Appendix A. Results of Monte Carlo experiment

Table A1. RMSE of direct impacts without omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$.

				OLS		SLX		SAR		SEM		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.0321	0.0350*	0.0322	0.0350	0.0321	0.0351	0.0321	0.0350	0.0323	0.0353	0.0321*	0.0351	0.0322	0.0350
0.5	0, 0	0.0	0, 0	0.0348	0.0376	0.0346	0.0373	0.0337*	0.0365*	0.0361	0.0514	0.0339	0.0375	0.0346	0.0374	0.0341	0.0369
0.0	0.4, 0.7	0.0	0, 0	0.0308*	0.0281*	0.0325	0.0363	0.0308	0.0304	0.0308	0.0282	0.0310	0.0354	0.0326	0.0363	0.0325	0.0363
0.5	0.4, 0.7	0.0	0, 0	0.0433	0.1459	0.0325	0.0353	0.0322*	0.0313*	0.0335	0.0471	0.0323	0.0338	0.0326	0.0347	0.0325	0.0348
0.0	0, 0	0.5	0, 0	0.0345	0.0372	0.0346	0.0373	0.0346	0.0427	0.0317*	0.0346*	0.0325	0.0373	0.0346	0.0372	0.0341	0.0370
0.5	0, 0	0.5	0, 0	0.0432	0.0456	0.0433	0.0455	0.0421	0.0663	0.0377	0.0623	0.0348*	0.0436	0.0433	0.0470	0.0380	0.0416*
0.0	0.4, 0.7	0.5	0, 0	0.0368	0.0379	0.0324	0.0352	0.0336	0.0655	0.0323*	0.0334*	0.0325	0.0344	0.0326	0.0348	0.0325	0.0347
0.5	0.4, 0.7	0.5	0, 0	0.0570	0.1547	0.0360	0.0363	0.0367	0.0513	0.0360	0.0392	0.0341*	0.0351*	0.0366	0.0352	0.0350	0.0353
0.0	0, 0	0.0	0.1, 0.8	0.0334	0.0372	0.0322	0.0350*	0.0333	0.0411	0.0336	0.0463	0.0317*	0.0504	0.0323	0.0350	0.0322	0.0350
0.5	0, 0	0.0	0.1, 0.8	0.0388	0.0441	0.0348	0.0377	0.0363	0.0875	0.0517	0.2033	0.0361	0.0422	0.0347	0.0373*	0.0344*	0.0402
0.0	0.4, 0.7	0.0	0.1, 0.8	0.0375	0.2843	0.0325	0.0363	0.0313	0.1256	0.0347	0.1820	0.0303*	0.1016	0.0325	0.0363*	0.0325	0.0363
0.5	0.4, 0.7	0.0	0.1, 0.8	0.0684	0.5806	0.0329	0.0397	0.0341	0.0861	0.0507	0.1096	0.0320*	0.1068	0.0326	0.0347*	0.0328	0.0360
0.0	0, 0	0.5	0.1, 0.8	0.0357	0.0393	0.0346	0.0373	0.0345	0.0478	0.0351	0.1047	0.0352	0.0390	0.0349	0.0379	0.0341*	0.0370*
0.5	0, 0	0.5	0.1, 0.8	0.0466	0.0510	0.0434	0.0458*	0.0396	0.0749	0.0555	0.2369	0.0390	0.0853	0.0440	0.0537	0.0388*	0.0583
0.0	0.4, 0.7	0.5	0.1, 0.8	0.0428	0.2866	0.0324*	0.0352	0.0325	0.0644	0.0347	0.0482	0.0327	0.0568	0.0327	0.0349	0.0325	0.0347*
0.5	0.4, 0.7	0.5	0.1, 0.8	0.0781	0.5844	0.0364	0.0404	0.0375	0.0533	0.0512	0.1381	0.0375	0.0532	0.0372	0.0356*	0.0355*	0.0370
Average				0.0434	0.1518	0.0348	0.0379	0.0347	0.0587	0.0386	0.0875	0.0336*	0.0517	0.0350	0.0377*	0.0340	0.0379
				0.0976		0.0363		0.0467		0.0631		0.0427		0.0363		0.0359*	

* Lowest RMSE for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A2. RMSE of indirect impacts without omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$.

				SLX		SAR		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.0903	0.0929	0.0121*	0.0302*	0.0366	0.0914	0.0909	0.0927	0.0907	0.0928
0.5	0, 0	0.0	0, 0	0.1371	0.1807	0.0449*	0.0843*	0.0876	0.2049	0.1766	0.1796	0.1302	0.2053
0.0	0.4, 0.7	0.0	0, 0	0.0745	0.0610	0.0113*	0.0280*	0.0240	0.0587	0.0748	0.0610	0.0748	0.0609
0.5	0.4, 0.7	0.0	0, 0	0.1143	0.1090	0.0406*	0.0644*	0.0572	0.1091	0.1368	0.0988	0.1098	0.1315
0.0	0, 0	0.5	0, 0	0.1292	0.1307	0.1728	0.4297	0.0570*	0.1415	0.1754	0.1789	0.1136	0.1165*
0.5	0, 0	0.5	0, 0	0.2150	0.2402*	0.5339	1.3185	0.1666	0.4097	0.4925	0.6443	0.1535*	0.2453
0.0	0.4, 0.7	0.5	0, 0	0.1082	0.0838	0.1377	0.3076	0.0317*	0.0760*	0.1363	0.0980	0.0968	0.0773
0.5	0.4, 0.7	0.5	0, 0	0.1837	0.1526*	0.3835	0.8000	0.0882*	0.1904	0.3674	0.3380	0.1374	0.1802
0.0	0, 0	0.0	0.1, 0.8	0.0903	0.0929	0.0467*	0.6617	0.1640	0.1566	0.0909	0.0953	0.0907	0.0928*
0.5	0, 0	0.0	0.1, 0.8	0.1648	0.5762	0.0820*	1.1564	0.3560	0.3315	0.1781	0.1999*	0.1771	0.7493
0.0	0.4, 0.7	0.0	0.1, 0.8	0.0745	0.0610	0.0341*	0.4238	0.1511	0.0726	0.0749	0.0618	0.0748	0.0609*
0.5	0.4, 0.7	0.0	0.1, 0.8	0.1373*	0.3220	0.1817	0.3776	0.3614	0.3485	0.1381	0.1104*	0.1500	0.4798
0.0	0, 0	0.5	0.1, 0.8	0.1292	0.1307	0.1388	0.2855	0.2987	0.2354	0.1831	0.4253	0.1136*	0.1165*
0.5	0, 0	0.5	0.1, 0.8	0.2328	0.5913	0.5372	0.3217*	0.4937	0.4227	0.5462	1.6884	0.2103*	0.8949
0.0	0.4, 0.7	0.5	0.1, 0.8	0.1082	0.0838	0.1610	0.1220	0.2438	0.1807	0.1404	0.2072	0.0968*	0.0773*
0.5	0.4, 0.7	0.5	0.1, 0.8	0.1983	0.3353*	0.5526	0.6058	0.5483	0.6037	0.3837	0.8393	0.1870*	0.6627
Average				0.1367	0.2028*	0.1919	0.4386	0.1979	0.2271	0.2116	0.3324	0.1254*	0.2652
				0.1697*		0.3153		0.2125		0.2720		0.1953	

* Lowest RMSE for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A3. RMSE of direct impacts with omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0.3, 0)^\intercal$.

				OLS		SLX		SAR		SEM		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.3011	0.0350*	0.3010*	0.0350	0.3014	0.0350	0.3011	0.0350	0.3021	0.0354	0.3010	0.0352	0.3010	0.0350
0.5	0, 0	0.0	0, 0	0.3148	0.0379	0.3152	0.0373	0.3152	0.0366*	0.2736*	0.0520	0.3162	0.0374	0.3154	0.0374	0.3112	0.0369
0.0	0.4, 0.7	0.0	0, 0	0.3014	0.0281*	0.3007	0.0363	0.3015	0.0301	0.3014	0.0282	0.3014	0.0330	0.3007*	0.0364	0.3007	0.0363
0.5	0.4, 0.7	0.0	0, 0	0.3668	0.1462	0.3137	0.0353	0.3153	0.0311*	0.2951*	0.0451	0.3156	0.0326	0.3147	0.0348	0.3137	0.0348
0.0	0, 0	0.5	0, 0	0.3151	0.0373	0.3153	0.0373	0.3213	0.0424	0.2906*	0.0347*	0.3056	0.0391	0.3154	0.0374	0.3128	0.0370
0.5	0, 0	0.5	0, 0	0.3499	0.0466	0.3504	0.0456	0.3655	0.0655	0.2453*	0.0627	0.3301	0.0474	0.3583	0.0469	0.3226	0.0416*
0.0	0.4, 0.7	0.5	0, 0	0.3464	0.0384	0.3141	0.0352	0.3121	0.0651	0.3067*	0.0336*	0.3130	0.0355	0.3147	0.0347	0.3141	0.0347
0.5	0.4, 0.7	0.5	0, 0	0.4507	0.1559	0.3466	0.0363	0.3527	0.0511	0.2680*	0.0405	0.3345	0.0352*	0.3531	0.0353	0.3318	0.0353
0.0	0, 0	0.0	0.1, 0.8	0.3009	0.0372	0.3010	0.0350*	0.3018	0.0408	0.2975	0.0463	0.2884*	0.0505	0.3009	0.0351	0.3010	0.0350
0.5	0, 0	0.0	0.1, 0.8	0.3149	0.0445	0.3152	0.0377	0.3184	0.0876	0.2464*	0.2050	0.3297	0.0449	0.3155	0.0373*	0.3094	0.0403
0.0	0.4, 0.7	0.0	0.1, 0.8	0.3159	0.2843	0.3007	0.0363	0.2929	0.1314	0.3051	0.1820	0.2472*	0.1203	0.3007	0.0363*	0.3007	0.0363
0.5	0.4, 0.7	0.0	0.1, 0.8	0.3896	0.5807	0.3135	0.0397	0.3195	0.0902	0.2530*	0.1114	0.3018	0.1151	0.3147	0.0347*	0.3131	0.0360
0.0	0, 0	0.5	0.1, 0.8	0.3149	0.0395	0.3153	0.0373	0.3210	0.0478	0.2762*	0.1057	0.3262	0.0405	0.3158	0.0380	0.3128	0.0370*
0.5	0, 0	0.5	0.1, 0.8	0.3499	0.0522	0.3505	0.0459*	0.3641	0.0754	0.2205*	0.2382	0.3588	0.0870	0.3593	0.0534	0.3181	0.0584
0.0	0.4, 0.7	0.5	0.1, 0.8	0.3609	0.2867	0.3141	0.0352	0.3128	0.0669	0.2900*	0.0463	0.3055	0.0633	0.3147	0.0349	0.3141	0.0347*
0.5	0.4, 0.7	0.5	0.1, 0.8	0.4732	0.5848	0.3464	0.0404	0.3603	0.0545	0.2388*	0.1409	0.3603	0.0535	0.3523	0.0356*	0.3283	0.0372
Average				0.3479	0.1522	0.3196	0.0379	0.3235	0.0595	0.2756*	0.0880	0.3148	0.0544	0.3217	0.0377*	0.3128	0.0379
				0.2501		0.1787		0.1915		0.1818		0.1846		0.1797		0.1754*	

* Lowest RMSE for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A4. RMSE of indirect impacts with omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0.3, 0)^\intercal$.

				SLX		SAR		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.0903	0.0929	0.0288*	0.0290*	0.0690	0.0693	0.0907	0.0927	0.0907	0.0928
0.5	0, 0	0.0	0, 0	0.2049	0.1807	0.3058	0.0818*	0.3601	0.1662	0.3477	0.1797	0.1629*	0.2053
0.0	0.4, 0.7	0.0	0, 0	0.0745	0.0610	0.0265*	0.0266*	0.0486	0.0482	0.0747	0.0611	0.0748	0.0609
0.5	0.4, 0.7	0.0	0, 0	0.2153	0.1091	0.2993	0.0615*	0.3197	0.0945	0.3266	0.0988	0.1764*	0.1315
0.0	0, 0	0.5	0, 0	0.2492	0.1307	0.4181	0.4194	0.1948*	0.1961	0.3467	0.1791	0.2189	0.1164*
0.5	0, 0	0.5	0, 0	0.5124	0.2405*	1.5642	1.2857	0.7623	0.5244	1.5075	0.6378	0.2954*	0.2454
0.0	0.4, 0.7	0.5	0, 0	0.2529	0.0839	0.3516	0.3032	0.1300*	0.1194	0.3261	0.0983	0.2270	0.0773*
0.5	0.4, 0.7	0.5	0, 0	0.5703	0.1533*	1.2656	0.7828	0.5845	0.2854	1.3652	0.3336	0.3490*	0.1807
0.0	0, 0	0.0	0.1, 0.8	0.0903	0.0929	0.0562*	0.6666	0.4080	0.2711	0.0910	0.0954	0.0907	0.0928*
0.5	0, 0	0.0	0.1, 0.8	0.1685	0.5761	0.5023	1.1710	1.1624	0.4710	0.3491	0.1994*	0.1234*	0.7496
0.0	0.4, 0.7	0.0	0.1, 0.8	0.0745*	0.0610	0.1867	0.4442	0.4065	0.1267	0.0750	0.0618	0.0748	0.0609*
0.5	0.4, 0.7	0.0	0.1, 0.8	0.1833	0.3220	0.8884	0.4307	1.2033	0.2167	0.3272	0.1098*	0.1325*	0.4804
0.0	0, 0	0.5	0.1, 0.8	0.2492	0.1307	0.4806	0.2946	0.7523	0.1748	0.3824	0.4252	0.2189*	0.1164*
0.5	0, 0	0.5	0.1, 0.8	0.4647	0.5912	1.8671	0.3076*	1.7147	0.4123	1.5691	1.6597	0.2219*	0.8959
0.0	0.4, 0.7	0.5	0.1, 0.8	0.2529	0.0839	0.5336	0.1372	0.6841	0.1186	0.3490	0.2067	0.2270*	0.0773*
0.5	0.4, 0.7	0.5	0.1, 0.8	0.5318	0.3355*	1.8952	0.5415	1.8538	0.5077	1.3240	0.8206	0.2762*	0.6655
Average				0.2616	0.2028*	0.6669	0.4365	0.6659	0.2376	0.5533	0.3287	0.1850*	0.2656
				0.2322		0.5517		0.4518		0.4410		0.2253*	

* Lowest RMSE for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A5. Bias of direct impacts without omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$.

				OLS		SLX		SAR		SEM		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	−0.0006	0.0027	−0.0007	0.0027	−0.0004	0.0030	−0.0007	0.0028	−0.0000*	0.0045	−0.0007	0.0026*	−0.0007	0.0027
0.5	0, 0	0.0	0, 0	−0.0003	0.0029	−0.0002	0.0031	−0.0005	0.0031	−0.0172	−0.0378	−0.0001*	0.0045	−0.0001	0.0033	−0.0019	−0.0009*
0.0	0.4, 0.7	0.0	0, 0	−0.0002	0.0029	−0.0011	0.0021	−0.0001*	0.0031	−0.0002	0.0029	−0.0002	0.0028	−0.0011	0.0021*	−0.0011	0.0022
0.5	0.4, 0.7	0.0	0, 0	0.0209	0.1401	−0.0010	−0.0021*	0.0000*	0.0035	−0.0080	0.0301	0.0001	0.0042	−0.0006	0.0023	−0.0010	0.0035
0.0	0, 0	0.5	0, 0	0.0001*	0.0034	−0.0001	0.0034	0.0073	0.0223	−0.0011	0.0023*	0.0009	0.0075	−0.0002	0.0033	−0.0003	0.0031
0.5	0, 0	0.5	0, 0	0.0007	0.0041*	0.0007*	0.0044	0.0192	0.0524	−0.0232	−0.0530	0.0024	0.0112	0.0033	0.0106	−0.0044	−0.0072
0.0	0.4, 0.7	0.5	0, 0	0.0006	0.0040	−0.0006	0.0023*	−0.0060	−0.0570	−0.0008	0.0029	−0.0002*	0.0026	−0.0006	0.0025	−0.0006	0.0025
0.5	0.4, 0.7	0.5	0, 0	0.0222	0.1422	−0.0003*	−0.0018	0.0035	−0.0376	−0.0176	−0.0168	0.0003	0.0046	0.0011	0.0037	−0.0028	0.0004*
0.0	0, 0	0.0	0.1, 0.8	−0.0010	0.0020*	−0.0007	0.0027	−0.0025	−0.0182	−0.0044	−0.0229	−0.0032	0.0363	−0.0006*	0.0026	−0.0007	0.0027
0.5	0, 0	0.0	0.1, 0.8	−0.0007	0.0015*	−0.0002	0.0024	−0.0068	−0.0781	−0.0400	−0.1998	0.0039	−0.0071	−0.0001*	0.0034	−0.0036	−0.0144
0.0	0.4, 0.7	0.0	0.1, 0.8	0.0140	0.2816	−0.0011	0.0021	−0.0003*	0.1214	0.0032	0.1737	−0.0137	0.0976	−0.0011	0.0019*	−0.0011	0.0022
0.5	0.4, 0.7	0.0	0.1, 0.8	0.0420	0.5754	−0.0012	−0.0164	0.0004*	0.0794	−0.0366	−0.1011	−0.0005	0.1023	−0.0005	0.0023*	−0.0014	0.0067
0.0	0, 0	0.5	0.1, 0.8	−0.0003	0.0026*	−0.0001*	0.0034	0.0033	−0.0298	−0.0138	−0.0981	0.0058	−0.0032	0.0003	0.0070	−0.0003	0.0031
0.5	0, 0	0.5	0.1, 0.8	0.0003*	0.0027*	0.0007	0.0036	0.0092	−0.0617	−0.0464	−0.2344	0.0075	−0.0718	0.0049	0.0280	−0.0086	−0.0410
0.0	0.4, 0.7	0.5	0.1, 0.8	0.0148	0.2828	−0.0006	0.0023*	−0.0016	0.0562	−0.0087	0.0237	−0.0061	0.0478	−0.0006*	0.0041	−0.0006	0.0025
0.5	0.4, 0.7	0.5	0.1, 0.8	0.0432	0.5776	−0.0006*	−0.0160	0.0061	0.0405	−0.0394	−0.1326	0.0065	0.0402	0.0014	0.0047*	−0.0056	−0.0085
Average (absolute bias)				0.0101	0.1268	0.0006*	0.0044*	0.0042	0.0417	0.0163	0.0709	0.0032	0.0280	0.0011	0.0053	0.0022	0.0065
				0.0684		0.0025*		0.0230		0.0436		0.0156		0.0032		0.0043	

* Lowest bias for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{W}\boldsymbol{y}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{W}\boldsymbol{x}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{W}\boldsymbol{u}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{W}\boldsymbol{X}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A6. Bias of indirect impacts without omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$.

				SLX		SAR		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.0064	0.0060	0.0013*	0.0030*	0.0105	0.0264	0.0067	0.0058	0.0065	0.0058
0.5	0, 0	0.0	0, 0	−0.0457	−0.1252	0.0030*	0.0110*	0.0175	0.0474	0.0120	0.0138	−0.0637	−0.1689
0.0	0.4, 0.7	0.0	0, 0	0.0055	0.0022	0.0006*	0.0008*	0.0043	0.0078	0.0057	0.0023	0.0055	0.0021
0.5	0.4, 0.7	0.0	0, 0	−0.0358	−0.0696	0.0016*	0.0051*	0.0073	0.0159	0.0098	0.0059	−0.0514	−0.1060
0.0	0, 0	0.5	0, 0	0.0086	0.0108	0.1679	0.4225	0.0243	0.0613	0.0127	0.0130	0.0068*	0.0076*
0.5	0, 0	0.5	0, 0	−0.0421*	−0.1169*	0.5107	1.2887	0.0857	0.2210	0.1971	0.4513	−0.0786	−0.2038
0.0	0.4, 0.7	0.5	0, 0	0.0070	0.0053	0.1335	0.3030	0.0104	0.0233	0.0102	0.0059	0.0067*	0.0044*
0.5	0.4, 0.7	0.5	0, 0	−0.0331	−0.0641	0.3629	0.7805	0.0256*	0.0600*	0.1546	0.2556	−0.0672	−0.1484
0.0	0, 0	0.0	0.1, 0.8	0.0064*	0.0060	−0.0427	−0.6605	0.1543	−0.1062	0.0065	0.0068	0.0065	0.0058*
0.5	0, 0	0.0	0.1, 0.8	−0.0995	−0.5606	−0.0322	−1.1496	0.3229	−0.1349	0.0119*	0.0165*	−0.1349	−0.7393
0.0	0.4, 0.7	0.0	0.1, 0.8	0.0055*	0.0022	0.0223	−0.4209	0.1448	−0.0178	0.0056	0.0025	0.0055	0.0021*
0.5	0.4, 0.7	0.0	0.1, 0.8	−0.0777	−0.3093	0.1544	−0.3544	0.3395	0.2994	0.0096*	0.0057*	−0.1110	−0.4720
0.0	0, 0	0.5	0.1, 0.8	0.0086	0.0108	0.1286	−0.2720	0.2828	0.1264	0.0570	0.3836	0.0068*	0.0076*
0.5	0, 0	0.5	0.1, 0.8	−0.0958*	−0.5523	0.5008	0.0649*	0.4480	−0.0739	0.3238	1.6066	−0.1637	−0.8841
0.0	0.4, 0.7	0.5	0.1, 0.8	0.0070	0.0053	0.1526	−0.0948	0.2333	0.1365	0.0413	0.1804	0.0067*	0.0044*
0.5	0.4, 0.7	0.5	0.1, 0.8	−0.0750*	−0.3038*	0.5222	0.5486	0.5172	0.5282	0.2208	0.7967	−0.1425	−0.6537
Average (absolute bias)				0.0350*	0.1344	0.1711	0.3988	0.1643	0.1179*	0.0678	0.2345	0.0540	0.2135
				0.0847*		0.2849		0.1411		0.1512		0.1338	

* Lowest bias for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{W}\boldsymbol{y}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{W}\boldsymbol{x}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{W}\boldsymbol{u}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{W}\boldsymbol{X}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A7. Bias of direct impacts with omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0.3, 0)^\intercal$.

				OLS		SLX		SAR		SEM		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.2994	0.0027	0.2993*	0.0027	0.2997	0.0030	0.2993	0.0028	0.3004	0.0040	0.2993	0.0027*	0.2993	0.0027
0.5	0, 0	0.0	0, 0	0.3128	0.0029	0.3133	0.0032	0.3133	0.0032	0.2718*	−0.0384	0.3143	0.0043	0.3135	0.0034	0.3093	−0.0009*
0.0	0.4, 0.7	0.0	0, 0	0.2998	0.0029	0.2989	0.0021*	0.2999	0.0030	0.2998	0.0029	0.2998	0.0026	0.2989*	0.0022	0.2989	0.0022
0.5	0.4, 0.7	0.0	0, 0	0.3647	0.1401	0.3120	−0.0021*	0.3137	0.0034	0.2933*	0.0267	0.3139	0.0036	0.3130	0.0024	0.3120	0.0035
0.0	0, 0	0.5	0, 0	0.3132	0.0033	0.3134	0.0034	0.3195	0.0217	0.2889*	0.0022*	0.3036	0.0145	0.3135	0.0033	0.3109	0.0031
0.5	0, 0	0.5	0, 0	0.3469	0.0041*	0.3477	0.0045	0.3635	0.0514	0.2435*	−0.0534	0.3277	0.0255	0.3557	0.0105	0.3204	−0.0072
0.0	0.4, 0.7	0.5	0, 0	0.3443	0.0041	0.3124	0.0023*	0.3104	−0.0566	0.3050*	0.0028	0.3112	−0.0064	0.3130	0.0025	0.3124	0.0025
0.5	0.4, 0.7	0.5	0, 0	0.4470	0.1423	0.3447	−0.0017	0.3508	−0.0373	0.2661*	−0.0194	0.3325	0.0012	0.3512	0.0036	0.3299	0.0004*
0.0	0, 0	0.0	0.1, 0.8	0.2990	0.0020*	0.2993	0.0027	0.2999	−0.0177	0.2956	−0.0229	0.2865*	0.0354	0.2992	0.0027	0.2993	0.0027
0.5	0, 0	0.0	0.1, 0.8	0.3124	0.0015*	0.3133	0.0024	0.3164	−0.0782	0.2442*	−0.2015	0.3277	−0.0150	0.3135	0.0034	0.3075	−0.0145
0.0	0.4, 0.7	0.0	0.1, 0.8	0.3140	0.2816	0.2989	0.0021	0.2912	0.1274	0.3032	0.1737	0.2454*	0.1169	0.2990	0.0019*	0.2989	0.0022
0.5	0.4, 0.7	0.0	0.1, 0.8	0.3857	0.5754	0.3117	−0.0163	0.3177	0.0838	0.2505*	−0.1030	0.3000	0.1109	0.3131	0.0022*	0.3114	0.0067
0.0	0, 0	0.5	0.1, 0.8	0.3128	0.0026*	0.3134	0.0034	0.3191	−0.0299	0.2743*	−0.0991	0.3244	−0.0094	0.3139	0.0070	0.3109	0.0031
0.5	0, 0	0.5	0.1, 0.8	0.3465	0.0027*	0.3477	0.0037	0.3620	−0.0624	0.2184*	−0.2358	0.3566	−0.0739	0.3566	0.0274	0.3158	−0.0412
0.0	0.4, 0.7	0.5	0.1, 0.8	0.3585	0.2828	0.3124	0.0023*	0.3112	0.0591	0.2881*	0.0200	0.3038	0.0554	0.3130	0.0040	0.3124	0.0025
0.5	0.4, 0.7	0.5	0.1, 0.8	0.4680	0.5776	0.3445	−0.0159	0.3584	0.0421	0.2365*	−0.1355	0.3584	0.0404	0.3504	0.0047*	0.3264	−0.0089
Average (absolute bias)				0.3453	0.1268	0.3177	0.0044*	0.3217	0.0425	0.2736*	0.0713	0.3129	0.0325	0.3198	0.0052	0.3110	0.0065
				0.2361		0.1611		0.1821		0.1724		0.1727		0.1625		0.1588*	

* Lowest bias for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Table A8. Bias of indirect impacts with omv. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0.3, 0)^\intercal$.

				SLX		SAR		SAC		SDM		SDEM	
ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.0	0, 0	0.0	0, 0	0.0064	0.0060	0.0032*	0.0031*	0.0176	0.0177	0.0067	0.0059	0.0065	0.0058
0.5	0, 0	0.0	0, 0	0.1588	−0.1251	0.2947	0.0113*	0.3220	0.0388	0.2989	0.0143	0.1165*	−0.1689
0.0	0.4, 0.7	0.0	0, 0	0.0055	0.0022	0.0018*	0.0011*	0.0083	0.0064	0.0057	0.0021	0.0055	0.0021
0.5	0.4, 0.7	0.0	0, 0	0.1858	−0.0696	0.2910	0.0058	0.3019	0.0143	0.2960	0.0058*	0.1471*	−0.1060
0.0	0, 0	0.5	0, 0	0.2131	0.0109	0.4112	0.4127	0.1437*	0.1455	0.2985	0.0137	0.1871	0.0077*
0.5	0, 0	0.5	0, 0	0.4664	−0.1164*	1.5406	1.2576	0.6997	0.4293	1.4320	0.4455	0.2638*	−0.2040
0.0	0.4, 0.7	0.5	0, 0	0.2286	0.0053	0.3459	0.2990	0.1003*	0.0930	0.2961	0.0061	0.2054	0.0045*
0.5	0.4, 0.7	0.5	0, 0	0.5404	−0.0639*	1.2476	0.7650	0.5493	0.2298	1.3194	0.2504	0.3272*	−0.1488
0.0	0, 0	0.0	0.1, 0.8	0.0064*	0.0060	0.0396	−0.6655	0.3985	−0.2498	0.0066	0.0068	0.0065	0.0058*
0.5	0, 0	0.0	0.1, 0.8	0.1050	−0.5605	0.4865	−1.1647	1.1389	−0.3839	0.2992	0.0162*	0.0445*	−0.7396
0.0	0.4, 0.7	0.0	0.1, 0.8	0.0055*	0.0022	0.1817	−0.4417	0.4020	−0.1071	0.0056	0.0024	0.0055	0.0021*
0.5	0.4, 0.7	0.0	0.1, 0.8	0.1439	−0.3093	0.8781	−0.4118	1.1915	0.1341	0.2960	0.0057*	0.0855*	−0.4725
0.0	0, 0	0.5	0.1, 0.8	0.2131	0.0109	0.4718	−0.2825	0.7329	−0.0184	0.3400	0.3834	0.1871*	0.0077*
0.5	0, 0	0.5	0.1, 0.8	0.4127	−0.5518	1.8377	0.0338*	1.6697	−0.1388	1.4996	1.5784	0.1775*	−0.8851
0.0	0.4, 0.7	0.5	0.1, 0.8	0.2286	0.0053	0.5274	−0.1162	0.6751	0.0508	0.3217	0.1799	0.2054*	0.0045*
0.5	0.4, 0.7	0.5	0.1, 0.8	0.4985	−0.3036*	1.8747	0.4823	1.8309	0.4265	1.2818	0.7785	0.2474*	−0.6565
Average (absolute bias)				0.2137	0.1343*	0.6521	0.3971	0.6364	0.1553	0.5002	0.2309	0.1387*	0.2138
				0.1740*		0.5246		0.3958		0.3656		0.1763	

* Lowest bias for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Appendix B. Different combinations of autocorrelation

Table B1. Bias of direct impacts for different strengths of autocorrelation. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$, $\boldsymbol{\delta} = (0, 0)^\intercal$, $\boldsymbol{\theta} = (0.1, 0.8)^\intercal$.

		OLS		SLX		SAR		SEM		SAC		SDM		SDEM	
ρ	λ	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$				
0.3	0.3	-0.0004	0.0022*	−0.0001*	0.0031	−0.0004	−0.0518	−0.0271	−0.1503	0.0050	−0.0142	0.0004	0.0068	−0.0017	−0.0055
0.5	0.3	-0.0002	0.0021*	0.0003	0.0030	−0.0000*	−0.0741	−0.0441	−0.2219	0.0055	−0.0464	0.0017	0.0119	−0.0065	−0.0300
0.7	0.3	-0.0000*	0.0014*	0.0007	0.0024	0.0009	−0.1104	−0.0711	−0.3317	0.0012	−0.1109	0.0048	0.0245	−0.0217	−0.0996
0.9	0.3	-0.0006*	-0.0037	0.0009	−0.0027*	−0.0080	−0.2325	−0.1360	−0.5993	−0.0270	−0.3120	0.0116	0.0494	−0.0761	−0.3347
0.3	0.5	0.0000*	0.0027*	0.0003	0.0036	0.0061	−0.0465	−0.0301	−0.1686	0.0088	−0.0334	0.0019	0.0152	−0.0026	−0.0111
0.5	0.5	0.0003*	0.0027*	0.0007	0.0036	0.0092	−0.0617	−0.0464	−0.2344	0.0075	−0.0718	0.0049	0.0280	−0.0086	−0.0410
0.7	0.5	0.0007	0.0024*	0.0013	0.0034	0.0142	−0.0871	−0.0725	−0.3389	−0.0005*	−0.1470	0.0119	0.0578	−0.0245	−0.1127
0.9	0.5	0.0005*	-0.0016	0.0018	−0.0006*	0.0039	−0.2090	−0.1364	−0.6015	−0.0356	−0.3655	0.0235	0.0998	−0.0773	−0.3407
0.3	0.7	0.0007*	0.0037*	0.0009	0.0045	0.0203	−0.0256	−0.0327	−0.1844	0.0166	−0.0452	0.0061	0.0381	−0.0037	−0.0174
0.5	0.7	0.0011*	0.0040*	0.0015	0.0049	0.0279	−0.0290	−0.0484	−0.2453	0.0129	−0.0899	0.0130	0.0680	−0.0106	−0.0510
0.7	0.7	0.0018	0.0043*	0.0023	0.0054	0.0363	−0.0438	−0.0737	−0.3452	0.0005*	−0.1747	0.0263	0.1230	−0.0265	−0.1226
0.9	0.7	0.0022*	0.0027*	0.0033	0.0037	0.0157	−0.1861	−0.1367	−0.6032	−0.0422	−0.4083	0.0360	0.1528	−0.0778	−0.3445
0.3	0.9	0.0021*	0.0069*	0.0021	0.0077	0.0599	0.0492	−0.0348	−0.1975	0.0430	−0.0172	0.0201	0.1160	−0.0047	−0.0232
0.5	0.9	0.0029*	0.0083*	0.0030	0.0092	0.0681	0.0507	−0.0499	−0.2540	0.0346	−0.0723	0.0328	0.1660	−0.0119	−0.0583
0.7	0.9	0.0042*	0.0110*	0.0044	0.0120	0.0654	0.0152	−0.0744	−0.3495	0.0148	−0.1717	0.0465	0.2142	−0.0274	−0.1284
0.9	0.9	0.0059*	0.0183*	0.0065	0.0191	0.0224	−0.1736	−0.1366	−0.6039	−0.0409	−0.4287	0.0449	0.1814	−0.0775	−0.3454
Average		0.0015*	0.0049*	0.0019	0.0056	0.0224	0.0904	0.0719	0.3393	0.0185	0.1568	0.0179	0.0845	0.0287	0.1291
(absolute bias)		0.0032*		0.0037		0.0564		0.2056		0.0877		0.0512		0.0789	

* Lowest bias for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Table B2. Bias of indirect impacts for different strengths of autocorrelation. $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$, $\boldsymbol{\delta} = (0, 0)^\intercal$, $\boldsymbol{\theta} = (0.1, 0.8)^\intercal$.

		SLX		SAR		SAC		SDM		SDEM	
ρ	λ	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$	$\boldsymbol{x}_1$	$\boldsymbol{x}_2$
0.3	0.3	-0.0260*	-0.1971	0.0890	−0.5762	0.2900	−0.0351*	0.0686	0.3528	−0.0420	−0.2831
0.5	0.3	-0.0978*	-0.5567	0.1863	−0.6482	0.3776	−0.1366*	0.1374	0.6562	−0.1525	−0.8284
0.7	0.3	-0.3245*	-1.6044	0.4664	−0.6929	0.4893	−0.6352*	0.3418	1.5363	−0.4851	−2.3461
0.9	0.3	-1.8563	-8.3520	0.7387	−3.6504*	−0.1147*	−6.0352	0.9216	3.9014	−2.3812	−10.6470
0.3	0.5	-0.0245*	-0.1936	0.2670	−0.1768	0.3690	0.0839*	0.1520	0.8308	−0.0477	−0.3147
0.5	0.5	-0.0958*	-0.5523	0.5008	0.0649*	0.4480	−0.0739	0.3238	1.6066	−0.1637	−0.8841
0.7	0.5	-0.3219*	-1.5977	1.0849	0.7313*	0.4992	−0.7792	0.8223	3.7944	−0.4983	−2.4074
0.9	0.5	-1.8524	-8.3378	1.4847	−1.9049*	−0.3411*	−6.8599	1.9225	8.3204	−2.3870	−10.6740
0.3	0.7	-0.0219*	-0.1870*	0.7086	0.8009	0.5559	0.4223	0.3612	2.0194	−0.0536	−0.3465
0.5	0.7	-0.0925*	-0.5435	1.2625	1.7761	0.6306	0.2161*	0.7878	3.9738	−0.1731	−0.9316
0.7	0.7	-0.3174*	-1.5845	2.2593	3.4158	0.6228	−0.6721*	1.7894	8.3603	−0.5078	−2.4529
0.9	0.7	-1.8458	-8.3083	2.2187	−0.2088*	−0.4630*	−7.3746	2.9508	12.8685	−2.3900	−10.6909
0.3	0.9	-0.0166*	-0.1651*	2.4503	4.6096	1.4205	2.1489	1.1525	6.6166	−0.0586	−0.3737
0.5	0.9	-0.0860*	-0.5139*	3.3502	6.4141	1.4331	1.7591	2.0378	10.4425	−0.1795	−0.9651
0.7	0.9	-0.3087*	-1.5387	3.9543	7.2462	1.2674	0.4890*	3.1944	15.0044	−0.5123	−2.4786
0.9	0.9	-1.8342	-8.2010	2.6037	0.6582*	−0.2434*	−7.1352	3.5207	15.1102	−2.3891	−10.6950
Average		0.5701*	2.6521	1.4766	2.0984*	0.5979	2.1785	1.2803	5.9622	0.7763	3.5824
(absolute bias)		1.6111		1.7875		1.3882*		3.6212		2.1794	

* Lowest bias for $\boldsymbol{x}_k$ within the parameter combination. Number of observations=900, repetitions=1000. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Appendix C. Lagrange multiplier tests

Table C1. Rejection rates of H_0 (Lagrange multiplier test). $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$.

ρ	$\boldsymbol{\delta}$	λ	$\boldsymbol{\theta}$	LM_λ	LM_ρ	LM^*_λ	LM^*_ρ	$LM_{\lambda\rho}$
0.0	0, 0	0.0	0, 0	0.0410	0.0440	0.0520	0.0500	0.0580
0.4	0, 0	0.0	0, 0	1.0000	1.0000	0.0920	0.7750	1.0000
0.8	0, 0	0.0	0, 0	1.0000	1.0000	0.3880	0.9990	1.0000
0.0	0.4, 0.7	0.0	0, 0	0.0440	0.0520	0.0550	0.0590	0.0550
0.4	0.4, 0.7	0.0	0, 0	1.0000	1.0000	0.1340	0.9900	1.0000
0.8	0.4, 0.7	0.0	0, 0	1.0000	1.0000	0.9950	1.0000	1.0000
0.0	0, 0	0.4	0, 0	1.0000	1.0000	0.7190	0.1140	1.0000
0.4	0, 0	0.4	0, 0	1.0000	1.0000	0.8560	0.6830	1.0000
0.8	0, 0	0.4	0, 0	1.0000	1.0000	0.8380	0.9780	1.0000
0.0	0.4, 0.7	0.4	0, 0	1.0000	1.0000	0.9430	0.1100	1.0000
0.4	0.4, 0.7	0.4	0, 0	1.0000	1.0000	0.9970	0.9560	1.0000
0.8	0.4, 0.7	0.4	0, 0	1.0000	1.0000	1.0000	1.0000	1.0000
0.0	0, 0	0.8	0, 0	1.0000	1.0000	0.9990	0.2860	1.0000
0.4	0, 0	0.8	0, 0	1.0000	1.0000	0.9960	0.5190	1.0000
0.8	0, 0	0.8	0, 0	1.0000	1.0000	0.7450	0.7410	1.0000
0.0	0.4, 0.7	0.8	0, 0	1.0000	1.0000	1.0000	0.3000	1.0000
0.4	0.4, 0.7	0.8	0, 0	1.0000	1.0000	1.0000	0.7280	1.0000
0.8	0.4, 0.7	0.8	0, 0	1.0000	1.0000	1.0000	0.9410	1.0000
0.0	0, 0	0.0	0.1, 0.8	0.4240	0.9910	1.0000	1.0000	1.0000
0.4	0, 0	0.0	0.1, 0.8	1.0000	1.0000	1.0000	1.0000	1.0000
0.8	0, 0	0.0	0.1, 0.8	1.0000	1.0000	1.0000	1.0000	1.0000
0.0	0.4, 0.7	0.0	0.1, 0.8	0.8320	1.0000	1.0000	1.0000	1.0000
0.4	0.4, 0.7	0.0	0.1, 0.8	1.0000	1.0000	0.9960	1.0000	1.0000
0.8	0.4, 0.7	0.0	0.1, 0.8	1.0000	1.0000	0.4970	1.0000	1.0000
0.0	0, 0	0.4	0.1, 0.8	1.0000	1.0000	0.9900	1.0000	1.0000
0.4	0, 0	0.4	0.1, 0.8	1.0000	1.0000	0.9530	1.0000	1.0000
0.8	0, 0	0.4	0.1, 0.8	1.0000	1.0000	0.8520	1.0000	1.0000
0.0	0.4, 0.7	0.4	0.1, 0.8	1.0000	1.0000	0.9560	1.0000	1.0000
0.4	0.4, 0.7	0.4	0.1, 0.8	1.0000	1.0000	0.0930	1.0000	1.0000
0.8	0.4, 0.7	0.4	0.1, 0.8	1.0000	1.0000	0.9600	1.0000	1.0000
0.0	0, 0	0.8	0.1, 0.8	1.0000	1.0000	0.2590	0.9930	1.0000
0.4	0, 0	0.8	0.1, 0.8	1.0000	1.0000	0.2370	0.9940	1.0000
0.8	0, 0	0.8	0.1, 0.8	1.0000	1.0000	0.1530	0.9940	1.0000
0.0	0.4, 0.7	0.8	0.1, 0.8	1.0000	1.0000	0.9880	1.0000	1.0000
0.4	0.4, 0.7	0.8	0.1, 0.8	1.0000	1.0000	1.0000	1.0000	1.0000
0.8	0.4, 0.7	0.8	0.1, 0.8	1.0000	1.0000	1.0000	1.0000	1.0000

Number of observations=900, repetitions=1000. LM = Lagrange multiplier test, LM^* = Robust Lagrange multiplier test, each for H_0: $\lambda = 0$, H_0: $\rho = 0$, H_0: $\lambda, \rho = 0$. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

Appendix D. Different specifications of W

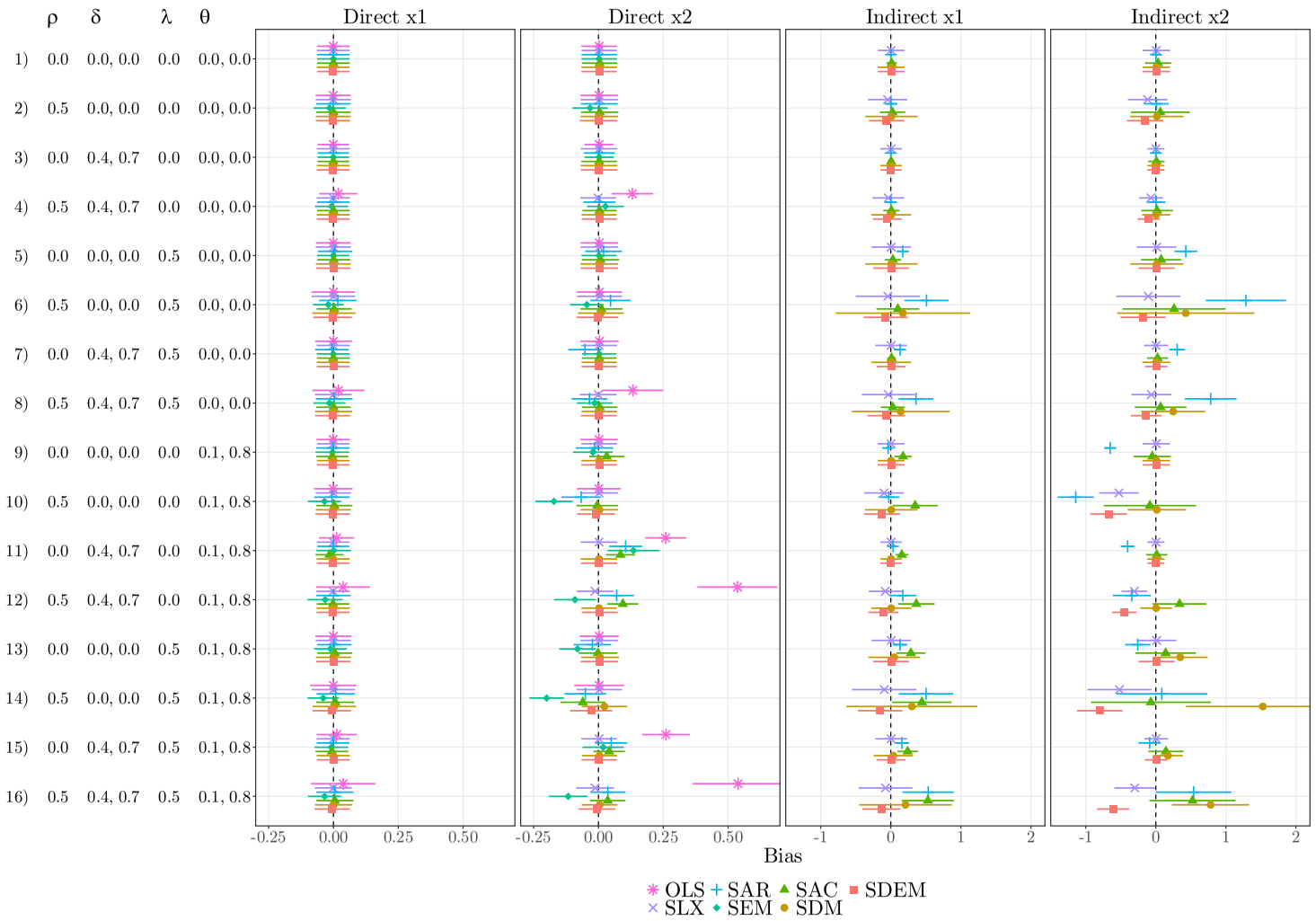

Figure D1. $\boldsymbol{W}$ = 10-nearest neighbours, inverse distance weighted, row-normalized. Bias of impacts and 95% confidence interval of empirical standard deviation without omv: $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.

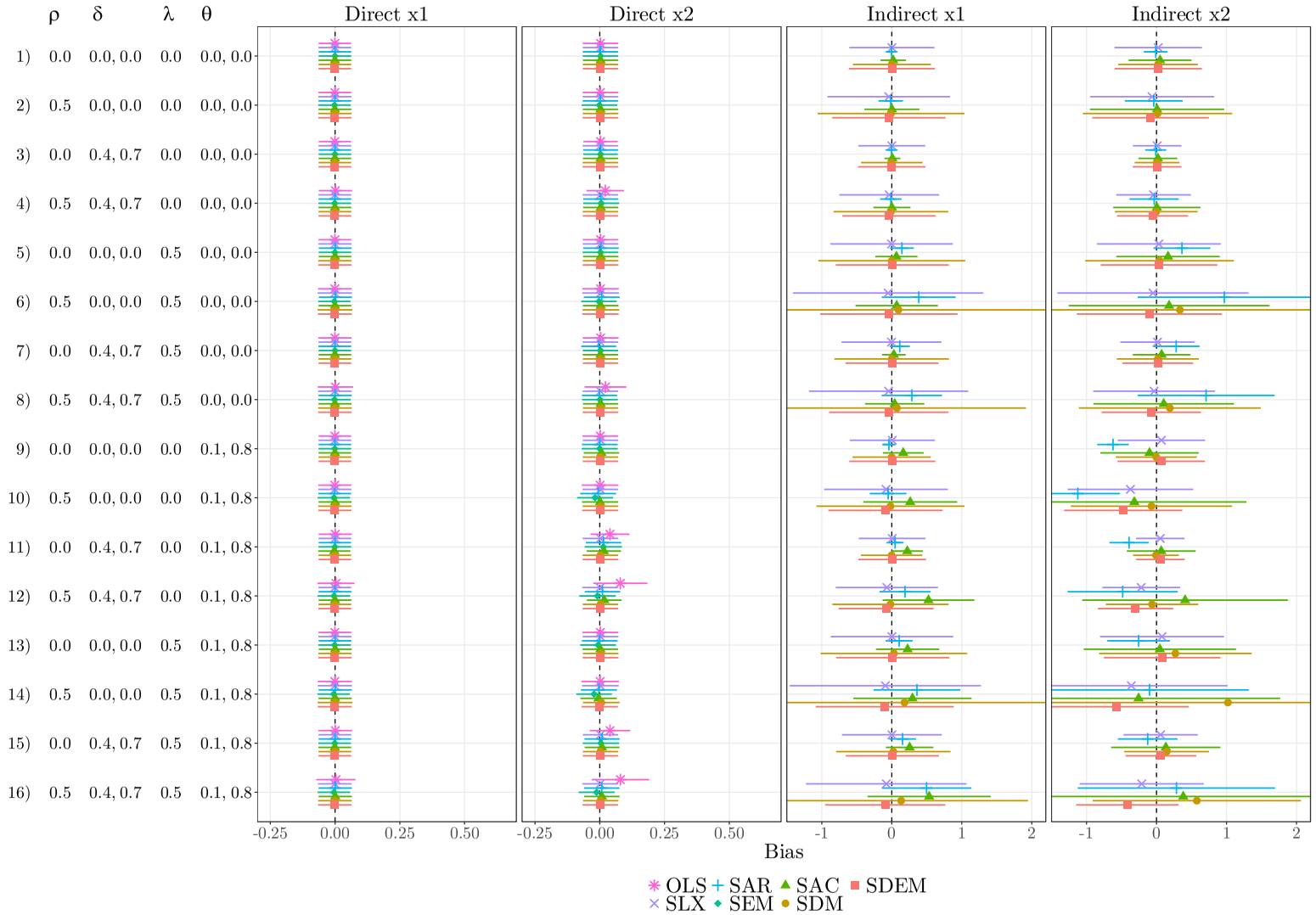

Figure D2. $\boldsymbol{W}$ = inverse distance weighted neighbours (cut-off: 100 neighbours), maximum eigenvalue-normalized. Bias of impacts and 95% confidence interval of empirical standard deviation without omv: $\boldsymbol{\beta} = (0.2, 0.5)^\intercal$, $\boldsymbol{\gamma} = (0, 0)^\intercal$. ρ = autocorrelation in the dependent variable ($\boldsymbol{Wy}$); $\boldsymbol{\delta}$ = autocorrelation in the covariates ($\boldsymbol{x}_k = f(\boldsymbol{Wx}_k)$); λ = autocorrelation in the disturbances ($\boldsymbol{Wu}$); $\boldsymbol{\theta}$ = spatial spillover effects of covariates ($\boldsymbol{WX}$); $\boldsymbol{\gamma}$ = strength of omv.