How home and host country industrial policies affect investment location choice? The case of Chinese investments in the EU solar and wind industries

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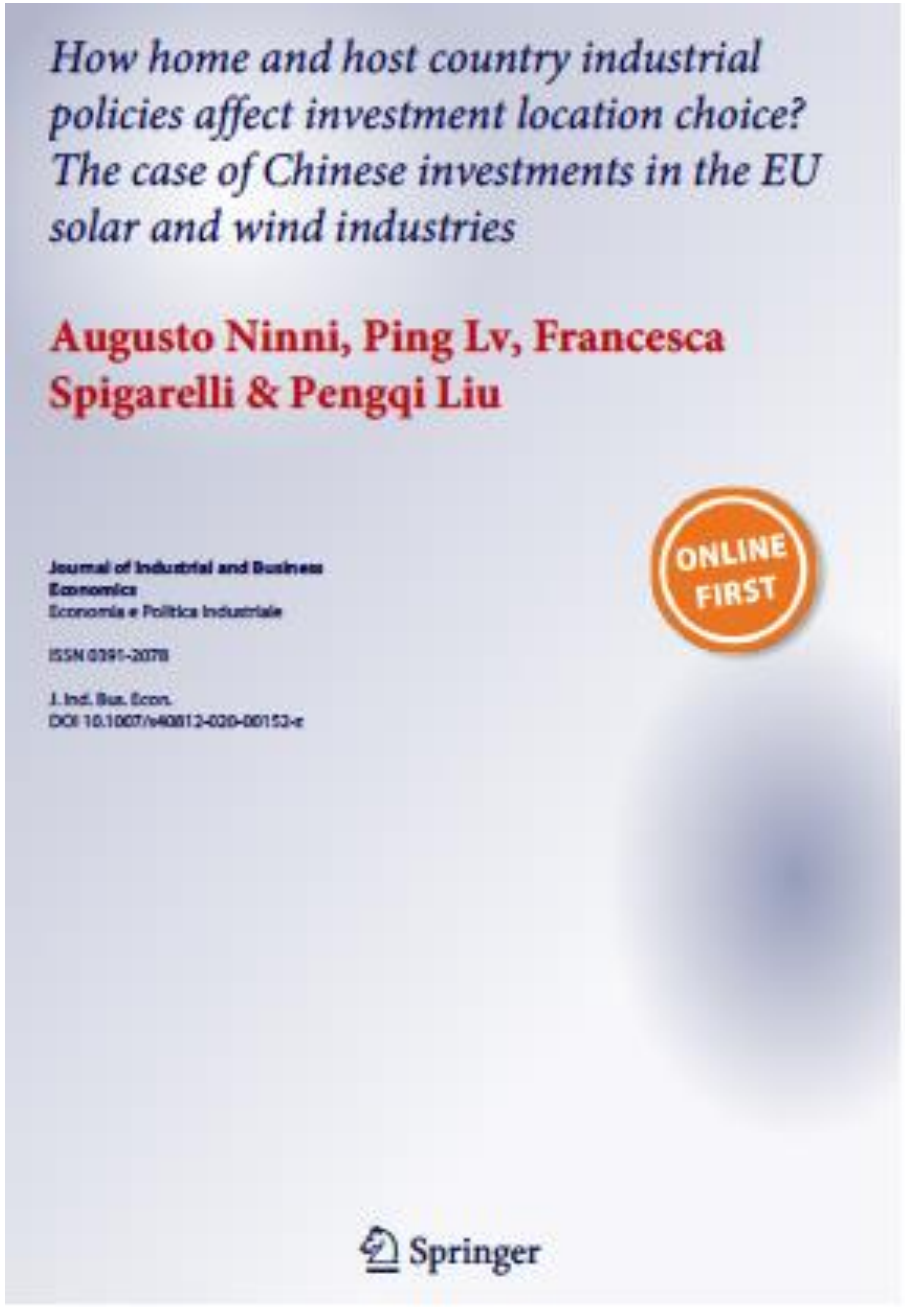

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The Background

Recently, the debate about the role and impact of **selective industrial policies**, targeting selected companies, regions and territories or specific industries has re-gained attention among scholars and policy makers.

This is due also to unpredictable protectionist measures implemented by major global economic players—US in primis—to protect specific sectors or preserve local companies' competitiveness.

Indeed, not only protectionist measures might influence the global competition in key economic sectors, but also the **use of different/asymmetric selective policies**, targeting the same industry, could impact on trade and investments.

The Background and purpose

We define as asymmetric those policies that tend to promote the same goals, but stimulating different and opposite forces of the market, namely the demand vs the supply.

In the specific case of renewable energy sources (RES), in the last decade, while EU countries relied on demand-oriented measures, aiming at promoting their utilization as sources for the generation of electricity, China has been promoting supply-side interventions to stimulate domestic production of components for renewable energy (Xu and Su 2016).

Purpose: We leverage on the case of Chinese investments in Europe in the RES industries, namely photovoltaic (PV) and wind sectors, to investigate the role played by asymmetries of home and host countries selective policies in investment location choice of international firms.

Theoretical background

Intersection of Industrial Policy and International Business literature, focusing on issues of energy policy.

We look at the influence of RES supportive measures introduced by EU member states on the attractiveness of EU countries, as destination target for Chinese firms investing abroad.

At the same time, we consider sectorial policies in China and their impact (as home country factor) on Chinese international expansion towards Europe.

Research Questions

RQ1: **High quality of host institutions and high level of economic development create a positive environment that attracts investment of Chinese firms to the EU in the RES sector.**

Larger endowment of resources, including a good level of technology and human capital and good local institutions in Europe, should act as pull factors for Chinese firms.

RQ2: **The level of development of the RES sector in host countries impact on decision to invest abroad**.

Host RES sectors attributes and characteristics affect location decision. We consider that high level of development of RES in host countries attracts more investments from China.

Research Questions

RQ3: **High quality of home institutions and high level of economic development in home provinces, create a positive environment that stimulates Chinese firms to go abroad**. Larger endowment of resources, including a good level of technology and good local institutions in China, should act as push factors in the implementation of international ventures for Chinese firms.

RQ4: **The level of development of the RES sector in home countries impact on decision to invest abroad**. Home RES sectors conditions and characteristics affect location decision. Subsidies contributed to generating over capacity in China, forcing Chinese firms to look abroad for outlet markets (push factor). Thus, more subsidies paid in Chinese provinces should result in a higher number of Chinese firms investing in Europe

Variable specification and the empirical model

We leverage on Ministry of Commerce (MofCom) database and perform econometric models on home and host country factors affecting location choice of Chinese multinationals in Europe.

Our research target is all Chinese firms in PV and wind sectors with foreign subsidiaries in **EU by the end of 2015**.
The dataset incorporates a total of **283 investments** in the EU: **218** location choices by 140 Chinese PV firms from 2005 to 2015, as well as **65** location choices by 23 Chinese wind firms from 2009 to 2015.
Over this period, **17 EU** countries were target destinations for the PV and **14** for the wind sector

Table 1 Host country distribution of Chinese investments in the EU in PV and Wind sectors, 2005–2015. Source: Author's calculation on MofCom database

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Austria								1				1
Bulgaria						1	7	10	1	1		20
Belgium							2		1	1		4
Poland							1					1
Denmark						1		4				5
Germany	1		3	1	11	12	34	36	14	2	11	125
France						2	2		6	2		12
Netherlands		1			1	2		4	6	1	1	16
Czech Rep.						2	2					4
Luxemburg			1			1	8	10	4	1	1	26
Romania							1	2	1			4
Portugal							1			1		2
Sweden								3			1	4
Slovakia							1					1
Spain			1	1	3	3	2		1	2	3	16
Hungary					2	1		1				4
Italy					1	3	4	4	4	1	1	18
UK				1			6	3	3	2	5	20
Total	1	1	5	3	18	28	71	78	41	14	23	283

Table 2 Source province distribution of Chinese investments in the EU in PV and Wind sectors, 2005–2015. Source: Author's calculation on MofCom database

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Anhui						2	6	2				10
Beijing				1	5		7	6	4		4	27
Fujian								4				4
Gansu											1	1
Guangdong						2	3	4	3	1	1	14
Hebei					2		4	1	1	1	1	10
Henan										1		1
Hubei							1	2		1		4
Hunan						1	6	9	1			17
Jilin									1			1
Jiangsu	1	1	4		4	8	20	26	13	6	8	91
Jiangxi						1		3		1		5
Liaoning						1		1			2	4
Neimenggu								1				1
Shandong				1	1	2	3	2	1		2	12
Shan'xi							1					1
Shanghai					2	3	3	1	3		2	14
Sichuan							1				1	2
Tianjin						4						4
Xinjiang							1					4
Yunnan										1		1
Zhejiang			1	1	4	4	15	12	14	1	1	53
Chongqing								1	1			2
Total	1	1	5	3	18	28	71	78	41	14	23	283

Variable specification

To test our research questions, we developed an econometric model which includes **home region and host country endowments, institutional and sectoral variables** as **determinants** of Chinese investment in Europe.

We incorporate control variables at **firm level**.

Since China is a huge country with regional disparity and heterogeneous regional institutional environments, we adopt a **provincial level analysis** for the home country.

Host country factors

Home province factors

Industry focus

Table 3 Variables and data sources

Variables	Measurement	Data sources
Dependent variable		
Country chosen	1 = the choice of the country, 0 = otherwise	MofCom
Independent variables		
Host country: endowments and institutions		
GDP	Logarithm of host country GDP (100 million dollars)	World Bank
Human capital	Gross tertiary education enrollment rate (%)	Global competitiveness report
Technological readiness	Agility with which an economy adopts existing technologies to enhance the productivity of its industries. Scoring from 1 (strongly disagree) to 7 (strongly agree)	Global competitiveness report
Prevalence of trade barriers	Trade barriers are government-placed restrictions on trade between nations. Scoring from 1 (strongly disagree) to 7 (strongly agree)	Global competitiveness report
Home country: regional endowments and institutions		
GDP	Logarithm of home provincial GDP (100 million yuan)	National Bureau of Statistics of China
Technological readiness	Perceptions of the likelihood that the technology market will be impartial and efficiency. Scoring from0 (weak) to 5 (strong).	Business Environment Index for China's Province
Government management	Perceptions of the likelihood that the government will be open, fair, impartial and efficiency. Scoring from 0 (weak) to 5 (strong).	Business Environment Index for China's Province
Host country: sectoral specificity		
Solar and wind installment	Logarithm of solar and wind installment (MW)	Eurostat
Subsidies	Logarithm of average government support in RES (€/MWh)	Council of European Energy Regulators
Home country: regional sectoral specificity		
Power consumption	Logarithm of power consumption per capita (KWh per capita)	National Bureau of Statistics of China
Pollution	Logarithm of waste water and sulphur dioxide emissions per 10,000 people (ton per 10,000 people)	National Bureau of Statistics of China
Subsidies	Logarithm of government subsidies for electricity price in RES (¥/MWh)	National Energy Administration of China

Variables	Measurement	Data sources
Control variables		
Size	Log of number of employees	Firm's homepage or annual report
Age	Number of years since the founding of the firm	Firm's homepage or annual report
Ownership	1 = SOE, 0 = non-SOE	Firm's homepage or annual report
Entry mode	1 = greenfield, 0 = non-greenfield	MofCom

Empirical model

We examine the impact of home country and host country factors on Chinese green OFDI in 4 logit models

Model 1 looks at the effects of host country endowments and institutional variables on Chinese OFDI in PV and wind sectors, to test RQ1. A statistically significant positive coefficient of GDP suggests that the large market size of the host country—as key country endowments factor—is attractive to Chinese firms in PV and wind sectors. More interesting is the negative and significant influence that the level of human capital has on the investment location decision of Chinese firms in EU. RQ1 is partially supported.

Model 2 considers not only the effect of endowments and institutional variables in host countries, but also the sectoral variables, which is used to test RQ2. The coefficients of two host country sectoral variables in Model 2 are both positive and significant. RQ2 is totally supported

Model 3 includes home regional endowments and institutional variables on the basis of models 1 and 2, to test RQ3.

The coefficient of provincial GDP is not statistically significant

The coefficient of the technological readiness is negative and statistically significant.

The coefficient of government management is positive but not significant. Poor governance of home regions cannot stimulate Chinese investments in the global market.

RQ3 cannot be supported.

Model 4 illustrates the core of our analysis, which is related to the specificity

of RES sector and possible heterogeneity of government preferential policies to test RQ4.

The coefficient of pollution is significant with positive signs.

The coefficient of subsidies provided by the government is significant with negative signs. This result indicates that more subsidies by the home regional government will reduce the propensity of Chinese RE firms' investing abroad

RQ4 cannot be totally supported.

Results

Home country (Chinese provinces) push factors		Host countries (European States) pull factors	
Country endowments and institutions			
GDP	N	GDP	+
Technological readiness	–	Human capital	–
Government management	N	Technological readiness	+
		Prevalence of trade barriers	–
Sectoral specificity			
Power consumption	N	Solar and wind installment	+
Pollution	+	Subsidies	+
Subsidies	–		

"+" indicates positive effect on location choice; "–" indicates negative effect on location choice; "N" indicates no effect on location choice

Robustness test

Table 10 Summary of robustness test Results

Home country (Chinese provinces) push factors		Host countries (EU States) pull factors	
Country endowments and institutions			
GDP	N	GDP	+
Technological readiness	–	Human capital	– → +
Government management	N → +	Technological readiness	+
		Prevalence of trade barriers	–
Sectoral specificity			
Power consumption	N	Solar and wind installment	+
Pollution	+ → N	Subsidies	+
Subsidies	–		

"+" indicates positive effect on location choice; "–" indicates negative effect on location choice; "N" indicates no effect on location choice

The results of core variables we considered—the subsidies of the host country and the home country—remain unchanged, confirming that sectoral subsidies in home country have a crowding out effect, while sectoral subsidies in host countries will attract Chinese companies to invest RES in EU

Conclusions

Purpose: to explore the influence played by RE sources' supportive measures introduced by EU member states on the attractiveness of EU countries, as destination target for Chinese firms investing abroad. At the same time, we intended to see the role played by asymmetries between EU and Chinese industry supportive policies.

Results

1. Impact of home and host country factors on location choice

Host country endowments and institutional variables: large market size of the host country, as well as endowment of technological assets is attractive to Chinese firms.

On the contrary, the level of human capital has a negative impact.

Home regional endowments and institutional variables: large market size of the home region may not facilitates Chinese firms to go abroad. However, firms from province with inactive technology market are more capable of investing in EU.

Conclusions

2. The impact of sectoral specificity is clear, both at home region and host country level.

Home: Chinese firms from areas with high level of environmental stress are stimulated to grow, because of urgent internal needs for products. As a result, they might be more mature and competitive or sound to invest abroad.
However, Chinese government subsidies might have had a crowding out effect on Chinese firm's willingness to invest abroad. More generous production subsidies seem to have discouraged Chinese investments abroad.

Host: a good industry development and favourable supportive measures act as catalyst for Chinese firms in the PV and wind sectors. Location choices are affected by the quality/competitiveness of the industry, as well as of the generosity of domestic incentive

Implications

- **Economic benefits** of Chinese investments in the RE sectors are clear. They include the long-term opportunity to reactivate the growth trends of the RE industry in those countries that suffered the most during the financial crisis. Partnering with Chinese firms can help European companies create backward linkages to improve their access to the Chinese restricted market.
- **Political concerns** are also evident. Chinese investments are unevenly distributed in Europe, as our study revealed, with some countries becoming more and more dependent on Chinese resources for internal growth
- China has been developing a very **intense industrial policy**, which intends to gain control in the near future over the key phases of global supply chains. “Technology leaders in Europe are increasingly worried that such a government-guided and state-supported attack on European technology leadership will hurt Europe’s long-term competitiveness and harm competition-driven global innovation dynamics”

Appendix

Table 5 Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Size	1													
(2) Age	0.473***	1												
(3) Host GDP	0.004	0.006	1											
(4) Host human capital	0.018	0.017	0.486***	1										
(5) Host technological readiness	0.038***	0.019	0.354***	0.018	1									
(6) Host prevalence of trade barriers	−0.017	−0.039***	0.009	−0.208***	0.467***	1								
(7) Host solar and wind installment	0.039***	0.033**	0.805***	0.590***	0.346***	−0.180***	1							
(8) Host Subsidies	0.021	0.028*	0.048***	−0.234***	−0.209***	−0.244***	0.079***	1						
(9) Home GDP	−0.051***	−0.155***	0.007	0.046***	0.073***	−0.183***	0.120***	0.048***	1					

Appendix

Table 5 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(10) Home technological readiness	0.008	−0.195***	0.010	0.033**	0.086***	−0.147***	0.119***	0.037**	0.647***	1				
(11) Home government management	−0.041***	−0.200***	0.005	−0.044***	0.013	0.160***	−0.039***	−0.036**	0.222***	0.544***	1			
(12) Home power consumption	−0.147***	−0.270***	0.008	0.025*	0.047***	−0.113***	0.081***	0.030**	0.584***	0.633***	0.462***	1		
(13) Home pollution	−0.124***	−0.165***	0.002	0.016	0.017	−0.080***	0.043***	0.027*	0.517***	0.534***	0.477***	0.801***	1	
(14) Home subsidies	0.124***	0.254***	0.001	0.031**	0.071***	−0.136***	0.097***	0.029**	0.064***	0.215***	0.242***	0.088***	0.364***	1

*$p<0.1$, **$p<0.05$, ***$p<0.01$