

Two Stage Path Analysis with Corrected Standard Error (Updated lavaan)

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Author Note

Add Note

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7 **Results**

Table 1

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

p	N/p	Joint SEM		Global SAM		Local SAM		2S-PA		2S-PA Rel	
		$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
$\gamma = 0$											
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

Raw 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	-27.10 (4.25)	-9.67 (5.70)	-7.75 (1.50)	-5.79 (5.75)	-7.75 (1.50)	-5.79 (5.75)
	25	-6.61 (1.80)	-2.96 (3.00)	-2.55 (1.55)	-2.30 (2.95)	-2.55 (1.55)	-2.30 (2.95)
	100	-1.40 (1.25)	0.39 (1.00)	-0.47 (1.30)	0.56 (0.95)	-0.47 (1.30)	0.56 (0.95)
10	6	-12.17 (2.45)	-2.54 (5.25)	-4.42 (1.85)	-1.39 (5.20)	-4.42 (1.85)	-1.39 (5.20)
	25	-0.61 (1.30)	-3.16 (3.35)	1.14 (1.25)	-2.92 (3.35)	1.14 (1.25)	-2.92 (3.35)
	100	-2.44 (1.00)	1.95 (1.30)	-2.08 (1.00)	2.01 (1.30)	-2.08 (1.00)	2.01 (1.30)
20	6	-5.33 (1.85)	-4.37 (5.90)	-1.89 (1.85)	-4.00 (5.80)	-1.89 (1.85)	-4.00 (5.80)
	25	-0.46 (0.60)	2.47 (2.00)	0.30 (0.65)	2.56 (2.05)	0.30 (0.65)	2.56 (2.05)
	100	-2.80 (0.60)	0.80 (0.85)	-2.64 (0.60)	0.82 (0.85)	-2.64 (0.60)	0.82 (0.85)
$\gamma = 0.3$							
5	6	-31.59 (2.00)	-9.49 (1.85)	-14.55 (2.20)	-5.77 (2.05)	-14.55 (2.20)	-5.77 (2.05)
	25	-3.48 (1.35)	-1.89 (0.85)	0.53 (1.50)	-1.18 (0.90)	0.53 (1.50)	-1.18 (0.90)
	100	0.96 (0.95)	0.18 (1.00)	1.85 (0.85)	0.31 (1.00)	1.85 (0.85)	0.31 (1.00)
10	6	-29.33 (2.10)	-3.95 (1.50)	-23.37 (1.75)	-2.74 (1.60)	-23.37 (1.75)	-2.74 (1.60)
	25	-5.58 (0.55)	2.33 (1.00)	-3.87 (0.75)	2.60 (1.00)	-3.87 (0.75)	2.60 (1.00)
	100	-2.28 (1.10)	-2.71 (0.70)	-1.76 (1.10)	-2.64 (0.70)	-1.76 (1.10)	-2.64 (0.70)
20	6	-49.06 (1.60)	-5.56 (1.75)	-47.43 (1.35)	-5.12 (1.75)	-47.43 (1.35)	-5.12 (1.75)
	25	-8.00 (0.75)	-6.55 (1.00)	-7.25 (0.75)	-6.47 (1.00)	-7.25 (0.75)	-6.47 (1.00)
	100	-0.60 (1.40)	-1.84 (0.90)	-0.64 (1.20)	-1.82 (0.90)	-0.64 (1.20)	-1.82 (0.90)
$\gamma = 0.6$							
5	6	-41.10 (1.20)	-10.75 (0.05)	-31.59 (1.60)	-6.37 (0.10)	-31.59 (1.60)	-6.37 (0.10)
	25	-7.27 (0.50)	-2.27 (0.25)	-3.63 (0.70)	-1.56 (0.25)	-3.63 (0.70)	-1.56 (0.25)
	100	-1.65 (0.80)	-0.28 (1.00)	-0.77 (0.65)	-0.17 (1.00)	-0.77 (0.65)	-0.17 (1.00)
10	6	-60.03 (0.45)	-14.02 (0.35)	-58.83 (0.85)	-12.61 (0.35)	-58.83 (0.85)	-12.61 (0.35)
	25	-21.16 (0.65)	-1.83 (0.85)	-19.43 (0.65)	-1.46 (0.90)	-19.43 (0.65)	-1.46 (0.90)
	100	-1.31 (0.80)	-1.30 (0.75)	-0.77 (0.75)	-1.20 (0.70)	-0.77 (0.75)	-1.20 (0.70)
20	6	-76.99 (0.40)	-21.70 (0.50)	-76.75 (0.30)	-21.19 (0.50)	-76.75 (0.30)	-21.19 (0.50)
	25	-40.08 (1.00)	-2.97 (0.75)	-43.62 (1.00)	-2.86 (0.75)	-43.62 (1.00)	-2.86 (0.75)
	100	-0.40 (0.55)	1.73 (0.95)	-0.30 (0.55)	1.76 (0.95)	-0.30 (0.55)	1.76 (0.95)

Table 3

Raw 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	-17.99 (10.55)	-8.77 (7.25)	-17.74 (9.55)	-8.48 (7.25)	-10.62 (11.10)	-8.71 (7.15)	-16.50 (9.70)	-8.29 (7.20)
	25	-6.65 (1.85)	-2.96 (3.00)	-6.40 (1.95)	-2.88 (2.80)	-6.44 (1.85)	-2.95 (3.00)	-6.29 (1.85)	-2.88 (2.75)
	100	-1.41 (1.20)	0.39 (1.05)	-1.35 (1.20)	0.41 (1.05)	-1.37 (1.25)	0.39 (1.00)	-1.33 (1.25)	0.41 (1.05)
10	6	-11.96 (2.80)	-2.54 (5.25)	-11.49 (1.80)	-2.41 (5.10)	-11.69 (2.25)	-2.53 (5.20)	-11.36 (1.55)	-2.40 (5.10)
	25	-0.61 (1.35)	-3.16 (3.35)	-0.50 (1.15)	-3.13 (3.00)	-0.56 (1.15)	-3.16 (3.35)	-0.47 (1.10)	-3.12 (3.00)
	100	-2.44 (1.00)	1.95 (1.30)	-2.42 (1.00)	1.96 (1.25)	-2.43 (1.00)	1.95 (1.25)	-2.41 (1.00)	1.96 (1.25)
20	6	-5.28 (1.85)	-4.38 (5.90)	-5.11 (1.70)	-4.32 (5.50)	-5.24 (1.90)	-4.37 (5.90)	-5.08 (1.65)	-4.32 (5.45)
	25	-0.46 (0.60)	2.47 (2.00)	-0.42 (0.60)	2.48 (1.95)	-0.45 (0.60)	2.47 (2.00)	-0.41 (0.55)	2.48 (2.00)
	100	-2.80 (0.60)	0.80 (0.85)	-2.79 (0.60)	0.81 (0.75)	-2.80 (0.60)	0.80 (0.85)	-2.79 (0.60)	0.81 (0.75)
$\gamma = 0.3$									
5	6	-28.21 (8.45)	-8.66 (2.30)	-27.30 (8.55)	-7.83 (2.25)	-20.40 (9.50)	-8.50 (2.25)	-25.64 (8.65)	-7.54 (2.40)
	25	-3.75 (1.35)	-1.92 (0.90)	-2.15 (1.70)	-1.14 (0.95)	-2.27 (1.85)	-1.83 (0.90)	-1.38 (1.70)	-1.07 (0.95)
	100	0.74 (0.95)	0.16 (1.00)	2.33 (1.25)	0.92 (1.05)	1.96 (1.00)	0.24 (1.00)	2.97 (1.00)	0.99 (1.05)
10	6	-35.03 (2.15)	-3.96 (1.55)	-33.84 (2.00)	-3.20 (1.60)	-34.27 (1.95)	-3.89 (1.50)	-33.45 (1.90)	-3.14 (1.65)
	25	-8.38 (0.55)	2.33 (1.00)	-6.96 (0.80)	3.05 (1.20)	-7.65 (0.75)	2.38 (1.00)	-6.56 (0.85)	3.10 (1.15)
	100	-2.35 (1.10)	-2.72 (0.70)	-0.87 (1.15)	-2.04 (0.85)	-1.61 (0.95)	-2.67 (0.70)	-0.46 (1.25)	-2.00 (0.85)
20	6	-52.65 (1.60)	-5.59 (1.75)	-51.97 (1.20)	-5.05 (1.80)	-52.45 (1.25)	-5.56 (1.70)	-51.84 (1.10)	-5.03 (1.80)
	25	-21.83 (0.75)	-6.55 (1.00)	-20.78 (0.75)	-6.04 (0.95)	-21.53 (0.80)	-6.52 (1.00)	-20.59 (0.80)	-6.02 (0.90)
	100	-0.63 (1.40)	-1.84 (0.90)	0.70 (1.40)	-1.31 (0.90)	-0.25 (1.35)	-1.82 (0.90)	0.94 (1.35)	-1.29 (0.90)
$\gamma = 0.6$									
5	6	-50.79 (4.85)	-11.85 (0.05)	-55.61 (4.70)	-8.64 (0.20)	423.27 (7.80)	-11.03 (0.15)	-17.88 (5.65)	-7.99 (0.15)
	25	-12.11 (0.60)	-2.44 (0.25)	-5.93 (0.80)	1.37 (0.25)	-4.70 (1.10)	-1.75 (0.25)	-2.25 (0.80)	1.93 (0.35)
	100	-2.81 (0.85)	-0.44 (1.00)	4.04 (0.70)	3.51 (0.90)	4.30 (0.60)	0.23 (0.95)	7.61 (0.70)	4.05 (0.90)
10	6	-67.14 (0.45)	-14.07 (0.35)	-64.87 (0.70)	-10.94 (0.35)	-65.21 (0.65)	-13.64 (0.35)	-63.86 (0.60)	-10.59 (0.35)
	25	-16.06 (0.65)	-1.88 (0.85)	-10.15 (0.80)	1.76 (0.90)	-11.68 (0.95)	-1.41 (0.85)	-7.85 (0.90)	2.14 (0.90)
	100	-1.72 (0.90)	-1.35 (0.75)	5.18 (0.50)	2.30 (0.80)	3.29 (0.60)	-0.89 (0.75)	7.82 (0.60)	2.68 (0.80)
20	6	-78.85 (0.40)	-26.14 (0.45)	-77.49 (0.40)	-24.03 (0.40)	-78.26 (0.35)	-25.96 (0.45)	-77.13 (0.40)	-23.88 (0.40)
	25	-48.10 (1.00)	-2.98 (0.75)	-44.72 (0.90)	-0.17 (0.70)	-46.63 (0.85)	-2.75 (0.75)	-43.83 (0.75)	0.03 (0.65)
	100	-0.55 (0.55)	1.72 (0.95)	5.97 (0.50)	4.69 (0.95)	2.29 (0.55)	1.97 (0.95)	7.69 (0.55)	4.91 (0.95)

Table 4

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 5

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 6

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

Replications.

p	N/p	Joint SEM		Global SAM		Local SAM		2S-PA		2S-PA-Rel		2S-PA Corrected		2S-PA-Rel Corrected	
		$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$	$\rho = .70$	$\rho = .90$
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

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

p	N/p	Joint SEM			Global SAM			Local SAM			2S-PA			2S-PA-Rel			2S-PA Corrected			2S-PA-Rel Corrected		
		$\rho = .70$	$\rho = .90$	$\rho = .99$	$\rho = .70$	$\rho = .90$	$\rho = .99$	$\rho = .70$	$\rho = .90$	$\rho = .99$	$\rho = .70$	$\rho = .90$	$\rho = .99$	$\rho = .70$	$\rho = .90$	$\rho = .99$	$\rho = .70$	$\rho = .90$	$\rho = .99$	$\rho = .70$	$\rho = .90$	
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	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	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	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	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	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	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	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	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	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	0.31	0.19	0.31	0.19	0.32	0.19	0.31	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	0.08	0.40	0.09	0.40	0.09	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	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	0.02	0.02	0.02	0.02	0.02	0.02	

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

[illegible]