

Web Appendix for

Local Networks and Technology Adoption during Industry-Wide Technological Change

N Vera Chau

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OA.1 Overview

This supplemental appendix collects disclosure-heavy exhibits that support the main paper and main appendix. It reports the detailed robustness tables behind the condensed robustness discussion, alternative lease-link response estimates, the full distance ladder, the full network-type-by-weight grid, formation-level network coefficients, formation-level signal estimates by weight, alternative heterogeneity cuts, descriptive sorting diagnostics, trajectory classifications and additional mechanism diagnostics.

OA.2 Lease-Link and Spatial-Scope Robustness

The robustness discussion uses the name-matched lease-link bunching diagnostic to check whether an alternative lease-link construction generates a similar expiration clock. Table OA.1 reports the corresponding pooled response estimates. These estimates are not central paper evidence, but they disclose how the pooled specification changes when the peer-activity measure is rebuilt using the name-matched construction.

Table OA.1: Name-matched pooled response estimates				
	Adopt (ext)	Invest (ext)	Adopt (int)	Invest (int)
Peer performance (WY)	0.0154* (0.0083)	0.0188 (0.0115)	0.2791** (0.1152)	0.4676 (0.7438)
Peer skill (WZ)	-0.0084 (0.0109)	-0.0116 (0.0093)	-0.0668 (0.1285)	2.822*** (0.9757)
Peer-technique breadth	-0.0002* (0.0001)	-0.0002* (0.0001)	0.0003 (0.0004)	0.0000 (0.0022)
Technique intensity	0.0281*** (0.0085)	0.0348*** (0.0101)	0.3729 (0.5462)	1.711 (1.101)

Notes. The table reports the coefficient on $\hat{E}_{c,t-1}^{-f} \times S_{gt}$ from the pooled L1 response specification after rebuilding the peer-activity bunching measure using name-matched well-lease links. Controls, fixed effects and county-clustered standard errors match the baseline pooled specification. Standard errors are in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.2. Detailed distance ladder. The preferred body specification constructs peer activity within 0.25 miles. The robustness tables below report a compact coefficient-only summary. The table below reports the full ladder with standard errors, p -values and sample sizes.

Radius	Signal	Outcome	Coef.	SE	p	N
10 mi.	Peer performance (WY)	Adopt (ext)	0.4114	0.1485	0.006	584,640
10 mi.	Peer performance (WY)	Invest (ext)	0.4933	0.1703	0.004	584,640
10 mi.	Peer performance (WY)	Adopt (int)	20.38	13.20	0.123	7,620
10 mi.	Peer performance (WY)	Invest (int)	27.10	19.86	0.172	8,975
10 mi.	Peer skill (WZ)	Adopt (ext)	0.2675	0.0560	0.000	152,672
10 mi.	Peer skill (WZ)	Invest (ext)	0.0992	0.0843	0.240	152,672
10 mi.	Peer skill (WZ)	Adopt (int)	-30.70	35.78	0.391	937
10 mi.	Peer skill (WZ)	Invest (int)	-22.33	40.60	0.582	1,105
10 mi.	Peer-technique breadth	Adopt (ext)	-0.0067	0.0023	0.004	685,252
10 mi.	Peer-technique breadth	Invest (ext)	-0.0085	0.0028	0.002	685,252
10 mi.	Peer-technique breadth	Adopt (int)	0.0858	0.0855	0.315	7,378
10 mi.	Peer-technique breadth	Invest (int)	-0.9077	0.3914	0.020	8,764
10 mi.	Technique intensity	Adopt (ext)	0.8759	0.2927	0.003	780,136
10 mi.	Technique intensity	Invest (ext)	0.8472	0.3639	0.020	780,136
10 mi.	Technique intensity	Adopt (int)	1.369	25.24	0.957	9,079
10 mi.	Technique intensity	Invest (int)	76.60	56.95	0.179	10,753
25 mi.	Peer performance (WY)	Adopt (ext)	0.1558	0.0590	0.008	584,640
25 mi.	Peer performance (WY)	Invest (ext)	0.1841	0.0711	0.010	584,640
25 mi.	Peer performance (WY)	Adopt (int)	8.421	2.429	0.001	7,620
25 mi.	Peer performance (WY)	Invest (int)	5.435	7.293	0.456	8,975
25 mi.	Peer skill (WZ)	Adopt (ext)	0.0189	0.2086	0.928	152,672
25 mi.	Peer skill (WZ)	Invest (ext)	0.0049	0.2060	0.981	152,672
25 mi.	Peer skill (WZ)	Adopt (int)	-0.3917	12.61	0.975	937
25 mi.	Peer skill (WZ)	Invest (int)	-38.08	30.67	0.214	1,105
25 mi.	Peer-technique breadth	Adopt (ext)	-0.0022	0.0005	0.000	685,252
25 mi.	Peer-technique breadth	Invest (ext)	-0.0027	0.0006	0.000	685,252
25 mi.	Peer-technique breadth	Adopt (int)	-0.0225	0.0236	0.340	7,378
25 mi.	Peer-technique breadth	Invest (int)	-0.3658	0.1246	0.003	8,764
25 mi.	Technique intensity	Adopt (ext)	0.2815	0.1205	0.020	780,136
25 mi.	Technique intensity	Invest (ext)	0.3129	0.1493	0.036	780,136
25 mi.	Technique intensity	Adopt (int)	8.477	4.751	0.074	9,079
25 mi.	Technique intensity	Invest (int)	41.43	12.64	0.001	10,753
50 mi.	Peer performance (WY)	Adopt (ext)	0.0840	0.0379	0.027	584,640
50 mi.	Peer performance (WY)	Invest (ext)	0.1083	0.0533	0.042	584,640
50 mi.	Peer performance (WY)	Adopt (int)	3.792	1.197	0.002	7,620
50 mi.	Peer performance (WY)	Invest (int)	1.948	2.666	0.465	8,975
50 mi.	Peer skill (WZ)	Adopt (ext)	-0.0057	0.0110	0.606	152,672
50 mi.	Peer skill (WZ)	Invest (ext)	0.0028	0.0143	0.847	152,672
50 mi.	Peer skill (WZ)	Adopt (int)	0.0043	0.6433	0.995	937
50 mi.	Peer skill (WZ)	Invest (int)	-1.565	2.963	0.597	1,105
50 mi.	Peer-technique breadth	Adopt (ext)	-0.0008	0.0002	0.001	685,252
50 mi.	Peer-technique breadth	Invest (ext)	-0.0010	0.0003	0.001	685,252
50 mi.	Peer-technique breadth	Adopt (int)	0.0009	0.0042	0.833	7,378
50 mi.	Peer-technique breadth	Invest (int)	-0.0472	0.0247	0.055	8,764
50 mi.	Technique intensity	Adopt (ext)	0.1107	0.0940	0.239	780,136
50 mi.	Technique intensity	Invest (ext)	0.1209	0.1126	0.283	780,136
50 mi.	Technique intensity	Adopt (int)	1.465	1.268	0.248	9,079
50 mi.	Technique intensity	Invest (int)	10.38	6.764	0.125	10,753
100 mi.	Peer performance (WY)	Adopt (ext)	0.0526	0.0235	0.025	584,640
100 mi.	Peer performance (WY)	Invest (ext)	0.0670	0.0332	0.043	584,640
100 mi.	Peer performance (WY)	Adopt (int)	0.9891	0.3551	0.005	7,620
100 mi.	Peer performance (WY)	Invest (int)	1.132	1.585	0.475	8,975
100 mi.	Peer skill (WZ)	Adopt (ext)	-0.0008	0.0076	0.917	152,672
100 mi.	Peer skill (WZ)	Invest (ext)	0.0044	0.0086	0.610	152,672
100 mi.	Peer skill (WZ)	Adopt (int)	0.1249	0.2628	0.635	937
100 mi.	Peer skill (WZ)	Invest (int)	1.905	0.9836	0.053	1,105
100 mi.	Peer-technique breadth	Adopt (ext)	-0.0005	0.0002	0.001	685,252
100 mi.	Peer-technique breadth	Invest (ext)	-0.0007	0.0002	0.001	685,252
100 mi.	Peer-technique breadth	Adopt (int)	0.0024	0.0023	0.290	7,378
100 mi.	Peer-technique breadth	Invest (int)	-0.0188	0.0180	0.295	8,764
100 mi.	Technique intensity	Adopt (ext)	0.0577	0.0529	0.275	780,136
100 mi.	Technique intensity	Invest (ext)	0.0639	0.0628	0.310	780,136
100 mi.	Technique intensity	Adopt (int)	0.5427	0.6246	0.385	9,079
100 mi.	Technique intensity	Invest (int)	5.973	3.995	0.135	10,753
200 mi.	Peer performance (WY)	Adopt (ext)	0.0352	0.0201	0.080	584,640
200 mi.	Peer performance (WY)	Invest (ext)	0.0440	0.0276	0.110	584,640
200 mi.	Peer performance (WY)	Adopt (int)	0.8375	0.3346	0.012	7,620
200 mi.	Peer performance (WY)	Invest (int)	1.236	1.494	0.408	8,975

Radius	Signal	Outcome	Coef.	SE	<i>p</i>	<i>N</i>
200 mi.	Peer skill (<i>WZ</i>)	Adopt (ext)	-0.0024	0.0077	0.750	152,672
200 mi.	Peer skill (<i>WZ</i>)	Invest (ext)	0.0027	0.0087	0.755	152,672
200 mi.	Peer skill (<i>WZ</i>)	Adopt (int)	0.1156	0.2652	0.663	937
200 mi.	Peer skill (<i>WZ</i>)	Invest (int)	1.796	1.052	0.088	1,105
200 mi.	Peer-technique breadth	Adopt (ext)	-0.0005	0.0001	0.001	685,252
200 mi.	Peer-technique breadth	Invest (ext)	-0.0006	0.0002	0.001	685,252
200 mi.	Peer-technique breadth	Adopt (int)	0.0016	0.0020	0.415	7,378
200 mi.	Peer-technique breadth	Invest (int)	-0.0154	0.0155	0.320	8,764
200 mi.	Technique intensity	Adopt (ext)	0.0475	0.0422	0.260	780,136
200 mi.	Technique intensity	Invest (ext)	0.0508	0.0505	0.315	780,136
200 mi.	Technique intensity	Adopt (int)	0.4368	0.4961	0.379	9,079
200 mi.	Technique intensity	Invest (int)	5.751	3.299	0.081	10,753
Full county	Peer performance (<i>WY</i>)	Adopt (ext)	0.0310	0.0188	0.100	584,640
Full county	Peer performance (<i>WY</i>)	Invest (ext)	0.0382	0.0255	0.135	584,640
Full county	Peer performance (<i>WY</i>)	Adopt (int)	0.6851	0.3428	0.046	7,620
Full county	Peer performance (<i>WY</i>)	Invest (int)	1.178	1.461	0.420	8,975
Full county	Peer skill (<i>WZ</i>)	Adopt (ext)	-0.0029	0.0076	0.706	152,672
Full county	Peer skill (<i>WZ</i>)	Invest (ext)	0.0023	0.0087	0.794	152,672
Full county	Peer skill (<i>WZ</i>)	Adopt (int)	0.1154	0.2651	0.663	937
Full county	Peer skill (<i>WZ</i>)	Invest (int)	1.797	1.051	0.087	1,105
Full county	Peer-technique breadth	Adopt (ext)	-0.0005	0.0001	0.001	685,252
Full county	Peer-technique breadth	Invest (ext)	-0.0006	0.0002	0.001	685,252
Full county	Peer-technique breadth	Adopt (int)	0.0013	0.0019	0.492	7,378
Full county	Peer-technique breadth	Invest (int)	-0.0134	0.0153	0.381	8,764
Full county	Technique intensity	Adopt (ext)	0.0462	0.0395	0.243	780,136
Full county	Technique intensity	Invest (ext)	0.0490	0.0473	0.301	780,136
Full county	Technique intensity	Adopt (int)	0.4257	0.4724	0.367	9,079
Full county	Technique intensity	Invest (int)	5.586	3.163	0.077	10,753

OA.3 Network-Measurement Disclosure

Table OA.3. Full network type by weight grid. The main text uses the preferred economically interpretable weight for each network signal. This table reports the pooled L1 response for every network type and weight in the full-control, one-quarter-lag specification. Confidence intervals are 95 percent intervals. Rows with failure reasons are disclosed rather than silently dropped.

Net.	Weight	Outcome	Coef.	95% CI	N	Reason
WY	Inv. dist.	Adopt ext.	0.3159**	[0.0302, 0.6017]	528,440	
WY	Inv. dist.	Invest ext.	0.4530**	[0.0318, 0.8741]	528,440	
WY	Inv. dist.	Adopt int.	2.822	[-5.135, 10.78]	7,410	
WY	Inv. dist.	Invest int.	20.11	[-20.15, 60.37]	8,911	
WY	Dist.-time	Adopt ext.	0.1558***	[0.0401, 0.2716]	584,640	
WY	Dist.-time	Invest ext.	0.1841**	[0.0448, 0.3233]	584,640	
WY	Dist.-time	Adopt int.	8.421***	[3.660, 13.18]	7,620	
WY	Dist.-time	Invest int.	5.435	[-8.860, 19.73]	8,975	
WY	Equal	Adopt ext.	0.4473*	[-0.0235, 0.9181]	56,298	
WY	Equal	Invest ext.	0.8649	[-0.1922, 1.922]	56,298	
WY	Equal	Adopt int.	-17.63***	[-27.83, -7.426]	1,170	
WY	Equal	Invest int.	65.71***	[26.58, 104.8]	1,457	
WY	Res. skill	Adopt ext.	--	--	--	rc=3498
WY	Res. skill	Invest ext.	--	--	--	rc=3498
WY	Res. skill	Adopt int.	--	--	--	single-value
WY	Res. skill	Invest int.	--	--	--	rc=3498
WZ	Inv. dist.	Adopt ext.	-1.837***	[-2.955, -0.7188]	146,164	
WZ	Inv. dist.	Invest ext.	-1.972***	[-2.934, -1.010]	146,164	
WZ	Inv. dist.	Adopt int.	-31.47	[-142.6, 79.63]	758	
WZ	Inv. dist.	Invest int.	-191.2	[-481.6, 99.09]	888	
WZ	Dist.-time	Adopt ext.	0.0189	[-0.3900, 0.4279]	152,672	
WZ	Dist.-time	Invest ext.	0.0049	[-0.3989, 0.4087]	152,672	
WZ	Dist.-time	Adopt int.	-0.3917	[-25.10, 24.32]	937	
WZ	Dist.-time	Invest int.	-38.08	[-98.19, 22.03]	1,105	
WZ	Equal	Adopt ext.	--	--	--	empty
WZ	Equal	Invest ext.	--	--	--	empty
WZ	Equal	Adopt int.	--	--	--	empty
WZ	Equal	Invest int.	--	--	--	empty
WZ	Res. skill	Adopt ext.	--	--	--	single-value
WZ	Res. skill	Invest ext.	--	--	--	single-value
WZ	Res. skill	Adopt int.	--	--	--	single-value
WZ	Res. skill	Invest int.	--	--	--	single-value
Breadth	Inv. dist.	Adopt ext.	-0.0005	[-0.0015, 0.0005]	567,773	
Breadth	Inv. dist.	Invest ext.	-0.0005	[-0.0017, 0.0006]	567,773	
Breadth	Inv. dist.	Adopt int.	-0.1250***	[-0.2180, -0.0321]	6,308	
Breadth	Inv. dist.	Invest int.	-0.3316***	[-0.5593, -0.1040]	7,517	
Breadth	Dist.-time	Adopt ext.	0.0003	[-0.0006, 0.0012]	635,049	
Breadth	Dist.-time	Invest ext.	0.0003	[-0.0008, 0.0013]	635,049	
Breadth	Dist.-time	Adopt int.	-0.0602*	[-0.1310, 0.0106]	6,041	
Breadth	Dist.-time	Invest int.	-0.5400***	[-0.7968, -0.2832]	7,228	
Breadth	Equal	Adopt ext.	-0.0022***	[-0.0033, -0.0012]	685,252	
Breadth	Equal	Invest ext.	-0.0027***	[-0.0040, -0.0015]	685,252	
Breadth	Equal	Adopt int.	-0.0225	[-0.0688, 0.0237]	7,378	
Breadth	Equal	Invest int.	-0.3658***	[-0.6100, -0.1217]	8,764	
Breadth	Res. skill	Adopt ext.	0.0000	[-0.0017, 0.0017]	522,424	
Breadth	Res. skill	Invest ext.	-0.0003	[-0.0022, 0.0016]	522,424	
Breadth	Res. skill	Adopt int.	0.0447	[-0.1342, 0.2237]	6,753	
Breadth	Res. skill	Invest int.	0.2295	[-0.2651, 0.7241]	7,953	
Intensity	Inv. dist.	Adopt ext.	-0.1762**	[-0.3297, -0.0227]	772,274	
Intensity	Inv. dist.	Invest ext.	-0.2285**	[-0.4070, -0.0499]	772,274	
Intensity	Inv. dist.	Adopt int.	6.746	[-1.501, 14.99]	9,294	
Intensity	Inv. dist.	Invest int.	-12.07	[-40.08, 15.93]	10,962	
Intensity	Dist.-time	Adopt ext.	0.2815**	[0.0453, 0.5178]	780,136	
Intensity	Dist.-time	Invest ext.	0.3129**	[0.0202, 0.6056]	780,136	
Intensity	Dist.-time	Adopt int.	8.477*	[-0.8340, 17.79]	9,079	
Intensity	Dist.-time	Invest int.	41.43***	[16.66, 66.19]	10,753	
Intensity	Equal	Adopt ext.	-0.0343	[-0.2325, 0.1638]	859,360	
Intensity	Equal	Invest ext.	-0.0452	[-0.2829, 0.1926]	859,360	
Intensity	Equal	Adopt int.	9.138*	[-0.1652, 18.44]	8,971	
Intensity	Equal	Invest int.	-3.987	[-36.09, 28.12]	10,584	
Intensity	Res. skill	Adopt ext.	-0.1495	[-0.3646, 0.0656]	821,171	
Intensity	Res. skill	Invest ext.	-0.1937	[-0.4367, 0.0494]	821,171	
Intensity	Res. skill	Adopt int.	12.24	[-4.082, 28.56]	9,298	

Net.	Weight	Outcome	Coef.	95% CI	<i>N</i>	Reason
Intensity	Res. skill	Invest int.	-39.90**	[-73.83, -5.974]	11,207	

Table OA.4. Formation-level network overlay coefficients. The main paper shows the formation-level network overlay as a compact figure. The table below reports the corresponding formation, network, weight, status, coefficient, standard error, test statistic and block timing entries.

Formation	First 2k	Network	Weight	Status	Coef.	SE	<i>t</i>	Block
Barnett	2007Q1	Peer-technique breadth	Equidistant	positive	9.000	—	—	6
Barnett	2007Q1	Drill time	Distance-time	positive	0.0181	0.0071	2.554	4
Barnett	2007Q1	Interval length	Distance-time	negative	-0.0191	0.0026	-7.444	4
Barnett	2007Q1	Technique intensity	Distance-time	positive	0.0231	—	3.323	6
Barnett	2007Q1	Peer performance (WY)	Distance-time	positive	0.0088	0.0024	3.742	4
Barnett	2007Q1	Peer skill (WZ)	Distance-time	none	—	—	—	—
Fayetteville	2010Q2	Peer-technique breadth	Equidistant	none	—	—	—	—
Fayetteville	2010Q2	Drill time	Distance-time	positive	0.0689	0.0308	2.233	2
Fayetteville	2010Q2	Interval length	Distance-time	negative	-0.0063	0.0017	-3.740	1
Fayetteville	2010Q2	Technique intensity	Distance-time	positive	0.0141	—	5.706	1
Fayetteville	2010Q2	Peer performance (WY)	Distance-time	positive	0.0483	0.0205	2.356	2
Fayetteville	2010Q2	Peer skill (WZ)	Distance-time	none	—	—	—	—
Bakken	2011Q3	Peer-technique breadth	Equidistant	positive	9.000	—	—	4
Bakken	2011Q3	Drill time	Distance-time	positive	0.1459	0.0095	15.42	1
Bakken	2011Q3	Interval length	Distance-time	positive	0.0861	0.0068	12.71	1
Bakken	2011Q3	Technique intensity	Distance-time	positive	0.0548	—	8.776	3
Bakken	2011Q3	Peer performance (WY)	Distance-time	positive	0.0854	0.0140	6.104	1
Bakken	2011Q3	Peer skill (WZ)	Distance-time	positive	0.3139	0.0528	5.941	4
Haynesville	2011Q4	Peer-technique breadth	Equidistant	positive	3.000	—	—	2
Haynesville	2011Q4	Drill time	Distance-time	negative	-0.0227	0.0051	-4.425	1
Haynesville	2011Q4	Interval length	Distance-time	positive	0.0250	0.0072	3.500	2
Haynesville	2011Q4	Technique intensity	Distance-time	positive	0.0517	—	7.266	2
Haynesville	2011Q4	Peer performance (WY)	Distance-time	positive	0.0482	0.0083	5.785	1
Haynesville	2011Q4	Peer skill (WZ)	Distance-time	negative	-0.0368	0.0130	-2.840	1
Marcellus	2011Q4	Peer-technique breadth	Equidistant	positive	2.000	—	—	3
Marcellus	2011Q4	Drill time	Distance-time	positive	0.0294	0.0096	3.067	4
Marcellus	2011Q4	Interval length	Distance-time	positive	0.0668	0.0105	6.383	5
Marcellus	2011Q4	Technique intensity	Distance-time	positive	0.0343	—	4.728	2
Marcellus	2011Q4	Peer performance (WY)	Distance-time	positive	0.0212	0.0091	2.342	3
Marcellus	2011Q4	Peer skill (WZ)	Distance-time	negative	-0.0864	0.0420	-2.056	3
Eagle Ford	2012Q1	Peer-technique breadth	Equidistant	positive	9.000	—	—	9
Eagle Ford	2012Q1	Drill time	Distance-time	positive	0.0649	0.0116	5.613	3
Eagle Ford	2012Q1	Interval length	Distance-time	positive	0.0634	0.0058	10.85	8
Eagle Ford	2012Q1	Technique intensity	Distance-time	positive	0.1048	—	14.71	6
Eagle Ford	2012Q1	Peer performance (WY)	Distance-time	positive	0.0603	0.0088	6.834	7
Eagle Ford	2012Q1	Peer skill (WZ)	Distance-time	negative	-0.0522	0.0065	-8.051	6
Woodford	2012Q3	Peer-technique breadth	Equidistant	positive	4.000	—	—	2
Woodford	2012Q3	Drill time	Distance-time	none	—	—	—	—
Woodford	2012Q3	Interval length	Distance-time	positive	0.0223	0.0054	4.166	1
Woodford	2012Q3	Technique intensity	Distance-time	positive	0.0498	—	6.991	2
Woodford	2012Q3	Peer performance (WY)	Distance-time	positive	0.0404	0.0056	7.256	2
Woodford	2012Q3	Peer skill (WZ)	Distance-time	none	—	—	—	—
Mississippian	2014Q1	Peer-technique breadth	Equidistant	positive	11.00	—	—	1
Mississippian	2014Q1	Drill time	Distance-time	positive	0.0383	0.0082	4.687	1
Mississippian	2014Q1	Interval length	Distance-time	positive	0.0068	0.0017	3.959	1
Mississippian	2014Q1	Technique intensity	Distance-time	positive	0.0274	—	2.960	3
Mississippian	2014Q1	Peer performance (WY)	Distance-time	positive	0.0273	0.0070	3.872	1
Mississippian	2014Q1	Peer skill (WZ)	Distance-time	positive	0.2040	0.0292	6.981	1
Three Forks	2014Q2	Peer-technique breadth	Equidistant	positive	8.000	—	—	2
Three Forks	2014Q2	Drill time	Distance-time	positive	0.1106	0.0213	5.199	1
Three Forks	2014Q2	Interval length	Distance-time	none	—	—	—	—
Three Forks	2014Q2	Technique intensity	Distance-time	positive	0.0108	—	2.858	2
Three Forks	2014Q2	Peer performance (WY)	Distance-time	positive	0.0655	0.0240	2.722	2
Three Forks	2014Q2	Peer skill (WZ)	Distance-time	none	—	—	—	—
Niobrara	2014Q3	Peer-technique breadth	Equidistant	positive	7.000	—	—	3
Niobrara	2014Q3	Drill time	Distance-time	positive	0.0703	0.0157	4.486	2
Niobrara	2014Q3	Interval length	Distance-time	negative	-0.0081	0.0038	-2.106	1
Niobrara	2014Q3	Technique intensity	Distance-time	positive	0.0506	—	7.185	3
Niobrara	2014Q3	Peer performance (WY)	Distance-time	positive	0.1144	0.0107	10.68	1
Niobrara	2014Q3	Peer skill (WZ)	Distance-time	positive	0.0320	0.0154	2.073	2
Bone Spring	2015Q1	Peer-technique breadth	Equidistant	positive	9.000	—	—	2
Bone Spring	2015Q1	Drill time	Distance-time	none	—	—	—	—
Bone Spring	2015Q1	Interval length	Distance-time	none	—	—	—	—
Bone Spring	2015Q1	Technique intensity	Distance-time	positive	0.0332	—	4.583	2
Bone Spring	2015Q1	Peer performance (WY)	Distance-time	positive	0.1076	0.0240	4.478	1
Bone Spring	2015Q1	Peer skill (WZ)	Distance-time	negative	-0.1171	0.0375	-3.121	1
Cleveland	2015Q1	Peer-technique breadth	Equidistant	positive	15.00	—	—	1

Formation	First 2k	Network	Weight	Status	Coef.	SE	<i>t</i>	Block
Cleveland	2015Q1	Drill time	Distance-time	none	–	–	–	–
Cleveland	2015Q1	Interval length	Distance-time	positive	0.0326	0.0028	11.59	1
Cleveland	2015Q1	Technique intensity	Distance-time	positive	0.0033	–	2.130	1
Cleveland	2015Q1	Peer performance (<i>WY</i>)	Distance-time	none	–	–	–	–
Cleveland	2015Q1	Peer skill (<i>WZ</i>)	Distance-time	none	–	–	–	–
Wolfcamp	2015Q1	Peer-technique breadth	Equidistant	positive	4.000	–	–	1
Wolfcamp	2015Q1	Drill time	Distance-time	positive	0.0596	0.0268	2.228	2
Wolfcamp	2015Q1	Interval length	Distance-time	positive	0.0237	0.0025	9.492	1
Wolfcamp	2015Q1	Technique intensity	Distance-time	positive	0.0557	–	7.490	2
Wolfcamp	2015Q1	Peer performance (<i>WY</i>)	Distance-time	positive	0.0496	0.0099	5.010	4
Wolfcamp	2015Q1	Peer skill (<i>WZ</i>)	Distance-time	negative	-0.1255	0.0288	-4.356	4
Trend Area	2015Q4	Peer-technique breadth	Equidistant	positive	4.000	–	–	5
Trend Area	2015Q4	Drill time	Distance-time	none	–	–	–	–
Trend Area	2015Q4	Interval length	Distance-time	negative	-0.0347	0.0065	-5.370	1
Trend Area	2015Q4	Technique intensity	Distance-time	positive	0.0422	–	5.918	5
Trend Area	2015Q4	Peer performance (<i>WY</i>)	Distance-time	positive	0.0551	0.0123	4.461	3
Trend Area	2015Q4	Peer skill (<i>WZ</i>)	Distance-time	negative	-0.1173	0.0245	-4.783	3
Point Pleasant	2020Q4	Peer-technique breadth	Equidistant	positive	1.000	–	–	1
Point Pleasant	2020Q4	Drill time	Distance-time	positive	0.0649	0.0282	2.298	1
Point Pleasant	2020Q4	Interval length	Distance-time	none	–	–	–	–
Point Pleasant	2020Q4	Technique intensity	Distance-time	positive	0.0428	–	5.843	1
Point Pleasant	2020Q4	Peer performance (<i>WY</i>)	Distance-time	none	–	–	–	–
Point Pleasant	2020Q4	Peer skill (<i>WZ</i>)	Distance-time	none	–	–	–	–

Table OA.5. Full formation-level signal estimates by weight. This table expands the coefficient-level network disclosure across all four weighting schemes. For peer performance, peer skill, interval length and drill time, each formation-signal-weight row reports the 2,000-well block with the largest absolute test statistic and gives the coefficient, standard error, test statistic, p -value and block number. For breadth, the reported value is the largest count of peer-technique attributes passing the 5% rule. For intensity, the reported value is the largest partial R^2 , with the Wald test reported in the test column.

Formation	First 2k	Signal	Weight	Status	Coef./value	SE	Test	p	Block
Barnett	2007Q1	Peer performance (WY)	Inverse distance	positive	0.0319	0.0035	9.105	< 0.001	2
Barnett	2007Q1	Peer performance (WY)	Distance-time	positive	0.0088	0.0024	3.742	< 0.001	4
Barnett	2007Q1	Peer performance (WY)	Equidistant	positive	0.0015	0.0007	2.108	0.035	5
Barnett	2007Q1	Peer performance (WY)	Residual skill	negative	-0.0207	0.0057	-3.647	< 0.001	5
Barnett	2007Q1	Peer skill (WZ)	Inverse distance	negative	-0.0112	0.0032	-3.468	< 0.001	2
Barnett	2007Q1	Peer skill (WZ)	Distance-time	none	-0.0194	0.0178	-1.093	0.274	1
Barnett	2007Q1	Peer skill (WZ)	Equidistant	positive	0.0036	0.0012	2.934	0.003	6
Barnett	2007Q1	Peer skill (WZ)	Residual skill	negative	-0.0015	0.0002	-10.02	< 0.001	3
Barnett	2007Q1	Peer-technique breadth	Inverse distance	positive	1.000	—	—	—	6
Barnett	2007Q1	Peer-technique breadth	Distance-time	positive	1.000	—	—	—	6
Barnett	2007Q1	Peer-technique breadth	Equidistant	positive	9.000	—	—	—	6
Barnett	2007Q1	Peer-technique breadth	Residual skill	positive	5.000	—	—	—	5
Barnett	2007Q1	Technique intensity	Inverse distance	positive	0.0380	—	5.660	< 0.001	6
Barnett	2007Q1	Technique intensity	Distance-time	positive	0.0231	—	3.323	< 0.001	6
Barnett	2007Q1	Technique intensity	Equidistant	positive	0.0172	—	2.401	0.002	6
Barnett	2007Q1	Technique intensity	Residual skill	positive	0.0219	—	10.47	< 0.001	4
Barnett	2007Q1	Interval length	Inverse distance	positive	0.0036	0.0015	2.440	0.015	2
Barnett	2007Q1	Interval length	Distance-time	negative	-0.0191	0.0026	-7.444	< 0.001	4
Barnett	2007Q1	Interval length	Equidistant	negative	-0.0009	0.0002	-3.689	< 0.001	4
Barnett	2007Q1	Interval length	Residual skill	positive	0.0166	0.0044	3.744	< 0.001	6
Barnett	2007Q1	Drill time	Inverse distance	positive	0.0116	0.0034	3.373	< 0.001	4
Barnett	2007Q1	Drill time	Distance-time	positive	0.0181	0.0071	2.554	0.011	4
Barnett	2007Q1	Drill time	Equidistant	negative	-0.0023	0.0005	-5.106	< 0.001	6
Barnett	2007Q1	Drill time	Residual skill	negative	-0.0100	0.0028	-3.626	< 0.001	6
Fayetteville	2010Q2	Peer performance (WY)	Inverse distance	positive	0.0151	0.0052	2.916	0.004	2
Fayetteville	2010Q2	Peer performance (WY)	Distance-time	positive	0.0483	0.0205	2.356	0.018	2
Fayetteville	2010Q2	Peer performance (WY)	Equidistant	none	-0.0021	0.0013	-1.663	0.096	1
Fayetteville	2010Q2	Peer performance (WY)	Residual skill	positive	0.0089	0.0012	7.658	< 0.001	1
Fayetteville	2010Q2	Peer skill (WZ)	Inverse distance	negative	-0.0157	0.0063	-2.503	0.012	2
Fayetteville	2010Q2	Peer skill (WZ)	Distance-time	none	-0.0370	0.0250	-1.482	0.138	2
Fayetteville	2010Q2	Peer skill (WZ)	Equidistant	none	-0.0029	0.0018	-1.626	0.104	1
Fayetteville	2010Q2	Peer skill (WZ)	Residual skill	negative	-0.0041	0.0004	-9.916	< 0.001	1
Fayetteville	2010Q2	Peer-technique breadth	Inverse distance	none	0.0000	—	—	—	1
Fayetteville	2010Q2	Peer-technique breadth	Distance-time	none	0.0000	—	—	—	1
Fayetteville	2010Q2	Peer-technique breadth	Equidistant	none	0.0000	—	—	—	1
Fayetteville	2010Q2	Peer-technique breadth	Residual skill	none	0.0000	—	—	—	1
Fayetteville	2010Q2	Technique intensity	Inverse distance	positive	0.0294	—	12.90	< 0.001	1
Fayetteville	2010Q2	Technique intensity	Distance-time	positive	0.0141	—	5.706	< 0.001	1
Fayetteville	2010Q2	Technique intensity	Equidistant	positive	0.0134	—	6.520	< 0.001	1
Fayetteville	2010Q2	Technique intensity	Residual skill	positive	0.0584	—	31.16	< 0.001	1
Fayetteville	2010Q2	Interval length	Inverse distance	none	0.0023	0.0015	1.517	0.129	2
Fayetteville	2010Q2	Interval length	Distance-time	negative	-0.0063	0.0017	-3.740	< 0.001	1
Fayetteville	2010Q2	Interval length	Equidistant	negative	-0.0024	0.0005	-4.769	< 0.001	1
Fayetteville	2010Q2	Interval length	Residual skill	positive	0.0032	0.0004	8.002	< 0.001	1
Fayetteville	2010Q2	Drill time	Inverse distance	positive	0.0217	0.0063	3.460	< 0.001	2
Fayetteville	2010Q2	Drill time	Distance-time	positive	0.0689	0.0308	2.233	0.026	2
Fayetteville	2010Q2	Drill time	Equidistant	none	-0.0017	0.0018	-0.9711	0.331	2
Fayetteville	2010Q2	Drill time	Residual skill	none	0.0106	0.0069	1.539	0.124	2
Bakken	2011Q3	Peer performance (WY)	Inverse distance	positive	0.0395	0.0056	7.032	< 0.001	2
Bakken	2011Q3	Peer performance (WY)	Distance-time	positive	0.0854	0.0140	6.104	< 0.001	1
Bakken	2011Q3	Peer performance (WY)	Equidistant	positive	0.0040	0.0008	4.717	< 0.001	1
Bakken	2011Q3	Peer performance (WY)	Residual skill	positive	0.0083	0.0016	5.302	< 0.001	2
Bakken	2011Q3	Peer skill (WZ)	Inverse distance	negative	-0.0859	0.0133	-6.459	< 0.001	2
Bakken	2011Q3	Peer skill (WZ)	Distance-time	positive	0.3139	0.0528	5.941	< 0.001	4
Bakken	2011Q3	Peer skill (WZ)	Equidistant	positive	0.0080	0.0017	4.658	< 0.001	4
Bakken	2011Q3	Peer skill (WZ)	Residual skill	negative	-0.0058	0.0010	-5.721	< 0.001	2
Bakken	2011Q3	Peer-technique breadth	Inverse distance	positive	5.000	—	—	—	4
Bakken	2011Q3	Peer-technique breadth	Distance-time	positive	8.000	—	—	—	4
Bakken	2011Q3	Peer-technique breadth	Equidistant	positive	9.000	—	—	—	4
Bakken	2011Q3	Peer-technique breadth	Residual skill	positive	3.000	—	—	—	1

Formation	First 2k	Signal	Weight	Status	Coef./value	SE	Test	p	Block
Bakken	2011Q3	Technique intensity	Inverse distance	positive	0.0714	—	10.76	< 0.001	3
Bakken	2011Q3	Technique intensity	Distance-time	positive	0.0548	—	8.776	< 0.001	3
Bakken	2011Q3	Technique intensity	Equidistant	positive	0.0658	—	10.56	< 0.001	3
Bakken	2011Q3	Technique intensity	Residual skill	positive	0.0587	—	8.409	< 0.001	2
Bakken	2011Q3	Interval length	Inverse distance	positive	0.0117	0.0010	11.15	< 0.001	1
Bakken	2011Q3	Interval length	Distance-time	positive	0.0861	0.0068	12.71	< 0.001	1
Bakken	2011Q3	Interval length	Equidistant	positive	0.0043	0.0004	11.25	< 0.001	1
Bakken	2011Q3	Interval length	Residual skill	positive	0.0054	0.0008	6.901	< 0.001	1
Bakken	2011Q3	Drill time	Inverse distance	positive	0.0262	0.0017	15.73	< 0.001	1
Bakken	2011Q3	Drill time	Distance-time	positive	0.1459	0.0095	15.42	< 0.001	1
Bakken	2011Q3	Drill time	Equidistant	positive	0.0066	0.0005	12.95	< 0.001	1
Bakken	2011Q3	Drill time	Residual skill	negative	-0.0098	0.0010	-9.623	< 0.001	4
Haynesville	2011Q4	Peer performance (WY)	Inverse distance	positive	0.0073	0.0015	4.798	< 0.001	1
Haynesville	2011Q4	Peer performance (WY)	Distance-time	positive	0.0482	0.0083	5.785	< 0.001	1
Haynesville	2011Q4	Peer performance (WY)	Equidistant	positive	0.0024	0.0004	6.036	< 0.001	2
Haynesville	2011Q4	Peer performance (WY)	Residual skill	positive	0.0032	0.0015	2.173	0.030	1
Haynesville	2011Q4	Peer skill (WZ)	Inverse distance	none	-0.0039	0.0024	-1.634	0.102	1
Haynesville	2011Q4	Peer skill (WZ)	Distance-time	negative	-0.0368	0.0130	-2.840	0.005	1
Haynesville	2011Q4	Peer skill (WZ)	Equidistant	negative	-0.0057	0.0008	-7.007	< 0.001	2
Haynesville	2011Q4	Peer skill (WZ)	Residual skill	negative	-0.0034	0.0017	-2.053	0.040	1
Haynesville	2011Q4	Peer-technique breadth	Inverse distance	positive	5.000	—	—	—	2
Haynesville	2011Q4	Peer-technique breadth	Distance-time	positive	8.000	—	—	—	2
Haynesville	2011Q4	Peer-technique breadth	Equidistant	positive	3.000	—	—	—	2
Haynesville	2011Q4	Peer-technique breadth	Residual skill	positive	1.000	—	—	—	2
Haynesville	2011Q4	Technique intensity	Inverse distance	positive	0.0683	—	9.783	< 0.001	2
Haynesville	2011Q4	Technique intensity	Distance-time	positive	0.0517	—	7.266	< 0.001	2
Haynesville	2011Q4	Technique intensity	Equidistant	positive	0.0510	—	7.129	< 0.001	2
Haynesville	2011Q4	Technique intensity	Residual skill	positive	0.0470	—	6.205	< 0.001	2
Haynesville	2011Q4	Interval length	Inverse distance	positive	0.0029	0.0013	2.231	0.026	2
Haynesville	2011Q4	Interval length	Distance-time	positive	0.0250	0.0072	3.500	< 0.001	2
Haynesville	2011Q4	Interval length	Equidistant	positive	0.0009	0.0002	4.495	< 0.001	1
Haynesville	2011Q4	Interval length	Residual skill	positive	0.0110	0.0018	6.022	< 0.001	1
Haynesville	2011Q4	Drill time	Inverse distance	negative	-0.0072	0.0013	-5.782	< 0.001	1
Haynesville	2011Q4	Drill time	Distance-time	negative	-0.0227	0.0051	-4.425	< 0.001	1
Haynesville	2011Q4	Drill time	Equidistant	positive	0.0043	0.0016	2.754	0.006	2
Haynesville	2011Q4	Drill time	Residual skill	negative	-0.0194	0.0048	-4.030	< 0.001	2
Marcellus	2011Q4	Peer performance (WY)	Inverse distance	none	0.0032	0.0022	1.415	0.157	5
Marcellus	2011Q4	Peer performance (WY)	Distance-time	positive	0.0212	0.0091	2.342	0.019	3
Marcellus	2011Q4	Peer performance (WY)	Equidistant	none	0.0009	0.0006	1.421	0.155	5
Marcellus	2011Q4	Peer performance (WY)	Residual skill	negative	-0.0078	0.0014	-5.681	< 0.001	2
Marcellus	2011Q4	Peer skill (WZ)	Inverse distance	negative	-0.0216	0.0100	-2.166	0.030	5
Marcellus	2011Q4	Peer skill (WZ)	Distance-time	negative	-0.0864	0.0420	-2.056	0.040	3
Marcellus	2011Q4	Peer skill (WZ)	Equidistant	none	-0.0035	0.0019	-1.856	0.063	3
Marcellus	2011Q4	Peer skill (WZ)	Residual skill	positive	0.0100	0.0018	5.579	< 0.001	2
Marcellus	2011Q4	Peer-technique breadth	Inverse distance	positive	3.000	—	—	—	4
Marcellus	2011Q4	Peer-technique breadth	Distance-time	positive	3.000	—	—	—	3
Marcellus	2011Q4	Peer-technique breadth	Equidistant	positive	2.000	—	—	—	3
Marcellus	2011Q4	Peer-technique breadth	Residual skill	positive	8.000	—	—	—	2
Marcellus	2011Q4	Technique intensity	Inverse distance	positive	0.0566	—	7.892	< 0.001	2
Marcellus	2011Q4	Technique intensity	Distance-time	positive	0.0343	—	4.728	< 0.001	2
Marcellus	2011Q4	Technique intensity	Equidistant	positive	0.0421	—	5.931	< 0.001	2
Marcellus	2011Q4	Technique intensity	Residual skill	positive	0.0315	—	4.338	< 0.001	3
Marcellus	2011Q4	Interval length	Inverse distance	positive	0.0163	0.0028	5.793	< 0.001	6
Marcellus	2011Q4	Interval length	Distance-time	positive	0.0668	0.0105	6.383	< 0.001	5
Marcellus	2011Q4	Interval length	Equidistant	positive	0.0038	0.0006	6.574	< 0.001	6
Marcellus	2011Q4	Interval length	Residual skill	negative	-0.0110	0.0020	-5.464	< 0.001	5
Marcellus	2011Q4	Drill time	Inverse distance	positive	0.0078	0.0025	3.067	0.002	4
Marcellus	2011Q4	Drill time	Distance-time	positive	0.0294	0.0096	3.067	0.002	4
Marcellus	2011Q4	Drill time	Equidistant	positive	0.0030	0.0005	6.233	< 0.001	4
Marcellus	2011Q4	Drill time	Residual skill	negative	-0.0100	0.0021	-4.665	< 0.001	1
Eagle Ford	2012Q1	Peer performance (WY)	Inverse distance	positive	0.0330	0.0056	5.858	< 0.001	1
Eagle Ford	2012Q1	Peer performance (WY)	Distance-time	positive	0.0603	0.0088	6.834	< 0.001	7
Eagle Ford	2012Q1	Peer performance (WY)	Equidistant	positive	0.0024	0.0004	5.753	< 0.001	7
Eagle Ford	2012Q1	Peer performance (WY)	Residual skill	negative	-0.0117	0.0025	-4.631	< 0.001	4
Eagle Ford	2012Q1	Peer skill (WZ)	Inverse distance	negative	-0.0232	0.0032	-7.220	< 0.001	6
Eagle Ford	2012Q1	Peer skill (WZ)	Distance-time	negative	-0.0522	0.0065	-8.051	< 0.001	6
Eagle Ford	2012Q1	Peer skill (WZ)	Equidistant	negative	-0.0014	0.0002	-5.953	< 0.001	6
Eagle Ford	2012Q1	Peer skill (WZ)	Residual skill	negative	-0.0011	0.0002	-5.165	< 0.001	1
Eagle Ford	2012Q1	Peer-technique breadth	Inverse distance	positive	5.000	—	—	—	9
Eagle Ford	2012Q1	Peer-technique breadth	Distance-time	positive	3.000	—	—	—	9
Eagle Ford	2012Q1	Peer-technique breadth	Equidistant	positive	9.000	—	—	—	9
Eagle Ford	2012Q1	Peer-technique breadth	Residual skill	positive	13.00	—	—	—	9
Eagle Ford	2012Q1	Technique intensity	Inverse distance	positive	0.1118	—	15.70	< 0.001	6
Eagle Ford	2012Q1	Technique intensity	Distance-time	positive	0.1048	—	14.71	< 0.001	6
Eagle Ford	2012Q1	Technique intensity	Equidistant	positive	0.0632	—	8.948	< 0.001	4

Formation	First 2k	Signal	Weight	Status	Coef./value	SE	Test	<i>p</i>	Block
Eagle Ford	2012Q1	Technique intensity	Residual skill	positive	0.0654	—	9.351	< 0.001	9
Eagle Ford	2012Q1	Interval length	Inverse distance	positive	0.0219	0.0018	12.22	< 0.001	8
Eagle Ford	2012Q1	Interval length	Distance-time	positive	0.0634	0.0058	10.85	< 0.001	8
Eagle Ford	2012Q1	Interval length	Equidistant	positive	0.0033	0.0003	12.37	< 0.001	8
Eagle Ford	2012Q1	Interval length	Residual skill	positive	0.0063	0.0011	5.553	< 0.001	11
Eagle Ford	2012Q1	Drill time	Inverse distance	positive	0.0254	0.0058	4.395	< 0.001	3
Eagle Ford	2012Q1	Drill time	Distance-time	positive	0.0649	0.0116	5.613	< 0.001	3
Eagle Ford	2012Q1	Drill time	Equidistant	positive	0.0017	0.0004	3.884	< 0.001	8
Eagle Ford	2012Q1	Drill time	Residual skill	negative	-0.0368	0.0054	-6.840	< 0.001	10
Woodford	2012Q3	Peer performance (WY)	Inverse distance	positive	0.0095	0.0014	6.574	< 0.001	2
Woodford	2012Q3	Peer performance (WY)	Distance-time	positive	0.0404	0.0056	7.256	< 0.001	2
Woodford	2012Q3	Peer performance (WY)	Equidistant	none	0.0016	0.0014	1.199	0.230	2
Woodford	2012Q3	Peer performance (WY)	Residual skill	positive	0.0021	0.0006	3.573	< 0.001	2
Woodford	2012Q3	Peer skill (WZ)	Inverse distance	none	-0.0047	0.0045	-1.041	0.298	1
Woodford	2012Q3	Peer skill (WZ)	Distance-time	none	0.0170	0.0148	1.142	0.254	2
Woodford	2012Q3	Peer skill (WZ)	Equidistant	none	0.0070	0.0044	1.590	0.112	2
Woodford	2012Q3	Peer skill (WZ)	Residual skill	negative	-0.0023	0.0005	-4.365	< 0.001	2
Woodford	2012Q3	Peer-technique breadth	Inverse distance	positive	1.000	—	—	—	1
Woodford	2012Q3	Peer-technique breadth	Distance-time	positive	5.000	—	—	—	2
Woodford	2012Q3	Peer-technique breadth	Equidistant	positive	4.000	—	—	—	2
Woodford	2012Q3	Peer-technique breadth	Residual skill	positive	1.000	—	—	—	1
Woodford	2012Q3	Technique intensity	Inverse distance	positive	0.0586	—	8.177	< 0.001	2
Woodford	2012Q3	Technique intensity	Distance-time	positive	0.0498	—	6.991	< 0.001	2
Woodford	2012Q3	Technique intensity	Equidistant	positive	0.0641	—	8.559	< 0.001	2
Woodford	2012Q3	Technique intensity	Residual skill	positive	0.0433	—	6.041	< 0.001	2
Woodford	2012Q3	Interval length	Inverse distance	positive	0.0038	0.0008	4.946	< 0.001	1
Woodford	2012Q3	Interval length	Distance-time	positive	0.0223	0.0054	4.166	< 0.001	1
Woodford	2012Q3	Interval length	Equidistant	positive	0.0022	0.0005	4.306	< 0.001	1
Woodford	2012Q3	Interval length	Residual skill	positive	0.0034	0.0005	6.163	< 0.001	1
Woodford	2012Q3	Drill time	Inverse distance	positive	0.0085	0.0022	3.931	< 0.001	1
Woodford	2012Q3	Drill time	Distance-time	none	0.0259	0.0143	1.810	0.070	1
Woodford	2012Q3	Drill time	Equidistant	none	0.0010	0.0011	0.8921	0.372	2
Woodford	2012Q3	Drill time	Residual skill	positive	0.0049	0.0016	3.040	0.002	1
Mississippian	2014Q1	Peer performance (WY)	Inverse distance	negative	-0.0056	0.0023	-2.432	0.015	1
Mississippian	2014Q1	Peer performance (WY)	Distance-time	positive	0.0273	0.0070	3.872	< 0.001	1
Mississippian	2014Q1	Peer performance (WY)	Equidistant	negative	-0.0036	0.0006	-6.466	< 0.001	1
Mississippian	2014Q1	Peer performance (WY)	Residual skill	positive	0.0012	0.0005	2.277	0.023	1
Mississippian	2014Q1	Peer skill (WZ)	Inverse distance	positive	0.0467	0.0064	7.359	< 0.001	1
Mississippian	2014Q1	Peer skill (WZ)	Distance-time	positive	0.2040	0.0292	6.981	< 0.001	1
Mississippian	2014Q1	Peer skill (WZ)	Equidistant	positive	0.0168	0.0020	8.264	< 0.001	1
Mississippian	2014Q1	Peer skill (WZ)	Residual skill	none	-0.0009	0.0005	-1.847	0.065	3
Mississippian	2014Q1	Peer-technique breadth	Inverse distance	positive	12.00	—	—	—	1
Mississippian	2014Q1	Peer-technique breadth	Distance-time	positive	10.00	—	—	—	1
Mississippian	2014Q1	Peer-technique breadth	Equidistant	positive	11.00	—	—	—	1
Mississippian	2014Q1	Peer-technique breadth	Residual skill	positive	1.000	—	—	—	1
Mississippian	2014Q1	Technique intensity	Inverse distance	positive	0.0822	—	10.01	< 0.001	1
Mississippian	2014Q1	Technique intensity	Distance-time	positive	0.0274	—	2.960	< 0.001	3
Mississippian	2014Q1	Technique intensity	Equidistant	positive	0.0536	—	7.575	< 0.001	1
Mississippian	2014Q1	Technique intensity	Residual skill	positive	0.0622	—	8.809	< 0.001	1
Mississippian	2014Q1	Interval length	Inverse distance	positive	0.0016	0.0003	4.965	< 0.001	1
Mississippian	2014Q1	Interval length	Distance-time	positive	0.0068	0.0017	3.959	< 0.001	1
Mississippian	2014Q1	Interval length	Equidistant	positive	0.0018	0.0004	4.899	< 0.001	3
Mississippian	2014Q1	Interval length	Residual skill	negative	-0.0021	0.0008	-2.587	0.010	2
Mississippian	2014Q1	Drill time	Inverse distance	positive	0.0414	0.0048	8.561	< 0.001	2
Mississippian	2014Q1	Drill time	Distance-time	positive	0.0383	0.0082	4.687	< 0.001	1
Mississippian	2014Q1	Drill time	Equidistant	positive	0.0027	0.0005	5.538	< 0.001	3
Mississippian	2014Q1	Drill time	Residual skill	negative	-0.0049	0.0013	-3.764	< 0.001	3
Three Forks	2014Q2	Peer performance (WY)	Inverse distance	positive	0.0201	0.0056	3.600	< 0.001	2
Three Forks	2014Q2	Peer performance (WY)	Distance-time	positive	0.0655	0.0240	2.722	0.006	2
Three Forks	2014Q2	Peer performance (WY)	Equidistant	none	0.0005	0.0012	0.4512	0.652	2
Three Forks	2014Q2	Peer performance (WY)	Residual skill	positive	0.0093	0.0020	4.566	< 0.001	1
Three Forks	2014Q2	Peer skill (WZ)	Inverse distance	negative	-0.0187	0.0091	-2.058	0.040	2
Three Forks	2014Q2	Peer skill (WZ)	Distance-time	none	0.0048	0.0434	0.1095	0.913	2
Three Forks	2014Q2	Peer skill (WZ)	Equidistant	none	0.0016	0.0018	0.9245	0.355	2
Three Forks	2014Q2	Peer skill (WZ)	Residual skill	negative	-0.0051	0.0011	-4.596	< 0.001	1
Three Forks	2014Q2	Peer-technique breadth	Inverse distance	none	0.0000	—	—	—	1
Three Forks	2014Q2	Peer-technique breadth	Distance-time	none	0.0000	—	—	—	1
Three Forks	2014Q2	Peer-technique breadth	Equidistant	positive	8.000	—	—	—	2
Three Forks	2014Q2	Peer-technique breadth	Residual skill	none	0.0000	—	—	—	1
Three Forks	2014Q2	Technique intensity	Inverse distance	positive	0.0309	—	4.546	< 0.001	2
Three Forks	2014Q2	Technique intensity	Distance-time	positive	0.0108	—	2.858	< 0.001	2
Three Forks	2014Q2	Technique intensity	Equidistant	positive	0.0348	—	4.868	< 0.001	2
Three Forks	2014Q2	Technique intensity	Residual skill	positive	0.0418	—	5.746	< 0.001	1
Three Forks	2014Q2	Interval length	Inverse distance	negative	-0.0055	0.0026	-2.083	0.037	1
Three Forks	2014Q2	Interval length	Distance-time	none	-0.0178	0.0122	-1.464	0.143	1

Formation	First 2k	Signal	Weight	Status	Coef./value	SE	Test	<i>p</i>	Block
Three Forks	2014Q2	Interval length	Equidistant	none	-0.0001	0.0003	-0.4244	0.671	2
Three Forks	2014Q2	Interval length	Residual skill	positive	0.0196	0.0046	4.287	< 0.001	1
Three Forks	2014Q2	Drill time	Inverse distance	positive	0.0276	0.0048	5.717	< 0.001	1
Three Forks	2014Q2	Drill time	Distance-time	positive	0.1106	0.0213	5.199	< 0.001	1
Three Forks	2014Q2	Drill time	Equidistant	positive	0.0032	0.0008	4.067	< 0.001	2
Three Forks	2014Q2	Drill time	Residual skill	negative	-0.0059	0.0011	-5.285	< 0.001	2
Niobrara	2014Q3	Peer performance (WY)	Inverse distance	positive	0.0260	0.0020	13.14	< 0.001	1
Niobrara	2014Q3	Peer performance (WY)	Distance-time	positive	0.1144	0.0107	10.68	< 0.001	1
Niobrara	2014Q3	Peer performance (WY)	Equidistant	positive	0.0019	0.0008	2.439	0.015	2
Niobrara	2014Q3	Peer performance (WY)	Residual skill	positive	0.0048	0.0015	3.188	0.001	1
Niobrara	2014Q3	Peer skill (WZ)	Inverse distance	negative	-0.0092	0.0035	-2.619	0.009	2
Niobrara	2014Q3	Peer skill (WZ)	Distance-time	positive	0.0320	0.0154	2.073	0.038	2
Niobrara	2014Q3	Peer skill (WZ)	Equidistant	positive	0.0047	0.0012	3.965	< 0.001	3
Niobrara	2014Q3	Peer skill (WZ)	Residual skill	negative	-0.0012	0.0003	-3.584	< 0.001	2
Niobrara	2014Q3	Peer-technique breadth	Inverse distance	positive	1.000	—	—	—	1
Niobrara	2014Q3	Peer-technique breadth	Distance-time	positive	11.00	—	—	—	2
Niobrara	2014Q3	Peer-technique breadth	Equidistant	positive	7.000	—	—	—	3
Niobrara	2014Q3	Peer-technique breadth	Residual skill	positive	2.000	—	—	—	3
Niobrara	2014Q3	Technique intensity	Inverse distance	positive	0.0444	—	6.002	< 0.001	1
Niobrara	2014Q3	Technique intensity	Distance-time	positive	0.0506	—	7.185	< 0.001	3
Niobrara	2014Q3	Technique intensity	Equidistant	positive	0.0662	—	8.952	< 0.001	2
Niobrara	2014Q3	Technique intensity	Residual skill	none	0.0634	—	1.576	0.072	3
Niobrara	2014Q3	Interval length	Inverse distance	positive	0.0011	0.0005	2.156	0.031	3
Niobrara	2014Q3	Interval length	Distance-time	negative	-0.0081	0.0038	-2.106	0.035	1
Niobrara	2014Q3	Interval length	Equidistant	negative	-0.0006	0.0003	-2.090	0.037	1
Niobrara	2014Q3	Interval length	Residual skill	negative	-0.0070	0.0017	-4.087	< 0.001	3
Niobrara	2014Q3	Drill time	Inverse distance	negative	-0.0128	0.0053	-2.433	0.015	2
Niobrara	2014Q3	Drill time	Distance-time	positive	0.0703	0.0157	4.486	< 0.001	2
Niobrara	2014Q3	Drill time	Equidistant	negative	-0.0042	0.0005	-8.821	< 0.001	1
Niobrara	2014Q3	Drill time	Residual skill	negative	-0.0086	0.0017	-5.120	< 0.001	1
Bone Spring	2015Q1	Peer performance (WY)	Inverse distance	positive	0.0267	0.0041	6.480	< 0.001	1
Bone Spring	2015Q1	Peer performance (WY)	Distance-time	positive	0.1076	0.0240	4.478	< 0.001	1
Bone Spring	2015Q1	Peer performance (WY)	Equidistant	none	-0.0022	0.0012	-1.775	0.076	2
Bone Spring	2015Q1	Peer performance (WY)	Residual skill	positive	0.0033	0.0016	2.009	0.045	1
Bone Spring	2015Q1	Peer skill (WZ)	Inverse distance	negative	-0.0277	0.0057	-4.887	< 0.001	1
Bone Spring	2015Q1	Peer skill (WZ)	Distance-time	negative	-0.1171	0.0375	-3.121	0.002	1
Bone Spring	2015Q1	Peer skill (WZ)	Equidistant	positive	0.0058	0.0028	2.051	0.040	2
Bone Spring	2015Q1	Peer skill (WZ)	Residual skill	negative	-0.0011	0.0005	-2.125	0.034	1
Bone Spring	2015Q1	Peer-technique breadth	Inverse distance	positive	2.000	—	—	—	2
Bone Spring	2015Q1	Peer-technique breadth	Distance-time	positive	7.000	—	—	—	2
Bone Spring	2015Q1	Peer-technique breadth	Equidistant	positive	9.000	—	—	—	2
Bone Spring	2015Q1	Peer-technique breadth	Residual skill	positive	1.000	—	—	—	1
Bone Spring	2015Q1	Technique intensity	Inverse distance	positive	0.0449	—	6.484	< 0.001	2
Bone Spring	2015Q1	Technique intensity	Distance-time	positive	0.0332	—	4.583	< 0.001	2
Bone Spring	2015Q1	Technique intensity	Equidistant	positive	0.0313	—	4.031	< 0.001	2
Bone Spring	2015Q1	Technique intensity	Residual skill	positive	0.0448	—	6.490	< 0.001	1
Bone Spring	2015Q1	Interval length	Inverse distance	none	0.0010	0.0017	0.5715	0.568	2
Bone Spring	2015Q1	Interval length	Distance-time	none	0.0062	0.0055	1.135	0.256	1
Bone Spring	2015Q1	Interval length	Equidistant	positive	0.0014	0.0005	3.120	0.002	1
Bone Spring	2015Q1	Interval length	Residual skill	none	-0.0020	0.0014	-1.366	0.172	1
Bone Spring	2015Q1	Drill time	Inverse distance	none	-0.0033	0.0154	-0.2125	0.832	2
Bone Spring	2015Q1	Drill time	Distance-time	none	0.0510	0.0560	0.9119	0.362	1
Bone Spring	2015Q1	Drill time	Equidistant	positive	0.0054	0.0025	2.182	0.029	1
Bone Spring	2015Q1	Drill time	Residual skill	none	-0.0112	0.0082	-1.369	0.171	2
Cleveland	2015Q1	Peer performance (WY)	Inverse distance	none	-0.0034	0.0048	-0.7223	0.470	1
Cleveland	2015Q1	Peer performance (WY)	Distance-time	none	0.0025	0.0185	0.1357	0.892	1
Cleveland	2015Q1	Peer performance (WY)	Equidistant	none	-0.0014	0.0020	-0.6948	0.487	1
Cleveland	2015Q1	Peer performance (WY)	Residual skill	none	0.0016	0.0044	0.3548	0.723	1
Cleveland	2015Q1	Peer skill (WZ)	Inverse distance	none	0.0009	0.0057	0.1583	0.874	1
Cleveland	2015Q1	Peer skill (WZ)	Distance-time	none	0.0120	0.0299	0.4023	0.687	1
Cleveland	2015Q1	Peer skill (WZ)	Equidistant	none	0.0005	0.0029	0.1634	0.870	1
Cleveland	2015Q1	Peer skill (WZ)	Residual skill	none	-0.0007	0.0015	-0.4840	0.628	1
Cleveland	2015Q1	Peer-technique breadth	Inverse distance	positive	3.000	—	—	—	1
Cleveland	2015Q1	Peer-technique breadth	Distance-time	positive	13.00	—	—	—	1
Cleveland	2015Q1	Peer-technique breadth	Equidistant	positive	15.00	—	—	—	1
Cleveland	2015Q1	Peer-technique breadth	Residual skill	positive	12.00	—	—	—	1
Cleveland	2015Q1	Technique intensity	Inverse distance	none	0.0056	—	1.273	0.209	1
Cleveland	2015Q1	Technique intensity	Distance-time	positive	0.0033	—	2.130	0.007	1
Cleveland	2015Q1	Technique intensity	Equidistant	positive	0.0183	—	2.761	< 0.001	1
Cleveland	2015Q1	Technique intensity	Residual skill	positive	0.0261	—	3.901	< 0.001	1
Cleveland	2015Q1	Interval length	Inverse distance	positive	0.0056	0.0005	11.47	< 0.001	1
Cleveland	2015Q1	Interval length	Distance-time	positive	0.0326	0.0028	11.59	< 0.001	1
Cleveland	2015Q1	Interval length	Equidistant	positive	0.0039	0.0002	15.72	< 0.001	1
Cleveland	2015Q1	Interval length	Residual skill	positive	0.0041	0.0005	8.268	< 0.001	1
Cleveland	2015Q1	Drill time	Inverse distance	none	-0.0019	0.0070	-0.2647	0.791	1

Formation	First 2k	Signal	Weight	Status	Coef./value	SE	Test	<i>p</i>	Block
Cleveland	2015Q1	Drill time	Distance-time	none	0.0509	0.0442	1.152	0.249	1
Cleveland	2015Q1	Drill time	Equidistant	none	0.0015	0.0033	0.4474	0.655	1
Cleveland	2015Q1	Drill time	Residual skill	none	-0.0039	0.0051	-0.7598	0.447	1
Wolfcamp	2015Q1	Peer performance (WY)	Inverse distance	positive	0.0179	0.0044	4.065	< 0.001	4
Wolfcamp	2015Q1	Peer performance (WY)	Distance-time	positive	0.0496	0.0099	5.010	< 0.001	4
Wolfcamp	2015Q1	Peer performance (WY)	Equidistant	none	0.0009	0.0005	1.903	0.057	3
Wolfcamp	2015Q1	Peer performance (WY)	Residual skill	positive	0.0087	0.0027	3.246	0.001	4
Wolfcamp	2015Q1	Peer skill (WZ)	Inverse distance	negative	-0.0467	0.0129	-3.619	< 0.001	4
Wolfcamp	2015Q1	Peer skill (WZ)	Distance-time	negative	-0.1255	0.0288	-4.356	< 0.001	4
Wolfcamp	2015Q1	Peer skill (WZ)	Equidistant	none	-0.0024	0.0014	-1.752	0.080	3
Wolfcamp	2015Q1	Peer skill (WZ)	Residual skill	negative	-0.0158	0.0048	-3.307	< 0.001	3
Wolfcamp	2015Q1	Peer-technique breadth	Inverse distance	positive	11.00	—	—	—	1
Wolfcamp	2015Q1	Peer-technique breadth	Distance-time	positive	10.00	—	—	—	1
Wolfcamp	2015Q1	Peer-technique breadth	Equidistant	positive	4.000	—	—	—	1
Wolfcamp	2015Q1	Peer-technique breadth	Residual skill	positive	3.000	—	—	—	4
Wolfcamp	2015Q1	Technique intensity	Inverse distance	positive	0.0622	—	7.845	< 0.001	2
Wolfcamp	2015Q1	Technique intensity	Distance-time	positive	0.0557	—	7.490	< 0.001	2
Wolfcamp	2015Q1	Technique intensity	Equidistant	positive	0.0615	—	8.585	< 0.001	4
Wolfcamp	2015Q1	Technique intensity	Residual skill	positive	0.0716	—	9.396	< 0.001	2
Wolfcamp	2015Q1	Interval length	Inverse distance	positive	0.0129	0.0018	7.000	< 0.001	2
Wolfcamp	2015Q1	Interval length	Distance-time	positive	0.0237	0.0025	9.492	< 0.001	1
Wolfcamp	2015Q1	Interval length	Equidistant	positive	0.0024	0.0002	12.18	< 0.001	1
Wolfcamp	2015Q1	Interval length	Residual skill	positive	0.0121	0.0019	6.238	< 0.001	3
Wolfcamp	2015Q1	Drill time	Inverse distance	negative	-0.0287	0.0141	-2.033	0.042	3
Wolfcamp	2015Q1	Drill time	Distance-time	positive	0.0596	0.0268	2.228	0.026	2
Wolfcamp	2015Q1	Drill time	Equidistant	positive	0.0022	0.0010	2.189	0.029	1
Wolfcamp	2015Q1	Drill time	Residual skill	none	-0.0049	0.0025	-1.938	0.053	2
Trend Area	2015Q4	Peer performance (WY)	Inverse distance	positive	0.0164	0.0040	4.118	< 0.001	3
Trend Area	2015Q4	Peer performance (WY)	Distance-time	positive	0.0551	0.0123	4.461	< 0.001	3
Trend Area	2015Q4	Peer performance (WY)	Equidistant	none	0.0014	0.0007	1.872	0.061	3
Trend Area	2015Q4	Peer performance (WY)	Residual skill	negative	-0.0053	0.0021	-2.580	0.010	4
Trend Area	2015Q4	Peer skill (WZ)	Inverse distance	negative	-0.0355	0.0081	-4.382	< 0.001	3
Trend Area	2015Q4	Peer skill (WZ)	Distance-time	negative	-0.1173	0.0245	-4.783	< 0.001	3
Trend Area	2015Q4	Peer skill (WZ)	Equidistant	negative	-0.0030	0.0014	-2.120	0.034	3
Trend Area	2015Q4	Peer skill (WZ)	Residual skill	positive	0.0051	0.0020	2.519	0.012	4
Trend Area	2015Q4	Peer-technique breadth	Inverse distance	positive	2.000	—	—	—	5
Trend Area	2015Q4	Peer-technique breadth	Distance-time	positive	1.000	—	—	—	4
Trend Area	2015Q4	Peer-technique breadth	Equidistant	positive	4.000	—	—	—	5
Trend Area	2015Q4	Peer-technique breadth	Residual skill	positive	5.000	—	—	—	4
Trend Area	2015Q4	Technique intensity	Inverse distance	positive	0.0334	—	5.223	< 0.001	4
Trend Area	2015Q4	Technique intensity	Distance-time	positive	0.0422	—	5.918	< 0.001	5
Trend Area	2015Q4	Technique intensity	Equidistant	positive	0.0497	—	7.592	< 0.001	2
Trend Area	2015Q4	Technique intensity	Residual skill	positive	0.0360	—	5.383	< 0.001	5
Trend Area	2015Q4	Interval length	Inverse distance	negative	-0.0041	0.0012	-3.390	< 0.001	1
Trend Area	2015Q4	Interval length	Distance-time	negative	-0.0347	0.0065	-5.370	< 0.001	1
Trend Area	2015Q4	Interval length	Equidistant	negative	-0.0011	0.0003	-3.663	< 0.001	1
Trend Area	2015Q4	Interval length	Residual skill	none	-0.0054	0.0036	-1.492	0.136	3
Trend Area	2015Q4	Drill time	Inverse distance	none	-0.0035	0.0025	-1.414	0.157	4
Trend Area	2015Q4	Drill time	Distance-time	none	0.0352	0.0243	1.446	0.148	2
Trend Area	2015Q4	Drill time	Equidistant	negative	-0.0016	0.0006	-2.486	0.013	4
Trend Area	2015Q4	Drill time	Residual skill	negative	-0.0308	0.0045	-6.874	< 0.001	5
Point Pleasant	2020Q4	Peer performance (WY)	Inverse distance	positive	0.0041	0.0014	2.824	0.005	1
Point Pleasant	2020Q4	Peer performance (WY)	Distance-time	none	0.0178	0.0094	1.897	0.058	1
Point Pleasant	2020Q4	Peer performance (WY)	Equidistant	positive	0.0015	0.0005	2.951	0.003	1
Point Pleasant	2020Q4	Peer performance (WY)	Residual skill	positive	0.0021	0.0007	3.071	0.002	1
Point Pleasant	2020Q4	Peer skill (WZ)	Inverse distance	none	-0.0105	0.0056	-1.882	0.060	1
Point Pleasant	2020Q4	Peer skill (WZ)	Distance-time	none	-0.0261	0.0365	-0.7138	0.475	1
Point Pleasant	2020Q4	Peer skill (WZ)	Equidistant	none	-0.0025	0.0017	-1.504	0.133	1
Point Pleasant	2020Q4	Peer skill (WZ)	Residual skill	negative	-0.0038	0.0013	-2.925	0.003	1
Point Pleasant	2020Q4	Peer-technique breadth	Inverse distance	positive	1.000	—	—	—	1
Point Pleasant	2020Q4	Peer-technique breadth	Distance-time	positive	1.000	—	—	—	1
Point Pleasant	2020Q4	Peer-technique breadth	Equidistant	positive	1.000	—	—	—	1
Point Pleasant	2020Q4	Peer-technique breadth	Residual skill	none	0.0000	—	—	—	1
Point Pleasant	2020Q4	Technique intensity	Inverse distance	positive	0.0415	—	5.448	< 0.001	1
Point Pleasant	2020Q4	Technique intensity	Distance-time	positive	0.0428	—	5.843	< 0.001	1
Point Pleasant	2020Q4	Technique intensity	Equidistant	positive	0.0225	—	3.156	< 0.001	1
Point Pleasant	2020Q4	Technique intensity	Residual skill	none	—	—	—	—	—
Point Pleasant	2020Q4	Interval length	Inverse distance	none	-0.0017	0.0014	-1.169	0.242	1
Point Pleasant	2020Q4	Interval length	Distance-time	none	-0.0163	0.0092	-1.776	0.076	1
Point Pleasant	2020Q4	Interval length	Equidistant	none	-0.0006	0.0004	-1.439	0.150	1
Point Pleasant	2020Q4	Interval length	Residual skill	none	0.0007	0.0007	1.002	0.316	1
Point Pleasant	2020Q4	Drill time	Inverse distance	positive	0.0151	0.0041	3.672	< 0.001	1
Point Pleasant	2020Q4	Drill time	Distance-time	positive	0.0649	0.0282	2.298	0.022	1
Point Pleasant	2020Q4	Drill time	Equidistant	none	0.0018	0.0014	1.296	0.195	1

Formation	First 2k	Signal	Weight	Status	Coef./value	SE	Test	p	Block
Point Pleasant	2020Q4	Drill time	Residual skill	negative	-0.0051	0.0022	-2.322	0.020	1

OA.4 Heterogeneity and Sorting Diagnostics

Table OA.6. Alternative firm-size and sophistication cuts. The main paper uses the preferred firm-type definitions. The table below repeats the high-minus-low contrasts using quartile-tail and legacy cutoffs. These are robustness checks for the heterogeneity definitions rather than separate mechanism estimates.

Cut	Dimension	Signal	Cohort	Outcome	Coef.	SE	<i>p</i>	<i>N</i>	Reason
qtail	size	Peer performance (WY)	early	Adopt (ext)	-0.1904	0.0732	0.009	66,548	
qtail	size	Peer performance (WY)	early	Invest (ext)	-0.0722	0.1288	0.575	66,548	
qtail	size	Peer performance (WY)	early	Adopt (int)	327.3	42.30	0.000	2,027	
qtail	size	Peer performance (WY)	early	Invest (int)	110.2	27.77	0.000	2,464	
qtail	size	Peer performance (WY)	late	Adopt (ext)	0.4072	0.1530	0.008	244,219	
qtail	size	Peer performance (WY)	late	Invest (ext)	0.4037	0.1589	0.011	244,219	
qtail	size	Peer performance (WY)	late	Adopt (int)	-765.1	417.2	0.067	5,023	
qtail	size	Peer performance (WY)	late	Invest (int)	47.44	105.2	0.652	5,483	
qtail	size	Peer skill (WZ)	early	Adopt (ext)	0.0000	0.0000	—	14,511	
qtail	size	Peer skill (WZ)	early	Invest (ext)	0.0000	0.0000	—	14,511	
qtail	size	Peer skill (WZ)	early	Adopt (int)	—	—	—	106	rc
qtail	size	Peer skill (WZ)	early	Invest (int)	—	—	—	119	rc
qtail	size	Peer skill (WZ)	late	Adopt (ext)	-2.610	0.9899	0.008	60,844	
qtail	size	Peer skill (WZ)	late	Invest (ext)	-2.589	0.9837	0.008	60,844	
qtail	size	Peer skill (WZ)	late	Adopt (int)	0.0000	0.0000	—	766	
qtail	size	Peer skill (WZ)	late	Invest (int)	0.0000	0.0000	—	858	
qtail	size	Peer-technique breadth	early	Adopt (ext)	-0.0011	0.0011	0.331	41,635	
qtail	size	Peer-technique breadth	early	Invest (ext)	0.0004	0.0009	0.636	41,635	
qtail	size	Peer-technique breadth	early	Adopt (int)	-2.686	1.058	0.011	1,118	
qtail	size	Peer-technique breadth	early	Invest (int)	1.342	0.5347	0.012	1,282	
qtail	size	Peer-technique breadth	late	Adopt (ext)	-0.0030	0.0017	0.079	317,231	
qtail	size	Peer-technique breadth	late	Invest (ext)	-0.0028	0.0016	0.085	317,231	
qtail	size	Peer-technique breadth	late	Adopt (int)	66.17	0.2166	0.000	5,639	
qtail	size	Peer-technique breadth	late	Invest (int)	-3.418	3.081	0.267	6,392	
qtail	size	Technique intensity	early	Adopt (ext)	-0.3448	0.1682	0.040	53,159	
qtail	size	Technique intensity	early	Invest (ext)	-0.2357	0.2044	0.249	53,159	
qtail	size	Technique intensity	early	Adopt (int)	0.0000	0.0000	—	1,733	
qtail	size	Technique intensity	early	Invest (int)	0.0000	0.0000	—	2,013	
qtail	size	Technique intensity	late	Adopt (ext)	0.6157	0.2400	0.010	360,317	
qtail	size	Technique intensity	late	Invest (ext)	0.6856	0.2605	0.008	360,317	
qtail	size	Technique intensity	late	Adopt (int)	1473.9	1363.2	0.280	6,544	
qtail	size	Technique intensity	late	Invest (int)	299.2	272.5	0.272	7,351	
qtail	soph	Peer performance (WY)	early	Adopt (ext)	-0.1232	0.0802	0.125	41,954	
qtail	soph	Peer performance (WY)	early	Invest (ext)	-0.1446	0.1716	0.399	41,954	
qtail	soph	Peer performance (WY)	early	Adopt (int)	132.4	148.7	0.373	1,127	
qtail	soph	Peer performance (WY)	early	Invest (int)	44.37	108.2	0.682	1,647	
qtail	soph	Peer performance (WY)	late	Adopt (ext)	0.1392	0.1800	0.439	153,574	
qtail	soph	Peer performance (WY)	late	Invest (ext)	0.0496	0.1472	0.736	153,574	
qtail	soph	Peer performance (WY)	late	Adopt (int)	-1909.5	1352.4	0.158	1,727	
qtail	soph	Peer performance (WY)	late	Invest (int)	308.6	43.94	0.000	2,403	
qtail	soph	Peer skill (WZ)	early	Adopt (ext)	0.0000	0.0000	—	8,929	
qtail	soph	Peer skill (WZ)	early	Invest (ext)	0.0000	0.0000	—	8,929	
qtail	soph	Peer skill (WZ)	early	Adopt (int)	0.0000	0.0000	—	49	
qtail	soph	Peer skill (WZ)	early	Invest (int)	—	—	—	67	rc
qtail	soph	Peer skill (WZ)	late	Adopt (ext)	0.1156	0.1229	0.347	38,499	
qtail	soph	Peer skill (WZ)	late	Invest (ext)	0.0365	0.2121	0.863	38,499	
qtail	soph	Peer skill (WZ)	late	Adopt (int)	0.0000	0.0000	—	246	
qtail	soph	Peer skill (WZ)	late	Invest (int)	0.0000	0.0000	—	385	
qtail	soph	Peer-technique breadth	early	Adopt (ext)	-0.0012	0.0014	0.421	25,946	
qtail	soph	Peer-technique breadth	early	Invest (ext)	-0.0022	0.0018	0.229	25,946	
qtail	soph	Peer-technique breadth	early	Adopt (int)	0.0000	0.0000	—	606	
qtail	soph	Peer-technique breadth	early	Invest (int)	0.0000	0.0000	—	785	
qtail	soph	Peer-technique breadth	late	Adopt (ext)	-0.0016	0.0011	0.154	197,335	
qtail	soph	Peer-technique breadth	late	Invest (ext)	-0.0028	0.0012	0.021	197,335	
qtail	soph	Peer-technique breadth	late	Adopt (int)	0.0000	0.0000	—	2,197	
qtail	soph	Peer-technique breadth	late	Invest (int)	0.0000	0.0000	—	3,228	
qtail	soph	Technique intensity	early	Adopt (ext)	-0.8085	0.3425	0.018	35,896	
qtail	soph	Technique intensity	early	Invest (ext)	-0.8565	0.4531	0.059	35,896	
qtail	soph	Technique intensity	early	Adopt (int)	-77.29	4.322	0.000	1,012	
qtail	soph	Technique intensity	early	Invest (int)	-28.94	26.19	0.269	1,370	
qtail	soph	Technique intensity	late	Adopt (ext)	0.3162	0.1878	0.092	226,413	
qtail	soph	Technique intensity	late	Invest (ext)	0.2781	0.2605	0.286	226,413	
qtail	soph	Technique intensity	late	Adopt (int)	2643.1	459.2	0.000	2,457	

Cut	Dimension	Signal	Cohort	Outcome	Coef.	SE	<i>p</i>	<i>N</i>	Reason
qtail	soph	Technique intensity	late	Invest (int)	-153.0	54.66	0.005	3,618	
legacy	size	Peer performance (WY)	early	Adopt (ext)	-0.0847	0.0845	0.316	119,441	
legacy	size	Peer performance (WY)	early	Invest (ext)	-0.0314	0.0806	0.697	119,441	
legacy	size	Peer performance (WY)	early	Adopt (int)	-16.24	14.96	0.278	2,268	
legacy	size	Peer performance (WY)	early	Invest (int)	23.11	8.081	0.004	2,843	
legacy	size	Peer performance (WY)	late	Adopt (ext)	0.4680	0.1937	0.016	465,685	
legacy	size	Peer performance (WY)	late	Invest (ext)	0.4734	0.1822	0.009	465,685	
legacy	size	Peer performance (WY)	late	Adopt (int)	-37.38	12.45	0.003	5,617	
legacy	size	Peer performance (WY)	late	Invest (int)	-24.65	32.46	0.448	6,424	
legacy	size	Peer skill (WZ)	early	Adopt (ext)	—	—	—	30,323	rc
legacy	size	Peer skill (WZ)	early	Invest (ext)	—	—	—	30,323	rc
legacy	size	Peer skill (WZ)	early	Adopt (int)	—	—	—	145	rc
legacy	size	Peer skill (WZ)	early	Invest (int)	—	—	—	168	rc
legacy	size	Peer skill (WZ)	late	Adopt (ext)	-0.2685	0.5188	0.605	122,723	
legacy	size	Peer skill (WZ)	late	Invest (ext)	-0.1680	0.5780	0.771	122,723	
legacy	size	Peer skill (WZ)	late	Adopt (int)	-21.78	14.77	0.140	887	
legacy	size	Peer skill (WZ)	late	Invest (int)	16.52	59.07	0.780	1,041	
legacy	size	Peer-technique breadth	early	Adopt (ext)	-0.0003	0.0013	0.827	74,979	
legacy	size	Peer-technique breadth	early	Invest (ext)	0.0004	0.0012	0.720	74,979	
legacy	size	Peer-technique breadth	early	Adopt (int)	0.3982	0.1896	0.036	1,251	
legacy	size	Peer-technique breadth	early	Invest (int)	0.1965	0.2728	0.471	1,484	
legacy	size	Peer-technique breadth	late	Adopt (ext)	-0.0031	0.0018	0.086	610,535	
legacy	size	Peer-technique breadth	late	Invest (ext)	-0.0029	0.0018	0.110	610,535	
legacy	size	Peer-technique breadth	late	Adopt (int)	0.0975	0.1139	0.392	6,396	
legacy	size	Peer-technique breadth	late	Invest (int)	-0.4129	0.1344	0.002	7,588	
legacy	size	Technique intensity	early	Adopt (ext)	-0.3691	0.1542	0.017	92,041	
legacy	size	Technique intensity	early	Invest (ext)	0.0014	0.1665	0.993	92,041	
legacy	size	Technique intensity	early	Adopt (int)	-19.78	21.21	0.351	1,916	
legacy	size	Technique intensity	early	Invest (int)	37.28	17.01	0.028	2,300	
legacy	size	Technique intensity	late	Adopt (ext)	0.4057	0.2789	0.146	688,361	
legacy	size	Technique intensity	late	Invest (ext)	0.4484	0.2917	0.124	688,361	
legacy	size	Technique intensity	late	Adopt (int)	-11.84	29.18	0.685	7,404	
legacy	size	Technique intensity	late	Invest (int)	50.73	29.03	0.081	8,726	
legacy	soph	Peer performance (WY)	early	Adopt (ext)	-0.1901	0.0823	0.021	87,436	
legacy	soph	Peer performance (WY)	early	Invest (ext)	-0.1568	0.1142	0.170	87,436	
legacy	soph	Peer performance (WY)	early	Adopt (int)	188.6	74.32	0.011	2,079	
legacy	soph	Peer performance (WY)	early	Invest (int)	-8.434	163.4	0.959	2,648	
legacy	soph	Peer performance (WY)	late	Adopt (ext)	0.3554	0.1568	0.023	349,359	
legacy	soph	Peer performance (WY)	late	Invest (ext)	0.3253	0.1718	0.058	349,359	
legacy	soph	Peer performance (WY)	late	Adopt (int)	-958.4	690.1	0.165	4,830	
legacy	soph	Peer performance (WY)	late	Invest (int)	244.0	62.34	0.000	5,619	
legacy	soph	Peer skill (WZ)	early	Adopt (ext)	—	—	—	22,510	rc
legacy	soph	Peer skill (WZ)	early	Invest (ext)	—	—	—	22,510	rc
legacy	soph	Peer skill (WZ)	early	Adopt (int)	—	—	—	122	rc
legacy	soph	Peer skill (WZ)	early	Invest (int)	—	—	—	142	rc
legacy	soph	Peer skill (WZ)	late	Adopt (ext)	0.0286	0.3035	0.925	92,567	
legacy	soph	Peer skill (WZ)	late	Invest (ext)	0.0131	0.3213	0.968	92,567	
legacy	soph	Peer skill (WZ)	late	Adopt (int)	0.0000	0.0000	—	706	
legacy	soph	Peer skill (WZ)	late	Invest (int)	0.0000	0.0000	—	860	
legacy	soph	Peer-technique breadth	early	Adopt (ext)	-0.0014	0.0008	0.087	56,364	
legacy	soph	Peer-technique breadth	early	Invest (ext)	-0.0019	0.0012	0.111	56,364	
legacy	soph	Peer-technique breadth	early	Adopt (int)	-2.045	1.973	0.300	1,084	
legacy	soph	Peer-technique breadth	early	Invest (int)	1.422	0.7423	0.055	1,307	
legacy	soph	Peer-technique breadth	late	Adopt (ext)	-0.0032	0.0016	0.045	459,060	
legacy	soph	Peer-technique breadth	late	Invest (ext)	-0.0038	0.0017	0.023	459,060	
legacy	soph	Peer-technique breadth	late	Adopt (int)	-8.627	4.941	0.081	5,581	
legacy	soph	Peer-technique breadth	late	Invest (int)	4.489	0.7324	0.000	6,753	
legacy	soph	Technique intensity	early	Adopt (ext)	-0.4809	0.1482	0.001	68,415	
legacy	soph	Technique intensity	early	Invest (ext)	-0.4648	0.2246	0.039	68,415	
legacy	soph	Technique intensity	early	Adopt (int)	-80.43	4.901	0.000	1,784	
legacy	soph	Technique intensity	early	Invest (int)	-38.66	24.23	0.111	2,168	
legacy	soph	Technique intensity	late	Adopt (ext)	0.5262	0.2224	0.018	515,651	
legacy	soph	Technique intensity	late	Invest (ext)	0.4936	0.2684	0.066	515,651	
legacy	soph	Technique intensity	late	Adopt (int)	1134.6	721.1	0.116	6,302	
legacy	soph	Technique intensity	late	Invest (int)	137.1	138.3	0.321	7,604	

Table OA.7. Descriptive operating-firm sorting by network signal. This table regresses operating-firm horizontal well counts on firm type interacted with the network signal, without the lease-expiration peer-activity shock. It is descriptive sorting evidence and should not be read as a causal network response.

Dimension	Signal	High-low diff.	SE	p	Low slope	High slope	N
size	Peer performance (WY)	-49.17	10.83	0.000	18.70	-30.48	8,975
size	Peer skill (WZ)	0.0000	0.0000	–	0.0000	0.0000	1,105
size	Peer-technique breadth	-0.1957	0.0830	0.018	0.1335	-0.0623	8,764
size	Technique intensity	14.26	12.56	0.256	-2.302	11.96	10,753
soph	Peer performance (WY)	-58.68	10.75	0.000	28.66	-30.02	8,975
soph	Peer skill (WZ)	0.0000	0.0000	–	0.0000	0.0000	1,105
soph	Peer-technique breadth	-0.7628	0.2445	0.002	0.7020	-0.0608	8,764
soph	Technique intensity	11.94	24.72	0.629	-0.3178	11.62	10,753

OA.5 Breadth-Maturity Diagnostic

Table OA.8. Breadth maturity diagnostic. The breadth signal can mark either useful codified information or mature, crowded development environments. This diagnostic relates breadth measures to formation development, operator counts and county counts.

Signal	Cum. wells	SE	p	Operators	SE	p	Counties	SE	p	N
br_eq	-0.5643	0.6236	0.365	0.1864	0.0591	0.002	0.0950	0.2637	0.719	488
br_invdist	-0.6506	0.7411	0.380	0.0097	0.0370	0.794	0.8397	0.1904	0.000	488
br_invdisttime	-0.1903	0.9193	0.836	0.1104	0.0506	0.029	0.3607	0.2563	0.159	488
in_eq	0.0049	0.0032	0.120	0.0007	0.0004	0.122	-0.0006	0.0016	0.719	350
in_invdisttime	0.0038	0.0031	0.229	0.0008	0.0003	0.001	-0.0043	0.0008	0.000	369

OA.6 Robustness Tables

This section reports the detailed robustness tables summarized in the robustness section of the main paper. The baseline unit in the response tables is a firm–county–formation–quarter. The coefficient of interest is the interaction between lagged expiration-driven peer activity and the predetermined local network signal, unless the note states otherwise. Table OA.9 reports the standardized pooled response. Tables OA.10–OA.12 report own-lease-clock restrictions. Tables OA.13–OA.14 report lease-link and expiration-bunching diagnostics. Tables OA.15–OA.19 report timing, placebo, no-signal and distance checks.

Table OA.9: Standardized pooled response to peer activity				
	Adopt (ext)	Invest (ext)	Adopt (int)	Invest (int)
<i>Peer performance (WY) [distance-time]</i>				
$z(\widehat{E}_{t-1}^{-f}) \times z(\text{signal})$	0.0008*** (0.0003)	0.0010*** (0.0004)	0.0914*** (0.0264)	0.0598 (0.0802)
N	584,640	584,640	7,620	8,975
R^2	0.389	0.410	0.906	0.651
<i>Peer skill (WZ) [distance-time]</i>				
$z(\widehat{E}_{t-1}^{-f}) \times z(\text{signal})$	0.0001 (0.0016)	0.0000 (0.0016)	−0.0030 (0.0975)	−0.3051 (0.2457)
N	152,672	152,672	937	1,105
R^2	0.536	0.542	0.980	0.865
<i>Peer-technique breadth [equidistant]</i>				
$z(\widehat{E}_{t-1}^{-f}) \times z(\text{signal})$	−0.0024*** (0.0006)	−0.0029*** (0.0007)	−0.0414 (0.0434)	−0.6776*** (0.2307)
N	685,252	685,252	7,378	8,764
R^2	0.358	0.375	0.956	0.581
<i>Technique intensity [distance-time]</i>				
$z(\widehat{E}_{t-1}^{-f}) \times z(\text{signal})$	0.0009** (0.0004)	0.0010** (0.0005)	0.0408* (0.0229)	0.2069*** (0.0631)
N	780,136	780,136	9,079	10,753
R^2	0.365	0.386	0.858	0.627
Controls	Yes	Yes	Yes	Yes

Notes. The unit is a firm–county–formation–quarter. Each panel estimates the one-quarter-lag pooled response specification separately for the listed network signal and outcome, restricting to formation-blocks where that signal is positive and statistically different from zero under the preferred weight. The peer-activity measure $\widehat{E}_{c,t-1}^{-f}$ and the local network signal S_{gt} are each replaced by z-scores within the estimation sample, so the coefficient is the response to a one-standard-deviation peer-activity measure interacted with a one-standard-deviation network signal.

Outcome definitions, controls, fixed effects and signal weights match the main pooled response table.

County-clustered standard errors are in parentheses. R^2 is unchanged by rescaling. * $p < 0.1$, ** $p < 0.05$,

*** $p < 0.01$.

Table OA.10: Sample loss from own lease-expiration restrictions

Sample	Rows before	Same-county drop	Any-firm-quarter drop	Same-county drop (%)
Full firm-county-quarter panel	1,005,661	3,142	133,682	0.312
Positive peer activity, 25-mile	83,636	559	11,347	0.668
Positive peer-performance signal	585,126	2,107	82,848	0.360
Positive peer-skill signal	153,046	373	22,175	0.244
Positive breadth signal	685,514	1,809	90,503	0.264
Positive intensity signal	780,402	2,133	99,330	0.273
Positive intensive-margin outcome	15,011	601	3,846	4.004

Notes. Rows are samples from the response panel before estimating peer-activity regressions. The same-county restriction drops firm-county-quarters in which the firm has a matched lease expiring in the same county-quarter as the outcome. The any-firm-quarter restriction drops all rows for a firm in a quarter if the firm has any matched lease expiring in that quarter, regardless of county. Positive-signal rows use the preferred signal-specific samples, and the positive intensive-margin row is the risk set for intensive adoption or intensive investment. The same-county restriction is used in the preferred response sample.

Table OA.11: Pooled peer-activity response after own-expiration restrictions

	Adopt (ext)	Invest (ext)	Adopt (int)	Invest (int)
<i>Drop own same-county expirations</i>				
Peer performance (WY)	0.1531*** (0.0568)	0.1835*** (0.0693)	9.449*** (2.929)	5.619 (8.288)
Peer skill (WZ)	0.0404 (0.2230)	0.0272 (0.2178)	-1.786 (12.18)	-37.46 (30.38)
Peer-technique breadth	-0.0020*** (0.0005)	-0.0025*** (0.0006)	-0.0222 (0.0238)	-0.3267** (0.1610)
Technique intensity	0.2661** (0.1161)	0.2988** (0.1436)	8.852* (5.191)	37.61*** (13.29)
<i>Drop any own firm-quarter expiration</i>				
Peer performance (WY)	0.1423** (0.0561)	0.1754*** (0.0662)	9.965*** (2.927)	-3.655 (10.38)
Peer skill (WZ)	0.0459 (0.1491)	0.0288 (0.1387)	-2.493 (12.83)	-41.14 (31.11)
Peer-technique breadth	-0.0019*** (0.0005)	-0.0025*** (0.0005)	-0.0363 (0.0306)	-0.3221* (0.1799)
Technique intensity	0.2392** (0.1012)	0.2835** (0.1275)	13.86* (7.757)	34.79** (17.66)

Notes. The unit is a firm-county-formation-quarter. Each row reports the coefficient on $\hat{E}_{c,t-1}^{-f} \times S_{gt}$ from the pooled one-quarter response specification after imposing the own-expiration restriction listed in the panel header. $\hat{E}_{c,t-1}^{-f}$ is expiration-driven peer activity lagged one quarter after excluding the responding firm's own operated and leased wells, and S_{gt} is the predetermined local network signal. Signal-specific samples, outcome definitions, controls, fixed effects and signal weights match the baseline pooled specification. Standard errors are clustered by county and shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.12: Body-result tracking under the same-county own-expiration restriction

Result family	Rows	Material flags	Sig.-bucket flags	Sign flags	> 10% flags	Missing
Table 2 pooled L1	32	10	2	0	9	0
Figure 8 cohort L1	56	29	4	2	29	0
Table 3 block L1	48	30	8	2	27	0
Figure 9 trajectories	144	74	16	1	68	0
Firm heterogeneity contrasts	64	25	5	0	21	0

Notes. Each row is a family of body-facing estimates rerun after dropping firm-county-quarters in which the firm has a matched same-county lease expiration. The comparison uses the unrestricted body result CSV files and the same-county restricted rerun. Significance buckets are $p < 0.01$, $p < 0.05$, $p < 0.10$ and not significant. A material flag is defined as a sign change, a significance-bucket change or an absolute relative coefficient change above 10 percent. The table is a tracking diagnostic, not a new response specification.

Table OA.13: Expiration bunching with county-quarter credibility checks

Specification	$\tau = -4$	$\tau = -3$	$\tau = -2$	$\tau = -1$	$\tau = 0$	$\tau = 1$	Cells
No FE PPML	0.2705*** (0.0995)	0.1221 (0.1291)	0.2926** (0.1458)	0.3808*** (0.1336)	0.3762*** (0.1186)	0.1337 (0.0851)	54,111
County and quarter FE PPML	0.2705*** (0.0995)	0.1221 (0.1291)	0.2926** (0.1458)	0.3808*** (0.1336)	0.3762*** (0.1186)	0.1337 (0.0851)	54,111
County-quarter FE PPML	0.2705*** (0.0995)	0.1221 (0.1291)	0.2926** (0.1458)	0.3808*** (0.1336)	0.3762*** (0.1186)	0.1337 (0.0851)	54,111
County-quarter FE OLS	0.0528*** (0.0194)	0.0240 (0.0227)	0.0658** (0.0278)	0.0960*** (0.0252)	0.1014*** (0.0246)	0.0344* (0.0176)	54,111
Full-distance county-quarter FE	0.0783 (0.0483)	0.0587 (0.0500)	0.0228 (0.0579)	0.1286** (0.0619)	0.1759*** (0.0504)	0.0276 (0.0365)	143,259
Wider-window county-quarter FE	0.5012*** (0.0822)	0.4453*** (0.1009)	0.6616*** (0.1065)	0.7345*** (0.1012)	0.6522*** (0.0763)	0.2860*** (0.0704)	67,662

Notes. The unit is a county by calendar-quarter by event-time cell. The dependent variable is the count of first wells linked to leases in county c , calendar quarter q , and event time τ , where τ is quarters from lease expiration to spud. Coefficients are estimates on expiration-window indicators for $\tau = -4, \dots, 1$ in a PPML count model, unless the row is marked OLS. All specifications include a fifth-degree polynomial in event time. Rows differ in whether they add county fixed effects, calendar-quarter fixed effects, county-by-calendar-quarter fixed effects, the full-distance lease-link sample or a wider event-time estimation window. The main spatial match uses wells within 0.25 miles of the linked lease. Standard errors are clustered by county and shown in parentheses. * $p < 0.1$,

** $p < 0.05$, *** $p < 0.01$.

Table OA.14: Name-matched lease links and first-well bunching around expiration

Event time to expiration	Observed first wells	Counterfactual	Excess	Excess / observed (%)
$[-8, -5]$	6,862	6741.1	120.9	1.76
-4	2,267	1835.0	432.0	19.06
-3	2,265	1887.9	377.1	16.65
-2	2,690	1979.4	710.6	26.41
-1	3,394	2133.4	1260.6	37.14
0	6,354	2366.6	3987.4	62.75
1	3,026	2684.3	341.7	11.29
$[2, 5]$	10,513	10503.7	9.3	0.09

Notes. The unit is an event-time bin, measured in quarters from lease expiration to the first linked well's spud quarter. The table aggregates national first linked wells under the name-matched lease-link construction. The counterfactual is the fitted non-bunching profile from the event-time bunching estimator, estimated outside the expiration window. Excess is observed first wells minus the fitted counterfactual, and excess divided by observed is the event-time share used to weight excess wells in the peer-activity construction.

Table OA.15: Pooled peer-activity response with lags one through four

	Adopt (ext)	Invest (ext)	Adopt (int)	Invest (int)
<i>Peer performance (WY) [distance-time]</i>				
<i>L1</i>	0.1164** (0.0463)	0.1321*** (0.0499)	5.9624*** (1.9736)	10.9992** (4.7258)
<i>L2</i>	0.0262 (0.0570)	0.0804 (0.0715)	-1.8714 (4.0202)	4.6753 (5.2418)
<i>L3</i>	0.1343** (0.0650)	0.1484** (0.0750)	14.9373* (8.7905)	-19.1926 (14.3284)
<i>L4</i>	0.0849 (0.0721)	0.0554 (0.0857)	6.6304* (3.9120)	-32.0700 (26.3382)
<i>Peer skill (WZ) [distance-time]</i>				
<i>L1</i>	-0.0599 (0.2647)	-0.0955 (0.2881)	0.6533 (12.7497)	-40.6585 (31.3775)
<i>L2</i>	-0.0572 (0.1923)	-0.1650 (0.1651)	-0.1352 (8.0811)	-20.9434 (32.5105)
<i>L3</i>	-0.0630 (0.1616)	-0.0845 (0.2228)	1.6632 (2.4435)	-2.1237 (17.5612)
<i>L4</i>	-0.2567* (0.1428)	-0.3493* (0.1889)	2.7034 (4.0373)	-0.4745 (23.3836)
<i>Peer-technique breadth [equidistant]</i>				
<i>L1</i>	-0.0009*** (0.0003)	-0.0013*** (0.0003)	-0.0233 (0.0278)	-0.1464 (0.1587)
<i>L2</i>	-0.0009*** (0.0003)	-0.0010*** (0.0004)	-0.0174 (0.0287)	-0.0003 (0.1033)
<i>L3</i>	-0.0007*** (0.0002)	-0.0008*** (0.0003)	0.0215 (0.0197)	-0.0268 (0.0683)
<i>L4</i>	-0.0012*** (0.0004)	-0.0013*** (0.0004)	-0.0697*** (0.0201)	-0.1275 (0.0842)
<i>Technique intensity [distance-time]</i>				
<i>L1</i>	0.2618*** (0.0930)	0.3005** (0.1185)	6.3547 (4.2337)	42.5533** (18.3402)
<i>L2</i>	0.0250 (0.0709)	0.0189 (0.0849)	6.3254** (3.1519)	4.8623 (8.9235)
<i>L3</i>	0.0714 (0.0925)	0.0602 (0.1057)	-0.2901 (4.6269)	3.5096 (18.5596)
<i>L4</i>	-0.0082 (0.0972)	-0.0381 (0.1154)	4.7348 (3.5194)	-22.5462 (15.1190)

Notes. The unit is a firm-county-formation-quarter. Each panel estimates the pooled response specification separately for the listed network signal and outcome, restricting to formation-blocks where that signal is positive and statistically different from zero under the preferred weight. Rows report β_k , the coefficient on $\hat{E}_{c,t-k}^{-f} \times S_{gt}$, with lags $k = 1, \dots, 4$ entered jointly. $\hat{E}_{c,t-k}^{-f}$ is expiration-driven peer activity in county c , lagged k quarters, after excluding the responding firm's own operated and leased wells. S_{gt} is the predetermined local network signal for formation g . Extensive columns use indicators for positive adoption or positive horizontal investment. Intensive columns condition on positive adoption or positive horizontal investment. Controls are the firm and county controls listed in the main paper's empirical specification. The response fixed effects and signal weights match the baseline pooled response table. County-clustered standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.16: Out-of-window peer activity

	Adopt (ext)	Invest (ext)	Adopt (int)	Invest (int)
<i>Out-of-window lease activity</i>				
Peer performance (WY)	0.0120 (0.0089)	0.0108 (0.0101)	0.3114 (0.2416)	0.0979 (0.6543)
Peer skill (WZ)	−0.0027 (0.0044)	−0.0029 (0.0050)	−0.1326 (0.2319)	0.1520 (0.2721)
Peer-technique breadth	−0.0001*** (0.0000)	−0.0001*** (0.0000)	−0.0009 (0.0013)	−0.0162* (0.0085)
Technique intensity	0.0151 (0.0110)	0.0193 (0.0128)	−0.1911 (0.2025)	0.5747 (0.9609)

Notes. The unit is a firm–county–formation–quarter. Each row reports the coefficient on out-of-window lease activity interacted with the listed local network signal, using the same signal-specific samples and outcome definitions as the baseline pooled specification. Out-of-window lease activity is nearby peer drilling linked to leases outside the expiration bunching window rather than the near-expiration excess measure. Controls, fixed effects and signal weights match the baseline pooled response specification. Standard errors are clustered by county and shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.17: Vertical-well placebo with horizontal peer-activity shocks

	Vertical county (ext)	Vertical county count
Peer performance (WY)	−0.1423** (0.0593)	−1.414*** (0.4568)
Peer skill (WZ)	0.1036 (0.0728)	0.3033 (0.7083)
Peer-technique breadth	0.0006** (0.0003)	0.0043 (0.0028)
Technique intensity	−0.1345 (0.0987)	−1.228** (0.4831)

Notes. The specification matches the preferred pooled one-quarter response design, but the dependent variables are vertical drilling margins measured at the firm–county–quarter level. Vertical county extensive is an indicator for positive vertical investment in the firm–county–quarter, and vertical county count is the corresponding vertical well count. The regressor of interest is the interaction between the horizontal expiration-driven peer-activity shock and the listed predetermined local network signal. Controls, fixed effects and signal weights match the baseline pooled response specification. Standard errors are clustered by county and shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.18: Peer activity in no-signal cells

	Adopt (ext)	Invest (ext)	Adopt (int)	Invest (int)
No measured positive signal	0.0145*** (0.0039)	0.0143*** (0.0040)	0.1055 (0.1083)	2.345 (1.822)

Notes. The unit is a firm–county–formation–quarter. The sample is restricted to cells without any positive preferred peer-performance, peer-skill, peer-technique breadth or technique-intensity signal. The row reports the coefficient on $\hat{E}_{c,t-1}^{-f}$, expiration-driven peer activity lagged one quarter after excluding the responding firm’s own operated and leased wells, from the pooled response specification without a network interaction. Outcome definitions, controls and fixed effects match the baseline pooled specification. Standard errors are clustered by county and shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.19: Distance ladder for peer-activity construction

Signal	Outcome	10 mi.	25 mi.	50 mi.	100 mi.	200 mi.	Full county
Peer performance (WY)	Adopt (ext)	0.4114***	0.1558***	0.0840**	0.0526**	0.0352*	0.0310
Peer performance (WY)	Invest (ext)	0.4933***	0.1841***	0.1083**	0.0670**	0.0440	0.0382
Peer performance (WY)	Adopt (int)	20.38	8.421***	3.792***	0.9891***	0.8375**	0.6851**
Peer performance (WY)	Invest (int)	27.10	5.435	1.948	1.132	1.236	1.178
Peer skill (WZ)	Adopt (ext)	0.2675***	0.0189	−0.0057	−0.0008	−0.0024	−0.0029
Peer skill (WZ)	Invest (ext)	0.0992	0.0049	0.0028	0.0044	0.0027	0.0023
Peer skill (WZ)	Adopt (int)	−30.70	−0.3917	0.0043	0.1249	0.1156	0.1154
Peer skill (WZ)	Invest (int)	−22.33	−38.08	−1.565	1.905*	1.796*	1.797*
Peer-technique breadth	Adopt (ext)	−0.0067***	−0.0022***	−0.0008***	−0.0005***	−0.0005***	−0.0005***
Peer-technique breadth	Invest (ext)	−0.0085***	−0.0027***	−0.0010***	−0.0007***	−0.0006***	−0.0006***
Peer-technique breadth	Adopt (int)	0.0858	−0.0225	0.0009	0.0024	0.0016	0.0013
Peer-technique breadth	Invest (int)	−0.9077**	−0.3658***	−0.0472*	−0.0188	−0.0154	−0.0134
Technique intensity	Adopt (ext)	0.8759***	0.2815**	0.1107	0.0577	0.0475	0.0462
Technique intensity	Invest (ext)	0.8472**	0.3129**	0.1209	0.0639	0.0508	0.0490
Technique intensity	Adopt (int)	1.369	8.477*	1.465	0.5427	0.4368	0.4257
Technique intensity	Invest (int)	76.60	41.43***	10.38	5.973	5.751*	5.586*

Notes. The unit is a firm–county–formation–quarter. Each cell reports the coefficient on $\hat{E}_{c,t-1}^{-f} \times S_{gt}$ from the pooled one-quarter response specification under the listed radius used to construct expiration-driven peer activity. S_{gt} is the predetermined local network signal for the row’s signal type. Signal-specific samples, outcome definitions, controls, fixed effects and signal weights otherwise match the baseline pooled specification. The preferred body specification uses the 25-mile construction. This summary reports coefficients only. Detailed standard errors, p -values and sample sizes are reported in Table OA.2.

OA.7 Network Trajectory Classifications

Figures OA.1 through OA.3 report the formation-block paths used to assign the trajectory buckets in main-paper Figure 7. Each panel is a formation. The panel title reports the assigned bucket and the number of estimated 2,000-well blocks. The classification is network specific and uses the same preferred weight as the main network measure, distance-time for peer performance and technique intensity, and equidistant for peer-technique breadth. Formations marked unclassified are not used in the corresponding trajectory split because the block path is too sparse or does not map cleanly to the displayed classes.

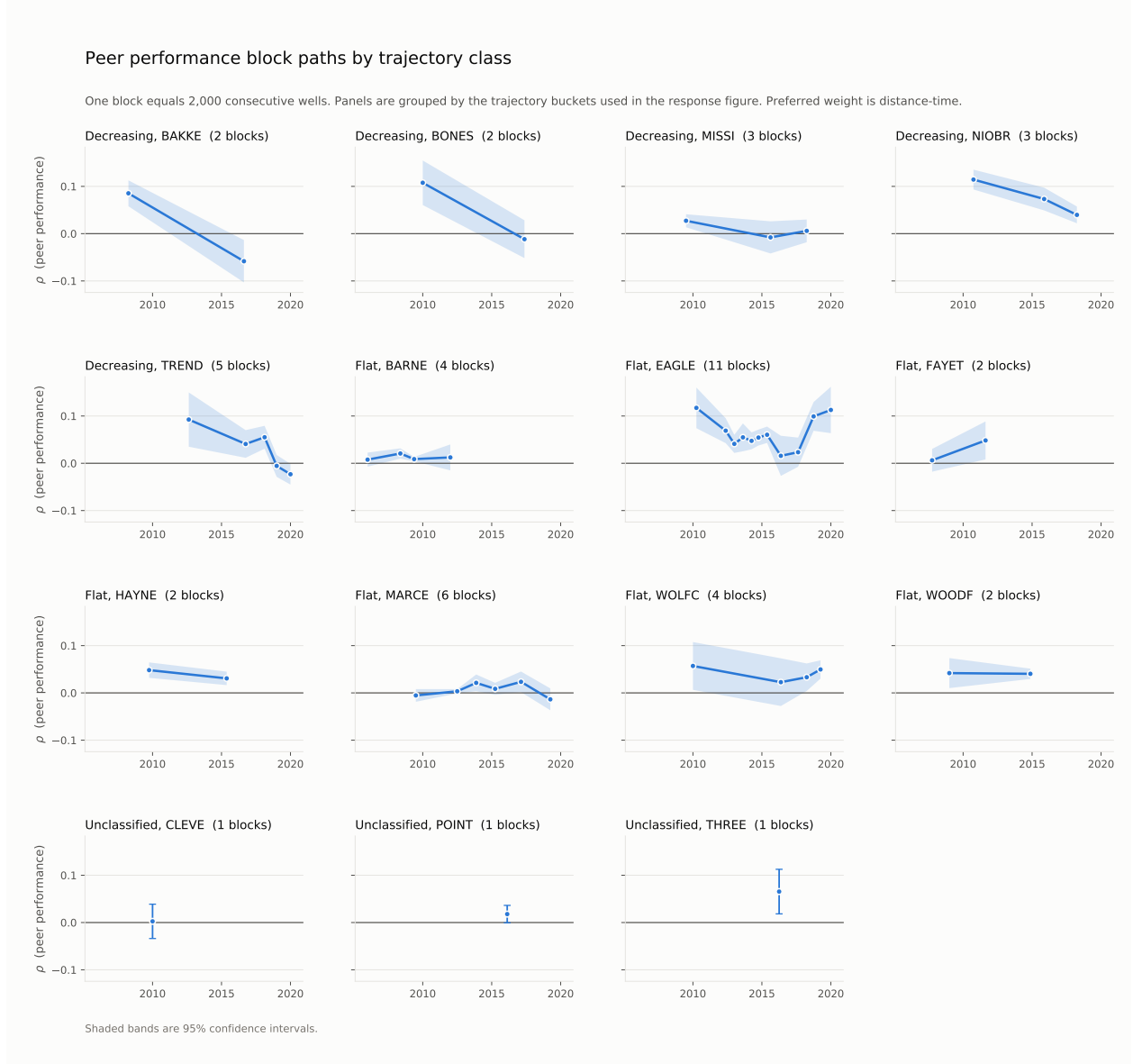


Figure OA.1: Peer performance block paths by trajectory classification

Notes. The unit is a formation by completed 2,000-well block. Each panel plots the estimated peer-performance signal WY , the coefficient on weighted prior peer productivity in the spatial network model. Panels are grouped by the trajectory classification used in main-paper Figure 7. The preferred peer-performance weight is distance-time. Shaded bands are 95% confidence intervals from the block-level spatial regression.

Peer technique breadth block paths by trajectory class

One block equals 2,000 consecutive wells. Panels are grouped by the trajectory buckets used in the response figure. Preferred weight is equidistant.



Breadth is the count of positive peer-technique loadings and has no separate confidence band.

Figure OA.2: Peer-technique breadth block paths by trajectory classification

Notes. The unit is a formation by completed 2,000-well block. Each panel plots peer-technique breadth, the count of observable technique attributes whose peer-exposure coefficient is positive with a 95% confidence interval excluding zero in the block-level spatial regression. Panels are grouped by the trajectory classification used in main-paper Figure 7. The preferred peer-technique breadth weight is equidistant.

Technique-intensity block paths by trajectory class

One block equals 2,000 consecutive wells. Panels are grouped by the trajectory buckets used in the response figure. Preferred weight is distance-time.



Intensity is the joint partial R^2 of peer-technique loadings and has no standard error band.

Figure OA.3: Technique intensity block paths by trajectory classification

Notes. The unit is a formation by completed 2,000-well block. Each panel plots technique intensity, the joint partial R^2 of the peer-technique attribute terms in the block-level spatial regression. Panels are grouped by the trajectory classification used in main-paper Figure 7. The preferred technique-intensity weight is distance-time.

OA.8 Additional Trajectory and Mechanism Diagnostics

This appendix reports the diagnostics used to interpret the trajectory, mechanism, and descriptive checks in Sections 5 and 6 of the main paper. The tables are not additional baseline specifications. They check whether the trajectory patterns are driven by thin cells, whether cumulative local productivity explains the adoption and intensive-investment split, whether WZ supplies an independent mechanism and whether the trajectory labels line up mechanically with simple dispersion measures for well design or productivity.

Table OA.20: Trajectory-by-cohort response coefficients underlying main-paper Figure 7

Signal	Cohort / path	Outcome	Estimate	N	Clusters
<i>Peer-technique breadth</i>					
	Early / increasing	Adopt (ext)	−0.0029*** (0.0007)	422,227	195
	Early / flat	Adopt (ext)	0.0152** (0.0071)	422,227	195
	Late / increasing	Adopt (ext)	−0.0049* (0.0028)	422,227	195
	Late / flat	Adopt (ext)	0.0017 (0.0018)	422,227	195
	Early / increasing	Invest (int)	0.1161 (0.1574)	8,004	146
	Early / flat	Invest (int)	5.338*** (1.892)	8,004	146
	Late / increasing	Invest (int)	−0.2171 (0.1705)	8,004	146
	Late / flat	Invest (int)	−1.146** (0.4574)	8,004	146
<i>Technique intensity</i>					
	Early / increasing	Adopt (ext)	−0.4370 (0.7814)	737,795	225
	Early / flat	Adopt (ext)	−0.2086 (0.1741)	737,795	225
	Early / decreasing	Adopt (ext)	−0.0973 (0.0682)	737,795	225
	Late / increasing	Adopt (ext)	0.4026*** (0.1478)	737,795	225
	Late / flat	Adopt (ext)	0.2069* (0.1198)	737,795	225
	Late / decreasing	Adopt (ext)	−8.149*** (0.5093)	737,795	225
	Early / increasing	Invest (int)	209.6 (210.7)	10,024	156
	Early / flat	Invest (int)	41.12*** (12.61)	10,024	156
	Early / decreasing	Invest (int)	−176.2*** (35.20)	10,024	156
	Late / increasing	Invest (int)	17.03 (23.70)	10,024	156
	Late / flat	Invest (int)	21.07 (31.03)	10,024	156
	Late / decreasing	Invest (int)	74.09** (36.04)	10,024	156
<i>Peer performance (WY)</i>					
	Early / decreasing	Adopt (ext)	1.024 (0.8664)	575,078	235
	Early / flat	Adopt (ext)	0.1514* (0.0902)	575,078	235
	Late / decreasing	Adopt (ext)	0.1571* (0.0821)	575,078	235
	Late / flat	Adopt (ext)	−0.0140 (0.2394)	575,078	235
	Early / decreasing	Invest (int)	379.4*** (94.25)	8,774	163
	Early / flat	Invest (int)	11.78** (5.278)	8,774	163
	Late / decreasing	Invest (int)	−14.25 (19.77)	8,774	163
	Late / flat	Invest (int)	−14.45 (67.91)	8,774	163

Notes. The unit is a firm–county–formation–quarter. The table reports the coefficients plotted in main-paper Figure 7. Each row is β_{er}^s from the trajectory-response specification, the coefficient on $\hat{E}_{c,t-1}^{-f} \times S_{gt}^s$ within the indicated cohort-by-trajectory cell for signal s . $\hat{E}_{c,t-1}^{-f}$ is leave-firm-out expiration-driven peer activity lagged one quarter, and S_{gt}^s is the predetermined local network signal. The sample is restricted to formation-blocks with an available trajectory classification and a positive signal under the preferred weight. Controls, fixed effects and county-clustered standard errors match the baseline response specification. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.21: Formal contrasts for the trajectory-by-cohort response

Signal / outcome	Contrast	Estimate	<i>N</i>	Clusters
<i>Peer-technique breadth, Adopt (ext)</i>				
	DID: increasing vs. flat	−0.0115 (0.0075)	422,227	195
	Late − early, increasing	−0.0020 (0.0027)	422,227	195
	Late − early, flat	−0.0135* (0.0070)	422,227	195
<i>Peer-technique breadth, Invest (int)</i>				
	DID: increasing vs. flat	−6.151*** (1.998)	8,004	146
	Late − early, increasing	−0.3332 (0.2464)	8,004	146
	Late − early, flat	−6.484*** (1.980)	8,004	146
<i>Technique intensity, Adopt (ext)</i>				
	DID: increasing vs. flat	−0.4241 (0.8203)	737,795	225
	DID: increasing vs. decreasing	−8.891*** (0.9369)	737,795	225
	DID: flat vs. decreasing	−8.467*** (0.5540)	737,795	225
	Late − early, increasing	0.8396 (0.7890)	737,795	225
	Late − early, flat	0.4155* (0.2373)	737,795	225
	Late − early, decreasing	−8.052*** (0.5050)	737,795	225
<i>Technique intensity, Invest (int)</i>				
	DID: increasing vs. flat	172.5 (214.6)	10,024	156
	DID: increasing vs. decreasing	442.9** (210.8)	10,024	156
	DID: flat vs. decreasing	270.4*** (67.79)	10,024	156
	Late − early, increasing	−192.6 (210.4)	10,024	156
	Late − early, flat	−20.05 (31.06)	10,024	156
	Late − early, decreasing	250.3*** (58.43)	10,024	156
<i>Peer performance (WY), Adopt (ext)</i>				
	DID: decreasing vs. flat	0.7017 (0.8780)	575,078	235
	Late − early, decreasing	−0.8671 (0.8327)	575,078	235
	Late − early, flat	−0.1654 (0.2622)	575,078	235
<i>Peer performance (WY), Invest (int)</i>				
	DID: decreasing vs. flat	367.5*** (132.0)	8,774	163
	Late − early, decreasing	−393.7*** (95.50)	8,774	163
	Late − early, flat	−26.24 (68.68)	8,774	163

Notes. The table reports linear contrasts of the β_{cr}^s coefficients from the trajectory-response specification.

Late-early contrasts compare the late and early cohort coefficients within the same trajectory cell.

Difference-in-differences contrasts compare those late-early changes across trajectory cells for the same signal and outcome. *N* and clusters are from the underlying trajectory-response regression. Standard errors are county-clustered standard errors for the corresponding linear contrast. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.22: Formation membership in the trajectory-by-cohort cells

Signal	Cohort / path	Forms	Adopt N	Invest N	Formations
Peer-technique breadth	Early / increasing	2	26,806	794	BARNE, THREE
Peer-technique breadth	Early / flat	2	17,850	522	EAGLE, MARCE
Peer-technique breadth	Late / increasing	8	185,828	3,594	BAKKE, BARNE, BONES, HAYNE, NIOBR, THREE, TREND, WOODF
Peer-technique breadth	Late / flat	4	191,910	3,358	EAGLE, MARCE, POINT, WOLFC
Technique intensity	Early / increasing	2	38,638	479	BARNE, WOODF
Technique intensity	Early / flat	3	39,624	1,373	EAGLE, HAYNE, NIOBR
Technique intensity	Early / decreasing	1	13,254	300	MARCE
Technique intensity	Late / increasing	5	480,523	4,494	BARNE, MISSI, TREND, WOLFC, WOODF
Technique intensity	Late / flat	3	110,638	2,450	EAGLE, HAYNE, NIOBR
Technique intensity	Late / decreasing	2	55,390	1,191	BAKKE, MARCE
Peer performance (WY)	Early / decreasing	3	34,403	616	BAKKE, MISSI, NIOBR
Peer performance (WY)	Early / flat	6	85,038	2,227	BARNE, EAGLE, FAYET, HAYNE, MARCE, WOODF
Peer performance (WY)	Late / decreasing	4	154,664	2,256	BONES, MISSI, NIOBR, TREND
Peer performance (WY)	Late / flat	6	301,460	3,968	EAGLE, FAYET, HAYNE, MARCE, WOLFC, WOODF

Notes. Each row is a signal-by-outcome-by-cohort-by-trajectory cell from main-paper Figure 7. The table reports the number of formations, firm–county–formation–quarter observations, county clusters and formation membership behind each displayed trajectory-response estimate. Formation names are abbreviated using the cleaned formation codes in the analysis files. The table is a cell-size diagnostic, not a separate regression.

Table OA.23: Leave-one-formation-out diagnostics for main-paper Figure 7

Signal	Cell	Outcome	Full	LOO min	LOO max	Sign flips
Peer-technique breadth	Early / increasing	Adopt (ext)	-0.0029***	-0.2031 (BARNE)	-0.0022 (WOLFC)	0
Peer-technique breadth	Early / flat	Adopt (ext)	0.0152**	-0.0044 (EAGLE)	0.0164 (THREE)	1
Peer-technique breadth	Late / increasing	Adopt (ext)	-0.0049*	-0.0072 (BONES)	-0.0021 (TREND)	0
Peer-technique breadth	Late / flat	Adopt (ext)	0.0017	-0.0009 (WOLFC)	0.0026 (TREND)	2
Peer-technique breadth	Early / increasing	Invest (int)	0.1161	0.0400 (MARCE)	0.1303 (NIOBR)	0
Peer-technique breadth	Early / flat	Invest (int)	5.338***	-8.473 (EAGLE)	5.524 (BARNE)	1
Peer-technique breadth	Late / increasing	Invest (int)	-0.2171	-0.2947 (NIOBR)	-0.0131 (WOLFC)	0
Peer-technique breadth	Late / flat	Invest (int)	-1.146**	-1.260 (BONES)	0.6036 (WOLFC)	1
Technique intensity	Early / increasing	Adopt (ext)	-0.4370	-1.344 (BARNE)	-0.2712 (MISSI)	0
Technique intensity	Early / flat	Adopt (ext)	-0.2086	-0.2365 (HAYNE)	-0.0468 (EAGLE)	0
Technique intensity	Early / decreasing	Adopt (ext)	-0.0973	-0.1067 (EAGLE)	-0.0951 (TREND)	0
Technique intensity	Late / increasing	Adopt (ext)	0.4026***	0.2604 (MISSI)	0.6364 (WOLFC)	0
Technique intensity	Late / flat	Adopt (ext)	0.2069*	-0.2652 (EAGLE)	0.2459 (HAYNE)	1
Technique intensity	Late / decreasing	Adopt (ext)	-8.149***	-8.361 (WOLFC)	-7.354 (MISSI)	0
Technique intensity	Early / increasing	Invest (int)	209.6	-65.94 (BARNE)	239.7 (WOLFC)	1
Technique intensity	Early / flat	Invest (int)	41.12***	-2498.6 (EAGLE)	44.37 (WOODF)	1
Technique intensity	Early / decreasing	Invest (int)	-176.2***	-203.1 (WOODF)	-161.5 (HAYNE)	0
Technique intensity	Late / increasing	Invest (int)	17.03	5.385 (MISSI)	67.82 (TREND)	0
Technique intensity	Late / flat	Invest (int)	21.07	6.275 (NIOBR)	204.2 (EAGLE)	0
Technique intensity	Late / decreasing	Invest (int)	74.09**	58.95 (WOODF)	91.08 (WOLFC)	0
Peer performance (WY)	Early / decreasing	Adopt (ext)	1.024	-0.3328 (MISSI)	1.064 (WOODF)	1
Peer performance (WY)	Early / flat	Adopt (ext)	0.1514*	0.0546 (EAGLE)	0.1758 (BARNE)	0
Peer performance (WY)	Late / decreasing	Adopt (ext)	0.1571*	-0.2187 (MISSI)	0.2056 (NIOBR)	1
Peer performance (WY)	Late / flat	Adopt (ext)	-0.0140	-0.2822 (EAGLE)	0.2459 (WOLFC)	5
Peer performance (WY)	Early / decreasing	Invest (int)	379.4***	294.3 (NIOBR)	554.7 (MISSI)	0
Peer performance (WY)	Early / flat	Invest (int)	11.78**	-29.06 (EAGLE)	12.46 (MARCE)	1
Peer performance (WY)	Late / decreasing	Invest (int)	-14.25	-32.22 (TREND)	7.141 (NIOBR)	1
Peer performance (WY)	Late / flat	Invest (int)	-14.45	-75.83 (WOLFC)	31.59 (TREND)	2

Notes. Each row starts from the trajectory-response coefficient β_{er}^s plotted in main-paper Figure 7. Full is the estimate using all formations in the cell. LOO min and LOO max report the smallest and largest coefficient obtained after dropping one formation from that cell and re-estimating the same specification; the omitted formation is shown in parentheses. Sign flips count how many leave-one-formation-out estimates change sign relative to the full-cell coefficient. This table is an influence diagnostic.

Table OA.24: Cumulative local productivity split

Signal	Outcome	Cohort	Low prior prod.	High prior prod.	High – low
<i>Peer performance (WY)</i>					
	Adopt (ext)	Early	−0.0526 (0.0951)	−0.1278 (0.2098)	−0.0752 (0.2234)
	Adopt (ext)	Late	0.2126*** (0.0800)	−0.2423 (0.5441)	−0.4549 (0.5606)
	Invest (int)	Early	8.652* (4.982)	301.5** (117.5)	292.8** (118.8)
	Invest (int)	Late	2.333 (11.47)	167.1** (72.23)	164.8** (72.51)
<i>Peer-technique breadth</i>					
	Adopt (ext)	Early	−0.0010 (0.0006)	0.0008 (0.0006)	0.0017** (0.0007)
	Adopt (ext)	Late	−0.0019* (0.0011)	−0.0026 (0.0019)	−0.0007 (0.0020)
	Invest (int)	Early	1.264 (0.9385)	0.1289* (0.0766)	−1.135 (0.9512)
	Invest (int)	Late	−0.1970 (0.1644)	−0.5778 (0.3765)	−0.3808 (0.4236)
<i>Technique intensity</i>					
	Adopt (ext)	Early	−0.2187** (0.1070)	0.0988 (0.2955)	0.3175 (0.3424)
	Adopt (ext)	Late	0.4349*** (0.1653)	0.3157* (0.1883)	−0.1192 (0.2138)
	Invest (int)	Early	39.62*** (11.58)	291.7* (175.4)	252.1 (178.2)
	Invest (int)	Late	−12.27 (26.82)	3.120 (41.20)	15.39 (51.82)

Notes. The unit is a firm–county–formation–quarter. Each entry reports $\hat{\beta}_L$ or $\hat{\beta}_H$ from the cumulative-productivity split specification, the coefficient on $\hat{E}_{c,t-1}^{-f} \times S_{gt}^s$ estimated separately by whether cumulative formation-level productivity growth before the current 2,000-well block is below or above the sample median. High–low is the linear contrast $\hat{\beta}_H - \hat{\beta}_L$. The sample is restricted to positive-signal cells for the listed signal. Controls, fixed effects and county clustering match the main-paper cumulative-productivity split specification. The body table reports the subset most directly related to the adoption and intensive-investment interpretation. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.25: Peer-skill diagnostics

Signal	Outcome	Cohort	Estimate	<i>N</i>	Clusters
<i>Panel A. WZ-eligible formation response</i>					
Peer performance (<i>WY</i>)	Adopt (ext)	Early	0.5557*** (0.2062)	33,410	95
Peer performance (<i>WY</i>)	Adopt (ext)	Late	0.0110 (0.0451)	117,384	99
Peer skill (<i>WZ</i>)	Adopt (ext)	Late	0.1058 (0.0776)	113,098	107
Peer-technique breadth	Adopt (ext)	Late	0.0002 (0.0002)	229,096	107
Technique intensity	Adopt (ext)	Late	−0.0339 (0.2630)	217,997	104
Peer performance (<i>WY</i>)	Invest (int)	Early	44.27 (53.70)	544	28
Peer performance (<i>WY</i>)	Invest (int)	Late	−14.04 (34.44)	705	28
Peer skill (<i>WZ</i>)	Invest (int)	Late	26.83 (18.36)	711	33
Peer-technique breadth	Invest (int)	Late	−0.2348 (0.3384)	1,356	41
Technique intensity	Invest (int)	Late	180.5 (180.8)	1,514	44
<i>Panel B. WZ timing cells</i>					
WZ state	Formations	Blocks	Mean <i>WZ</i>	Mean <i>WY</i>	
None Yet	14	48	−0.0342	0.0396	
First Positive	3	3	0.1833	0.0141	
After Positive	2	3	0.0092	0.0126	
<i>Panel C. Bakken block diagnostic</i>					
Block	First quarter	<i>WY</i>	<i>WZ</i>	WZ state	Prior prod. growth
1	2005q1	0.0854***	−0.0669**	none yet	0.000
2	2011q3			none yet	0.000
3	2013q2			none yet	0.081
4	2014q4	−0.0583**	0.3139***	first positive	0.186

Notes. Panel A reports response coefficients from the baseline peer-activity specification, restricted to formations in which the preferred *WZ* signal is positive and statistically significant in at least one completed 2,000-well block. Each row is estimated separately by signal, outcome and cohort, and the estimate is the coefficient on $\widehat{E}_{c,t-1}^{-f} \times S_{gt}$.

Standard errors are clustered by county and shown in parentheses. Panel B is a formation-block count by *WZ* timing cell, where none yet denotes blocks before the first positive *WZ* signal, first positive denotes the first such block, and after positive denotes later blocks in formations with a prior positive *WZ* signal. Panel C reports the Bakken block path because Bakken is one of the clearest *WZ* cases. The four-signal *WZ* horse race is not reported because requiring positive *WZ*, peer performance, peer-technique breadth, and technique intensity in the same eligible cells leaves no usable regression sample. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.26: Response by peer-skill timing cell

Signal	Outcome	WZ state / cohort	Estimate	<i>N</i>	Clusters
Peer performance (WY)	Adopt (ext)	None Yet / All WZ periods	0.1772 (0.6459)	9,076	25
Peer performance (WY)	Adopt (ext)	First Positive / All WZ periods	0.0433 (0.2289)	136,891	101
Peer performance (WY)	Adopt (ext)	First Positive / Late	−0.0832 (0.2017)	106,448	99
Peer skill (WZ)	Adopt (ext)	First Positive / All WZ periods	0.1027 (0.0781)	143,541	109
Peer skill (WZ)	Adopt (ext)	First Positive / Late	0.1058 (0.0776)	113,098	107
Technique intensity	Adopt (ext)	After Positive / All WZ periods	−0.3525 (0.3580)	194,243	96
Technique intensity	Adopt (ext)	After Positive / Late	−0.3525 (0.3580)	194,243	96
Peer performance (WY)	Invest (int)	None Yet / All WZ periods	−214.0*** (69.27)	528	19
Peer performance (WY)	Invest (int)	First Positive / All WZ periods	37.22 (128.6)	619	32
Peer performance (WY)	Invest (int)	First Positive / Late	−132.7** (61.50)	464	27
Peer skill (WZ)	Invest (int)	First Positive / All WZ periods	−22.47 (31.43)	866	38
Peer skill (WZ)	Invest (int)	First Positive / Late	26.83 (18.36)	711	33
Technique intensity	Invest (int)	After Positive / All WZ periods	−146.9 (99.76)	583	33
Technique intensity	Invest (int)	After Positive / Late	−146.9 (99.76)	583	33

Notes. The unit is a firm–county–formation–quarter. Each row reports the coefficient on $\hat{E}_{c,t-1}^{-f} \times S_{gt}$ from the baseline peer-activity response specification, estimated within the listed *WZ* timing cell and, when shown, cohort. Timing cells are defined from the first local completed 2,000-well block in which the preferred *WZ* signal is positive and statistically significant. None yet denotes blocks before a positive *WZ* signal, first positive denotes the first such block, and after positive denotes later blocks in formations with a prior positive *WZ* signal. Controls, fixed effects and outcome definitions match the baseline response specification. Standard errors are clustered by county and shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA.27: Formation-complexity diagnostics

Signal / path	Blocks	Interval disp.	Depth disp.	Drill-time disp.	Prod. disp.	FE prod. disp.
<i>Panel A. Complexity by trajectory</i>						
Peer performance / decreasing	17	0.281	0.143	0.564	0.636	0.707
Peer performance / flat	33	0.327	0.188	0.655	0.741	0.814
Breadth / increasing	26	0.299	0.132	0.591	0.663	0.769
Breadth / flat	22	0.325	0.225	0.665	0.743	0.756
Technique intensity / increasing	20	0.326	0.156	0.604	0.757	0.864
Technique intensity / flat	16	0.277	0.204	0.639	0.633	0.760
Technique intensity / decreasing	10	0.342		0.654	0.736	0.665
<i>Panel B. Selected correlations with complexity</i>						
Signal / complexity	Blocks	Pearson	Spearman			
Peer performance / Interval dispersion	49	-0.135	-0.240			
Peer skill / Interval dispersion	49	-0.205	-0.088			
Breadth / Interval dispersion	54	-0.000	-0.020			
Technique intensity / Interval dispersion	43	-0.273	-0.246			
Peer performance / Depth dispersion	33	0.369	0.438			
Peer skill / Depth dispersion	33	-0.187	-0.237			
Breadth / Depth dispersion	35	-0.138	-0.149			
Technique intensity / Depth dispersion	30	0.296	0.246			
Peer performance / Productivity dispersion	49	-0.084	-0.191			
Peer skill / Productivity dispersion	49	0.110	0.106			
Breadth / Productivity dispersion	54	0.135	0.103			
Technique intensity / Productivity dispersion	43	-0.205	-0.280			
Peer performance / Productivity FE dispersion	49	0.083	0.053			
Peer skill / Productivity FE dispersion	49	0.067	0.122			
Breadth / Productivity FE dispersion	54	0.027	0.012			
Technique intensity / Productivity FE dispersion	43	-0.174	-0.188			

Notes. The unit is a formation by completed 2,000-well block. Panel A reports mean within-block dispersion diagnostics by network trajectory, using interval length, true vertical depth, drill time, raw productivity and productivity residualized with fixed effects. Panel B reports Pearson and Spearman correlations between each network signal and the listed complexity measure across formation-blocks. Depth has thinner coverage than the other measures. These diagnostics are descriptive and are not used as causal tests.