

# Internet Appendix for

## “What Affects Innovation More: Policy or Policy Uncertainty?”

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This internet appendix provides supplemental analyses and robustness tests to the main results presented in “What Affects Innovation More: Policy or Policy Uncertainty?”

The tables are organized as follows:

Table IA1: Time-series averages and standard deviations of the country-level political, economic, and innovation variables.

Table IA2: Robustness check for Table 2 in the main text using the level of R&D as a measure of innovation activities.

Table IA3: Robustness check for Table 2 in the main text using the growth rate of patent-based innovation variables.

Table IA4: Robustness check for Table 3 in the main text using the growth rate of patent-based innovation variables.

**TABLE IA1**  
**Summary Statistics (Country-level)**

This table reports the time series averages and standard deviations of country-level variables including  $\text{SYSTEM}_{i,t}$ ,  $\text{POLICY}_{i,t}$ ,  $\text{ELECTION}_{i,t}$ , and  $\text{GDP}_{i,t}$ , and country-industry-level innovation variables including  $\text{PATENT}_{j,i,t}$ ,  $\text{CITATION}_{j,i,t}$ ,  $\text{ORIGINALITY}_{j,i,t}$ ,  $\text{CITATION\_TOP\_25\%}_{j,i,t}$ ,  $\text{CITATION\_BOTTOM\_25\%}_{j,i,t}$ ,  $\text{CITATION\_STD\_DEV}_{j,i,t}$ ,  $\text{EXPLORATION}_{j,i,t}$ , and  $\text{EXPLOITATION}_{j,i,t}$  of 43 countries. Here,  $j$  indicates an industry,  $i$  indicates a country, and  $i=1,2,\dots,43$ .  $t$  indicates a year that ranges from 1976 to 2010.  $\text{SYSTEM}_{i,t}$  is categorized into three values: parliamentary (2), assembly-elected president (1), and presidential (0).  $\text{POLICY}_{i,t}$  is also categorized into three values by orientation: right (-1), center (0), and left (1).  $\text{GDP}_{i,t}$  indicates the annual growth of country  $i$ 's GDP in year  $t$ .  $\text{ELECTION}_{i,t}$  indicates an indicator variable that equals one if there is any national election (presidential election for countries adopting the presidential system and parliamentary elections for countries adopting the parliamentary or assembly-elected president system) in country  $i$  in year  $t$ .

	SYSTEM		POLICY		ELECTION		GDP		PATENT		CITATION		ORIGINALITY	
	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.
Argentina	0.00	0.00	-0.14	0.85	0.17	0.38	0.025	0.065	2.8	6.0	31.9	104.1	0.4	0.9
Australia	2.00	0.00	-0.09	1.01	0.34	0.48	0.033	0.016	66.9	147.5	614.2	1244.8	13.2	34.8
Austria	2.00	0.00	0.60	0.81	0.29	0.46	0.025	0.014	43.4	72.4	265.4	438.6	7.0	13.5
Brazil	0.29	0.46	-0.09	1.01	0.17	0.38	0.032	0.035	8.0	16.9	42.4	84.2	1.3	3.1
Bulgaria	1.26	0.44	0.33	0.96	0.19	0.28	0.022	0.053	2.3	5.7	11.2	27.0	0.2	0.4
Canada	2.00	0.00	0.20	0.99	0.29	0.46	0.029	0.020	244.7	464.3	2728.5	5597.0	44.6	89.1
Chile	0.00	0.00	0.09	0.95	0.14	0.36	0.053	0.042	1.1	3.1	3.8	11.3	0.2	0.6
Colombia	0.00	0.00	-0.34	0.48	0.26	0.44	0.038	0.023	0.6	1.2	5.1	15.2	0.1	0.3
Croatia	1.00	1.03	-0.70	0.73	0.11	0.32	0.040	0.020	0.9	4.5	4.5	26.2	0.1	0.8
Denmark	2.00	0.00	-0.14	1.00	0.34	0.48	0.022	0.018	34.3	85.6	296.5	807.4	6.3	16.2
Finland	2.00	0.00	0.40	0.65	0.23	0.43	0.028	0.027	51.7	122.2	482.6	1588.2	7.7	16.6
France	2.00	0.00	-0.14	1.00	0.23	0.43	0.022	0.013	330.7	567.9	2601.8	4741.7	51.7	93.6
Germany	2.00	0.00	-0.20	0.99	0.29	0.46	0.021	0.016	1010.6	1689.4	7118.8	12181.4	161.5	300.7
Greece	1.69	0.47	-0.09	1.01	0.29	0.46	0.024	0.024	1.9	4.5	12.0	30.4	0.3	0.8
Hungary	1.57	0.50	0.77	0.65	0.20	0.41	0.018	0.034	19.1	57.2	99.0	301.6	2.2	6.7
Iceland	2.00	0.00	-0.79	0.41	0.29	0.46	0.036	0.030	1.0	2.9	12.0	44.8	0.2	0.7
India	2.00	0.00	0.66	0.76	0.26	0.44	0.056	0.029	42.5	151.1	139.7	458.7	5.3	18.5
Ireland	2.00	0.00	-0.31	0.47	0.26	0.44	0.049	0.032	12.3	30.6	153.3	399.8	2.3	5.8
Israel	1.71	0.71	-0.54	0.85	0.31	0.47	0.042	0.025	77.0	191.9	960.7	2640.1	14.7	35.6
Italy	2.00	0.00	-0.03	0.71	0.29	0.46	0.021	0.017	132.4	229.4	821.4	1453.3	19.4	36.2

Japan	2.00	0.00	-0.88	0.48	0.34	0.48	0.027	0.022	3104.3	5857.8	28077.2	59405.4	532.4	1061.6
Luxembourg	2.00	0.00	-0.11	0.32	0.20	0.41	0.043	0.029	3.4	4.9	19.3	35.5	0.6	1.1
Mexico	0.00	0.00	0.43	0.92	0.20	0.41	0.033	0.036	5.9	10.0	41.3	88.1	1.1	2.2
Netherlands	2.00	0.00	-0.37	0.94	0.31	0.47	0.026	0.015	111.6	200.9	954.7	1848.9	20.3	44.5
New Zealand	2.00	0.00	-0.14	1.00	0.31	0.47	0.023	0.021	8.6	18.3	71.9	178.0	1.6	3.6
Norway	2.00	0.00	0.20	0.99	0.26	0.44	0.031	0.017	16.8	31.9	126.9	288.8	3.2	6.7
Pakistan	0.80	0.96	0.54	0.88	0.11	0.32	0.052	0.022	0.2	0.7	1.3	8.0	0.0	0.1
Philippines	0.00	0.00	-0.22	0.42	0.14	0.36	0.035	0.035	1.5	5.2	13.7	62.2	0.3	0.9
Poland	0.43	0.50	0.66	0.76	0.20	0.41	0.040	0.033	4.4	9.0	28.2	71.9	0.6	1.5
Portugal	1.60	0.81	0.11	0.96	0.31	0.47	0.029	0.025	1.2	3.5	4.6	12.1	0.2	0.6
Romania	1.60	0.50	0.48	0.74	0.23	0.43	0.016	0.056	1.3	4.2	12.4	49.7	0.3	1.2
Russia	0.00	0.00	-0.46	0.52	0.21	0.42	0.013	0.078	44.7	78.0	357.3	655.7	4.5	7.7
S. Africa	1.26	0.44	-0.09	1.01	0.26	0.44	0.025	0.024	8.2	11.6	75.6	135.6	1.2	2.1
S. Korea	0.34	0.48	-0.66	0.48	0.17	0.38	0.067	0.038	384.0	1378.7	1533.9	5083.2	59.2	195.0
Spain	1.89	0.47	0.36	0.86	0.26	0.44	0.028	0.016	24.8	58.7	125.2	274.1	3.7	9.0
Sweden	2.00	0.00	0.46	0.82	0.31	0.47	0.021	0.019	97.2	174.7	915.5	1993.6	15.6	30.2
Switzerland	2.00	0.00	0.14	1.01	0.23	0.43	0.018	0.016	125.2	209.3	1030.5	1859.9	20.0	36.2
Turkey	1.83	0.57	-0.50	0.78	0.20	0.41	0.042	0.042	1.1	3.0	6.8	21.3	0.2	0.7
UK	2.00	0.00	-0.03	1.01	0.23	0.43	0.025	0.018	299.1	532.9	3111.8	5941.1	51.4	97.1
Ukraine	0.00	0.00	0.25	0.45	0.11	0.32	-0.010	0.092	1.9	4.7	22.6	147.0	0.3	0.8
Uruguay	0.00	0.00	-0.56	0.85	0.17	0.38	0.024	0.051	0.1	0.4	0.5	3.5	0.0	0.1
USA	0.00	0.00	-0.20	0.99	0.26	0.44	0.031	0.019	6507.3	11926.5	99828.8	211676.1	1322.7	2535.0
Venezuela	0.00	0.00	0.23	1.01	0.20	0.41	0.025	0.061	2.1	4.4	19.0	53.2	0.3	0.7

	CITATION_TOP_25_%		CITATION_BOTTO_M_25_%		CITATION_STD_DEV		EXPLORATION		EXPLOITATION	
	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.	Ave.	St.dev.
Argentina	0.7	2.0	1.2	3.3	2.8	11.1	2.6	5.5	0.2	0.6
Australia	19.6	54.9	27.6	70.4	46.4	81.3	54.0	107.6	12.9	48.2
Austria	7.2	17.5	21.7	39.5	25.0	40.6	36.7	62.8	6.7	11.5
Brazil	1.5	4.7	4.5	11.6	4.2	11.1	6.9	14.8	1.1	2.9
Bulgaria	0.3	1.3	1.3	2.9	0.3	1.0	2.2	5.2	0.1	0.8
Canada	78.5	180.6	82.4	189.3	126.9	212.8	200.8	376.2	43.9	100.2
Chile	0.2	1.2	0.7	2.3	0.2	1.0	1.1	3.1	0.1	0.2
Colombia	0.1	0.6	0.3	0.9	0.1	0.8	0.5	1.2	0.1	0.2
Croatia	0.1	0.6	0.6	3.6	0.3	2.4	0.8	4.3	0.1	0.5
Denmark	7.9	20.4	15.4	43.7	21.3	43.5	28.7	70.0	5.5	17.4
Finland	12.4	38.3	21.4	47.4	22.5	51.1	44.0	103.7	7.7	21.7
France	59.5	115.5	152.9	296.8	107.1	176.0	271.2	461.6	59.6	118.5
Germany	175.5	338.5	462.3	840.3	131.7	204.4	772.1	1284.9	238.5	453.3

Greece	0.5	1.9	0.9	2.6	1.1	4.8	1.7	4.2	0.2	0.6
Hungary	1.8	5.1	12.1	39.7	2.9	7.6	16.1	45.9	3.0	12.4
Iceland	0.5	1.6	0.3	1.0	0.7	3.1	0.8	2.0	0.2	1.1
India	11.2	60.0	25.2	99.9	8.1	26.7	37.2	135.9	5.3	19.6
Ireland	4.6	13.6	4.5	13.6	11.1	29.9	10.1	25.3	2.2	6.5
Israel	28.2	78.3	27.7	84.7	48.1	114.6	63.4	159.1	13.6	39.2
Italy	20.9	45.6	66.9	127.7	55.3	85.2	111.9	190.7	20.6	43.0
Japan	771.2	1743.9	1133.7	2345.2	160.2	261.8	2139.8	4046.9	964.5	2047.0
Luxembourg	0.4	1.0	1.7	2.7	1.3	2.8	2.0	2.9	1.4	2.8
Mexico	1.2	3.0	2.8	5.3	3.8	11.5	5.0	8.2	0.9	2.4
Netherlands	23.2	46.8	49.7	98.0	65.3	114.3	86.4	157.5	25.1	50.3
New Zealand	2.0	4.8	4.0	10.3	4.6	10.9	7.8	16.4	0.8	2.4
Norway	3.6	8.1	7.4	15.5	10.7	21.9	15.0	28.4	1.8	3.9
Pakistan	0.1	0.5	0.1	0.6	0.0	0.5	0.2	0.7	0.0	0.1
Philippines	0.6	2.6	0.6	2.1	0.9	4.4	1.2	4.0	0.4	1.7
Poland	0.8	2.6	2.4	5.6	1.5	5.4	4.0	8.1	0.4	1.6
Portugal	0.2	0.8	0.7	2.6	0.3	1.6	1.1	3.2	0.1	0.5
Romania	0.6	2.5	0.5	2.0	0.5	3.0	1.3	4.0	0.1	0.4
Russia	7.5	14.7	22.1	39.1	15.2	30.1	41.9	75.1	2.7	7.7
S. Africa	1.6	2.6	3.5	5.7	6.5	11.6	7.5	10.6	0.6	1.3
S. Korea	106.5	539.3	196.2	771.4	36.0	89.1	333.3	1213.9	50.6	205.1
Spain	4.8	16.4	13.7	37.2	11.8	24.3	21.6	50.8	3.3	9.7
Sweden	21.7	43.4	40.6	80.1	61.0	101.4	81.3	142.3	15.9	38.2
Switzerland	24.7	51.0	58.1	111.0	73.7	121.8	97.8	163.6	27.5	53.8
Turkey	0.3	1.2	0.5	1.7	0.6	2.4	1.0	2.7	0.1	0.5
UK	74.0	140.1	118.5	241.4	136.6	223.3	241.7	423.8	57.4	117.8
Ukraine	0.4	1.5	1.0	2.7	0.8	4.3	1.7	4.1	0.2	0.8
Uruguay	0.0	0.1	0.1	0.4	0.0	0.2	0.1	0.4	0.0	0.1
USA	2424.8	4947.6	1894.2	4154.3	309.3	497.1	4547.9	8257.7	1959.4	4129.4
Venezuela	0.4	1.1	0.9	1.9	1.1	3.4	1.6	3.2	0.5	1.7

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**TABLE IA2**  
**Regression Analysis for the Relation between Policy Uncertainty and R&D**

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This table reports the results of regressing  $RD_{j,i,t+1}$  (i.e., the logarithmic value of R&D expenditures reported by industry  $j$  of country  $i$  in year  $t+1$ ) on  $ELECTION_{i,t}$  (an indicator variable that equals one if there is at least one election in country  $i$  in year  $t$  and 0 otherwise),  $RIGHT_{i,t}$  (an indicator variable that equals one if country  $i$ 's government is right-wing in year  $t$  and 0 otherwise),  $LEFT_{i,t}$  (an indicator variable that equals one if country  $i$ 's government is left-wing in year  $t$  and 0 otherwise),  $GDP_{i,t}$  (the growth of GDP of country  $i$  in year  $t$ ), current  $RD_{j,i,t}$ , country-industry fixed effects, and year fixed effects. Industries with missing R&D are dropped, as firms do not need to disclose their R&D in some countries or do not often report R&D in some industries. We include all 43 countries in our sample. Numbers reported in parentheses are two-way clustered standard errors by country-industries and by years. The sample year  $t$  is from 1976 to 2010. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

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	INNOVATION		RD	
	(1)	(2)	(3)	(4)
$ELECTION_{i,t}$	-0.097** (-2.202)	-0.099** (-2.224)	-0.099** (-2.222)	-0.100** (-2.212)
$RD_{j,i,t}$	0.687*** (33.389)	0.685*** (33.972)	0.685*** (33.977)	0.685*** (33.968)
$GDP_{i,t}$		0.032*** (2.662)	0.032*** (2.643)	0.033*** (2.692)
$RIGHT_{i,t}$			0.002 (0.080)	
$LEFT_{i,t}$				-0.05 (-1.323)

No. of Obs.	6,714	6,714	6,714	6,714
$R^2$	0.485	0.486	0.486	0.486
Country-industry FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes

**TABLE IA3**  
**Regression Analysis for the Relation between Policy Uncertainty and Innovation Growth**

This table reports the results of regressing  $\Delta\text{INNOVATION}_{j,i,t+1}$  (i.e., the growth in innovation measures of industry  $j$  of country  $i$  in year  $t+1$ , defined as the logarithm of 1 plus innovation measures in year  $t+1$  minus the logarithm of 1 plus innovation measures in year  $t$ ) on  $\text{ELECTION}_{i,t}$  (an indicator variable that equals one if there is at least one election in country  $i$  in year  $t$  and zero otherwise),  $\text{RIGHT}_{i,t}$  (an indicator variable that equals one if country  $i$ 's government is right-wing in year  $t$  and zero otherwise),  $\text{LEFT}_{i,t}$  (an indicator variable that equals one if country  $i$ 's government is left-wing in year  $t$  and zero otherwise),  $\text{GDP}_{i,t}$  (the growth of GDP of country  $i$  in year  $t$ ), current growth in innovation  $\Delta\text{INNOVATION}_{j,i,t}$ , country-industry fixed effects, and year fixed effects.  $\text{INNOVATION}_{j,i,t}$  includes  $\text{PATENT}_{j,i,t}$ ,  $\text{CITATION}_{j,i,t}$ ,  $\text{CITATION\_TOP\_25\%}_{j,i,t}$ ,  $\text{CITATION\_BOTTOM\_25\%}_{j,i,t}$ ,  $\text{CITATION\_STD\_DEV}_{j,i,t}$ ,  $\text{ORIGINALITY}_{j,i,t}$ ,  $\text{EXPLORATION}_{j,i,t}$ , and  $\text{EXPLOITATION}_{j,i,t}$ . We include all 43 countries in our sample. Numbers reported in parentheses are two-way clustered standard errors by country-industries and by years. The sample year  $t$  is from 1976 to 2010. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	INNOVATION	PATENT	CITATION	ORIGINALITY	CITATION_TOP_25%	CITATION_BOTTOM_25%	CITATION_STD_DEV	EXPLORATION	EXPLOITATION
$\text{ELECTION}_{i,t}$	-0.019*** (-2.997)	-0.040** (-2.322)		-0.017* (-1.891)	-0.020** (-2.283)	-0.005 (-0.605)	-0.021 (-1.426)	-0.015*** (-2.602)	-0.006 (-0.495)
$\text{INNOVATION}_{j,i,t}$	-0.413*** (-22.893)	-0.426*** (-29.283)		-0.369*** (-11.226)	-0.478*** (-21.703)	-0.439*** (-25.403)	-0.441*** (-30.820)	-0.420*** (-23.006)	-0.092 (-0.810)
$\text{GDP}_{i,t}$	0.002 (1.280)	0.000 (0.085)		0.004*** (4.371)	0.000 (0.124)	0.001 (0.633)	0.004 (1.216)	0.001 (0.550)	0.006*** (3.780)
$\text{LEFT}_{i,t}$	0.005 (0.499)	0.001 (0.068)		0.014* (1.930)	-0.005 (-0.632)	0.008 (0.883)	-0.018 (-1.238)	0.002 (0.253)	0.017 (1.257)
No. of Obs.	25,060	25,060		25,060	25,060	25,060	20,110	25,060	2,5060
$R^2$	0.168	0.185		0.137	0.226	0.19	0.201	0.174	0.011
Country-industry FEs	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes

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**TABLE IA4****Regression Analysis for the Relation between Policy Uncertainty and Innovation Growth: Close Presidential Elections**

This table reports the results of regressing  $\Delta\text{INNOVATION}_{j,i,t+1}$  (i.e., the growth in innovation measures of industry  $j$  of country  $i$  in year  $t+1$ , defined as the logarithm of one plus innovation measures in year  $t+1$  minus the logarithm of one plus innovation measures in year  $t$ ) on  $\text{CLOSEELECTION}_{i,t}$  (an indicator variable that equals one if there is at least one close election in country  $i$  in year  $t$  and zero otherwise),  $\text{RIGHT}_{i,t}$  (an indicator variable that equals one if country  $i$ 's government is right-wing in year  $t$  and zero otherwise),  $\text{LEFT}_{i,t}$  (an indicator variable that equals one if country  $i$ 's government is left-wing in year  $t$  and zero otherwise),  $\text{GDP}_{i,t}$  (the growth of GDP of country  $i$  in year  $t$ ), current growth in innovation  $\Delta\text{INNOVATION}_{j,i,t}$ , country-industry fixed effects, and year fixed effects.  $\text{INNOVATION}_{j,i,t}$  includes  $\text{PATENT}_{j,i,t}$ ,  $\text{CITATION}_{j,i,t}$ ,  $\text{CITATION\_TOP\_25\%}_{j,i,t}$ ,  $\text{CITATION\_BOTTOM\_25\%}_{j,i,t}$ ,  $\text{CITATION\_STD\_DEV}_{j,i,t}$ ,  $\text{ORIGINALITY}_{j,i,t}$ ,  $\text{EXPLORATION}_{j,i,t}$ , and  $\text{EXPLOITATION}_{j,i,t}$ . We include all 43 countries in our sample. Numbers reported in parentheses are two-way clustered standard errors by country-industries and by years. The sample year  $t$  is from 1976 to 2010. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

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	INNOVATION	PATENT	CITATION	ORIGINALITY	CITATION_TOP_25_%	CITATION_BOTTOM_25_%	CITATION_STD_DEV	EXPLORATION	EXPLOITATION
$\text{ELECTION}_{i,t}$	-0.058*** (-3.170)	-0.141** (-2.277)	-0.008 (-0.127)	0.003 (0.185)	-0.054 (-1.309)	0.004 (0.121)	-0.057*** (-2.717)	0.059 (0.781)	
$\text{INNOVATION}_{j,i,t}$	-0.412*** (-22.958)	-0.426*** (-29.280)	-0.369*** (-11.268)	-0.478*** (-21.573)	-0.439*** (-25.452)	-0.438*** (-27.569)	-0.420*** (-23.086)	-0.093 (-0.817)	
$\text{GDP}_{i,t}$	0.002 (1.277)	0.000 (0.104)	0.004*** (4.257)	0.000 (0.055)	0.001 (0.684)	0.004 (1.189)	0.001 (0.573)	0.006*** (3.731)	
$\text{LEFT}_{i,t}$	0.005	0.001	0.014**	-0.005	0.008	-0.013	0.002	0.017	

	(0.488)	(0.045)	(1.961)	(-0.642)	(0.866)	(-0.994)	(0.237)	(1.270)
No. of Obs.	25,060	25,060	25,060	25,060	25,060	22,123	25,060	25,060
$R^2$	0.167	0.185	0.136	0.225	0.190	0.197	0.174	0.011
Country-industry FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes