Internet Appendix

For

Religion, Gambling Attitudes and Corporate Innovation

by

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Here, we present detailed variable definitions and additional tests that support the main analysis in the paper.

A.1 Variable definitions

Variables that appear in the regressions are defined in Table A.1.

A.2 Summary statistics of rest of the variables

Panel A of Table A.2 presents summary statistics of location-level variables at the county level. Panel B presents summary statistics of most control variables at the firm-year level.

A.3 Correlations

Table A.1 presents pairwise Pearson correlations between some of our key variables of interest. All non-italicized coefficients are statistically significant at the 1% level. These correlations are consistent with our story and with the more rigorous analysis in the paper. For instance, *LnCPRatio* is positively correlated with $(R\&D/Assets)_{12}$, *LnPatent*, *LnTechAdjCites* and *LnCitePerPat* consistent with our hypothesis that firms in counties with more Catholics relative to Protestants invest more in R&D and produce more and better quality innovation output. Not surprisingly, R&D expenditure is positively correlated with *LnPatent, LnTechAdjCites,* and *LnCitePerPat,* suggesting that a higher level of R&D investment is an essential requirement for innovation. Furthermore, R&D expenditure is positively correlated with both idiosyncratic volatility and idiosyncratic skewness of a stock, consistent with our hypothesis that R&D expenditure contributes positively to a stock's lottery factors.

All of the county-level variables are correlated with each other and with our main explanatory variable of interest, *LnCPRatio.* Interestingly, the correlations suggest that Catholics are more concentrated in more religious counties. Counties with higher concentrations of Catholics relative to Protestants tend to be more populated, more urban, have older populations and experience larger increase in the fraction of foreign-born population. They also have higher (lower) proportions of college graduates, females, and Hispanic populations (households with married couples).

A.4 Citations per patent as innovation outcome

We estimate a set of regressions of citations per patent (*LnCitePerPat*) as an additional measure of the quality of innovation output. Column 3 of Table A.4 shows the model with the full set of (untabulated) firm and county-level controls. The estimated coefficient 0.157 on *LnCPRatio* suggests that going from a county at the 25th percentile to one at the 75th percentile of *LnCPRatio* increases *LnCitePerPat* by 0.139 (=0.157*(1.337-0.449), see Table 1 in the paper), which is an increase of 18% over its unconditional mean of 0.797.

Consistent with our hypothesis that the effect of gambling preferences on innovation should be larger in firms in innovative industries, the coefficient estimate of *LnCPRatio* in column 2 is much larger in innovative industries as it is in non-innovative industries in column 3 in predicting *LnCitePerPat*. These coefficients on *LnCPRatio* in innovative and non-innovative industries are also statistically different from each other ($p < .01$).

A.5 Robustness checks

In this section, we present and discuss several robustness tests of our main results on R&D expenditures, patents and citations. Broadly, we examine whether our results are robust to other plausible specifications. The first six rows in Panel A of Table A.5 summarize these results. The first three columns report the coefficient estimate of LnCPRatio, its standard error, and the number of observations in the regressions of R&D expenditures for our full sample. The next two sets of three columns each present the results of regressions of patent counts and tech-adjusted citations. To save space, we do not tabulate the robustness checks on sub-samples partitioned by industry innovativeness but note that the effects are generally stronger in the innovative industry subsample.

First, we check whether our results are driven by our choice of normalization of the main explanatory variable[1]. In theory, *LnCPRatio* rises without bound but falls towards zero. We follow prior studies and use the relative size of Catholics and Protestants because Catholics tend to tolerate gambling, while Protestants do not. We do so because the numerator and the denominator go in opposite directions, so *CPRatio* serves as a sharper proxy for local gambling preference. However, our conclusions do not change if we use the ratio of Catholics to the sum of Catholics and Protestants, *C/(C+P)*, instead of *LnCPRatio*. Consistent with the results of our baseline specification, *C/(C+P)* positively and significantly predicts R&D expenditures, the number of patents and adjusted citations. In each case, the (untabulated) coefficient estimate is larger for the sub-sample of firms in innovative industries.

We next check whether our main results are sensitive to normalization of our main dependent variables. In our baseline regressions of patents and citations, we follow the prior literature and use the unscaled log of patents or citations as a dependent variable and control for firm size. Our main results continue to hold if we normalize patents and tech-adjusted citation counts by total assets, similar to the way we treat R&D expenditures, as shown in row (2) of Table A.5.

There are many firm-years with zero R&D expenditures, zero patents and zero citations. So, one concern is whether our results are driven by a jump from zero patents (or citations or R&D) to a positive number. We deal with this issue in two ways. First, for each of the three dependent variables, we estimate a Tobit model, which explicitly accounts for a jump in the distribution at zero. In row (3), these results are qualitatively similar to those under the OLS and are statistically significant. Second, we repeat the regression analysis by excluding all firm-years with zero R&D, patents and citations. This approach eliminates the impact of the jump from zero to positive values. In row (4), despite losing about more than two-thirds of our observations, our results remain quantitatively similar and statistically significant.

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[1] We thank an anonymous referee for suggesting this and the subsequent check.

A.6 Evidence from corporate headquarters relocations

We try to mitigate a potential bias coming from unobserved fixed firm-level omitted variables by investigating whether firms that move their corporate headquarters to a higher CPRatio area spend more on R&D following the move[2]. We use the SEC Analytics Suite to identify changes in the state of our sample firms' headquarters reported in their 10K filings for each year from 1994 to 2006. In cases where this database reports a move by a firm in one year followed by a move back the following year, we used Factiva news search and other Internet sources to verify that the firm's headquarters actually moved to a new location. We then average the CPRatios across all the counties in a state to create a state-level CPRatio each year. We do so because from the SEC Analytics Suite we only know if a firm changed the *state* of headquarters. For each of the 194 firms in our sample that moved their headquarters state over this period, we calculate *Δ(LnCPRatioState)* and *Δ(R&D/Assets)*, which measure the change in these variables for the year after the move compared to the year before the move.[3] We exclude the year the firm appears in a new state because the relocation takes place at different times during the year for different firms and to allow time for a change in corporate policies. We then estimate the following regression, which has one observation for each mover firm, and use standard errors corrected for heteroskedasticity:

$$\Delta(R\&D/Assets) = b_o + b_1\,\Delta(LnCPRatioState) + \text{2-digit SIC industry dummies} + \text{year dummies},$$

Despite a small sample size, in untabulated tests, the estimated coefficient of *Δ(LnCPRatioState)* in this regression is significantly positive, with a t-statistic of 1.99. This finding suggests that firms increase their R&D spending in the year following a move to a state with a higher preference for gambling, and support our main findings based on panel regressions.

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[2] While this test does not rule out a situation where an omitted firm characteristic (e.g., innovativeness) shifts, causing the firm to relocate to a more economically viable county, and this viability is correlated with CPRatio, our reading of a number of news articles related to the moves does not suggest that the moves were specifically related to innovation.

[3] *CPRatioState*, increases (decreases) in 106 (88) cases.

A.7 Innovative efficiency and quality variance

If R&D expenditures made by firms in counties with higher CPRatios are partly facilitated by a gambling motive, what can we say about innovative efficiency, i.e., the relation between innovation input, i.e., R&D expenditures, and innovation output, i.e., patents and citations generated by these firms? If gambling preferences instill a corporate culture of tolerating failures in hopes of large gains from potential break-through innovations, this culture would lead to more exploration and experimentation and even some risky long-shots. Since a few of these 'gambles' would turn out to be viable patents, but most would not, we should find that firms in high CPRatio areas have a lower marginal productivity of R&D expenditures in generating patents and citations, even if the total number of patents and citations obtained by these firms are higher because of higher R&D spending. More experimentation also implies greater variation in the quality of these firms' innovation output. We measure variation in the quality of a firm's innovation output by the variance of citations to its patents following González-Uribe and Xu (2014).

We develop a regression model to estimate the productivity of R&D expenditure in generating innovation outputs. To this end, we modify the regressions of innovation outputs shown in Table 2, Panel A by recognizing two important issues. First, to estimate innovation output (i.e., patents and citations) per dollar of innovation input (i.e., R&D dollars), we need the unscaled R&D expenditure as an explanatory variable, and the raw number of successful patent applications and technology-adjusted citations as dependent variables. Second, the relation between R&D dollars and patents or citation counts varies significantly across industries. For example, it might take several hundred million dollars in R&D expenditures to develop one viable patent in a drug company, while a toy company might generate a patent with a few million dollars in R&D. Consequently, our empirical model here has the raw value of each innovation output variable as the dependent variable, and the dollar value of R&D and its interaction with *LnCPRatio* and with each of the 2-digit SIC industry code dummy variables as explanatory variables. As before, the regressions use the average of the first and second lags of R&D (i.e., $R\&D_{12}$). The interaction of R&D expenditure with *LnCPRatio* estimates the effect of gambling attitudes on innovation efficiency, whereas the interactions of R&D with each industry dummy control for an industry effect on the relation between R&D spending and the number of patents or citations.

The first two columns of Table A.6 show the results of regressions of patent applications and technology-adjusted citations, respectively. The control variables are the same as in column 3 of Table 3, Panel A. For brevity, we only tabulate the coefficient estimates on $R\&D_{12}$, *LnCPRatio* and their interaction. Consistent with our hypothesis, we obtain a negative and statistically significant coefficient on the interaction of $R\&D_{12}$ and *LnCPRatio* in explaining both of the innovation outputs. These results imply that an extra dollar spent on R&D by firms in high CPRatio counties produces fewer patents and adjusted citations after controlling for firm-specific and county-level variables and the cross sectional variation in patent productivity across industries. As expected, the coefficient estimates on the main effects of *LnCPRatio* and $R\&D_{12}$ remain positive and statistically significant.

Moreover, column 3 of Table A.6 shows that patents obtained by firms in higher CPRatio areas tend to have greater variation in quality, in terms of citations obtained by these patents throughout their lives. This finding is consistent with the view that gambling preference leads to more exploratory research, which induces greater variation in patent quality, with some patents becoming highly successful by obtaining most of the citations (González-Uribe and Xu (2014)).

References:

González-Uribe, Juanita and Moqi Xu, 2014, CEO contract horizon and innovation, Working paper, London School of Economics.

Table A.1: Variable definitions

Variable Name	Description
Patent Applications	The number of (eventually granted) patents applied for during a year. Replaced by zero if missing.
LnPatent	Natural logarithm of one plus Patent Applications.
Citations Per Patent	The total number of citations received during the sample period on all patents filed (and eventually received) by a firm in a given year, scaled by the number of the patents filed (and eventually received) by the firm during the year. The number of citations is adjusted by the weighting index of Hall, Jaffe and Trajtenberg (2001, 2005). Replaced by zero if citation counts are missing.
LnCitePerPat	Natural logarithm of one plus Citations Per Patent
Tech-Adjusted Citations	Total number of technology class-adjusted citations received during the sample period on all patents filed (and eventually received) by a firm during the year. Each patent's adjusted citation count is divided by the average adjusted citation count for all patents filed (and eventually granted) in the same technology class during the year by all the sample firms. A patent's adjusted citation count is its number of citations, adjusted by the weighting index of Hall, Jaffe and Trajtenberg (2001, 2005). Replaced by zero if citation counts are missing.
LnTechAdjCites	Natural logarithm of one plus Tech-Adjusted Citations.
LnCPRatio	Natural logarithm of one plus the ratio of the number of Catholic adherents to the number of Protestant adherents in a county in a given year.
$R\&D_{12}$	The average of the first and the second lags of R&D expenditures (Compustat data item: XRD). Replaced by zero if missing.
R&D/Assets	R&D expenditure (Compustat data item: XRD) divided by total assets (Compustat data item: AT). Replaced by zero if missing.
$(R\&D/Assets)_{12}$	The average of the first and the second lags of R&D/Assets
CitesVariance	Variance of lifetime citations obtained by all patents applied for and granted in a given year.
LnSales	Natural logarithm of sales (Compustat: SALE).
LnFirmAge	Natural logarithm of firm age, approximated by current fiscal year minus the year the firm first appears in Compustat.
Idio. Volatility	Idiosyncratic volatility, computed as the standard deviation of the residuals obtained by regressing daily returns on a stock on Fama and French (1993) and Carhart's (1997) four factors over a year.
Idio. Skewness	Idiosyncratic skewness, computed as the skewness of residuals obtained by regressing daily returns on a stock on excess market return and excess market return squared over a year.
Lottery Stock	An indicator variable that equals one if a stock's returns exhibit above-median idiosyncratic volatility and above-median idiosyncratic skewness in a given year, and zero otherwise.
ROA	Operating income before depreciation divided by total assets (Compustat: OIBDP/AT).
Ln(PPE/Emp)	Natural logarithm of net property, plant and equipment divided by the number of employees (Compustat: PPENT/EMP).
Book Leverage	Long-term plus short-term debt divided by total assets [Compustat: (DLC + DLTT)/AT].
Capex	Capital expenditure divided by total assets (Compustat: CAPX/AT)
Tobin's Q	Ratio of market value of assets to book value of assets = Market value of equity plus book value of assets minus book value of equity minus accumulated deferred taxes, all divided by the book value of assets [Compustat: (AT - CEQ +

	CSHO*PRCC_F - TXDITC)/AT].
KZ Index	Kaplan and Zingales index for a given year calculated as -1.001909 *KZ_CashFlowToCapital + 0.2826389*KZ_Q + 3.139193*KZ_Leverage - 39.3678*KZ_Div - 1.314759*KZ_CashToCapital where, KZ_CashFlowToCapital = (IB + DP))/lag(PPENT) from Compustat; KZ_Q = (AT + PRCC_F*CSHO - CEQ - TXDB)/AT from Compustat; KZ_Leverage = (DLTT+ DLC)/(DLTT + DLC+ SEQ) from Compustat; KZ_Div = (DVC + DVP)/ lag(PPENT) from Compustat; KZ_CashToCapital = CHE/ lag(PPENT) from Compustat.
HHI	Herfindahl-Hirschman index based on sales for a given SIC industry code measured at the end of a fiscal year.
Inst. Own	Percentage of a firm's stock held by institutional investors at the end of a fiscal year, reported in SEC Form 13F.
LnAnalysts	Natural logarithm of one plus the number of analysts following a firm in a given year.
Discr. Current Accr.>0	An indicator variable that equals one if a firm has positive discretionary current accruals, computed using the Modified Jones Model in a given year, and zero otherwise.
LnPopulation	Natural logarithm of a county's population in a given year.
Pop. Growth	First difference of LnPopulation
Younger	An indicator variable that equals one if the median age of the people in a firm-county is less than the median age for all the firm-counties in a given year, and equals zero otherwise.
Rural Urban Continuum	A classification scheme that distinguishes metropolitan (i.e., metro) counties by the population size of their metro area, and nonmetropolitan counties by the degree of urbanization and adjacency to a metro area(s). Scaled from 1 to 9, where a higher number means more rural (1 to 3: metro areas; 4 to 9: non-metro areas).
College Grads	Percentage of 25 years or older residents in a county who have at least a Bachelor's degree.
Hispanics	Fraction of Hispanic population to total population of a county in a given year
Foreign Born Growth	Difference in the fraction of foreign-born population in a state over ten years.
Savings rate	(Per capita income - per capita personal consumption expenditure)/per capita income, in a state in the year 1997: From Bureau of Economic Analysis
Married Household	Percentage of population living in households of married couples in a county.
Male to Female Ratio	Ratio of male population to female population in a county.
LnAdherentsPer1000	Natural logarithm of the number of religious adherents in a county per 1000 residents.
Dem/Rep	Ratio of popular votes to Democratic presidential candidate to Republican presidential candidate in a county
Excess Cash	Residual from a regression of a firm's cash to assets ratio on control variables as in Opler et. al. (1999) and Bates, Kahle and Stulz (2009).
LnMarketCap	Natural logarithm of the market capitalization of a firm calculated at the end of the fiscal year calculated as price per share multiplied by the number of common shares outstanding (Compustat: PRCC_F*CSHO).
Amihud Illiquidity	Absolute daily returns per unit of trading volume, averaged over the number of trading days in a year.
Dividend Payer	An indicator variable that equals one if the firm pays a cash dividend in a given year, and equals zero otherwise.
Turnover	Average monthly shares traded divided by the number of shares outstanding during

	a year.
Stock Return	Holding period stock return for a year.
Price Per Share	Price per share at the end of a fiscal year.
Market Beta	Loadings on market risk premium estimated by a factor model using the prior sixty monthly returns.
SMB Beta	Loadings on the SMB factor estimated by a four factor model using the prior sixty monthly returns.
HML Beta	Loadings on the HML factor estimated by a four factor model using the prior sixty monthly returns.
SmallFirm	An indicator variable that equals one if a firm in a given year has a smaller market capitalization than the median of all firms, and zero otherwise.
Low BE/PI	An indicator variable that equals one if BE/PI associated with a firm-year is below its median, and equals zero otherwise. BE/PI is calculated as the ratio of the aggregate book value of equity of all publicly-traded firms headquartered in a county divided by the aggregate personal income (= per capita income * number of residents) of the county. A county's per capita income is approximated by its state's per capita income.
High Indiv Invest	An indicator variable that equals one if a firm has above-median fraction of individual investors (i.e. below-median fraction of institutional investors) in a given year, and zero otherwise.
CEO (Mgmt. Team) Vega	Dollar change in CEO's (average of top managers') option holdings for a 1% change in stock return volatility, in millions.
CEO (Mgmt. Team) Option Delta	Dollar change in CEO's (average of top managers') option holdings for a 1% change in stock price, in millions.
Holder67	Option-based measure of overconfidence based on HLT (2012). An indicator variable that equals one for all the years after a CEO holds stock options that are at least 67% in the money.
Innovative Ind	An indicator variable that equals one for 4-digit SIC industries whose citations per patent exceed the median for all industries in a given year; it equals zero for other industries.
PeerPE	Natural logarithm of total market value of equity divided by total earnings of all other firms in a firm's industry, as defined by the two-digit SIC code.
Business Segments	Number of business segments from Compustat Segment file.

Table A.2: Summary statistics

The table reports the summary statistics of our key variables of interest. Panel A shows county-related variables at the county-level for the latest year that a county appears in our sample. Panel B shows variables at the firm-year level. The sample consists of U.S. public companies on CRSP and Compustat, excluding financial firms (2-digit SIC codes 60 to 69) and utilities (2-digit SIC code 49), from 1980 to 2006. All the variables used in the regression analyses are defined in the Appendix.

Panel A: County-level summary statistics

	Mean	Std. Dev.	25th percentile	Median	75th Percentile	N
All Adherents per 1000	505.8	132.3	412	496	585	566
Catholics per 1000	182.7	130.7	77	161	256	566
Protestants per 1000	288.3	159.8	162	260	397	566
CPRatio	1.116	1.372	0.242	0.615	1.341	566
LnCPRatio	0.608	0.495	0.217	0.480	0.850	566
College Grads (%)	24.8	10.194	17.0	23.7	31.2	566
Deflated Income ($ ‘000)	46.1	7.1	42.2	45.2	51.1	566
Male to Female Ratio	0.962	0.043	0.937	0.958	0.980	566
Married Household Fraction	0.528	0.077	0.481	0.532	0.580	566
Hispanics	0.082	0.106	0.017	0.042	0.099	566
Age Group	7.9	0.511	7.6	7.9	8.2	566
Rural Urban Continuum	2.603	1.855	1.000	2.000	3.000	566
Total Population (‘000)	324.12	387.6	733	164.4	411.5	566
Savings Rate	0.090	0.049	0.067	0.095	0.117	566
Dem/Rep	1.113	0.856	0.631	0.937	1.273	566
Foreign Born Growth	3.015	4.447	0.456	1.706	4.906	566

Panel B: Firm-year-level summary statistics

Variable	Mean	Std. Dev.	25th percentile	Median	75th Percentile	N
Total Assets ($ millions)	2316.441	1.2e+04	49.688	203.410	983.091	32424
Sales ($millions)	1963.456	8425.579	48.207	215.134	972.852	32424
Sales Growth	0.084	0.325	-0.023	0.076	0.187	32424
ROA	0.089	0.191	0.059	0.122	0.180	32424
Firm Age	19.421	12.636	9.000	16.000	29.000	32424
PPE/Emp	136.804	456.771	14.941	29.602	71.947	32424
Book Leverage	0.241	0.201	0.074	0.216	0.354	32424
Capex	0.067	0.065	0.024	0.048	0.086	32424
KZ Index	-4.093	13.730	-3.723	-0.589	0.987	32424
HHI	0.399	0.248	0.208	0.340	0.533	32424
Inst. Own	0.368	0.267	0.123	0.346	0.581	32424
Number of Analysts	7.352	9.850	0.000	3.000	11.000	32424
Discr. Current Accr.>0	0.474	0.499	0.000	0.000	1.000	32424
Tobin's Q	1.816	1.528	1.009	1.323	1.962	32424
Stock Return	0.197	0.716	-0.188	0.083	0.389	32424
Market Cap ($millions)	2156.299	1.1e+04	36.208	161.630	818.481	32172
Amihud Illiquidity	2.579	9.417	0.008	0.100	1.049	32172
Dividend Payer	0.414	0.493	0.000	0.000	1.000	32172
Turnover	1.137	1.327	0.344	0.688	1.380	32172

Stock Return	0.200	0.743	-0.200	0.078	0.395	32172
Price Per Share	19.592	18.889	5.205	13.725	28.000	32172
Market Beta	1.006	0.766	0.599	0.980	1.378	32172
SMB Beta	0.902	1.168	0.200	0.754	1.439	32172
HML Beta	0.071	1.282	-0.522	0.146	0.751	32172
Acquisitions	0.020	0.057	0.000	0.000	0.005	36253
Industry Sigma	0.081	0.051	0.044	0.069	0.101	36253
CEO Vega	0.139	0.243	0.017	0.052	0.146	7806
CEO Option Delta	0.284	0.514	0.032	0.105	0.287	7806
Mgmt. Team Vega	0.060	0.096	0.010	0.025	0.063	7806
Mgmt. Team Option Delta	0.121	0.199	0.019	0.050	0.129	7806
Holder67	0.494	0.500	0.000	0.000	1.000	7806

Table A.3: Correlation Matrix

The table reports the Pearson correlation coefficients among select variables of interest. The sample consists of U.S. public companies on CRSP and Compustat, excluding financial firms (2-digit SIC codes 60 to 69) and utilities (2-digit SIC code 49), from 1980 to 2006. All the variables used in the regression analyses are defined in the Appendix, Table A.1. All continuous variables are winsorized at the 1% level in both tails. All non-italicized correlations are statistically significant at the 1% level.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LnCPRatio	(1)	1							
$(R\&D/Assets)_{12}$	(2)	0.18	1						
LnPatent	(3)	0.09	0.12	1					
LnCitePerPat	(4)	0.09	0.17	0.62	1				
LnTechAdjCites	(5)	0.07	0.08	0.89	0.63	1			
Lottery Stock	(6)	0.05	0.21	-0.18	-0.11	-0.16	1		
Idio. Volatility	(7)	0.06	0.27	-0.25	-0.15	-0.21	0.58	1	
Idio. Skewness	(8)	0.02	0.06	-0.12	-0.08	-0.10	0.44	0.25	1
LnSales	(9)	-0.05	-0.34	0.45	0.25	0.40	-0.40	-0.53	-0.22
Sales Growth	(10)	*-0.01*	-0.02	*0.00*	*0.00*	-0.01	-0.06	-0.07	-0.08
ROA	(11)	-0.11	-0.60	0.10	0.04	0.12	-0.32	-0.43	-0.17
Stock Return	(12)	*0.01*	*0.01*	*0.00*	*0.00*	0.00	0.15	*0.01*	0.23
Firm Age	(13)	*0.00*	-0.23	0.32	0.19	0.29	-0.28	-0.40	-0.08
Ln(PPE/Emp)	(14)	-0.14	-0.11	0.08	*-0.01*	0.05	-0.09	-0.12	-0.05
Book Leverage	(15)	-0.10	-0.19	-0.06	-0.08	-0.05	0.06	0.08	0.04
Capex	(16)	-0.18	-0.12	-0.03	-0.04	0.02	-0.05	-0.08	-0.04
KZ Index	(17)	-0.12	-0.14	*0.00*	*0.00*	0.02	*0.00*	*0.00*	0.02
HHI	(18)	*-0.01*	-0.14	0.05	0.06	0.06	-0.04	-0.06	*0.01*
Inst. Own	(19)	*0.00*	-0.06	0.31	0.19	0.22	-0.35	-0.42	-0.25
LnAnalysts	(20)	-0.03	-0.02	0.42	0.28	0.37	-0.31	-0.39	-0.23
Tobin's Q	(21)	0.14	0.44	0.09	0.09	0.06	0.06	0.10	-0.06
Discr. Current Accr.>0	(22)	*0.00*	-0.03	-0.02	-0.04	-0.04	-0.02	-0.02	-0.02
LnPopulation	(23)	0.45	0.07	*0.01*	*0.00*	*0.00*	0.04	0.04	*0.01*
Pop. Growth	(24)	-0.07	*-0.01*	-0.02	*-0.01*	*-0.01*	0.02	0.02	*0.01*
Savings Rate	(25)	0.20	-0.05	-0.02	-0.06	*-0.01*	*0.00*	*-0.01*	0.03
Younger	(26)	-0.34	-0.03	-0.04	-0.03	-0.03	0.03	0.04	-0.01
Rural Urban Continuum	(27)	-0.28	-0.05	-0.03	-0.04	-0.05	0.00	*-0.01*	*0.00*
College Grads	(28)	0.22	0.26	0.08	0.03	*0.01*	0.09	0.13	-0.02
Hispanics	(29)	0.26	0.05	-0.06	-0.09	-0.08	0.09	0.11	*0.01*
Foreign Born Growth	(30)	0.30	0.19	-0.02	-0.09	-0.10	0.10	0.11	*0.01*
Married Household	(31)	-0.09	*-0.01*	0.04	0.08	0.08	*-0.01*	-0.03	0.03
Male to Female Ratio	(32)	-0.16	0.14	-0.03	-0.01	-0.04	0.11	0.14	*0.00*
LnAdherentsPer1000	(33)	0.30	-0.08	0.04	0.02	0.05	-0.06	-0.07	*-0.01*

Table A.4: Citations per patent and gambling preference

The table reports estimates of regressions of citation per patent (*LnCitePerPat*) on the local gambling preference proxy, *LnCPRatio*. All the variables are defined in the Appendix (Table A.1). All firm-level independent variables are lagged by one year except for *R&D/Assets,* which is lagged by the average of the first and second lags. County-level control variables are contemporaneous. Standard errors in parentheses are double-clustered at *county*×*year* and firm levels. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: Citations per patent full sample

Dependent variable	(1) LnCitePerPat	(2) Innovative Ind.	(3) Non-Innovative Ind.
LnCPRatio	0.157***	0.248***	0.053*
	(0.031)	(0.050)	(0.028)
$(R\&D/Assets)_{12}$	2.072***	2.254***	1.456***
	(0.155)	(0.227)	(0.151)
Firm and County Controls	Yes	Yes	Yes
Year/Industry FE	Yes	Yes	Yes
Observations	31164	12010	19154
Adjusted R^2	0.329	0.316	0.315

Table A.5 Robustness checks

The table reports the results of several tests of robustness performed on the regressions of *R&D/Assets, LnPatent*, and *LnTechAdjCites*. All regressions include year and industry dummies, where industry is defined based on 2-digit SIC codes. All continuous variables are winsorized at 1% in both tails. Standard errors in parentheses are double-clustered at *county*×*year* and firm levels. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	R&D/Assets			LnPatent			LnTechAdjCites		
	Coeff.	S.E.	N	Coeff.	S.E.	N	Coeff.	S.E.	N
1) C/(C+P) instead of LnCPRatio	0.010**	0.004	32424	0.374***	0.086	31164	0.403***	0.078	31164
2) Patents/Assets and Citations/Assets as dep. vars.				0.002***	0.001	31164	0.067***	0.012	31164
3) Tobit instead of OLS	0.015***	0.004	32424	0.242***	0.075	31164	0.343***	0.087	31164
4) Sample with non-zero R&D, patents, and citations	0.007**	2.22	17047	0.172***	3.16	10781	0.207***	3.23	8435

Table A.6 Innovative efficiency and quality variance

Columns 1 and 2 of the table report the results of regressions of *Patent Applications* and *Tech-Adjusted Citations* on *LnCPRatio*, $R\&D_{12}$ and *LnCPRatio** $R\&D_{12}$ and other control variables. Column 3 reports the results of the regression of variance in citations of granted patents (*CitesVariance*). Control variables are the same as in column 1 of Table 3, but are not reported for brevity. All independent variables at the firm-level are lagged by one year except for *R&D* which is lagged by the average of the first and second lags. County-level control variables are contemporaneous. All regressions include year and industry dummies, where industry is defined based on 2-digit SIC codes. Regressions in columns 1 and 2 include the interactions of $R\&D_{12}$ with each industry dummy. All continuous variables are winsorized at 1% in both tails. Intercepts are not reported. Standard errors in parentheses are double-clustered at *county*× *year* and firm levels. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	(1) Patent Applications	(2) Tech-Adjusted Citations	(3) CitesVariance
LnCPRatio	2.546***	2.334**	99.49***
	(2.68)	(2.46)	(8.49)
LnCPRatio*$R\&D_{12}$	-0.031**	-0.026**	
	(-2.53)	(-2.18)	
$R\&D_{12}$	1.860***	1.527**	
	(2.84)	(2.40)	
LnPatent			42.12***
			(8.495)
Other Firm/County Controls	Yes	Yes	Yes
($R\&D_{12}$*Industry dummies)	Yes	Yes	No
Year/Industry FE	Yes	Yes	Yes
Observations	31172	31172	8651
Adjusted R^2	0.559	0.447	0.119