Is the Dragon Learning to Fly? China's Patent Explosion At Home and Abroad

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  - or will we get an **outcome somewhere inbetween** these extremes?

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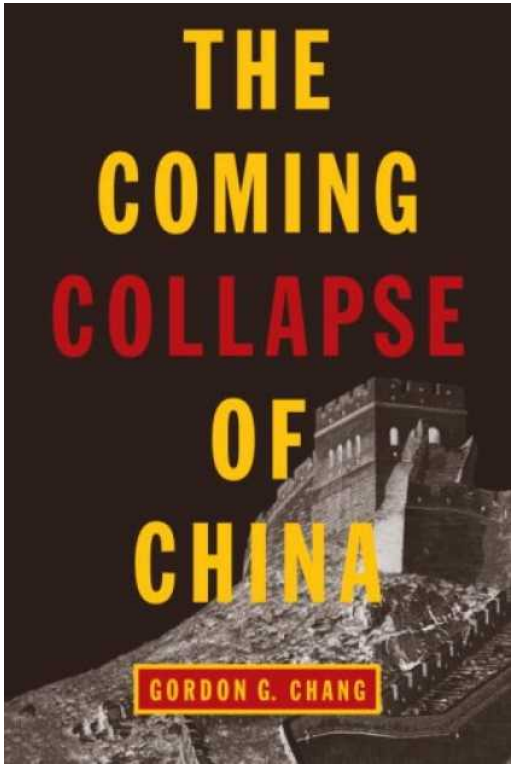

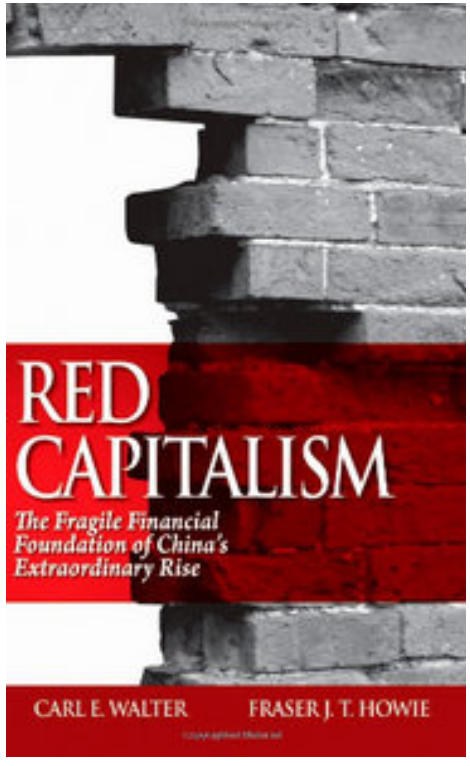

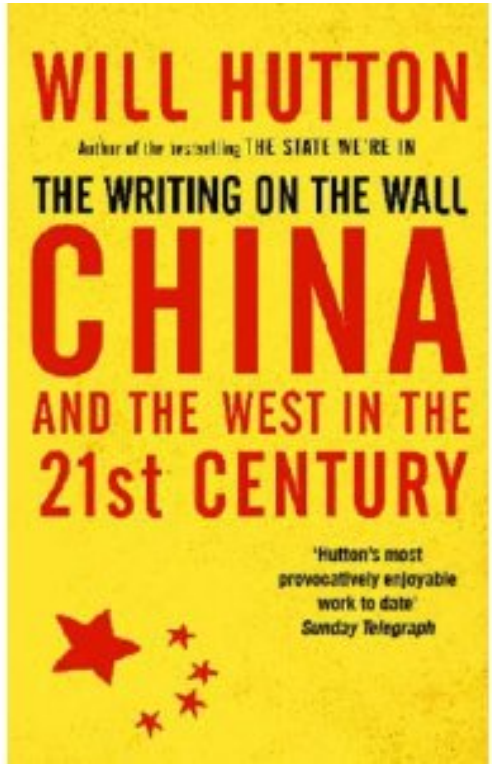

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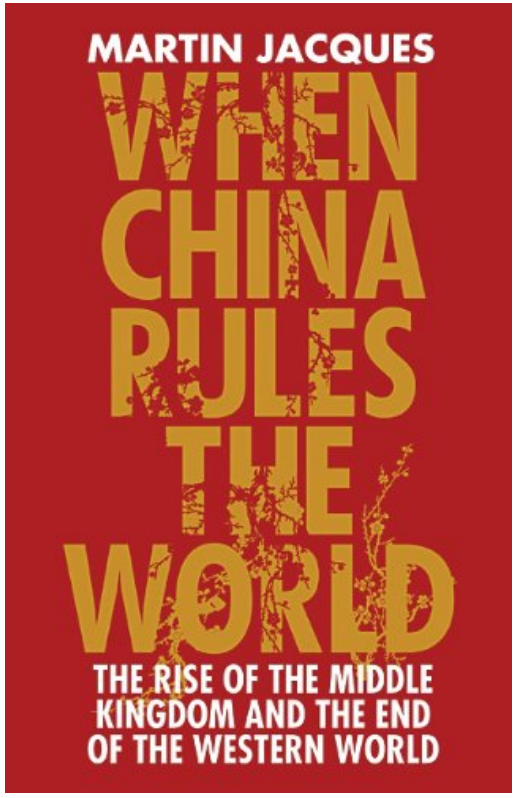

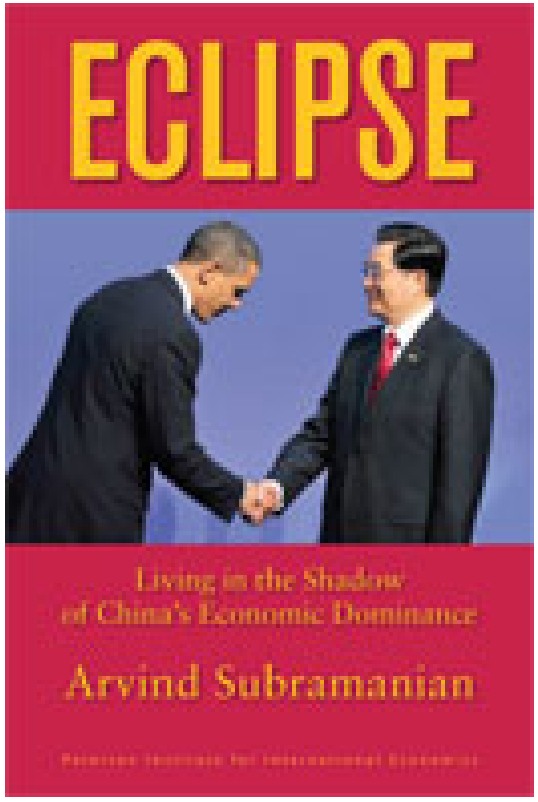

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- The Dragon is not airborne yet, still **flapping its wings in preparation for flight**.

SIPO vs. USPTO

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- **Industrial applicability** criterion for SIPO more in line with EPO than 'liberal' USPTO.
- Substantially **higher fees** to take out and maintain a patent with USPTO than SIPO. ⇒ higher cost for USPTO patents during our sample period.

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1. **Firm-level information**: China's Annual Survey of Industrial Enterprises (**ASIE**) compiled by the NBS, period 1999-2006 (population of state-owned firms & non-state-owned companies with annual sales > 5m CNY). Versions of this dataset widely used in literature (*firm names in Chinese, unique firm id*).

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3. **'Bridge'** that links the firm-level data with patent data: Bureau van Dijk (BvD) **Oriana** (*names in English, unique firm id shared with ASIE*). Selection into Oriana unclear.

USPTO: Top 10 firms (1985-2006)

Rank	Company	#Patents	Share
1	Hongfujin Precision Industry (Foxconn)	513	26.42%
2	Huawei Technology	399	20.55%
3	Fuzhun Precision Industry (Foxconn)	215	11.07%
4	China Petroleum Chemical (Sinopec)	161	8.29%
5	Semiconductor Manufacturing Intern.	126	6.49%
6	Futaihong Precision Industry (Foxconn)	100	5.15%
7	ZTE	61	3.14%
8	Lenovo	38	1.96%
9	BYD	33	1.70%
10	China International Marine Containers	18	0.93%
	Other	278	14.32%
	Total	1,942	100.00%

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1	Huawei Technology	15,603	34.09%
2	ZTE	4,594	10.04%
3	LG Electronics Appliances Tianjin	4,244	9.27%
4	Hongfujin Precision Industry (Foxconn)	3,710	8.11%
5	China Petroleum Chemical (Sinopec)	1,977	4.32%
6	Lenovo	1,137	2.48%
7	BYD	835	1.82%
8	LG Electronics Shanghai	775	1.69%
9	Baoshan Iron & Steel	756	1.65%
10	Inventec Shanghai	711	1.55%
	Other	11,423	24.96%
	Total	45,765	100.00%

Product vs. Process Innovation (1985-2006)

Innovation Type	USPTO		SIPO	
	Share	#Patents	Share	#Patents
Product	46.8%	895	29.9%	293
Process	20.3%	389	36.9%	362
Product & Process	32.8%	628	33.2%	325
Total	100.00%	1,912	100.00%	980

Notes: Figures are based on manual investigation of claims of all USPTO patents and a random sample of SIPO patents.

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- The nature of this data and the concentration of patenting uncovered by our study creates **formidable challenges for econometric analysis**, conclusions should be judged against these concerns.

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- Repeat the above exercise for **firms in ICT equipment sectors** only to confirm results.

Patenting Decision

	Bivariate Probit			Trivariate Probit	
Dep. Var.	USPTO	SIPO	H ‡	USPTO	SIPO
Selection	-	-		×	×
log R&D pw	0.190	0.159	.25	0.188	0.161
	[0.027]**	[0.011]**		[0.027]**	[0.010]**
(log R&D pw)^2	0.025	0.014	.07	0.022	0.013
	[0.007]**	[0.003]**		[0.006]**	[0.003]**
log Workers	0.397	0.271	.00	0.527	0.479
	[0.041]**	[0.022]**		[0.034]**	[0.015]**
log Exp/Sales	0.286	-0.052	.00	0.257	-0.047
	[0.063]**	[0.011]**		[0.060]**	[0.011]**
log Firm age	-0.213	-0.040	.00	-0.151	0.026
	[0.060]**	[0.023]		[0.050]**	[0.019]
ρ^s (st.error)				.372 [.027]**	.508 [.011]**
ρ^p (st.error)		.733 [.034]**			.612 [.036]**
obs		64,652			848,441
Firms		19,956			392,441

Notes: Among other covariates not reported: constant, ownership (insign.) and year dummies (sign.). Clustered st.errors (firm-level). Diagnostic tests in the paper. Dep. var. in each case is a dummy (1=patent, 0=no patent; 1=inclusion in Oriana for selection equation). ‡ p-values for cross-equation homogeneity test.

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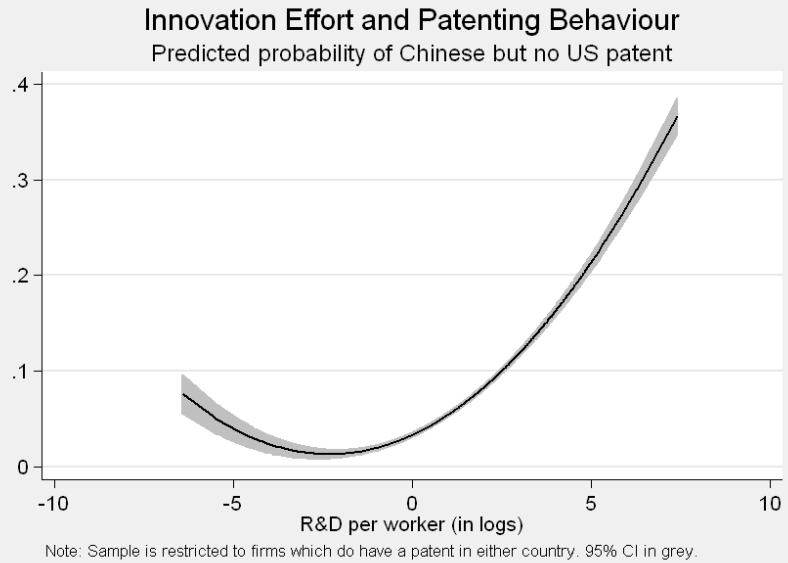

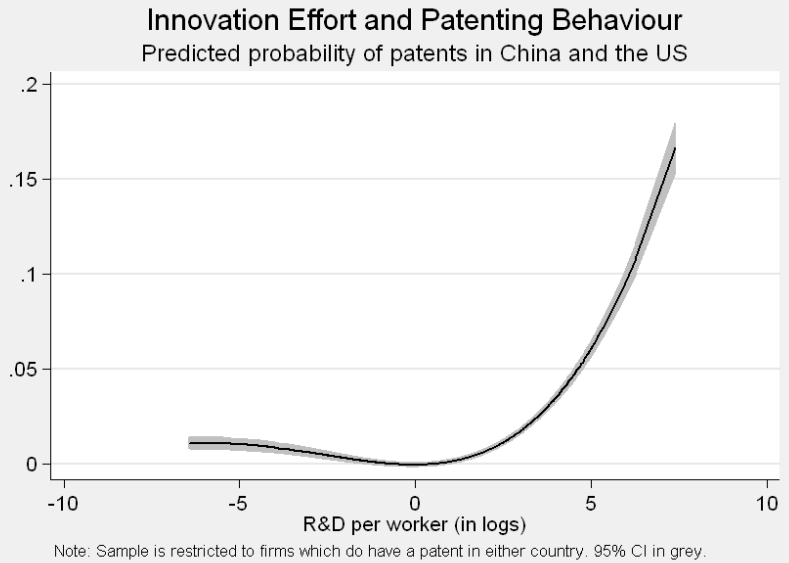

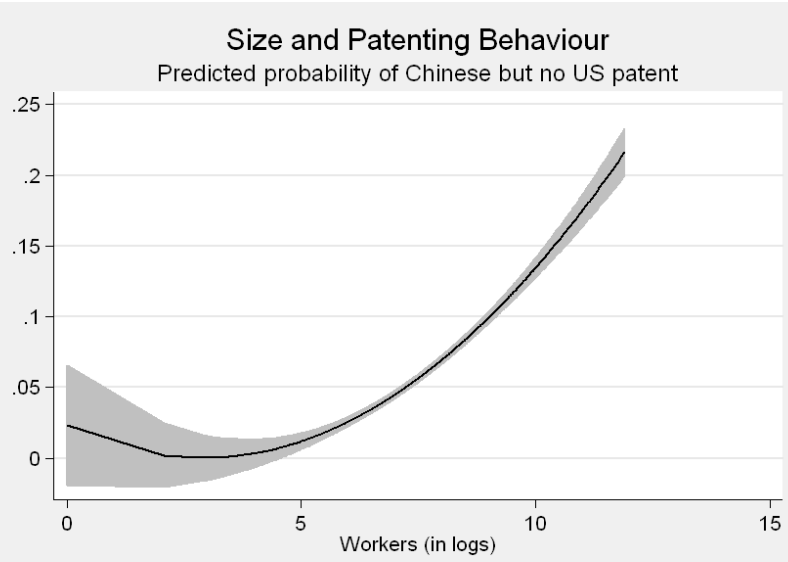

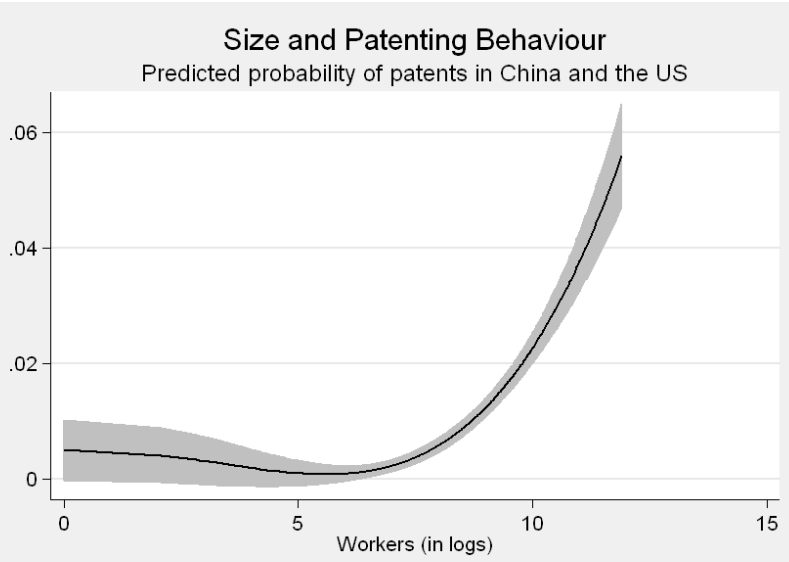

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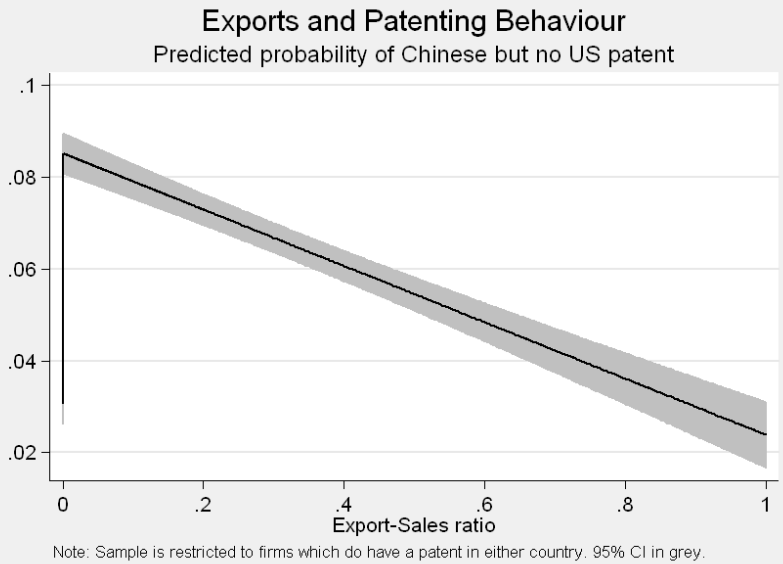

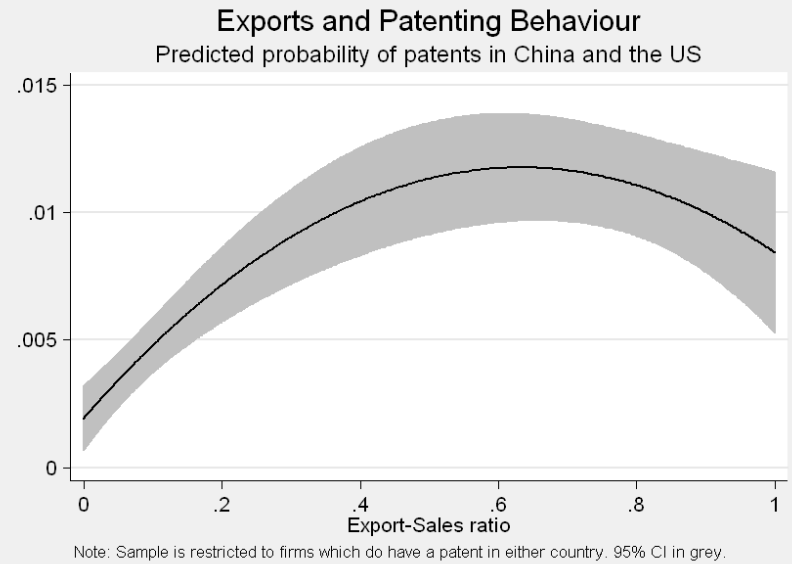

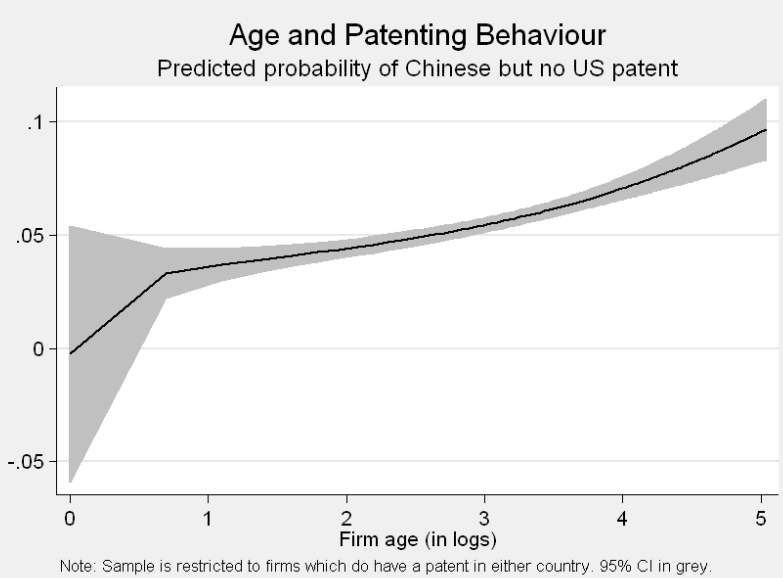

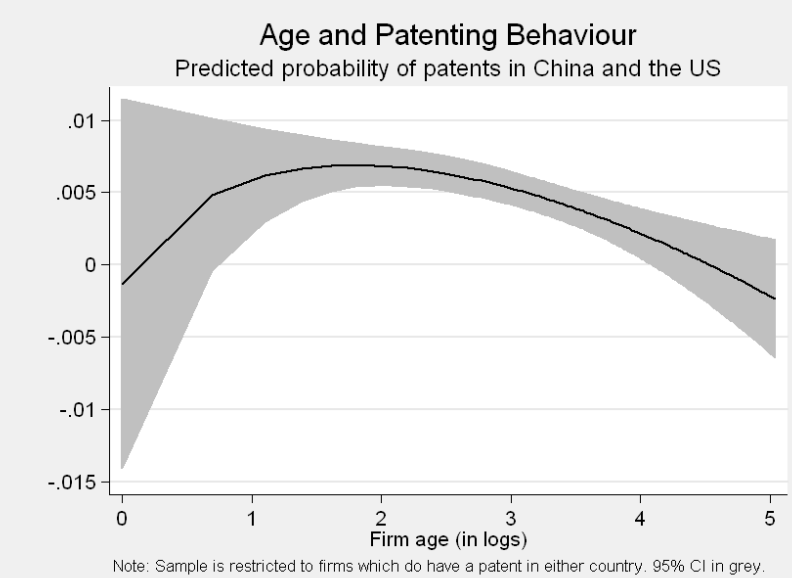

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4. **'Which firms file patents in the US as well as China?'**
   ⇒ Younger, larger, more export-oriented ones.

Our Conclusions

1. **'What is behind the Chinese patent explosion?'**
   ⇒ A handful of firms.

2. **'Is there evidence for wider technological take-off?'**
   ⇒ Based on our analysis: No.

3. **'Is China falling into the Middle-Income Trap?', 'Is there evidence for a pure Red Queen Run?'**
   ⇒ There are some (albeit few) very innovative, global players based in China.

4. **'Which firms file patents in the US as well as China?'**
   ⇒ Younger, larger, more export-oriented ones.

Thank you.

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