Two Stage Path Analysis with Corrected Standard Error

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Author Note

Add Note

Two Stage Path Analysis with Corrected Standard Error

Results

Table 1

Standardized Bias and Raw Bias of Path Coefficient Estimates (γ) Across 2,000 Replications.

		Joint SEM		Global SAM		Local SAM		2S-PA		2S-PA Rel	
p	N/p	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
						$\gamma = 0$					
5	6	0.03 (0.01)	0.04 (0.01)	0.02 (0.00)	0.04 (0.01)	0.02 (0.00)	0.04 (0.01)	0.01 (0.00)	0.04 (0.01)	0.01 (0.00)	0.04 (0.01)
	25	-0.01 (-0.00)	0.00 (0.00)	-0.01 (-0.00)	0.00 (0.00)	-0.01 (-0.00)	0.00 (0.00)	-0.01 (-0.00)	0.00 (0.00)	-0.01 (-0.00)	0.00 (0.00)
	100	0.01 (0.00)	0.03 (0.00)	0.01 (0.00)	0.03 (0.00)	0.01 (0.00)	0.03 (0.00)	0.01 (0.00)	0.03 (0.00)	0.01 (0.00)	0.03 (0.00)
10	6	-0.02 (-0.00)	0.03 (0.00)	-0.01 (-0.00)	0.03 (0.00)	-0.01 (-0.00)	0.03 (0.00)	-0.02 (-0.00)	0.03 (0.00)	-0.02 (-0.00)	0.03 (0.00)
	25	0.03 (0.00)	0.00 (0.00)	0.03 (0.00)	0.00 (0.00)	0.03 (0.00)	0.00 (0.00)	0.03 (0.00)	0.00 (0.00)	0.03 (0.00)	0.00 (0.00)
	100	0.06 (0.00)	0.00 (0.00)	0.06 (0.00)	0.00 (0.00)	0.06 (0.00)	0.00 (0.00)	0.06 (0.00)	0.00 (0.00)	0.06 (0.00)	0.00 (0.00)
20	6	-0.02 (-0.00)	0.03 (0.00)	-0.02 (-0.00)	0.03 (0.00)	-0.02 (-0.00)	0.03 (0.00)	-0.04 (-0.00)	0.03 (0.00)	-0.04 (-0.00)	0.03 (0.00)
	25	-0.03 (-0.00)	0.03 (0.00)	-0.03 (-0.00)	0.03 (0.00)	-0.03 (-0.00)	0.03 (0.00)	-0.03 (-0.00)	0.03 (0.00)	-0.03 (-0.00)	0.03 (0.00)
	100	0.01 (0.00)	0.02 (0.00)	0.01 (0.00)	0.02 (0.00)	0.01 (0.00)	0.02 (0.00)	0.01 (0.00)	0.02 (0.00)	0.01 (0.00)	0.02 (0.00)
						$\gamma = 0.3$					
5	6	-0.10 (-0.03)	-0.03 (-0.01)	-0.32 (-0.08)	-0.09 (-0.02)	-0.32 (-0.08)	-0.09 (-0.02)	-0.16 (-0.05)	-0.03 (-0.01)	-0.16 (-0.05)	-0.03 (-0.01)
	25	-0.03 (-0.00)	-0.00 (-0.00)	-0.13 (-0.01)	-0.02 (-0.00)	-0.13 (-0.01)	-0.02 (-0.00)	-0.03 (-0.00)	-0.00 (-0.00)	-0.03 (-0.00)	-0.00 (-0.00)
	100	0.03 (0.00)	-0.01 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	0.03 (0.00)	-0.01 (-0.00)	0.03 (0.00)	-0.01 (-0.00)
10	6	-0.15 (-0.03)	0.00 (0.00)	-0.27 (-0.05)	-0.02 (-0.00)	-0.27 (-0.05)	-0.02 (-0.00)	-0.20 (-0.05)	0.00 (0.00)	-0.20 (-0.05)	0.00 (0.00)
	25	-0.03 (-0.00)	-0.02 (-0.00)	-0.10 (-0.01)	-0.03 (-0.00)	-0.10 (-0.01)	-0.03 (-0.00)	-0.04 (-0.00)	-0.02 (-0.00)	-0.04 (-0.00)	-0.02 (-0.00)
	100	0.02 (0.00)	-0.01 (-0.00)	-0.00 (-0.00)	-0.02 (-0.00)	-0.00 (-0.00)	-0.02 (-0.00)	0.02 (0.00)	-0.01 (-0.00)	0.02 (0.00)	-0.01 (-0.00)
20	6	-0.26 (-0.05)	-0.01 (-0.00)	-0.31 (-0.06)	-0.03 (-0.00)	-0.31 (-0.06)	-0.03 (-0.00)	-0.31 (-0.07)	-0.01 (-0.00)	-0.31 (-0.07)	-0.01 (-0.00)
	25	-0.04 (-0.00)	-0.03 (-0.00)	-0.08 (-0.00)	-0.04 (-0.00)	-0.08 (-0.00)	-0.04 (-0.00)	-0.06 (-0.00)	-0.03 (-0.00)	-0.06 (-0.00)	-0.03 (-0.00)
	100	-0.01 (-0.00)	0.04 (0.00)	-0.02 (-0.00)	0.03 (0.00)	-0.02 (-0.00)	0.03 (0.00)	-0.01 (-0.00)	0.04 (0.00)	-0.01 (-0.00)	0.04 (0.00)
						$\gamma = 0.6$					
5	6	-0.13 (-0.04)	-0.06 (-0.01)	**-0.55 (-0.15)**	-0.19 (-0.03)	**-0.55 (-0.15)**	-0.19 (-0.03)	-0.22 (-0.10)	-0.06 (-0.01)	-0.23 (-0.10)	-0.06 (-0.01)
	25	-0.00 (-0.00)	-0.02 (-0.00)	-0.25 (-0.02)	-0.08 (-0.01)	-0.25 (-0.02)	-0.08 (-0.01)	-0.01 (-0.00)	-0.02 (-0.00)	-0.01 (-0.00)	-0.02 (-0.00)
	100	-0.02 (-0.00)	-0.02 (-0.00)	-0.13 (-0.01)	-0.04 (-0.00)	-0.13 (-0.01)	-0.04 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)
10	6	-0.22 (-0.07)	-0.01 (-0.00)	-0.40 (-0.12)	-0.07 (-0.01)	-0.40 (-0.12)	-0.07 (-0.01)	-0.29 (-0.11)	-0.01 (-0.00)	-0.29 (-0.11)	-0.01 (-0.00)
	25	-0.01 (-0.00)	0.01 (0.00)	-0.14 (-0.01)	-0.02 (-0.00)	-0.14 (-0.01)	-0.02 (-0.00)	-0.00 (-0.00)	0.01 (0.00)	-0.00 (-0.00)	0.01 (0.00)
	100	-0.00 (-0.00)	-0.02 (-0.00)	-0.07 (-0.00)	-0.04 (-0.00)	-0.07 (-0.00)	-0.04 (-0.00)	-0.00 (-0.00)	-0.02 (-0.00)	-0.00 (-0.00)	-0.02 (-0.00)
20	6	-0.30 (-0.10)	-0.04 (-0.00)	-0.37 (-0.13)	-0.07 (-0.01)	-0.37 (-0.13)	-0.07 (-0.01)	-0.33 (-0.13)	-0.04 (-0.00)	-0.33 (-0.13)	-0.04 (-0.00)
	25	-0.05 (-0.00)	-0.03 (-0.00)	-0.11 (-0.01)	-0.04 (-0.00)	-0.11 (-0.01)	-0.04 (-0.00)	-0.06 (-0.00)	-0.03 (-0.00)	-0.06 (-0.00)	-0.03 (-0.00)
	100	0.02 (0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	-0.02 (-0.00)	0.02 (0.00)	-0.02 (-0.00)	0.02 (0.00)	-0.02 (-0.00)

Table 2

Robust Relative Standard Error (SE) Bias Ratio and Outlier Proportion of SE (%) of Path Coefficient Estimates (γ) Across 2,000 Replications.

		Joint SEM		Global SAM		Local SAM	
p	N/p	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
				$\gamma = 0$			
5	6	**-27.29 (4.25)**	**-13.72 (5.70)**	-9.95 (1.50)	**-10.36 (5.75)**	-9.95 (1.50)	**-10.36 (5.75)**
	25	**-10.80 (1.80)**	-4.11 (3.00)	-6.92 (1.55)	-3.35 (2.95)	-6.93 (1.55)	-3.35 (2.95)
	100	-0.43 (1.25)	0.19 (1.00)	0.19 (1.30)	0.25 (0.95)	0.19 (1.30)	0.25 (0.95)
10	6	**-10.55 (2.45)**	-3.71 (5.25)	-3.66 (1.85)	-2.06 (5.20)	-3.66 (1.85)	-2.06 (5.20)
	25	-1.61 (1.30)	-0.86 (3.35)	-0.80 (1.25)	-0.40 (3.35)	-0.80 (1.25)	-0.40 (3.35)
	100	-4.86 (1.00)	0.70 (1.30)	-5.46 (1.00)	0.82 (1.30)	-5.46 (1.00)	0.82 (1.30)
20	6	-7.90 (1.85)	-6.83 (5.90)	-4.25 (1.85)	-6.34 (5.80)	-4.25 (1.85)	-6.34 (5.80)
	25	-1.03 (0.60)	1.59 (2.00)	0.01 (0.65)	1.63 (2.05)	0.01 (0.65)	1.63 (2.05)
	100	-5.11 (0.60)	0.80 (0.85)	-3.32 (0.60)	1.02 (0.85)	-3.32 (0.60)	1.02 (0.85)
				$\gamma = 0.3$			
5	6	**-27.85 (2.00)**	-5.41 (1.85)	**-11.92 (2.20)**	-2.71 (2.05)	**-11.92 (2.20)**	-2.71 (2.05)
	25	-4.21 (1.35)	-3.32 (0.85)	2.37 (1.50)	-2.43 (0.90)	2.37 (1.50)	-2.43 (0.90)
	100	-1.93 (0.95)	2.68 (1.00)	-1.33 (0.85)	3.27 (1.00)	-1.33 (0.85)	3.27 (1.00)
10	6	**-16.19 (2.10)**	-3.62 (1.50)	**-11.00 (1.75)**	-2.27 (1.60)	**-11.00 (1.75)**	-2.27 (1.60)
	25	-2.98 (0.55)	2.61 (1.00)	-1.24 (0.75)	3.30 (1.00)	-1.24 (0.75)	3.30 (1.00)
	100	-2.00 (1.10)	-5.85 (0.70)	-0.95 (1.10)	-5.65 (0.70)	-0.95 (1.10)	-5.65 (0.70)
20	6	**-14.47 (1.60)**	1.98 (1.75)	**-13.47 (1.35)**	2.36 (1.75)	**-13.47 (1.35)**	2.36 (1.75)
	25	4.02 (0.75)	0.14 (1.00)	5.15 (0.75)	0.16 (1.00)	5.15 (0.75)	0.16 (1.00)
	100	-3.19 (1.40)	-0.81 (0.90)	-2.77 (1.20)	-0.76 (0.90)	-2.77 (1.20)	-0.76 (0.90)
				$\gamma = 0.6$			
5	6	**-26.65 (1.20)**	-4.36 (0.05)	**-10.54 (1.60)**	-2.19 (0.10)	**-10.54 (1.60)**	-2.19 (0.10)
	25	-7.30 (0.50)	-1.69 (0.25)	-3.80 (0.70)	-0.91 (0.25)	-3.80 (0.70)	-0.91 (0.25)
	100	0.48 (0.80)	3.48 (1.00)	2.74 (0.65)	2.89 (1.00)	2.74 (0.65)	2.89 (1.00)
10	6	**-17.45 (0.45)**	-5.21 (0.35)	-9.41 (0.85)	-3.18 (0.35)	-9.41 (0.85)	-3.18 (0.35)
	25	0.37 (0.65)	2.24 (0.85)	3.40 (0.65)	2.73 (0.90)	3.40 (0.65)	2.73 (0.90)
	100	0.91 (0.80)	0.60 (0.75)	1.53 (0.75)	0.08 (0.70)	1.53 (0.75)	0.08 (0.70)
20	6	**-15.33 (0.40)**	-1.34 (0.50)	**-14.66 (0.30)**	-1.02 (0.50)	**-14.66 (0.30)**	-1.02 (0.50)
	25	0.31 (1.00)	-3.49 (0.75)	2.63 (1.00)	-4.04 (0.75)	2.63 (1.00)	-4.04 (0.75)
	100	-0.62 (0.55)	2.37 (0.95)	-1.07 (0.55)	1.76 (0.95)	-1.07 (0.55)	1.76 (0.95)

Table 3

Robust Relative Standard Error (SE) Bias Ratio and Outlier Proportion of SE (%) of Path Coefficient Estimates (γ) Across 2,000 Replications (for 2S-PA Methods).

		2S-PA		2S-PA-Rel		2S-PA Corrected		2S-PA-Rel Corrected	
p	N/p	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
					$\gamma = 0$				
5	6	**-23.10 (10.55)**	**-13.38 (7.25)**	**-22.50 (9.55)**	**-13.21 (7.25)**	**-22.18 (11.10)**	**-13.36 (7.15)**	**-22.01 (9.70)**	**-13.18 (7.20)**
	25	**-10.82 (1.85)**	-4.11 (3.00)	**-10.63 (1.95)**	-4.07 (2.80)	**-10.66 (1.85)**	-4.11 (3.00)	**-10.56 (1.85)**	-4.06 (2.75)
	100	-0.44 (1.20)	0.19 (1.05)	-0.36 (1.20)	0.21 (1.05)	-0.38 (1.25)	0.19 (1.00)	-0.33 (1.25)	0.21 (1.05)
10	6	**-10.52 (2.80)**	-3.66 (5.25)	**-10.20 (1.80)**	-3.60 (5.10)	**-10.34 (2.25)**	-3.66 (5.20)	**-10.07 (1.55)**	-3.60 (5.10)
	25	-1.61 (1.35)	-0.86 (3.35)	-1.50 (1.15)	-0.84 (3.00)	-1.56 (1.15)	-0.86 (3.35)	-1.48 (1.10)	-0.84 (3.00)
	100	-4.86 (1.00)	0.70 (1.30)	-4.84 (1.00)	0.70 (1.25)	-4.84 (1.00)	0.70 (1.25)	-4.84 (1.00)	0.70 (1.25)
20	6	-8.17 (1.85)	-6.83 (5.90)	-8.03 (1.70)	-6.81 (5.50)	-8.15 (1.90)	-6.83 (5.90)	-8.01 (1.65)	-6.81 (5.45)
	25	-1.00 (0.60)	1.59 (2.00)	-0.97 (0.60)	1.60 (1.95)	-0.99 (0.60)	1.59 (2.00)	-0.96 (0.55)	1.60 (2.00)
	100	-5.11 (0.60)	0.80 (0.85)	-5.10 (0.60)	0.80 (0.75)	-5.11 (0.60)	0.80 (0.85)	-5.09 (0.60)	0.80 (0.75)
					$\gamma = 0.3$				
5	6	**-24.15 (8.45)**	-3.79 (2.30)	**-22.57 (8.55)**	-3.15 (2.25)	**-22.36 (9.50)**	-3.69 (2.25)	**-21.61 (8.65)**	-3.05 (2.40)
	25	-4.40 (1.35)	-3.36 (0.90)	-2.95 (1.70)	-2.64 (0.95)	-3.14 (1.85)	-3.30 (0.90)	-2.38 (1.70)	-2.58 (0.95)
	100	-2.13 (0.95)	2.65 (1.00)	-0.61 (1.25)	3.42 (1.05)	-1.01 (1.00)	2.74 (1.00)	0.00 (1.00)	3.48 (1.05)
10	6	**-19.62 (2.15)**	-3.62 (1.55)	**-18.34 (2.00)**	-2.97 (1.60)	**-18.96 (1.95)**	-3.59 (1.50)	**-18.02 (1.90)**	-2.91 (1.65)
	25	-3.10 (0.55)	2.60 (1.00)	-1.71 (0.80)	3.31 (1.20)	-2.36 (0.75)	2.66 (1.00)	-1.35 (0.85)	3.36 (1.15)
	100	-2.05 (1.10)	-5.85 (0.70)	-0.56 (1.15)	-5.19 (0.85)	-1.31 (0.95)	-5.79 (0.70)	-0.16 (1.25)	-5.15 (0.85)
20	6	**-18.66 (1.60)**	1.98 (1.75)	**-17.66 (1.20)**	2.55 (1.80)	**-18.36 (1.25)**	2.01 (1.70)	**-17.46 (1.10)**	2.58 (1.80)
	25	3.25 (0.75)	0.14 (1.00)	4.61 (0.75)	0.67 (0.95)	3.63 (0.80)	0.17 (1.00)	4.84 (0.80)	0.69 (0.90)
	100	-3.21 (1.40)	-0.81 (0.90)	-1.91 (1.40)	-0.29 (0.90)	-2.84 (1.35)	-0.79 (0.90)	-1.67 (1.35)	-0.27 (0.90)
					$\gamma = 0.6$				
5	6	**-31.57 (4.85)**	-4.40 (0.05)	**-27.26 (4.70)**	-0.91 (0.20)	**-23.88 (7.80)**	-3.50 (0.15)	**-22.94 (5.65)**	-0.17 (0.15)
	25	-8.86 (0.60)	-1.90 (0.25)	-2.43 (0.80)	2.06 (0.25)	-1.38 (1.10)	-1.16 (0.25)	1.27 (0.80)	2.59 (0.35)
	100	-0.69 (0.85)	3.32 (1.00)	6.37 (0.70)	7.40 (0.90)	6.62 (0.60)	4.01 (0.95)	**10.02 (0.70)**	7.96 (0.90)
10	6	**-22.34 (0.45)**	-5.25 (0.35)	**-16.84 (0.70)**	-1.80 (0.35)	**-18.13 (0.65)**	-4.79 (0.35)	**-14.66 (0.60)**	-1.41 (0.35)
	25	-0.07 (0.65)	2.19 (0.85)	6.94 (0.80)	6.01 (0.90)	5.02 (0.95)	2.67 (0.85)	9.63 (0.90)	6.38 (0.90)
	100	0.51 (0.90)	0.56 (0.75)	7.52 (0.50)	4.30 (0.80)	5.56 (0.60)	1.01 (0.75)	**10.21 (0.60)**	4.67 (0.80)
20	6	**-17.51 (0.40)**	-1.22 (0.45)	**-12.19 (0.40)**	1.62 (0.40)	**-15.23 (0.35)**	-0.99 (0.45)	**-10.82 (0.40)**	1.82 (0.40)
	25	0.45 (1.00)	-3.51 (0.75)	6.99 (0.90)	-0.69 (0.70)	3.28 (0.85)	-3.27 (0.75)	8.69 (0.75)	-0.47 (0.65)
	100	-0.77 (0.55)	2.35 (0.95)	5.84 (0.50)	5.33 (0.95)	2.16 (0.55)	2.61 (0.95)	7.57 (0.55)	5.54 (0.95)

Table 4

Coverage Rate of 95 % Confidence Interval (CI) of Path Coefficient Estimates (γ) Across 2,000 Replications.

		Joint SEM		Global SAM		Local SAM		2S-PA		2S-PA-Rel		2S-PA Corrected		2S-PA-Rel Corrected	
p	*N/p*	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
								$\gamma = 0$							
5	6	**82.7**	**90.15**	91.40	91.65	91.40	91.65	**85.3**	**90.5**	**85.6**	**90.85**	**87.4**	**90.5**	**87.3**	**90.9**
	25	92.95	93.95	94.50	94.05	94.50	94.05	92.95	93.95	93	93.95	93	93.95	93.2	93.95
	100	94.3	94.15	94.55	94.25	94.55	94.25	94.25	94.15	94.3	94.15	94.3	94.15	94.3	94.15
10	6	**89.35**	92.75	92.25	93.00	92.25	93.00	**89.35**	92.75	**89.95**	92.85	**89.75**	92.75	**90**	92.85
	25	94.45	93.5	95.00	93.50	95.00	93.50	94.4	93.5	94.45	93.5	94.45	93.5	94.5	93.5
	100	94.3	95.4	94.60	95.35	94.60	95.35	94.3	95.4	94.4	95.4	94.3	95.4	94.4	95.4
20	6	93.65	93.3	94.25	93.35	94.25	93.35	93.65	93.3	93.8	93.35	93.7	93.3	93.85	93.35
	25	94.5	95.65	94.75	95.70	94.75	95.70	94.5	95.65	94.55	95.7	94.5	95.65	94.55	95.7
	100	94.35	95	94.25	95.00	94.25	95.00	94.35	95	94.4	95	94.35	95	94.4	95
								$\gamma = 0.3$							
5	6	**80**	**89.15**	**88.7**	91.20	**88.7**	91.20	**82.15**	**89.45**	**83**	**90.15**	**84.75**	**89.55**	**84.2**	**90.2**
	25	93.4	94.25	94.4	94.45	94.4	94.45	93.35	94.25	93.75	94.45	93.75	94.25	94.15	94.55
	100	94.95	94.75	95.15	94.80	95.15	94.80	94.95	94.75	95.4	95.1	95.3	94.85	95.55	95.15
10	6	**85.9**	92.95	**88.35**	93.20	**88.35**	93.20	**83.7**	92.9	**84.45**	93.05	**84.3**	92.95	**84.6**	93.1
	25	93.95	95.45	94.45	95.45	94.45	95.45	93.85	95.45	94.3	95.5	94.1	95.45	94.45	95.5
	100	94.45	94	94.4	94.10	94.4	94.10	94.45	94	94.8	94.3	94.6	94	94.9	94.3
20	6	**84.85**	93.65	**86.15**	93.65	**86.15**	93.65	**82.45**	93.65	**83.1**	93.7	**82.55**	93.7	**83.1**	93.7
	25	94.9	94.5	95	94.60	95	94.60	94.55	94.5	94.7	94.7	94.55	94.5	94.8	94.7
	100	95.1	94.3	95.15	94.40	95.15	94.40	95.1	94.3	95.4	94.35	95.3	94.35	95.45	94.35
								$\gamma = 0.6$							
5	6	**79.35**	**89.25**	**87.3**	92.20	**87.3**	92.20	**77**	**89.3**	**79.5**	**90.65**	**83.1**	**89.8**	**82.7**	**90.95**
	25	92.15	94.1	93.75	94.80	93.75	94.80	91.4	94.05	93.65	95.35	94.6	94.4	95.15	95.45
	100	94.35	94.65	94.65	94.75	94.65	94.75	93.9	94.6	96	95.4	96.1	94.85	96.55	95.5
10	6	**83.6**	91.25	**87**	92.55	**87**	92.55	**80.55**	91.2	**82.95**	92.55	**83.1**	91.7	**83.95**	92.8
	25	93.9	94.25	95	94.60	95	94.60	93.75	94.25	95.55	95.1	95.25	94.35	96.3	95.15
	100	94.85	95.05	95.05	95.20	95.05	95.20	94.85	95.05	96	95.9	95.5	95.1	96.2	95.95
20	6	**83.5**	92.45	**84.55**	92.95	**84.55**	92.95	**81.75**	92.4	**83.35**	93.05	**82.5**	92.5	**83.9**	93.1
	25	94.25	94.65	94.35	94.65	94.35	94.65	94	94.65	95.1	95.3	94.6	94.75	95.55	95.3
	100	94.8	95.75	94.55	95.85	94.55	95.85	94.7	95.75	96	96.3	95.2	95.85	96.5	96.3

Table 5

Root Mean Square Error (RMSE) of Latent Interaction Estimates (γ) Across 2,000 Replications.

		Joint SEM		Global SAM		Local SAM		2S-PA		2S-PA-Rel		2S-PA Corrected		2S-PA-Rel Corrected	
p	*N/p*	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
								$\gamma = 0$							
5	6	0.29	0.21	0.24	0.20	0.24	0.20	0.29	0.21	0.29	0.21	0.29	0.21	0.29	0.21
	25	0.13	0.10	0.12	0.10	0.12	0.10	0.13	0.10	0.13	0.10	0.13	0.10	0.13	0.10
	100	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05
10	6	0.19	0.14	0.17	0.14	0.17	0.14	0.19	0.14	0.19	0.14	0.19	0.14	0.19	0.14
	25	0.08	0.07	0.08	0.07	0.08	0.07	0.08	0.07	0.08	0.07	0.08	0.07	0.08	0.07
	100	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03
20	6	0.12	0.10	0.11	0.10	0.11	0.10	0.12	0.10	0.12	0.10	0.12	0.10	0.12	0.10
	25	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05
	100	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02
								$\gamma = 0.3$							
5	6	0.30	0.19	0.26	0.19	0.26	0.19	0.32	0.19	0.31	0.19	0.32	0.19	0.31	0.19
	25	0.12	0.09	0.11	0.09	0.11	0.09	0.12	0.09	0.12	0.09	0.12	0.09	0.12	0.09
	100	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04
10	6	0.22	0.13	0.21	0.13	0.21	0.13	0.24	0.13	0.24	0.13	0.24	0.13	0.24	0.13
	25	0.08	0.06	0.08	0.06	0.08	0.06	0.09	0.06	0.09	0.06	0.09	0.06	0.09	0.06
	100	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03
20	6	0.21	0.09	0.21	0.09	0.21	0.09	0.23	0.09	0.23	0.09	0.23	0.09	0.23	0.09
	25	0.06	0.05	0.06	0.05	0.06	0.05	0.07	0.05	0.07	0.05	0.07	0.05	0.07	0.05
	100	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02
								$\gamma = 0.6$							
5	6	0.35	0.15	0.31	0.15	0.31	0.15	0.44	0.15	0.44	0.15	0.44	0.15	0.44	0.15
	25	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07	0.10	0.07
	100	0.05	0.03	0.05	0.03	0.05	0.03	0.05	0.03	0.05	0.03	0.05	0.03	0.05	0.03
10	6	0.31	0.11	0.33	0.11	0.33	0.11	0.38	0.11	0.38	0.11	0.38	0.11	0.38	0.11
	25	0.08	0.05	0.08	0.05	0.08	0.05	0.07	0.05	0.07	0.05	0.07	0.05	0.07	0.05
	100	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02
20	6	0.36	0.08	0.38	0.08	0.38	0.08	0.40	0.09	0.40	0.09	0.40	0.09	0.40	0.09
	25	0.07	0.03	0.07	0.03	0.07	0.03	0.08	0.03	0.08	0.03	0.08	0.03	0.08	0.03
	100	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Table 6

Empirical Type I Error Rate and Statistical Power Across 2,000 Replications.

		Joint SEM		Global SAM		Local SAM		2S-PA		2S-PA-Rel		2S-PA Corrected		2S-PA-Rel Corrected	
p	N/p	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
Empirical Type I Error Rate ($\gamma = 0$)															
5	6	0.17	0.10	0.09	0.08	0.09	0.08	0.15	0.10	0.14	0.09	0.13	0.10	0.13	0.09
	25	0.07	0.06	0.06	0.06	0.06	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06
	100	0.06	0.06	0.05	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
10	6	0.11	0.07	0.08	0.07	0.08	0.07	0.11	0.07	0.10	0.07	0.10	0.07	0.10	0.07
	25	0.06	0.07	0.05	0.07	0.05	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07
	100	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05
20	6	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.07
	25	0.06	0.04	0.05	0.04	0.05	0.04	0.06	0.04	0.05	0.04	0.06	0.04	0.05	0.04
	100	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05
Statistical Power ($\gamma = 0.3$)															
5	6	0.37	0.41	0.25	0.39	0.25	0.39	0.35	0.41	0.34	0.40	0.32	0.41	0.32	0.40
	25	0.72	0.89	0.70	0.89	0.70	0.89	0.72	0.89	0.72	0.89	0.72	0.89	0.72	0.89
	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	6	0.50	0.64	0.45	0.63	0.45	0.63	0.50	0.64	0.49	0.63	0.49	0.63	0.49	0.63
	25	0.95	0.99	0.95	0.99	0.95	0.99	0.95	0.99	0.95	0.99	0.95	0.99	0.95	0.99
	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	6	0.79	0.89	0.78	0.89	0.78	0.89	0.79	0.89	0.79	0.89	0.79	0.89	0.79	0.89
	25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Statistical Power ($\gamma = 0.6$)															
5	6	0.81	0.93	0.67	0.93	0.67	0.93	0.79	0.93	0.78	0.93	0.76	0.93	0.77	0.93
	25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	6	0.97	1.00	0.95	1.00	0.95	1.00	0.97	1.00	0.97	1.00	0.97	1.00	0.97	1.00
	25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20	6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00