GLIMMPSE Validation Report:

GLMM(F, g) Example 6. Median power for the uncorrected univariate approach to repeated measures, Box, Geisser-Greenhouse, and Huynh-Feldt tests, using Davies Algorithm

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1. Introduction

The following report contains validation results for the JavaStatistics library, a component of the GLIMMPSE software system. For more information about GLIMMPSE and related publications, please visit

http://samplesizeshop.org.

The automated validation tests shown below compare power values produced by the JavaStatistics library to published results and also to simulation. Sources for published values include POWERLIB (Johnson *et al.* 2007) and a SAS IML implementation of the methods described by Glueck and Muller (2003).

Validation results are listed in Section 3 of the report. Timing results show the calculation and simulation times for the overall experiment and the mean times per power calculation. Summary statistics show the maximum absolute deviation between the power value calculated by the JavaStatistics library and the results obtained from SAS or via simulation. The table in Section 3.3 shows the deviation values for each individual power comparison. Deviations larger than 10^{-6} from SAS power values and 0.05 for simulated power values are displayed in red.

2. Study Design

The study design in Example 6 is a three sample design with a baseline covariate and four repeated measurements. We calculate the median power for a test of no difference between groups at each time point. We calculate median power for the uncorrected univariate approach to repeated measures, Box, Geisser-Greenhouse, and Huynh-Feldt tests. The exact distribution of the test statistic under the alternative hypothesis is obtained using Davies' algorithm described in

Davies, R. B. (1980). Algorithm AS 155: The Distribution of a Linear Combination of Chi-Square Random Variables. *Applied Statistics*, 29(3), 323-333.

Median power is calculated for the following combinations of mean differences and per group sample sizes.

- 1. Per group sample size of 5, with beta scale values 0.4997025, 0.8075886, and 1.097641
- 2. Per group sample size of 25, with beta scale values 0.1651525, 0.2623301, and 0.3508015
- 3. Per group sample size of 50, with beta scale values 0.1141548, 0.1812892, and 0.2423835

The example is based on Table II from

Glueck, D. H., & Muller, K. E. (2003). Adjusting power for a baseline covariate in linear models. *Statistics in Medicine*, 22(16), 2535-2551.



2.1. Inputs to the Power Calculation

2.1.1. List Inputs

Type I error rates

0.0500000

Sigma scale values

1.0000000

Statistical tests

UNIREP-HF

Power methods

quantile

Power quantile values:

0.5000000

2.1.2. Matrix Inputs

$$\mathsf{Es} \left(\mathbf{X} \right) \ = \ \begin{bmatrix} 1.0000 & 0.0000 & 0.0000 \\ 0.0000 & 1.0000 & 0.0000 \\ 0.0000 & 0.0000 & 1.0000 \end{bmatrix}$$

$$\mathbf{B}_{(4\times4)} \ = \ \begin{bmatrix} 0.2424 & 0.0000 & 0.0000 & 0.0000 \\ 0.0000 & 0.4848 & 0.0000 & 0.0000 \\ 0.0000 & 0.0000 & 0.0000 & 0.0000 \\ 0.5000 & 0.5000 & 0.5000 & 0.0000 \end{bmatrix}$$

$$\begin{array}{cccccc} \mathbf{C} & = & \begin{bmatrix} 1.0000 & -1.0000 & 0.0000 & 0.0000 \\ 1.0000 & 0.0000 & -1.0000 & 0.0000 \end{bmatrix} \end{array}$$

$$\mathbf{U}_{(4\times4)} = \begin{bmatrix} 1.0000 & 0.0000 & 0.0000 & 0.0000 \\ 0.0000 & 1.0000 & 0.0000 & 0.0000 \\ 0.0000 & 0.0000 & 1.0000 & 0.0000 \\ 0.0000 & 0.0000 & 0.0000 & 1.0000 \end{bmatrix}$$

$$\Theta_0 = \begin{bmatrix}
0.0000 & 0.0000 & 0.0000 & 0.0000 \\
0.0000 & 0.0000 & 0.0000 & 0.0000
\end{bmatrix}$$

$$\Sigma_{E \atop (4\times4)} = \begin{bmatrix} 0.7500 & -0.2500 & -0.2500 & 0.0000 \\ -0.2500 & 0.7500 & -0.2500 & 0.0000 \\ -0.2500 & -0.2500 & 0.7500 & 0.0000 \\ 0.0000 & 0.0000 & 0.0000 & 1.0000 \end{bmatrix}$$

$$\Sigma_{Y} = \begin{bmatrix} 1.0000 & 0.0000 & 0.0000 & 0.0000 \\ 0.0000 & 1.0000 & 0.0000 & 0.0000 \\ 0.0000 & 0.0000 & 1.0000 & 0.0000 \\ 0.0000 & 0.0000 & 0.0000 & 1.0000 \end{bmatrix}$$

$$\sum_{\substack{g \\ (1 \times 1)}} = \begin{bmatrix} 1.0000 \end{bmatrix}$$

3. Validation Results

A total of 36 power values were computed for this experiment.

3.1. Timing

	Total Time (seconds)	Mean Time (seconds)
Calculation	0.0630000	1.75E-3
Simulation	3370.5490000	9.36E1

3.2. Summary Statistics

Max deviation from SAS	0.07344508
Max deviation from simulation	0.09434062

3.3. Full Validation Results

Power	SAS	Sim Power	Test	Sigma	Beta Scale	Total N	Alpha	Method	Quantile
	Power	(deviation)		Scale					
	(deviation)								
0.2424326	0.2574627	0.2170000	UNIREP	1.0000000	0.4997025	15	0.0500000	quantile	0.5
	(0.0150301)	(0.0254326)							
0.5829768	0.6157907	0.5740000	UNIREP	1.0000000	0.8075886	15	0.0500000	quantile	0.5
	(0.0328139)	(0.0089768)							
0.8745636	0.8962456	0.8820050	UNIREP	1.0000000	1.0976410	15	0.0500000	quantile	0.5
	(0.0216820)	(0.0074414)							
0.1698463	0.1784793	0.1480050	UNIREP	1.0000000	0.1651525	75	0.0500000	quantile	0.5
	(0.0086330)	(0.0218413)							
0.3814075	0.4055003	0.3620000	UNIREP	1.0000000	0.2623301	75	0.0500000	quantile	0.5
	(0.0240928)	(0.0194075)							
0.6435968	0.6741570	0.6460000	UNIREP	1.0000000	0.3508015	75	0.0500000	quantile	0.5
	(0.0305602)	(0.0024032)							
0.1662583	0.1745793	0.1380000	UNIREP	1.0000000	0.1141548	150	0.0500000	quantile	0.5
	(0.0083210)	(0.0282583)							
0.3712475	0.3946540	0.3480100	UNIREP	1.0000000	0.1812892	150	0.0500000	quantile	0.5
	(0.0234065)	(0.0232375)							



0.529073 0.6599488 0.6300050 UNIREP 1.0000000 0.242335 150 0.0500000 quantile 0.5 0.0241084 0.0234279 0.0140000 UNIREP 1.0000000 0.0497025 15 0.0500000 quantile 0.5 0.1343630 0.1676701 0.1230625 UNIREP 1.0000000 0.037586 15 0.0500000 quantile 0.5 0.4145764 0.0274331 0.0130000 UNIREP 1.0000000 0.075861 15 0.0500000 quantile 0.5 0.4145764 0.0029101 0.0140000 UNIREP 1.0000000 0.075861 15 0.0500000 quantile 0.5 0.00203769 0.0029161 0.0073001 UNIREP 1.0000000 0.161525 75 0.0500000 quantile 0.5 0.0039675 0.0029161 0.0073001 UNIREP 1.0000000 0.3568015 75 0.0500000 quantile 0.5 0.00205171 0.0036000 0.0036001 UNIREP 1.0000000 0.3568015 75 0.0500000 quantile 0.5 0.00205171 0.0036001 UNIREP 1.0000000 0.1812892 150 0.0500000 quantile 0.5 0.0027174 0.0038503 0.0095173 BOX 0.000000 0.1812892 150 0.0500000 quantile 0.5 0.0027174 0.0036001 0.0075001 UNIREP 1.0000000 0.1812892 150 0.0500000 quantile 0.5 0.0027174 0.0036001 0.00770000 UNIREP 1.0000000 0.242335 150 0.0500000 quantile 0.5 0.154517 0.194430 0.0177740 BOX 0.000000 0.000000 0.000000 quantile 0.5 0.154517 0.194430 0.0037005 UNIREP 1.0000000 0.000000 0.000000 quantile 0.5 0.4337158 0.0030050 0.0030050 UNIREP 1.0000000 0.000000 0.000000 quantile 0.5 0.00352554 0.0030050 0.0000000 UNIREP 1.0000000 0.000000 0.000000 quantile 0.5 0.00352554 0.0030050 0.0000000 0.000000 0.0000000 0.0000000 quantile 0.5 0.00390770 0.0030050 0.0000000 0.000000 0.0000000 0.0000000 quantile 0.5 0.00390770 0.0000000 0.0000000 0.0000000 0.0000000 quantile 0.5 0.00390771 0.0000000 0.0000000 0.0000000 0.0000000 quantile 0.5 0.00000000000000000000000000000000000										
0.22416	0.6290973	0.6594848	0.6300050	UNIREP	1.0000000	0.2423835	150	0.0500000	quantile	0.5
0.0043165 0.0123065 0.0123067 0.01320590 0.0182690 0.01826										
0.1343630 0.1617641 0.1230600 UNIREP 1.0000000 0.8075886 15 0.0500000 quantile 0.5	0.0241064				1.0000000	0.4997025	15	0.0500000	quantile	0.5
0.027174 0.0276381 0.0113580 BOX 0.076000 1.0976410 15 0.050000 quantile 0.5										
0.4146784 0.4746085 0.4250509 UNIREP 1.0000000 1.0976410 15 0.0500000 quantile 0.5	0.1343630		0.1230050	UNIREP-	1.0000000	0.8075886	15	0.0500000	quantile	0.5
0.003768 0.0232859 0.0130000 DNIREP. 0.000000 0.1651525 75	0.4145784		0.4250050	UNIREP-	1.0000000	1.0976410	15	0.0500000	quantile	0.5
0.0023611 (0.0073708) BOX										
0.083675 0.0997010 0.0750000 UNIREP- 1.0000000 0.2623301 75	0.0203708	0.0232869	0.0130000	UNIREP-	1.0000000	0.1651525	75	0.0500000	quantile	0.5
Color Colo										
0.240441	0.0836875	0.0997010	0.0750000	UNIREP-	1.0000000	0.2623301	75	0.0500000	quantile	0.5
		(0.0160135)	(0.0086875)							
0.022117	0.2404441	0.2808593	0.2410000		1.0000000	0.3508015	75	0.0500000	quantile	0.5
0.0028717 0.0983691 0.0995171 BOX 0.000000 UNIREP 1.0000000 0.1812892 150 0.0500000 quantile 0.5		(0.0404152)	(0.0005559)							
0.0921714	0.0205171	0.0234021	0.0110000	UNIREP-	1.0000000	0.1141548	150	0.0500000	quantile	0.5
0.0156520 (0.0127174 BOX 0.0500000 0.2423835 150 0.0500000 0.5		(0.0028850)	(0.0095171)							
0.255028	0.0827174	0.0983694	0.0700000	UNIREP-	1.0000000	0.1812892	150	0.0500000	quantile	0.5
1.546117 0.1904432 0.136050 UNIREP 1.000000 0.4997025 15 0.0500000 quantile 0.5		(0.0156520)	(0.0127174)							
0.1546117 0.1904432 0.1360050 UNIREP- 1.0000000 0.4997025 15 0.0500000 quantile 0.5	0.2358028	0.2752583	0.2320050	UNIREP-	1.0000000	0.2423835	150	0.0500000	quantile	0.5
(0.0358315) (0.0186067) GG		(0.0394555)	(0.0037978)							
0.4537158 0.5264085 0.4480050 UNIREP. 1.0000000 0.8075886 15 0.0500000 quantile 0.5 0.7916503 0.8475852 0.8000000 UNIREP. 1.0000000 1.0976410 15 0.0500000 quantile 0.5 0.1399771 0.1522502 0.190050 VOINEP. 1.0000000 0.1651525 75 0.0500000 quantile 0.5 0.3352554 0.3662415 0.3200000 UNIREP. 1.0000000 0.2623301 75 0.0500000 quantile 0.5 0.596677 0.63309452 0.6030050 UNIREP. 1.0000000 0.3508015 75 0.0500000 quantile 0.5 0.1408576 0.1508592 0.1140050 UNIREP. 1.0000000 0.141548 150 0.0500000 quantile 0.5 0.5891168 0.6252312 0.590000 UNIREP. 1.0000000 0.1491488 150 0.0500000 quantile 0.5 0.5891168 0.6252321 0.5900000 UNIREP. 1.00000	0 1546117	0.1904432	0.1360050	UNIREP-	1.0000000	0.4997025	15	0.0500000	quantile	0.5
Continue		(0.0358315)	(0.0186067)	GG						
0.7916503	0.4537158	0.5264085	0.4480050	UNIREP-	1.0000000	0.8075886	15	0.0500000	quantile	0.5
Co.0559349 Co.0033497 CO.0033497 CO.01399771 Co.01399771 Co.0132731 Co.0209721 C		(0.0726927)	(0.0057108)	GG						
0.1399771 0.1522502 0.190975 UNIREP- (0.0000721) 1.0000000 0.1651525 75 0.0500000 quantile 0.5 0.3352554 0.3602415 0.3200000 UNIREP- (0.0309861) (0.0152554) GG 0.0500000 quantile 0.5 0.5969677 0.6369452 (0.030957) (0.0060373) UNIREP- (0.0399775) 1.0000000 0.3508015 75 0.0500000 quantile 0.5 0.1408576 0.1508592 (0.0140050) UNIREP- (0.0060373) GG UNIREP- (0.0060373) 0.0500000 quantile 0.5 0.3321582 (0.3591489) 0.3319050 (0.0191532) GG UNIREP- (0.0191532) 1.0000000 0.1812892 150 0.0500000 quantile 0.5 0.5891168 (0.257321) 0.5900000 (0.0191532) GG 1.0000000 0.482335 150 0.0500000 quantile 0.5 0.52574627 (0.0464582) (0.0759995) URIREP- (0.0464582) (0.0759995) HF 1.0000000 0.8075886 15 0.0500000 quantile 0.5 0.8512829 (0.048652456 (0.068630) URIREP- (0.046638) (0.	0.7916503	0.8475852	0.8000000	UNIREP-	1.0000000	1.0976410	15	0.0500000	quantile	0.5
Color		(0.0559349)	(0.0083497)	GG						
0.3352554 (0.039861) 0.3200000 (0.0152554) UNIREP- GG 1.0000000 (0.039975) 0.2623301 (0.0399775) 75 0.0500000 (0.0399775) quantile (0.060373) 0.5 0.1408576 (0.0100016) 0.1508592 (0.0100016) 0.0060373 (0.0268526) UNIREP- GG 1.0000000 (0.0191532) 0.1141548 (0.0269907) 1.0000000 (0.0191532) 0.1141548 (0.0361153) 150 0.0500000 (0.0361153) quantile (0.0759995) 0.5 0.5423456 (0.0484582) 0.0259007 (0.0734451) 0.01812892 (0.0484652) 150 0.0500000 (0.0500000) quantile (0.05 0.5 0.8512829 (0.0484582) 0.025900000 (0.0734451) 0.01812892 (0.0759995) 15 0.0500000 (0.0734451) quantile (0.049627) 0.5 0.8512829 (0.0486583) 0.8962456 (0.0486583) 0.800000 (0.0286583) UNIREP- (0.025092) 1.0000000 (0.0286583) 1.0000000 (0.0286583) 1.0000000 (0.0496141) 0.0500000 (0.0286583) quantile (0.0275092) 0.5 0.6097317 (0.0481861) 0.6300500 (0.0181861) UNIREP- (0.038504) 1.0000000 (0.0165022) 0.1141548 (0.025092) 75 0.0500000 (0.080000) quantile (0.0316483) 0.5 0.1456854 (0.01830000) 0.11410	0.1399771	0.1522502	0.1190050	UNIREP-	1.0000000	0.1651525	75	0.0500000	quantile	0.5
Co.0309861 Co.0309861 Co.030956 Co.030950 UNIREP- Co.000000 Co.3508015 Co.030975 Co.0603735 Co.0060373 Co.0309775 Co.0603735 Co.0060373 Co.0309775 Co.0603735 Co.0309775 Co.0603735 Co.0309775 Co.060373 Co.0309775 Co.0309775 Co.0309775 Co.060373 Co.0309775 Co.0309775 Co.0309775 Co.0309775 Co.060373 Co.0309775 Co.0309775 Co.060373 Co.0309775 Co.0309		(0.0122731)	(0.0209721)	GG						
0.5969677 0.6369452 (0.039975) 0.6030050 (0.060373) UNIREP- GG 1.0000000 0.3508015 75 0.0500000 quantile 0.5 0.1408576 0.1508592 (0.0140050 (0.0268526) GG 0.1140050 (0.0268526) GG 0.0000000 (0.0268526) GG 0.0000000 (0.0269526) GG 0.00000000 (0.0269526) G	0.3352554	0.3662415	0.3200000	UNIREP-	1.0000000	0.2623301	75	0.0500000	quantile	0.5
Color		(0.0309861)	(0.0152554)	GG						
0.1408576 0.1508592 (0.0100016) 0.1140050 (0.0268526) UNIREP-GG 1.0000000 0.1141548 150 0.0500000 quantile 0.5 0.3321582 0.3591489 (0.0269907) 0.3130050 (0.0191532) UNIREP-GG 1.0000000 0.1812892 150 0.0500000 quantile 0.5 0.5891168 0.6252321 (0.0361153) 0.5900000 (0.0361153) UNIREP-GG 1.0000000 0.2423835 150 0.0500000 quantile 0.5 0.2120045 0.2574627 (0.045452) 0.1360050 (0.0734451) UNIREP-GG 1.0000000 0.4997025 15 0.0500000 quantile 0.5 0.8512829 0.6157907 (0.0734451) 0.4480050 (0.0449627) UNIREP-GG 1.0000000 1.0976410 15 0.0500000 quantile 0.5 0.1476633 0.1665622 (0.0189899) 0.109050 (0.048181) UNIREP-GG 1.0000000 0.1651525 (0.049181) 75 0.0500000 QG quantile 0.5 0.6097317 0.6579178 (0.0481861) 0.003050 (0.0067267) HF 1.0000000 QG 0.3580815 QG 75 0.0500000 Q	0.5969677	0.6369452	0.6030050	UNIREP-	1.0000000	0.3508015	75	0.0500000	quantile	0.5
Content Cont		(0.0399775)	(0.0060373)	GG						
0.3321582 0.3591489 (0.0269907) (0.0191532) 0.3130050 (0.0191532) UNIREP-GG 1.0000000 (0.01812892) 150 0.0500000 (0.050000) quantile (0.5 (0.0361153)) 0.5 0.5891168 0.6252321 (0.008832) (0.008832) (0.008832) 0.008832) (0.008832) 0.008832) (0.008832) 0.0080000 (0.04997025) 15 0.0500000 (0.049000) (0.0494806) 0.0500000 (0.07497025)<	0.1408576	0.1508592	0.1140050	UNIREP-	1.0000000	0.1141548	150	0.0500000	quantile	0.5
Color		(0.0100016)	(0.0268526)	GG						
0.5891168 0.6252321 (0.0361153) 0.5900000 (0.008832) UNIREP- GG 1.0000000 GG 0.2423835 150 0.0500000 quantile 0.5 0.2120045 0.2574627 (0.0454582) 0.1360050 (0.075995) UNIREP- HF 1.0000000 (0.0454582) 15 0.0500000 (0.0734451) quantile 0.5 0.8512829 0.8962456 (0.0449627) 0.8000000 (0.0449627) UNIREP- (0.0512829) 1.0000000 (0.048989) 1.0000000 (0.0286583) 1.0000000 (0.0481861) 0.1000000 (0.0275092) 0.1000000 (0.0481861) 0.1140050 (0.0067267) UNIREP- HF 1.0000000 (0.0131027) 0.3500000 (0.0315443) UNIREP- (0.0315483) 1.0000000 (0.0315483) 0.1140050 (0.0315483) UNIREP- (0.0315580) 1.0000000 (0.01812892) 0.1141548 (0.025668) 150 (0.02428335) 0.0500000 (0.03156443) 0.0500000 (0.03156483) Quantile (0.0315648) 0.0500000 (0.025668) 0.1812892 (0.000000 150 (0.02428335) 150 (0.0500000 0.0500000 (0.0500000 Quantile (0.5	0.3321582	0.3591489	0.3130050	UNIREP-	1.0000000	0.1812892	150	0.0500000	quantile	0.5
Color		(0.0269907)	(0.0191532)	GG						
0.2120045 0.2574627 (0.0454582) 0.1360050 (0.0759995) UNIREP- HF 1.0000000 0.4997025 15 0.0500000 0.0500000 quantile quantile 0.5 0.5423456 0.6157907 (0.0734451) 0.4480050 (0.0943406) UNIREP- HF 1.0000000 1.0976410 15 0.0500000 quantile 0.5 0.8512829 0.8962456 (0.0449627) 0.8000000 (0.0512829) UNIREP- HF 1.0000000 1.0976410 15 0.0500000 quantile 0.5 0.1476633 0.1665622 (0.0188989) 0.190050 (0.0286583) UNIREP- HF 1.0000000 1.000000 0.1651525 0.2623301 75 0.0500000 0.0500000 quantile 0.5 0.6097317 0.6579178 (0.0481861) 0.6030050 (0.0067267) UNIREP- HF 1.0000000 0.3508015 75 0.0500000 0.0500000 quantile 0.5 0.1445854 0.1576881 (0.0131027) 0.1140050 (0.0305804) UNIREP- HF 1.0000000 0.1812892 150 0.0500000 0.0500000 quantile 0.5 0.5993467 0.6355580 0.5900000 UNIREP- 1.0000000 1.0000000 0.2423835 150 0.0500000 0.0500000 quantile 0.5	0.5891168		0.5900000	UNIREP-	1.0000000	0.2423835	150	0.0500000	quantile	0.5
Color		(0.0361153)	(0.0008832)	GG						
0.5423456 0.6157907 (0.0943406) 0.4480050 (0.0943406) HF 1.0000000 (0.8075886) 15 0.0500000 (0.050000) quantile (0.5 (0.0734451)) 0.8962456 (0.0449627) 0.8000000 (0.0512829) HF 1.0000000 (0.1651525) 75 0.0500000 (0.050000) quantile (0.5 (0.0188989)) 0.3880233 (0.0280683) HF 0.0000000 (0.2623301) 75 0.0500000 (0.050000) quantile (0.5 (0.0481861)) 0.6007317 (0.0481861) 0.0067267) HF 0.0000000 (0.3508015) 75 0.0500000 (0.050000) quantile (0.5 (0.0131027)) 0.0500000 (0.01415443) 0.000000 (0.0141548) 0.0000000 (0.0141548) 0.0000000 (0.0141548) 0.0000000 (0.0141548) 0.0000000 (0.0141548) 0.0000000 (0.0141548) 0.0000000 (0.0141548) 0.0000000000 0.0000000 (0.0141548) 0.00000000 (0.0141548) 0.0000000 (0.0141548) 0.00000000 (0.0141548) 0.000000000000 0.0000000000 0.00000000000 0.000000000000 0.000000000 0.00000000 0.000000000 0.000000000 0.00000000 0.00000000 0.00000000 0.000000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 0.00000000 <td>0.2120045</td> <td>0.2574627</td> <td>0.1360050</td> <td>UNIREP-</td> <td>1.0000000</td> <td>0.4997025</td> <td>15</td> <td>0.0500000</td> <td>quantile</td> <td>0.5</td>	0.2120045	0.2574627	0.1360050	UNIREP-	1.0000000	0.4997025	15	0.0500000	quantile	0.5
(0.0734451) (0.0943406) HF		(0.0454582)	(0.0759995)	HF						
0.8512829 0.8962456 (0.0449627) 0.8000000 (0.0512829) UNIREP- HF 1.0000000 1.0976410 15 0.0500000 0.0500000 quantile quantile 0.5 0.5 0.1476633 0.1665622 (0.0188989) 0.1190050 (0.0286583) UNIREP- HF 1.0000000 0.2623301 75 0.0500000 0.0500000 quantile 0.5 0.5 0.6097317 0.6579178 (0.0481861) 0.6030050 (0.0067267) UNIREP- HF 1.0000000 0.3508015 75 0.0500000 0.0500000 quantile 0.5 0.5 0.1445854 0.1576881 (0.0315443) 0.1140050 (0.0305804) UNIREP- HF 1.0000000 0.1812892 150 0.0500000 0.0500000 quantile 0.5 0.5993467 0.6355580 0.5900000 UNIREP- 1.0000000 1.0000000 0.2423835 150 0.0500000 0.0500000 quantile 0.5	0.5423456	0.6157907	0.4480050	UNIREP-	1.0000000	0.8075886	15	0.0500000	quantile	0.5
(0.0449627) (0.0512829) HF		(0.0734451)	(0.0943406)							
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(0.0315443) (0.0250668) HF		(0.0131027)	(0.0305804)				<u> </u>		<u> </u>	
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		(0.0402113)	(0.0053467)	HF						

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