	Gee Liang&Zeger	1.0	0.7	0.5	0.2	0.1	0.0	0.0	1.9	2.3	1.2	1.5	0.9	0.3	0.5

Graphic for α=0.05: