

A P P E N D I X

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Table 1

The size of SPTP for  $n_1 = n_2 = n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$n_{21}$	$C_{32}$					
	1.0	2.0	3.0	5.0	10.0	20.0
1.0	0.0315	0.0614	0.0794	0.0957	0.0995	0.0870
1.5	0.0384	0.0692	0.0858	0.0991	0.0999	0.0866
2.0	0.0429	0.0730	0.0881	0.0994	0.0990	0.0859
4.0	0.0500	0.0752	0.0868	0.0954	0.0952	0.0889
8.0	0.0501	0.0703	0.0805	0.0898	0.0920	0.0826

Table 2

The size of SPTP for  $n_1 = 6, n_2 = n_3 = n_4 = 2, \alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\epsilon_{21}$	$\epsilon_{32}$					
	1.0	2.0	3.0	5.0	10.0	20.0
1.0	0.0295	0.0680	0.0887	0.1035	0.1021	0.0871
1.5	0.0427	0.0793	0.0945	0.1031	0.0993	0.0854
2.0	0.0505	0.0820	0.0934	0.0998	0.0967	0.0842
4.0	0.0564	0.0749	0.0832	0.0907	0.0921	0.0826
8.0	0.0486	0.0652	0.0756	0.0863	0.0905	0.0821

Table 3

The size of SPTP for  $n_1 = 6$ ,  $n_2 = 4$ ,  $n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$				
	1.0	2.0	3.0	5.0	10.0
1.0	0.0296	0.0731	0.0962	0.1103	0.1027
1.5	0.0401	0.0830	0.1025	0.1124	0.1027
2.0	0.0454	0.0851	0.1023	0.1110	0.1016
4.0	0.0471	0.0795	0.0955	0.1057	0.0992
8.0	0.0414	0.0736	0.0912	0.1033	0.0983

Table 4

The size of SPTP for  $n_1 = 10$ ,  $n_2 = 4$ ,  $n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$				
	1.0	2.0	3.0	5.0	9.0
1.0	0.0291	0.0757	0.0993	0.1125	0.1064
1.5	0.0424	0.0863	0.1046	0.1131	0.1056
2.0	0.0483	0.0869	0.1028	0.1107	0.1040
4.0	0.0474	0.0784	0.0944	0.1049	0.1012

Table 5

The size of SPTP for  $n_1 = n_2 = 6$ ,  $n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$				
	1.0	2.0	3.0	5.0	10.0
1.0	0.0305	0.0784	0.1036	0.1159	0.1018
1.5	0.0394	0.0874	0.1099	0.1195	0.1025
2.0	0.0433	0.0892	0.1101	0.1181	0.1019
4.0	0.0435	0.0846	0.1051	0.1144	0.1003
8.0	0.0393	0.0805	0.1021	0.1128	0.0997

Table 6

The size of SPTP for  $n_1 = 6$ ,  $n_2 = n_3 = 4$ ,  $n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$			
	1.0	2.0	3.0	5.0
1.0	0.0318	0.0637	0.0744	0.0744
1.5	0.0408	0.0692	0.0764	0.0742
2.0	0.0447	0.0696	0.0755	0.0731
4.0	0.0448	0.0652	0.0715	0.0710
6.0	0.0421	0.0631	0.0703	0.0705

Table 7

The size of SPTP for  $n_1 = n_2 = 10$ ,  $n_3 = 4$ ,  $n_4 = 2$ ,  $\lambda_1 = \lambda_2 = .25$

and  $\lambda_3 = \lambda_4 = \lambda_5 = .05$

$\epsilon_{21}$	$\epsilon_{32}$					
	1.0	2.0	3.0	5.0	10.0	20.0
1.0	0.0317	0.0704	0.0803	0.0741	0.0592	0.0523
1.5	0.0396	0.0757	0.0828	0.0747	0.0593	0.0523
2.0	0.0417	0.0755	0.0821	0.0742	0.0591	0.0522
4.0	0.0394	0.0722	0.0799	0.0732	0.0589	0.0522
8.0	0.0378	0.0715	0.0795	0.0731	0.0589	0.0522

Table 8

The size of SPTP for  $n_1 = n_2 = n_3 = 6$ ,  $n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$			
	1.0	2.0	3.0	5.0
1.0	0.0339	0.0613	0.0662	0.0618
1.5	0.0408	0.0646	0.0671	0.0617
2.0	0.0433	0.0645	0.0665	0.0612
4.0	0.0424	0.0617	0.0646	0.0605

Table 9

The size of SPTP for  $n_1 = 6$ ,  $n_2 = n_3 = n_4 = n_5 = 2$ ,  $\alpha_1 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$				
	1.0	2.0	3.0	5.0	7.0
1.0	0.0307	0.0729	0.0888	0.0890	0.0804
1.5	0.0421	0.0805	0.0908	0.0875	0.0789
2.0	0.0476	0.0806	0.0886	0.0854	0.0776
4.0	0.0480	0.0726	0.0815	0.0820	0.0760
8.0	0.0412	0.0679	0.0791	0.0813	0.0757

Table 10

The size of SPTP for  $n_1 = n_2 = 20$ ,  $n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$					
	1.0	2.0	3.0	5.0	10.0	20.0
1.0	0.0318	0.2589	0.7491	0.6928	0.5180	0.1278
1.5	0.0418	0.2664	0.7516	0.6933	0.5179	0.1278
2.0	0.0424	0.2646	0.7502	0.6928	0.5178	0.1278
4.0	0.0390	0.2617	0.7487	0.6923	0.5178	0.1278
8.0	0.0387	0.2616	0.7486	0.6923	0.5178	0.1278

Table 11

The size of SPTP for  $n_1 = n_2 = n_3 = 6$ ,  $n_4 = 4$ ,  $\alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{34}$			
	1.0	2.0	3.0	5.0
1.0	0.0322	0.0692	0.0768	0.0695
1.5	0.0409	0.0739	0.0778	0.0690
2.0	0.0445	0.0735	0.0765	0.0682
4.0	0.0434	0.0688	0.0732	0.0671

Table 12

The size of SPTP for  $n_1 = n_2 = 10$ ,  $n_3 = 6$ ,  $n_4 = 4$ ,  $\alpha_1 = \alpha_2 = .25$

and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\Theta_{21}$	$\Theta_{32}$					
	1.0	2.0	3.0	5.0	10.0	20.0
1.0	0.0316	0.0753	0.0803	0.0690	0.0540	0.0505
1.5	0.0410	0.0797	0.0811	0.0687	0.0539	0.0505
2.0	0.0435	0.0785	0.0797	0.0682	0.0538	0.0505
4.0	0.0400	0.0744	0.0776	0.0677	0.0538	0.0505
8.0	0.0381	0.0737	0.0774	0.0676	0.0538	0.0505

Table 13

Power of SPTP and NPT for  $n_1 = n_2 = n_3 = n_4 = 2$ ,  $x_1 = x_2 = .25$  and  
 $x_3 = x_4 = x_5 = .05$

$\theta_{21}$	$\theta_{32}$		$\theta_{43}$				
			1.0	2.0	4.0	10.0	50.0
1.0	1.0	SP	0.0315	0.1013	0.2343	0.4668	0.8066
		NP	0.0315	0.0611	0.1151	0.2454	0.6192
	1.5	SP	0.0481	0.1332	0.2703	0.4841	0.7996
		NP	0.0481	0.0918	0.1681	0.3357	0.7164
	2.0	SP	0.0614	0.1526	0.2853	0.4829	0.7909
		NP	0.0614	0.1157	0.2074	0.3955	0.7659
	3.0	SP	0.0794	0.1714	0.2907	0.4658	0.7753
		NP	0.0794	0.1471	0.2565	0.4631	0.8118
	5.0	SP	0.0957	0.1773	0.2760	0.4327	0.7559
		NP	0.0957	0.1747	0.2974	0.5142	0.8411
1.5	1.0	SP	0.0384	0.1148	0.2502	0.4778	0.8093
		NP	0.0384	0.0740	0.1377	0.2854	0.6663
	1.5	SP	0.0561	0.1447	0.2806	0.4894	0.8006
		NP	0.0561	0.1062	0.1921	0.3728	0.7482
	2.0	SP	0.0692	0.1617	0.2916	0.4854	0.7912
		NP	0.0692	0.1294	0.2292	0.4264	0.7880
	3.0	SP	0.0856	0.1765	0.2931	0.4661	0.7752
		NP	0.0856	0.1580	0.2729	0.4841	0.8243
	5.0	SP	0.0991	0.1787	0.2758	0.4321	0.7557
		NP	0.0991	0.1603	0.3056	0.5238	0.8462

Table 13 (Cont.)

21	32		$\theta_{43}$				
			1.0	2.0	4.0	10.0	50.0
2.0	1.0	SP	0.0429	0.1217	0.2562	0.4801	0.8094
		NP	0.0429	0.0823	0.1520	0.3095	0.6915
	1.5	SP	0.0605	0.1494	0.2830	0.4892	0.8002
		NP	0.0605	0.1141	0.2048	0.3917	0.7630
	2.0	SP	0.0730	0.1645	0.2922	0.4843	0.7907
		NP	0.0730	0.1361	0.2395	0.4406	0.7975
	3.0	SP	0.0881	0.1770	0.2919	0.4646	0.7747
		NP	0.0881	0.1619	0.2787	0.4914	0.8285
	5.0	SP	0.0994	0.1776	0.2743	0.4309	0.7553
		NP	0.0994	0.1808	0.3063	0.5246	0.8466
3.0	1.0	SP	0.0478	0.1269	0.2578	0.4776	0.8077
		NP	0.0478	0.0912	0.1672	0.3342	0.7151
	1.5	SP	0.0643	0.1511	0.2808	0.4853	0.7986
		NP	0.0643	0.1208	0.2156	0.4073	0.7746
	2.0	SP	0.0754	0.1639	0.2886	0.4805	0.7894
		NP	0.0754	0.1402	0.2460	0.4492	0.8031
	3.0	SP	0.0883	0.1743	0.2878	0.4615	0.7738
		NP	0.0883	0.1623	0.2792	0.4920	0.8268
	5.0	SP	0.0977	0.1743	0.2711	0.4290	0.7549
		NP	0.0977	0.1780	0.3022	0.5199	0.8441

Table 14

Power of SPTP and NPT for  $n_1 = 10$ ,  $n_2 = n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

		0.43					
$\alpha_1$	$\alpha_2$		1.0	2.0	4.0	10.0	50.0
1.0	1.0	SP	0.0291	0.1128	0.2591	0.4881	0.8123
		NP	0.0291	0.0566	0.1071	0.2306	0.5998
	1.5	SP	0.0534	0.1525	0.2929	0.4974	0.8024
		NP	0.0534	0.1014	0.1841	0.3607	0.7383
	2.0	SP	0.0718	0.1725	0.3025	0.4908	0.7922
		NP	0.0718	0.1340	0.2363	0.4362	0.7946
	3.0	SP	0.0931	0.1863	0.2995	0.4684	0.7755
		NP	0.0931	0.1703	0.2911	0.5066	0.8369
	5.0	SP	0.1062	0.1837	0.2779	0.4324	0.7556
		NP	0.1062	0.1920	0.3222	0.5430	0.8559
1.5	1.0	SP	0.0454	0.1360	0.2730	0.4883	0.8103
		NP	0.0454	0.0869	0.1598	0.3223	0.7040
	1.5	SP	0.0692	0.1640	0.2932	0.4917	0.7999
		NP	0.0692	0.1294	0.2292	0.4264	0.7880
	2.0	SP	0.0836	0.1758	0.2975	0.4843	0.7901
		NP	0.0836	0.1543	0.2673	0.4793	0.8202
	3.0	SP	0.0972	0.1822	0.2923	0.4630	0.7740
		NP	0.0972	0.1772	0.3010	0.5185	0.8433
	5.0	SP	0.1034	0.1776	0.2725	0.4294	0.7549
		NP	0.1034	0.1874	0.3157	0.5356	0.8522

Table 14 (Cont.)

$\epsilon_{21}$	$\epsilon_{32}$		$G_{43}$				
			1.0	2.0	4.0	10.0	50.0
2.0	1.0	SP	0.0544	0.1411	0.2690	0.4803	0.8072
		NP	0.0544	0.1032	0.1871	0.3652	0.7420
	1.5	SP	0.0742	0.1615	0.2851	0.4844	0.7977
		NP	0.0742	0.1381	0.2428	0.4449	0.8003
	2.0	SP	0.0848	0.1701	0.2893	0.4785	0.7885
		NP	0.0848	0.1563	0.2704	0.4809	0.8225
	3.0	SP	0.0942	0.1755	0.2859	0.4593	0.7731
		NP	0.0942	0.1722	0.2938	0.5098	0.8387
	5.0	SP	0.0989	0.1727	0.2689	0.4276	0.7545
		NP	0.0989	0.1800	0.3051	0.5233	0.8459
3.0	1.0	SP	0.0595	0.1353	0.2546	0.4673	0.8032
		NP	0.0595	0.1123	0.2020	0.3875	0.7598
	1.5	SP	0.0725	0.1505	0.2717	0.4753	0.7953
		NP	0.0725	0.1352	0.2382	0.4387	0.7963
	2.0	SP	0.0793	0.1588	0.2784	0.4720	0.7869
		NP	0.0793	0.1469	0.2562	0.4627	0.8116
	3.0	SP	0.0866	0.1664	0.2789	0.4557	0.7723
		NP	0.0866	0.1594	0.2750	0.4367	0.8258
	5.0	SP	0.0926	0.1675	0.2655	0.4260	0.7541
		NP	0.0926	0.1695	0.2899	0.5051	0.8361

Table 15

Power of SPTP and NPT for  $n_1 = n_2 = 10$ ,  $n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\alpha_{21}$	$\alpha_{32}$		$\alpha_{43}$				
			1.0	2.0	4.0	10.0	50.0
1.0	1.0	SP	0.0312	0.1333	0.3042	0.5307	0.8159
		NP	0.0312	0.0605	0.1141	0.2436	0.6169
	1.5	SP	0.0628	0.1833	0.3333	0.5120	0.7921
		NP	0.0628	0.1182	0.2114	0.4012	0.7701
	2.0	SP	0.0869	0.2043	0.3299	0.4838	0.7751
		NP	0.0869	0.1599	0.2757	0.4876	0.8263
	3.0	SP	0.1129	0.2093	0.3021	0.4397	0.7555
		NP	0.1129	0.2029	0.3373	0.5600	0.8642
	5.0	SP	0.1217	0.1858	0.2551	0.3951	0.7399
		NP	0.1217	0.2170	0.3566	0.5808	0.8739
1.5	1.0	SP	0.0400	0.1484	0.3182	0.5387	0.8179
		NP	0.0400	0.0769	0.1429	0.2941	0.6757
	1.5	SP	0.0726	0.1945	0.3416	0.5161	0.7930
		NP	0.0726	0.1354	0.2385	0.4391	0.7965
	2.0	SP	0.0957	0.2123	0.3351	0.4862	0.7756
		NP	0.0957	0.1747	0.2974	0.5142	0.8411
	3.0	SP	0.1189	0.2136	0.3047	0.4408	0.7557
		NP	0.1189	0.2125	0.3506	0.5744	0.8709
	5.0	SP	0.1247	0.1876	0.2560	0.3955	0.7399
		NP	0.1247	0.2217	0.3630	0.5876	0.8769

Table 15 (Cont.)

21	32		43					
			1.0	2.0	4.0	10.0	50.0	
2.0	1.0	SP	0.0425	0.1500	0.3180	0.5378	0.8175	.1281
		NP	0.0425	0.0815	0.1508	0.3074	0.6894	
	1.5	SP	0.0741	0.1943	0.3405	0.5152	0.7927	
		NP	0.0741	0.1380	0.2425	0.4445	0.8001	
	2.0	SP	0.0962	0.2114	0.3339	0.4855	0.7754	
		NP	0.0962	0.1755	0.2986	0.5156	0.8418	
✓	3.0	SP	0.1185	0.2126	0.3038	0.4403	0.7556	
		NP	0.1185	0.2119	0.3497	0.5734	0.8705	
	5.0	SP	0.1239	0.1869	0.2555	0.3953	0.7399	.1362
		NP	0.1239	0.2205	0.3613	0.5858	0.8761	
3.0	1.0	SP	0.0417	0.1461	0.3129	0.5342	0.8165	
		NP	0.0417	0.0801	0.1483	0.3032	0.6851	
	1.5	SP	0.0718	0.1901	0.3366	0.5129	0.7922	
		NP	0.0718	0.1340	0.2363	0.4362	0.7946	
	2.0	SP	0.0933	0.2078	0.3311	0.4840	0.7750	
		NP	0.0933	0.1707	0.2916	0.5071	0.8373	
	3.0	SP	0.1158	0.2101	0.3021	0.4395	0.7554	
		NP	0.1158	0.2076	0.3436	0.5670	0.8675	
	5.0	SP	0.1222	0.1856	0.2546	0.3949	0.7398	
		NP	0.1222	0.2178	0.3577	0.5820	0.8744	

Table 16

Power of SPTP and NPT for  $n_1 = n_2 = 10$ ,  $n_3 = 6$ ,  $n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
 and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

		$\theta_{45}$					
$\theta_{21}$	$\theta_{32}$		1.0	2.0	4.0	10.0	50.0
1.0	1.0	SP	0.0330	0.1485	0.3537	0.6392	0.9101
		NP	0.0330	0.1106	0.2746	0.5514	0.8847
	1.5	SP	0.0540	0.1816	0.3799	0.6503	0.9119
		NP	0.0540	0.1664	0.3579	0.6361	0.8867
	2.0	SP	0.0640	0.1881	0.3785	0.6456	0.9100
		NP	0.0640	0.1852	0.3890	0.6585	0.9127
	3.0	SP	0.0671	0.1810	0.3652	0.6404	0.9133
		NP	0.0671	0.1951	0.3890	0.6585	0.9127
	5.0	SP	0.0614	0.1685	0.3531	0.6288	0.9076
		NP	0.0614	0.1804	0.3732	0.6472	0.9126
1.5	1.0	SP	0.0403	0.1617	0.3666	0.6470	0.9120
		NP	0.0403	0.1327	0.3140	0.5927	0.8848
	1.5	SP	0.0595	0.1881	0.3848	0.6528	0.9124
		NP	0.0595	0.1756	0.3732	0.6361	0.9126
	2.0	SP	0.0674	0.1911	0.3803	0.6464	0.9102
		NP	0.0674	0.1931	0.3891	0.6586	0.9127
	3.0	SP	0.0682	0.1816	0.3654	0.6405	0.9133
		NP	0.0682	0.1951	0.3955	0.6655	0.9177
	5.0	SP	0.0614	0.1684	0.3531	0.6287	0.9076
		NP	0.0614	0.1804	0.3732	0.6472	0.9126

Table 16 (Cont.)

		$\Theta_{43}$					
21	32		1.0	2.0	4.0	10.0	50.0
2.0	1.0	SP	0.0420	0.1630	0.3668	0.6466	0.9119
		NP	0.0420	0.1366	0.3144	0.5927	0.8931
	1.5	SP	0.0598	0.1874	0.3837	0.6520	0.9122
		NP	0.0598	0.1757	0.3717	0.6473	0.8850
	2.0	SP	0.0669	0.1900	0.3793	0.6458	0.9100
		NP	0.0669	0.1925	0.3890	0.6585	0.9127
	3.0	SP	0.0676	0.1808	0.3648	0.6402	0.9132
		NP	0.0676	0.1860	0.3890	0.6585	0.9127
	5.0	SP	0.0611	0.1682	0.3529	0.6287	0.9076
		NP	0.0611	0.1756	0.3732	0.6361	0.9127
3.0	1.0	SP	0.0411	0.1599	0.3631	0.6441	0.9112
		NP	0.0411	0.1326	0.3144	0.5927	0.8847
	1.5	SP	0.0581	0.1847	0.3812	0.6506	0.9119
		NP	0.0581	0.1740	0.3679	0.6437	0.9107
	2.0	SP	0.0653	0.1881	0.3778	0.6450	0.9099
		NP	0.0653	0.1893	0.3881	0.6603	0.9603
	3.0	SP	0.0666	0.1800	0.3643	0.6399	0.9132
		NP	0.0666	0.1919	0.3916	0.6632	0.9169
	5.0	SP	0.0608	0.1679	0.3528	0.6286	0.9076
		NP	0.0608	0.1798	0.3757	0.6502	0.9128

APPENDIX

A<sub>1</sub>

Table 1

Power gain of SPTP over NPT for  $n_1 = n_2 = n_3 = n_4 = 2$ ,  $\alpha_1 = \alpha_2 = .25$   
and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$	$\theta_{43}$				
		1.0	2.0	4.0	10.0	50.0
1.0	1.0	0	0.0402	0.1192	0.2214	0.1874
	1.5	0	0.0414	0.1022	0.1484	0.0832
	2.0	0	0.0369	0.0779	0.0874	0.0250
	3.0	0	0.0243	0.0342	0.0027	-0.0365
	5.0	0	0.0026	-0.0214	-0.0815	-0.0852
1.5	1.0	0	0.0408	0.1125	0.1924	0.1430
	1.5	0	0.0385	0.0885	0.1166	0.0524
	2.0	0	0.0323	0.0626	0.0590	0.0032
	3.0	0	0.0185	0.0202	-0.0180	-0.0491
	5.0	0	-0.0016	-0.0298	-0.0917	-0.0905
2.0	1.0	0	0.0394	0.1042	0.1706	0.1179
	1.5	0	0.0353	0.0782	0.0975	0.0372
	2.0	0	0.0284	0.0527	0.0437	-0.0068
	3.0	0	0.0151	0.0132	-0.0268	-0.0538
	5.0	0	-0.0032	-0.0320	-0.0937	-0.0913
3.0	1.0	0	0.0357	0.0906	0.1434	0.0926
	1.5	0	0.0303	0.0652	0.0780	0.0240
	2.0	0	0.0237	0.0426	0.0313	-0.0137
	3.0	0	0.0120	0.0086	-0.0305	-0.0550
	5.0	0	-0.0037	-0.0311	-0.0909	-0.0892

Table 2

Power gain of SPTP over NPT for  $n_1 = 10$ ,  $n_2 = n_3 = n_4 = 2$ ,  $x_1 = x_2 = .25$   
and  $x_3 = x_4 = x_5 = .05$

$\epsilon_{21}$	$\epsilon_{32}$	$\epsilon_{43}$				
		1.0	2.0	4.0	10.0	50.0
1.0	1.0	0.0000	0.0562	0.1520	0.2575	0.2125
	1.5	0.0000	0.0511	0.1088	0.1367	0.0641
	2.0	0.0000	0.0385	0.0662	0.0546	-0.0044
	3.0	0.0000	0.0160	0.0084	-0.0382	-0.0614
	5.0	0.0000	-0.0083	-0.0443	-0.1106	-0.1003
1.5	1.0	0.0000	0.0491	0.1132	0.1660	0.1063
	1.5	0.0000	0.0346	0.0640	0.0653	0.0119
	2.0	0.0000	0.0215	0.0302	0.0050	-0.0301
	3.0	0.0000	0.0050	-0.0087	-0.0555	-0.0693
	5.0	0.0000	-0.0098	-0.0432	-0.1062	-0.0973
2.0	1.0	0.0000	0.0379	0.0819	0.1151	0.0652
	1.5	0.0000	0.0234	0.0423	0.0395	-0.0026
	2.0	0.0000	0.0138	0.0189	-0.0024	-0.0340
	3.0	0.0000	0.0033	-0.0079	-0.0505	-0.0656
	5.0	0.0000	-0.0073	-0.0362	-0.0957	-0.0914
3.0	1.0	0.0000	0.0230	0.0526	0.0798	0.0434
	1.5	0.0000	0.0153	0.0335	0.0366	-0.0010
	2.0	0.0000	0.0119	0.0222	0.0093	-0.0247
	3.0	0.0000	0.0070	0.0039	-0.0310	-0.0535
	5.0	0.0000	-0.0020	-0.0244	-0.0791	-0.0820

Table 3

Power gain of SPTP over NPT for  $n_1 = n_2 = 10$ ,  $n_3 = n_4 = 2$ ,  
 $\alpha_1 = \alpha_2 = .25$  and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\Theta_{21}$	$\Theta_{32}$	$\Theta_{43}$				
		1.0	2.0	4.0	10.0	50.0
1.0	1.0	0.0000	0.0728	0.1901	0.2871	0.1990
	1.5	0.0000	0.0651	0.1219	0.1108	0.0220
	2.0	0.0000	0.0444	0.0542	-0.0038	-0.0512
	3.0	0.0000	0.0064	-0.0352	-0.1203	-0.1087
	5.0	0.0000	-0.0212	-0.1015	-0.1857	-0.1340
1.5	1.0	0.0000	0.0715	0.1753	0.2446	0.1422
	1.5	0.0000	0.0591	0.1021	0.0770	-0.0035
	2.0	0.0000	0.0376	0.0377	-0.0280	-0.0655
	3.0	0.0000	0.0011	-0.0459	-0.1336	-0.1152
	5.0	0.0000	-0.0341	-0.1070	-0.1921	-0.1370
2.0	1.0	0.0000	0.0685	0.1672	0.2304	0.1281
	1.5	0.0000	0.0563	0.0980	0.0707	-0.0074
	2.0	0.0000	0.0359	0.0353	-0.0301	-0.0664
	3.0	0.0000	0.0007	-0.0459	-0.1331	-0.1149
	5.0	0.0000	-0.0336	-0.1058	-0.1905	-0.1362
3.0	1.0	0.0000	0.0660	0.1646	0.2310	0.1314
	1.5	0.0000	0.0561	0.1003	0.0767	-0.0024
	2.0	0.0000	0.0371	0.0395	-0.0231	-0.0623
	3.0	0.0000	0.0025	-0.0417	-0.1275	-0.1121
	5.0	0.0000	-0.0322	-0.1029	-0.1871	-0.1346

Table 4

Lower gain of SPTP over NPT for  $n_1 = n_2 = 10$ ,  $n_3 = 6$ ,  $n_4 = 2$ ,  
 $\alpha_1 = \alpha_2 = .25$  and  $\alpha_3 = \alpha_4 = \alpha_5 = .05$

$\theta_{21}$	$\theta_{32}$	$\epsilon_{43}$				
		1.0	2.0	4.0	10.0	50.0
1.0	1.0	0.0000	0.0379	0.0791	0.0878	0.0254
	1.5	0.0000	0.0152	0.0220	0.0142	0.0252
	2.0	0.0000	0.0029	-0.0105	-0.0129	-0.0027
	3.0	0.0000	-0.0141	-0.0238	-0.0181	0.0006
	5.0	0.0000	-0.0119	-0.0201	-0.0184	-0.0050
1.5	1.0	0.0000	0.0290	0.0526	0.0543	0.0272
	1.5	0.0000	0.0125	0.0116	0.0167	-0.0002
	2.0	0.0000	-0.0020	-0.0088	-0.0122	-0.0025
	3.0	0.0000	-0.0135	-0.0301	-0.0250	-0.0044
	5.0	0.0000	-0.0120	-0.0201	-0.0185	-0.0050
2.0	1.0	0.0000	0.0264	0.0524	0.0539	0.0188
	1.5	0.0000	0.0117	0.0120	0.0047	0.0272
	2.0	0.0000	-0.0025	-0.0097	-0.0127	-0.0027
	3.0	0.0000	-0.0052	-0.0242	-0.0183	0.0005
	5.0	0.0000	-0.0074	-0.0203	-0.0074	-0.0051
3.0	1.0	0.0000	0.0273	0.0487	0.0514	0.0265
	1.5	0.0000	0.0107	0.0133	0.0069	0.0012
	2.0	0.0000	-0.0012	-0.0102	-0.0153	-0.0504
	3.0	0.0000	-0.0119	-0.0273	-0.0233	-0.0037
	5.0	0.0000	-0.0119	-0.0229	-0.0216	-0.0052

A P P E N D I X

**B**

Table 1

Bias of  $V$  expressed as a fraction of  $\sigma_3^2$  for  $n_1=6, n_2=4, n_3=2$ .

$\rho_{12}$	$x$	$\rho_{23}$				
		0.2	0.4	0.6	0.8	1.0
0.2	0	-0.8067	-0.6600	-0.5733	-0.4867	-0.4000
	.05	-0.14515	-0.18853	-0.15442	-0.08484	0.00270
	.25	0.00664	0.03678	0.09031	0.16212	0.24751
	1.00	0	0	0	0	0
0.4	0	-0.7267	-0.6200	-0.5133	-0.4067	-0.3000
	.05	-0.15811	-0.21779	-0.19486	-0.13192	-0.04791
	.25	0.00639	0.03616	0.08953	0.16155	0.24758
	1.00	0	0	0	0	0
0.6	0	-0.7067	-0.5800	-0.4533	-0.3266	-0.2000
	.05	-0.16481	-0.22440	-0.19411	-0.12022	-0.02370
	.25	0.00692	0.03856	0.09529	0.17198	0.26383
	1.00	0	0	0	0	0
0.8	0	-0.6867	-0.5400	-0.3933	-0.2467	-0.1000
	.05	-0.16525	-0.21498	-0.16931	-0.07820	0.03607
	.25	0.00852	0.04478	0.10860	0.19429	0.29653
	1.00	0	0	0	0	0
1.0	0	-0.6667	-0.5000	-0.3333	-0.1667	0.0000
	.05	-0.16133	-0.19639	-0.23220	-0.02166	0.11208
	.25	0.01111	0.05428	0.12808	0.22586	0.34163
	1.00	0	0	0	0	0

Table 2

Bias of  $V$  expressed as a fraction of  $\sigma_3^2$  for  $n_1=12$ ,  $n_2=n_3=10$ .

$n_2$	$x$	$\frac{4}{23}$				
		0.2	0.4	0.6	0.8	1.0
0.2	0	-0.6100	-0.5325	-0.4550	-0.3775	-0.3000
	.05	-0.03246	-0.09960	-0.09992	-0.05176	0.01963
	.25	-0.00116	-0.00456	0.00668	0.04146	0.09677
	1.00	0	0	0	0	0
0.4	0	-0.5950	-0.5025	-0.4100	-0.3175	-0.2250
	.05	-0.03319	-0.10812	-0.12316	-0.09017	-0.03099
	.25	-0.00117	-0.00473	0.00589	0.03962	0.09365
	1.00	0	0	0	0	0
0.6	0	-0.5800	-0.4725	-0.3650	-0.2575	-0.1500
	.05	-0.03529	-0.12145	-0.14390	-0.10876	-0.04091
	.25	-0.00120	-0.00518	0.00482	0.03878	0.09476
	1.00	0	0	0	0	0
0.8	0	-0.5650	-0.4425	-0.3200	-0.1975	-0.0750
	.05	-0.03759	-0.12821	-0.14350	-0.09324	-0.00779
	.25	-0.00123	-0.00515	0.00670	0.04591	0.11047
	1.00	0	0	0	0	0
1.0	0	-0.5500	-0.4125	-0.2750	-0.1375	0.0000
	.05	-0.03903	-0.12650	-0.12696	-0.05789	0.04635
	.25	-0.00121	-0.00396	0.01314	0.06243	0.14051
	1.00	0	0	0	0	0

Table 3

Mean Square error of  $V$  expressed as a fraction of  $\sigma_3^4$  for  
 $n_1 = 6, n_2 = 4, n_3 = 2.$

12	$x$	$\rho_{23}$				
		0.2	0.4	0.6	0.8	1.0
0.2	0	0.6809	0.4728	0.3777	0.3024	0.2467
	0.05	1.02065	0.82036	0.6667	0.59137	0.58653
	0.25	0.98341	0.93222	0.88073	0.85714	0.87688
	1.00	1.0000	1.0000	1.0000	1.0000	1.0000
0.4	0	0.5586	0.4232	0.3161	0.2373	0.1867
	0.05	1.03801	0.84210	0.67274	0.56877	0.52698
	0.25	0.98371	0.93229	0.87925	0.85270	0.86823
	1.00	1.0000	1.0000	1.0000	1.0000	1.0000
0.6	0	0.5336	0.5039	0.2641	0.1892	0.1533
	0.05	1.04352	0.83309	0.64194	0.51813	0.46122
	0.25	0.98261	0.92762	0.86947	0.83766	0.84908
	1.00	1.0000	1.0000	1.0000	1.0000	1.0000
0.8	0	0.5031	0.3368	0.2217	0.1584	0.1467
	0.05	1.03995	0.81115	0.60594	0.47331	0.42853
	0.25	0.97982	0.91876	0.85498	0.82094	0.83551
	1.00	1.0000	1.0000	1.0000	1.0000	1.0000
1.00	0	0.4778	0.3000	0.1829	0.1445	0.1667
	0.05	1.03119	0.73561	0.57486	0.45629	0.43008
	0.25	0.97566	0.90751	0.84005	0.80968	0.83756
	1.00	1.0000	1.0000	1.0000	1.0000	1.0000

Table 4

Mean square error of  $V$  expressed as a fraction of  $\sigma_3^4$  for

$$n_1 = 12, n_2 = n_3 = 10$$

12	$\kappa$	$\psi_{23}$				
		0.2	0.4	0.6	0.8	1.00
0.2	0	0.39245	0.30637	0.233925	0.175136	0.13000
	.05	0.22552	0.21857	0.16982	0.13704	0.13299
	.25	0.20119	0.19951	0.18419	0.16786	0.16554
	1.00	0.2000	0.2000	0.2000	0.2000	0.2000
0.4	0	0.374485	0.275756	0.19600	0.135236	0.093435
	0.05	0.22659	0.22774	0.18699	0.15367	0.14000
	0.25	0.20120	0.19973	0.18493	0.16901	0.16653
	1.00	0.2000	0.2000	0.2000	0.2000	0.2000
0.6	0	0.35705	0.247266	0.163075	0.103736	0.07000
	.05	0.22935	0.23806	0.19226	0.14553	0.11886
	.25	0.20125	0.20015	0.18519	0.16762	0.16243
	1.00	0.2000	0.2000	0.2000	0.2000	0.2000
0.8	0	0.340135	0.220866	0.13456	0.080636	0.059685
	.05	0.23198	0.23990	0.18265	0.12778	0.10150
	.25	0.20128	0.19985	0.18263	0.16197	0.15596
	1.00	0.2000	0.2000	0.2000	0.2000	0.2000
1.0	0	0.32375	0.196566	0.110625	0.065936	0.06250
	.05	0.23329	0.23465	0.16792	0.11318	0.09833
	.25	0.20124	0.19835	0.17761	0.15549	0.15452
	1.00	0.2000	0.2000	0.2000	0.2000	0.2000

Table 5

Relative efficiency of  $V$  to  $V_3$  for  $n_1 = 6$ ,  $n_2 = 4$ ,  $n_3 = 2$ 

$\lambda$	$x$	$\psi_{23}$				
		0.2	0.4	0.6	0.8	1.0
0.2	0	146.8614	211.5059	264.7603	330.6878	405.3506
	.05	97.9767	121.8977	149.9992	169.0989	170.4942
	.25	101.6869	107.2708	113.5421	116.6670	114.0406
	1.00	100	100	100	100	100
0.4	0	179.0189	236.2948	316.3555	421.4075	535.6186
	.05	96.3382	118.7507	148.6458	175.8179	189.7605
	.25	101.6559	107.2627	113.7332	117.2745	115.1768
	1.00	100	100	100	100	100
0.6	0	187.4062	198.4520	378.6444	528.5412	652.3157
	.05	95.8295	120.0350	155.7778	193.0017	216.8162
	.25	101.7697	107.8027	115.0125	119.3801	117.7745
	1.00	100	100	100	100	100
0.8	0	198.5308	296.9121	451.0600	631.3131	681.6632
	.05	96.1585	123.2817	165.0328	209.0694	233.3558
	.25	102.0595	108.8423	116.9618	121.8115	119.6873
	1.00	100	100	100	100	100
1.0	0	209.2925	333.3333	529.3806	692.0415	599.8800
	.05	96.9753	127.2896	173.9553	219.1588	232.5148
	.25	102.4947	110.1916	119.0405	123.5055	119.3944
	1.00	100	100	100	100	100

Table 6

Relative efficiency of  $V$  to  $V_3$  for  $n_1 = 12$ ,  $n_2 = n_3 = 10$ 

$n_2$	$\alpha$	$\frac{V}{V_3}$				
		0.2	0.4	0.6	0.8	1.0
12	0	50.9619	65.2805	85.4974	114.1969	153.8461
	.05	38.6639	91.5039	117.7717	145.9427	150.3872
	.25	99.4085	100.2456	106.5835	119.1469	120.8167
	1.00	100	100	100	100	100
14	0	53.4056	72.5279	102.0408	147.8896	214.0525
	.05	88.2651	87.8194	106.9575	130.1490	142.8571
	.25	99.4036	100.1351	108.1490	118.3361	120.0984
	1.00	100	100	100	100	100
16	0	56.0146	80.8846	122.5429	192.7971	222.2222
	.05	87.2030	84.0124	104.0257	137.4287	168.2651
	.25	99.3789	99.9251	107.9971	119.3175	123.1299
	1.00	100	100	100	100	100
18	0	58.8001	90.5526	146.8538	246.0281	335.0925
	.05	86.2143	83.3681	109.4990	156.5190	197.0443
	.25	99.3641	100.0750	109.5110	123.4796	126.2380
	1.00	100	100	100	100	100
20	0	61.7761	101.7469	180.7909	303.3244	320.0000
	.05	85.7302	85.2333	119.1043	176.7096	203.3967
	.25	99.3838	100.8318	112.6052	128.6256	129.4330
	1.00	100	100	100	100	100