The CO2 Question: Technical Progress and the Climate Crisis

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Two views on the role of green innovation on emissions

Green innovation

<u>Allows for emission reductions</u>

- Brown firms change from carbon-intensive production to renewable production
- Brown firms improve efficiency of their fossil fuel use
- e.g. Aghion et al. (2016)

<u>Does not allow for emission reductions</u>

- Jevons (1865) paradox: Efficiency increases, but higher consumption dominates any efficiency gain
- Arrow: Replacement effect (1962) & Economics of learning-by-doing (1971) drive path dependency
- Displacement effect: Emissions spill over to other parts of the production network

This paper: Global perspective on the role of green innovation in decarbonization

1. What is the impact of green innovation on future corporate emissions?

   $\Rightarrow$ More green innovation does not allow for emission reductions

2. What are possible underlying economic mechanisms?

   $\Rightarrow$ Path dependency in the production of innovation

   $\Rightarrow$ The role of the Jevons paradox

   $\Rightarrow$ Emission displacements

Outline

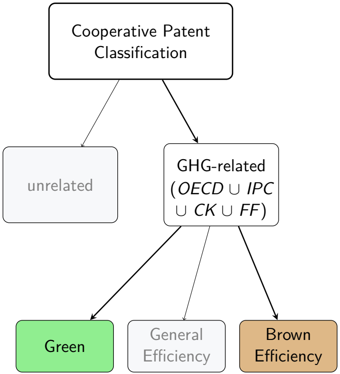
- Data and setting
- What is the impact of green innovation on future corporate emissions?
- What are possible underlying economic mechanisms?

Data: Firm-level data on carbon emissions and patenting

1. Carbon emission data from S&P Global Trucost
   - Public firm scope 1, scope 2 and scope 3 CO_2 equivalent emission data
   - Coverage: 2005 to 2020
2. Patent data from Orbis Intellectual Property
   - Global patent data for public and private firms
   - Main results with patents granted by the European Patent Office (EPO) including patent purchases
3. Financial information from Orbis, FactSet and Worldscope

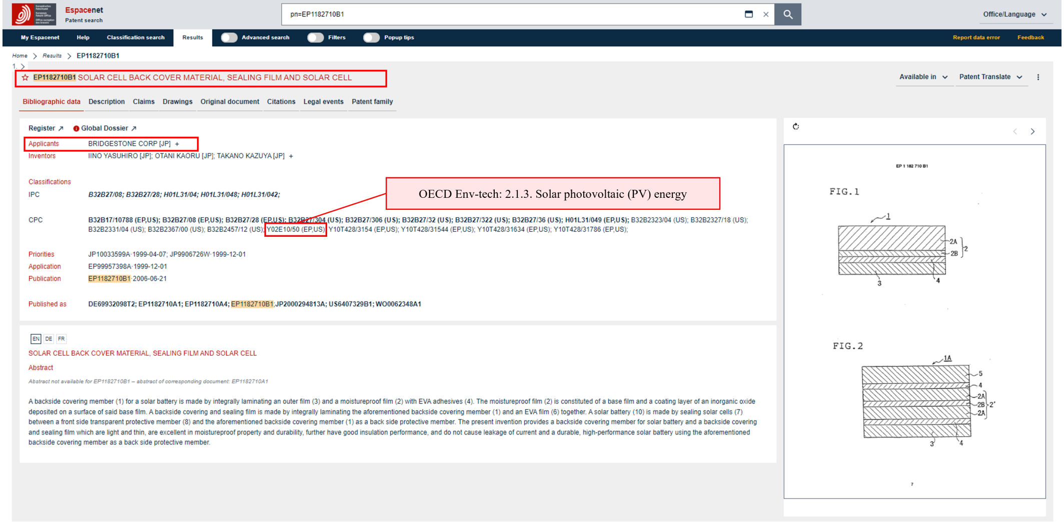
What qualifies as green innovation?

- Pool greenhouse gas related classifications from 4 sources:
  OECD Env-tech; IPC Green Inventory; Fossil fuels (FF) efficiency improving classes by Lanzi et al. (2011); & a self classification based on Corporate Knights Clean 200 companies (CK)
- Split greenhouse gas related classifications in 2 types:
  1. **Green**: Technologies that substitute carbon dioxide emitting technologies for carbon dioxide-free technologies
  2. **Brown efficiency (brown)**: Technologies that improve process efficiencies of fossil fuel sources and thus reduce carbon dioxide emissions per output



Sources Word clouds

Green patent example



Brown efficiency patent example

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EP2521618B1 METHOD OF COATING A MONOLITH SUBSTRATE WITH CATALYST COMPONENT

Available in

Bibliographic data | Description | Claims | Drawings | Original document | Citations | Legal events | Patent family

Register ↗ Global Dossier ↗

Applicants: JOHNSON MATTHEY PLC [GB] +

Inventors: CHANDLER GUY RICHARD [GB]; FLANAGAN KEITH ANTHONY [GB]; PHILLIPS PAUL RICHARD [GB]; SCHOFIELD PAUL [GB]; SPENCER MICHAEL LEONARD WILLIAM [GB]; STRUTT HEDLEY MICHAEL [GB]; ADERHOLD DIRK [GB] +

OECD Env-tech: 1.1.2. Emissions abatement from mobile sources (e.g. NOx, CO, HC, PM emissions from motor vehicles)

Classifications

IPC: *A44B13/00; B01J37/02; B01J37/04; B05D7/22; B28B11/04; F01N3/20;*

CPC: **A44B13/0011 (EP,KR,US); B01D53/00 (GB); B01D53/94 (GB); B01D53/9418 (US); B01J15/005 (KR,US); B01J21/08 (US); B01J27/224 (US); B01J29/763 (US); B01J3/03 (KR); B01J35/04 (US); B01J37/02 (KR); B01J37/0215 (GB); B01J37/0246 (US); B05C9/02 (GB,KR); B05C9/04 (KR); B05C9/045 (KR); B05D1/00 (GB); B05D1/002 (GB); B05D5/00 (GB); B05D7/22 (GB,KR); B05D7/24 (GB); F01N3/035 (GB); F01N3/08 (KR); F01N3/105 (GB); F01N3/20 (GB,KR); F01N3/2066 (GB);** B01D2255/91 (US); B01D2255/9155 (US); B05C9/02 (US); B05C9/04 (US); B05C9/045 (US);

Priorities: GB201000019A·2010-01-04; GB2011050005W·2011-01-04

Application: EP11702492A·2011-01-04

Publication: EP2521618B1·2013-08-28

Published as: **AR081146A1; AU2011203392A1; BR112012016574A2; CN102781586A; CN102781586B; DE102011002449A1; DK2521618T3; EP2521618A1; EP2521618B1;EP2521618B8; EP2659976A1; EP2659976B1; EP2659976B8; EP2889083A1; GB2477602A; GB2477602A8; GB2477602B; GB2477602B8; GB2487847A; GB2487847A8; GB2487847B; GB2487847B8; HK1178482A1; JP2013516307A; JP2015062896A; JP5646649B2; JP5883909B2; KR101789665B1; KR20120105554A; MX2012007828A; MY159963A; PL2521618T3; RU2012133433A; RU2014151995A; RU2014151995A3; RU2541575C2; SG182338A1; US2011268624A1; US2014186232A1; US2016325272A1; US8703236B2; US9415365B2; WO2011080525A1; ZA201204800B**

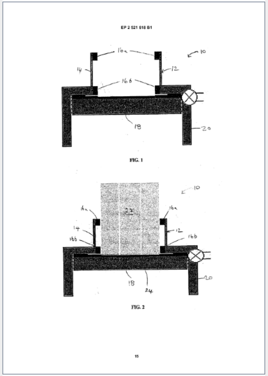
EN FR DE

METHOD OF COATING A MONOLITH SUBSTRATE WITH CATALYST COMPONENT

Abstract

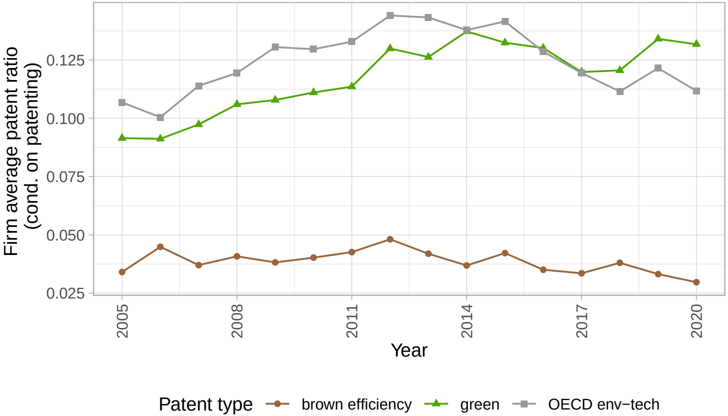
Abstract not available for EP2521618B1 – abstract of corresponding document: WO2011080525A1

A method of coating a honeycomb monolith substrate comprising a plurality of channels with a liquid comprising a catalyst component comprises the steps of: (i) holding a honeycomb monolith substrate substantially vertically; (ii) introducing a pre-determined volume of the liquid into the substrate via open ends of the channels at a lower end of the substrate; (iii) sealingly retaining the introduced liquid within the substrate; (iv) inverting the substrate containing the retained liquid; and (v) applying a vacuum to open ends of the channels of the substrate at the inverted, lower end of the substrate to draw the liquid along the channels of the substrate.



Patent ratio, as innovation measure, to focus on relative attention

$$\text{Green patent ratio}_{f,t} = \frac{\text{Green patent count}_{f,t}}{\text{Any patent count}_{f,t}}; \qquad \text{Brown patent ratio}_{f,t} = \frac{\text{Brown patent count}_{f,t}}{\text{Any patent count}_{f,t}}$$



Outline

Data and setting

What is the impact of green innovation on future corporate emissions?

What are possible underlying economic mechanisms?

Does green/ brown innovation allow for emission reductions?

$$y_{f,t} = \beta_0 + \beta_1 \text{Green/Brown Patent Ratio}_{f,t-5} + \Omega Controls_{f,t-5} + \Gamma_c + \Gamma_f + \Gamma_t + \varepsilon_{f,t}$$

	(1) LOGS1TOT	(2) LOGS2TOT	(3) LOGS3UPTOT
Panel A: Green innovation			
5-YEAR LAG GREENRATIOEP	0.015	−0.036	0.009
	(0.028)	(0.026)	(0.017)
Observations	15482	15482	15482
R2	0.973	0.965	0.985
Panel B: Brown innovation			
5-YEAR LAG BROWNEFFRATIOEP	0.065*	0.010	0.022
	(0.036)	(0.034)	(0.020)
Observations	15482	15482	15482
R2	0.973	0.965	0.985
Controls	yes	yes	yes
Country F.E.	yes	yes	yes
Year F.E.	yes	yes	yes
Firm F.E.	yes	yes	yes

Controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI. Standard errors are double clustered at firm and year dimension.

How large is the explanatory power of green/brown innovation?

$$y_{f,t} = \beta_0 + \beta_1 \text{Green/Brown Patent Ratio}_{f,t-5} + \Omega Controls_{f,t-5} + \Gamma_c + \Gamma_t + \varepsilon_{f,t}$$

	(1) LOGS1TOT	(2) LOGS2TOT	(3) LOGS3UPTOT
Panel A: Green innovation			
5-YEAR LAG GREENRATIOEP	0.695***	−0.253***	0.017
	(0.060)	(0.048)	(0.040)
Partial R2	0.00954	0.00251	0.0000144
R2 Full Model	0.635	0.701	0.730
R2 Reduced Model	0.631	0.700	0.730
Observations	16892	16892	16892
Panel B: Brown innovation			
5-YEAR LAG BROWNEFFRATIOEP	0.584***	−0.576***	0.589***
	(0.102)	(0.084)	(0.064)
Partial R2	0.00245	0.00474	0.00599
R2 Full Model	0.632	0.701	0.732
R2 Reduced Model	0.631	0.700	0.730
Observations	16892	16892	16892
Controls	yes	yes	yes
Country F.E.	yes	yes	yes
Year F.E.	yes	yes	yes

Controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI.
Standard errors are double clustered at firm and year dimension.

Outline

Data and setting

What is the impact of green innovation on future corporate emissions?

What are possible underlying economic mechanisms?

[1] Path dependency in the production of innovation

Consistent with the Arrow replacement effect (Arrow 1962) & learning-by-doing (Arrow 1971)

$$\text{Patent ratio}_{f,t} = \beta_0 + \beta_1 \text{LOGS1TOT}_{f,t-1} + \beta_2 \text{AGE}_{f,t-1} + \beta_3 STOCK_{f,t-1} + \Omega Controls_{f,t-1} + \Gamma_c + \Gamma_{i*t} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
		GREENRATIOEP			*BROWNEFFRATIOEP*	
1-YEAR LAG LOGS1TOT	0.091***	−0.053***	0.013			
	(0.008)	(0.011)	(0.015)			
1-YEAR LAG AGE (/100)	−0.303***	−0.186***				
	(0.033)	(0.030)				
1-YEAR LAG PATSTOCKGREENEP (/100)	0.052***	0.035***	−0.002			
	(0.004)	(0.004)	(0.003)			
1-YEAR LAG PATSTOCKBROWNEFFEP (/100)						
Country F.E.	yes	yes	yes			
Year F.E.	yes	yes	yes			
Industry X Year F.E.	no	yes	no			
Firm F.E.	no	no	yes			
Observations	27860	24818	20173			
Pseudo R2	0.0775	0.317	0.516			

Estimated with Poisson pseudo-maximum likelihood. Other controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI. Standard errors are double clustered at firm and year dimension.

[1] Path dependency in the production of innovation

Consistent with the Arrow replacement effect (Arrow 1962) & learning-by-doing (Arrow 1971)

$$\text{Patent ratio}_{f,t} = \beta_0 + \beta_1 \text{LOGS1TOT}_{f,t-1} + \beta_2 \text{AGE}_{f,t-1} + \beta_3 STOCK_{f,t-1} + \Omega Controls_{f,t-1} + \Gamma_c + \Gamma_{i*t} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
		GREENRATIOEP			*BROWNEFFRATIOEP*	
1-YEAR LAG LOGS1TOT	0.091***	−0.053***	0.013	0.058***	0.049**	−0.064**
	(0.008)	(0.011)	(0.015)	(0.014)	(0.020)	(0.032)
1-YEAR LAG AGE (/100)	−0.303***	−0.186***		0.235***	0.213***	
	(0.033)	(0.030)		(0.045)	(0.050)	
1-YEAR LAG PATSTOCKGREENEP (/100)	0.052***	0.035***	−0.002			
	(0.004)	(0.004)	(0.003)			
1-YEAR LAG PATSTOCKBROWNEFFEP (/100)				0.099***	0.047***	−0.001
				(0.009)	(0.008)	(0.008)
Country F.E.	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes
Industry X Year F.E.	no	yes	no	no	yes	no
Firm F.E.	no	no	yes	no	no	yes
Observations	27860	24818	20173	27767	20143	12186
Pseudo R2	0.0775	0.317	0.516	0.0989	0.439	0.527

Estimated with Poisson pseudo-maximum likelihood. Other controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI. Standard errors are double clustered at firm and year dimension.

[1] Broader path dependency because of a supply chain lock in

$$\text{Patent ratio}_{f,t} = \beta_0 + \beta_1 \text{LOG(Emissions)}_{f,t-1} + \beta_2 \text{AGE}_{f,t-1} + \beta_3 STOCK_{f,t-1} + \Omega Controls_{f,t-1} + \Gamma_c + \Gamma_{i*t} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
		GREENRATIOEP			*BROWNEFFRATIOEP*	
1-YEAR LAG LOGS2TOT	−0.056***			−0.031		
	(0.012)			(0.023)		
1-YEAR LAG LOGS3UPTOT		−0.128***			0.149***	
		(0.018)			(0.031)	
1-YEAR LAG LOGS3DOWNTOT			−0.025**			0.005
			(0.010)			(0.023)
1-YEAR LAG AGE (/100)	−0.189***	−0.176***	−0.186***	0.217***	0.204***	0.301***
	(0.031)	(0.031)	(0.059)	(0.050)	(0.050)	(0.098)
1-YEAR LAG PATSTOCKGREENEP (/100)	0.036***	0.035***	0.031***			
	(0.004)	(0.004)	(0.006)			
1-YEAR LAG PATSTOCKBROWNEFFEP (/100)				0.048***	0.047***	0.058***
				(0.008)	(0.008)	(0.015)
Controls	yes	yes	yes	yes	yes	yes
Country F.E.	yes	yes	yes	yes	yes	yes
Industry-Year F.E.	yes	yes	yes	yes	yes	yes
Observations	24818	24818	7681	20143	20143	6426
Pseudo R2	0.317	0.319	0.269	0.439	0.440	0.420

Estimated with Poisson pseudo-maximum likelihood. Other controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI. Standard errors are double clustered at firm and year dimension.

[2] Increase in sales and improvements in emission intensity in line with the Jevons Paradox

$$y_{f,t} = \beta_0 + \beta_1 \text{Brown Patent Ratio}_{f,t-5} + \Omega Controls_{f,t-5} + \Gamma_c + \Gamma_f + \Gamma_t + \varepsilon_{f,t}$$

	(1) LOGS1TOT	(2) LOGS2TOT	(3) LOGS3UPTOT	(4) S1INT	(5) S2INT	(6) S3UPINT	(7) LOGSALES
5-YEAR LAG BROWNEFFRATIOEP	0.065*	0.010	0.022	−0.067	−0.019*	0.004	0.029*
	(0.036)	(0.034)	(0.020)	(0.131)	(0.011)	(0.022)	(0.017)
Observations	15482	15482	15482	15482	15482	15482	18343
R2	0.973	0.965	0.985	0.971	0.933	0.981	0.989
Controls	yes	yes	yes	yes	yes	yes	yes
Country F.E.	yes	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes	yes
Firm F.E.	yes	yes	yes	yes	yes	yes	yes

Controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI. Standard errors are double clustered at firm and year dimension.

[3] Increase in scope 2 emissions at the industry level consistent with a displacement effect

$$y_{j,t} = \beta_0 + \beta_1 \text{Green Patent Ratio}_{j,t-5} + \Omega Controls_{j,t-5} + \Gamma_j + \Gamma_t + \varepsilon_{j,t}$$

	(1) LOGS1TOT	(2) LOGS2TOT	(3) LOGS3UPTOT	(4) S1INT	(5) S2INT	(6) S3UPINT	(7) LOGSALES
5-YEAR LAG GREENRATIOEP	0.191	0.274***	−0.009	−1.562*	0.191*	−0.153*	0.046
	(0.139)	(0.102)	(0.075)	(0.796)	(0.110)	(0.089)	(0.070)
Observations	708	708	708	708	708	708	708
R2	0.986	0.986	0.991	0.997	0.852	0.993	0.987
Controls	yes	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes	yes
Industry F.E.	yes	yes	yes	yes	yes	yes	yes

Controls include industry level sums, sums over sums or market capitalization weighted averages: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI. Standard errors are double clustered at GICS-6 industry and year dimension.

[3] Firms with higher green patent ratios tend to lose market share - a form of displacement

$$y_{f,t} = \beta_0 + \beta_1 \text{Green/ Brown Patent Ratio}_{f,t-5} + \Omega Controls_{f,t-5} + \text{Fixed Effects} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	MKTSHR GICS6							
3-YEAR LAG GREENRATIOEP	−0.070**				−0.046*			
	(0.032)				(0.025)			
5-YEAR LAG GREENRATIOEP		−0.122***				−0.042		
		(0.043)				(0.029)		
3-YEAR LAG BROWNEFFRATIOEP			0.028				0.040	
			(0.053)				(0.037)	
5-YEAR LAG BROWNEFFRATIOEP				−0.010				−0.012
				(0.067)				(0.046)
Observations	34043	25036	34043	25036	33147	24189	33147	24189
R2	0.469	0.477	0.469	0.477	0.887	0.903	0.887	0.903
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes	yes	yes
GICS6-Year F.E.	yes	yes	yes	yes	no	no	no	no
Firm F.E.	no	no	no	no	yes	yes	yes	yes

Controls include: *LOGASSETS*, *LOGPPE*, *LEVERAGE*, *ROE*, *INVEST/A*, and, *PUBLIC*. We double cluster standard errors at the firm and year dimension.

Conclusion

- More green innovation does not translate into reductions in emissions
  - $\Rightarrow$ Consistent with Jevons paradox
  - $\Rightarrow$ Consistent with displacement effect
- Companies do not switch their innovation profile
  - $\Rightarrow$ Path-dependency consistent with Arrow replacement effect and learning-by doing
  - $\Rightarrow$ Path dependency extends beyond firm operations to the production network
- Policy implications:
  - $\Rightarrow$ Decarbonization may require coordination of efforts across companies and sectors
  - $\Rightarrow$ Public sector green industrial policy can help overcome ecosystem replacement effects

Appendix

No. of technology classes in category by classification source

Classification source	Green		Efficiency brown		Efficiency general	
	No.	Perc.	No.	Perc.	No.	Perc.
OECD	123	2.31	1094	23.35	137	3.86
OECD & IPC	209	3.93	76	1.62	1042	29.34
OECD & IPC & FF	1	0.02	88	1.88	0	0
OECD & FF	0	0	14	0.3	0	0
IPC	4367	82.13	80	1.71	1970	55.46
IPC & FF	0	0	557	11.89	0	0
FF	0	0	2429	51.84	0	0
CK	617	11.6	348	7.43	403	11.35

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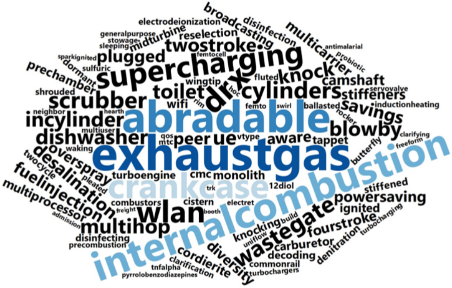
"Green" against "OECD"

"OECD" against "Green"



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Final “working” sample of 11,344 global firms with financial, EPO patents, and emission data

- 5,635 firms have at least one green patent registered over the time period
- 2,815 firms have at least one brown patent registered over the time period
- 62,273 firm-year observations with complete information from 2005 to 2020
- Average number of patents per firm and year:
  Any: 64.1 / Green: 4.9 / Brown: 1.6

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Number of patents increase with innovation capacity proxies

Suggests firms have capacity constraints which drives us to focus on patent ratios

Poisson pseudo maximum likelihood with standard errors double-clustered at firm and year dimensions:

$$\text{Patent Count}_{f,t} = \beta_0 + \beta_1 \text{Patent Stock}_{f,t-1} + \beta_2 Age_{f,t-1} + \beta_3 \text{Log(size)}_{f,t-1} + \beta_4 \text{Log(no empl)}_{f,t-1} + \Omega Controls_{f,t-1} + \Gamma_c + \Gamma_{i*t} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
	ANYCOUNTEP w. zeros			*ANYCOUNTEP* w/o zeros		
PATSTOCKANYEP (/100)	0.017***	0.013***	−0.002***	0.016***	0.014***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
AGE (/100)	0.152***	0.118***		0.071**	0.101***	
	(0.032)	(0.026)		(0.030)	(0.025)	
LOGSIZE	0.531***	0.488***	0.078***	0.447***	0.435***	0.079***
	(0.019)	(0.024)	(0.023)	(0.021)	(0.024)	(0.023)
LOGNOEMPL	0.330***	0.174***	0.055**	0.289***	0.161***	0.055**
	(0.014)	(0.022)	(0.023)	(0.017)	(0.020)	(0.024)
Country F.E.	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes
Industry X Year F.E.	no	yes	no	no	yes	no
Firm F.E.	no	no	yes	no	no	yes
Observations	68496	63945	37250	24960	23699	23828
Pseudo R2	0.653	0.831	0.921	0.642	0.804	0.909

Other controls include: LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI

Past green, respectively brown, patent stock suggest substitutability between the two types of innovation

Further motivation for using patent ratios to identify relative attention

$$\text{Green (brown) Count}_{f,t} = \beta_0 + \beta_1 \text{Green Stock}_{f,t-1} + \beta_2 \text{Brown Stock}_{f,t-1} + \Omega \, Controls_{f,t-1} + \Gamma_c + \Gamma_{i*t} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
		GREENCOUNTEP			*BROWNEFFCOUNTEP*	
PATSTOCKGREENEP (/100)	0.121***	0.139***	0.013***	−0.175***	−0.045***	−0.073***
	(0.007)	(0.009)	(0.004)	(0.018)	(0.011)	(0.011)
PATSTOCKBROWNEFFEP (/100)	−0.037***	−0.086***	−0.022***	0.305***	0.135***	0.060***
	(0.012)	(0.010)	(0.008)	(0.017)	(0.012)	(0.015)
Country F.E.	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes
Industry X Year F.E.	no	yes	no	no	yes	no
Firm F.E.	no	no	yes	no	no	yes
Observations	27860	24818	20173	27767	20143	12186
Pseudo R2	0.561	0.730	0.832	0.529	0.755	0.825

Other controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, MSCI, and AGE

Past dependence regressions with patent citations

$$\text{Pat var}_{f,t} = \beta_0 + \beta_1 \text{Stock}_{f,t-1} + \beta_2 Age_{f,t-1} + \beta_3 \text{Log(S1TOT)}_{f,t-1} + \Omega Controls_{f,t-1} + \Gamma_c + \Gamma_{i*t} + \varepsilon_{f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Maximum patent citation	*GREENCITMAXEP*			*BROWNEFFCITMAXEP*		
LOGS1TOT	-0.099^{***}	-0.228^{***}	-0.051	-0.032	0.079^{**}	0.171^{*}
	(0.024)	(0.057)	(0.066)	(0.028)	(0.036)	(0.089)
AGE (/100)	0.352^{**}	0.711^{***}		0.223^{*}	-0.052	
	(0.172)	(0.175)		(0.115)	(0.089)	
PATSTOCKGREENEP (/100)	0.061^{***}	0.067^{***}	-0.017			
	(0.009)	(0.009)	(0.014)			
PATSTOCKBROWNEFFEP (/100)				0.093^{***}	0.081^{***}	0.034^{**}
				(0.009)	(0.011)	(0.015)
Observations	21012	18737	15133	16885	12508	7430
Pseudo R2	0.400	0.658	0.725	0.415	0.719	0.701
Panel B: Blockbuster counts	*GREENBBCOUNTEP*			*BROWNEFFBBCOUNTEP*		
LOGS1TOT	-0.034^{**}	-0.015	-0.016	0.081^{***}	0.096^{**}	-0.027
	(0.014)	(0.030)	(0.033)	(0.018)	(0.042)	(0.054)
AGE (/100)	0.052	0.044		0.555^{***}	0.207^{***}	
	(0.068)	(0.073)		(0.059)	(0.076)	
PATSTOCKGREENEP (/100)	0.099^{***}	0.076^{***}	-0.010			
	(0.006)	(0.006)	(0.007)			
PATSTOCKBROWNEFFEP (/100)				0.145^{***}	0.119^{***}	0.030
				(0.011)	(0.012)	(0.020)
Observations	27707	17910	10607	27178	9943	5439
Pseudo R2	0.314	0.444	0.459	0.348	0.564	0.517
Controls.	yes	yes	yes	yes	yes	yes
Country F.E.	yes	yes	yes	yes	yes	yes
Year F.E.	yes	yes	yes	yes	yes	yes
Industry X Year F.E.	no	yes	no	no	yes	no
Firm F.E.	no	no	yes	no	no	yes

Other controls include: LOGSIZE, LOGPPE, LEVERAGE, ROE, M/B, INVEST/A, BETA, VOLAT, MOM, RET, and MSCI

back