

**Internet Appendix to**  
**Bank Geographic Diversification and Corporate Innovation:**  
**Evidence from the Lending Channel**

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INTERNET APPENDIX TABLE A.1  
**Bank Geographic Diversification and Corporate Innovation Output – OLS Regression**

Table A.1 presents the OLS results. The dependent variables are  $\ln(1+\text{PAT})$  that is the natural logarithm of one plus the total number of patents filed (and eventually granted), and  $\ln(1+\text{CITE})$  that is the natural logarithm of one plus the total number of non-self-citations received per patent. The independent variable is  $(1-\text{HHI})$ , which is one minus Herfindahl index of lending bank's assets across states. We cluster standard errors at the state level and report t-values in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

	$\ln(1+\text{PAT})$				$\ln(1+\text{CITE})$			
	t+1	t+2	t+3	(t+1, t+3)	t+1	t+2	t+3	(t+1, t+3)
	1	2	3	4	5	6	7	8
1-HHI	-0.037 (-1.368)	-0.044* (-1.952)	-0.042* (-1.684)	-0.135* (-1.773)	-0.039* (-1.879)	-0.049*** (-2.818)	-0.045*** (-2.793)	-0.051* (-1.846)
$\ln(\text{SALES})$	0.336*** (14.119)	0.301*** (13.151)	0.265*** (12.099)	1.004*** (12.104)	0.173*** (17.691)	0.148*** (15.963)	0.136*** (15.174)	0.220*** (16.071)
PPE	-0.335 (-1.588)	-0.279 (-1.423)	-0.229 (-1.441)	-1.036 (-1.658)	-0.297*** (-2.702)	-0.205 (-1.632)	-0.208* (-1.850)	-0.408** (-2.552)
CAPX	1.593*** (3.129)	1.426*** (2.849)	1.209*** (2.897)	4.869*** (3.221)	0.926** (2.106)	1.130** (2.500)	1.033** (2.672)	1.490** (2.156)
ROA	-0.193*** (-2.774)	-0.187*** (-2.736)	-0.126* (-1.821)	-0.994*** (-2.703)	-0.035 (-0.539)	-0.059 (-0.989)	-0.063 (-1.132)	-0.014 (-0.159)
LEVERAGE	-0.345*** (-2.994)	-0.350*** (-2.924)	-0.289*** (-2.771)	-1.103** (-2.405)	-0.256*** (-3.654)	-0.246*** (-3.120)	-0.224*** (-3.156)	-0.405*** (-3.693)
TOBIN_Q	0.043* (1.874)	0.041* (1.825)	0.036* (1.797)	0.127 (1.635)	0.026* (1.767)	0.022* (1.747)	0.017* (1.759)	0.033* (1.713)
H_INDEX	0.911 (0.951)	0.856 (0.849)	0.893 (1.041)	4.710 (1.178)	1.934** (2.524)	1.784** (2.120)	1.672* (1.788)	2.756*** (2.745)

H_INDEX^2	-1.343 (-0.877)	-1.721 (-1.081)	-2.262 (-1.678)	-8.837 (-1.118)	-3.525** (-2.402)	-3.284** (-2.103)	-3.686* (-1.796)	-5.264** (-2.306)
KZ_INDEX	0.000 (1.101)	0.000 (1.273)	0.000 (1.668)	0.001 (1.039)	0.000 (1.418)	0.000 (0.950)	0.000 (0.747)	0.000 (0.865)
ln(AGE)	0.104*** (3.382)	0.088*** (3.005)	0.072*** (2.724)	0.247** (2.641)	0.033 (1.487)	0.041** (2.340)	0.031* (1.741)	0.037 (1.119)
Industry fixed effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year fixed effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
N	38,486	38,486	38,486	38,486	38,486	38,486	38,486	38,486

INTERNET APPENDIX TABLE A.2

**Bank Geographic Diversification and Economic Value of Patents – 2SLS Regressions**

Table A.2 reports the results of the second-stage of 2SLS regression on how bank geographic diversification affects borrowing firms' patent economic value. The dependent variable  $\ln(1+\text{PATENT\_VALUE\_AVG})$  and  $\ln(1+\text{PATENT\_VALUE\_SUM})$  are the natural logarithm of one plus the average and sum of the economic value of a firm's patents, respectively. Patent economic values are obtained by multiplying the abnormal return in the equity market in response to the announcement of patent grant by the market cap on the day prior to patent grant announcement following Kogan et al. (2017). The independent variable is bank geographic diversification (1–HHI), which is instrumented using one minus the Predicted value of HHI from the gravity-deregulation model. All other variables are defined in Appendix B. We cluster standard errors at the state level and report t-values in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

	$\ln(1+\text{PATENT\_VALUE\_AVG})$				$\ln(1+\text{PATENT\_VALUE\_SUM})$			
	t+1	t+2	t+3	(t+1, t+3)	t+1	t+2	t+3	(t+1, t+3)
	1	2	3	4	5	6	7	8
1–HHI	1.509*	1.290**	0.725**	0.601**	2.306**	1.935***	1.006*	0.896**
	(1.892)	(2.347)	(2.395)	(2.367)	(2.198)	(3.140)	(1.774)	(2.331)
Control variables	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Industry fixed effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year fixed effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
N	38,486	38,486	38,486	38,486	38,486	38,486	38,486	38,486

# INTERNET APPENDIX TABLE A.3

## Additional Robustness Checks

Table A.3 reports the results of additional robustness checks. In panel A, we use the exact same gravity-deregulation model as that in Goetz et al. (2013):

$$\text{SHARE}_{bijt} = \alpha \text{Ln}(\text{DISTANCE}_{bij}) + \beta \text{Ln}(\text{POP}_{it} / \text{POP}_{jt}) + \varepsilon_{bijt}.$$

SHARE<sub>bijt</sub> is the percentage of BHC *b*'s assets in subsidiaries located in state *j* in year *t* and BHC

*b* is headquartered in state *i*. DISTANCE<sub>bij</sub> is the distance between BHC *b*'s headquarter location in home state *i* and the capital of state *j*. ln(POP<sub>it</sub>/POP<sub>jt</sub>) is the natural logarithm of the ratio of population in BHC *b*'s home state *i* and that in a foreign state *j* in year *t*. In panel B, we use deposit dispersion as an alternative measure of bank geographic diversification. In panel C, we focus on only lead bank lenders. In panel D, we estimate the first-stage model and obtain predicted value of (1–HHI). We calculate the average value of the predicted (1–HHI) of all BHCs from which a firm borrows in a year, then estimate the second-stage model using firm-year observations, rather than firm-BHC-year observations. We cluster standard errors at the state level and report t-values in parentheses. \*, \*\*, and \*\*\* denote statistical significance at the 10%, 5%, and 1% level, respectively.

	ln(1+PAT)				ln(1+CITE)			
	t+1	t+2	t+3	(t+1, t+3)	t+1	t+2	t+3	(t+1, t+3)
	1	2	3	4	5	6	7	8
<i>Panel A. Using the Same Gravity-Deregulation Model as that in Goetz et. al. (2013) to Construct the Instrumental Variable</i>								
1–HHI	0.606*	0.603*	0.368**	2.039**	1.489***	1.013**	0.519**	2.386**
	(1.716)	(1.757)	(1.421)	(2.288)	(3.025)	(2.035)	(1.271)	(1.899)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	38,486	38,486	38,486	38,486	38,486	38,486	38,486	38,486
<i>Panel B. Using Deposit Dispersion as an Alternative Measure of Geographic Diversification</i>								
1–HHI	2.196***	2.125**	1.299**	5.366**	3.163**	2.211**	0.486*	5.741**
	(2.657)	(2.430)	(2.103)	(2.253)	(2.445)	(2.238)	(1.899)	(2.175)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	36,126	34,298	32,569	32,430	36,290	34,495	32,745	32,649
<i>Panel C. Keeping Lead Banks Only</i>								
1-HHI	1.565** (1.944)	1.627* (1.623)	1.235** (1.976)	2.448*** (3.022)	1.466** (1.981)	1.191** (2.158)	0.535* (1.633)	2.001*** (3.728)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18,879	17,892	16,957	16,900	18,879	17,892	16,957	16,900
<i>Panel D. Estimating 1st and 2nd Stage Models Separately with Firm-Year Observations</i>								
Mean(1-HHI)	1.613* (1.826)	2.794*** (2.771)	2.498** (2.300)	6.505** (2.162)	3.691*** (3.799)	2.761*** (2.420)	1.005 (1.015)	3.755*** (2.994)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10,804	10,161	9,539	9,489	10,842	10,205	9,579	9,542