

Study on the Impacts of China's Waste Paper Import Restrictive Policies on the Cycle Synchronization between the Chinese and International Waste Paper Markets

Table S1: New policies on waste paper import in recent years

Title of Policy	Issue Date	Implementation Date	Specification
Operation Green Fence	-	2013.2.1-2013.11.30	Contamination rate of 1.5% enforced for waste paper import; stricter inspections on incoming containers loaded with recyclables; penalties strengthened for foreign garbage smuggling
Catalogue of imported waste management	2014.12.30	2015.1.1	Waste paper listed in "Catalogue of solid waste used as raw materials under restricted import"
Implementation plan for prohibiting the entry of foreign garbage and advancing the reform of the solid waste import administration system (The Plan)	2017.7.27	2017.7.27	Unsorted waste paper banned from import; penalties strengthened for foreign garbage smuggling; stricter control on the issuance and use of solid waste import licenses
Catalogue of imported waste management	2017.8.10	2017.12.31	Unsorted waste paper adjusted from "Catalogue of solid waste used as raw materials under restricted import" to "Catalogue of banned import solid waste"
Provisions on environmental protection and management of imported waste paper	2017.12.14	2017.12.14	Mill with production capacity less than 50,000 tons per year prohibited from importing waste paper
Environmental protection control standard for imported solid wastes as raw materials—Waste and scrap of paper or paperboard	2017.12.29	2018.3.1	Contamination rate cut from 1.5% to 0.5%

Table S2: The Augmented Dickey–Fuller unit root test results

PDOA in levels			PDOA in first-difference			PIMA in levels			PIMA in first-difference		
None	Const	Trend	None	Const	Trend	None	Const	Trend	None	Const	Trend
0.2584	-1.095	-1.6257	-6.9984***	-7.0267***	-6.9755***	0.4489	-1.1184	-1.9526	-6.6835***	-6.7329***	-6.6824***
-0.9101	-1.9692	-1.6243	-7.6020***	-7.5827***	-7.7943***	0.1947	-1.2181	-0.9437	-7.6272***	-7.5892***	-7.8468***
-1.6983*	-1.0049	-1.0148	-7.1383***	-7.2633***	-7.2465***	-1.333	-1.4565	-1.6154	-4.1247***	-4.1487***	-4.2067***
-0.9653	-1.1633	-1.6228	-7.2367***	-7.2255***	-7.1681***	-1.1649	-1.0905	-1.5813	-5.5285***	-5.5549***	-5.5209***
-1.4672	-0.775	-1.5346	-6.8608***	-6.9491***	-6.8946***	-1.1305	-1.6118	-2.5488	-3.9705***	-3.9812***	-3.9533**
-1.538	-0.7544	-1.7254	-7.0914***	-7.2082***	-7.1517***	-1.207	-1.153	-3.0906	-4.2326***	-4.3177***	-4.3334***
-1.277	-0.886	-1.9289	-7.1088***	-7.1407***	-7.0892***	-1.0619	-2.4192	-4.0217**	-4.5396***	-4.5251***	-4.4861***
-1.1725	-1.8251	-2.917	-8.0056***	-7.9733***	-7.9200***	-0.8605	-1.3644	-1.5564	-7.3387***	-7.2919***	-7.2383***
-1.0548	-1.1091	-2.2848	-7.2429***	-7.2402***	-7.1828***	-1.0248	-1.8955	-2.1493	-3.1377***	-3.1341**	-3.1326
-0.896	-1.8741	-2.3935	-7.0889***	-7.0399***	-6.9790***	1.0885	-0.0698	-1.5888	-4.9648***	-5.1138***	-5.2903***
-0.6206	-2.0169	-2.0572	-7.4144***	-7.3655***	-7.3345***	-1.3746	-0.9127	-2.7556	-4.2824***	-4.9979***	-4.9927***
-0.5489	-1.7746	-1.6554	-6.7615***	-6.7087***	-6.7253***	-0.3987	-3.1503**	-3.2198*	-7.3678***	-7.3079***	-7.2457***
-1.1058	-2.5207	-2.4372	-5.8469***	-5.8450***	-5.8016***	0.8339	-0.3913	-2.133	-8.1006***	-8.2137***	-8.2468***
-0.2127	-2.6236*	-2.6076	-7.4574***	-7.4091***	-7.3511***	-0.845	-2.9477**	-3.1725*	-5.1930***	-5.1436***	-5.0973***
-0.733	-2.4048	-2.556	-7.6805***	-7.6251***	-7.5776***	-0.8388	-1.9081	-1.7089	-7.1317***	-7.0791***	-7.0864***
-1.2329	-0.9365	-2.3923	-7.0484***	-7.1002***	-7.0599***	-0.8436	-2.6541*	-3.3365*	-5.1615***	-5.1350***	-5.0941***
-1.2304	-0.825	-2.3989	-7.4839***	-7.5314***	-7.4797***	-0.6718	-2.2296	-2.6228	-5.7375***	-5.6920***	-5.7078***
-1.7003*	-1.0074	-1.8074	-7.7101***	-7.8614***	-7.8105***	0.126	-2.0037	-2.0502	-6.0470***	-6.0271***	-6.1695***
-1.0372	-2.0269	-2.5663	-9.2754***	-9.2368***	-9.1991***	-0.181	-1.7498	-2.2942	-5.8018***	-5.7857***	-5.7812***
-1.1082	-0.8973	-1.3442	-7.2401***	-7.2392***	-7.1826***	0.0588	-1.6012	-2.0017	-6.7450***	-6.7000***	-6.6407***
-0.4643	-2.8474*	-3.2556*	-4.1360***	-4.0998***	-4.0641**	0.5806	-0.6726	-2.7222	-5.7982***	-5.8359***	-5.8532***
-0.4862	-2.6314*	-3.2903*	-7.5903***	-7.5092***	-7.4954***	-1.0181	-1.872	-2.6527	-6.8066***	-6.7949***	-6.7588***
-0.7683	-1.3933	-1.7645	-7.0564***	-7.0069***	-6.9302***	0.0698	-1.4203	-2.2359	-7.5610***	-7.5356***	-7.4792***
1.7009	-0.2328	-1.7311	-3.5515***	-3.8120***	-3.7032**	-0.1939	-2.8866*	-2.8857	-6.7383***	-6.6913***	-6.6589***
-0.9413	-1.3775	-1.5849	-6.8950***	-6.8523***	-6.7994***	-0.3858	-2.1405	-2.5492	-8.3506***	-8.2876***	-8.2194***
0.1589	-1.3346	-1.5267	-7.7413***	-7.7162***	-7.6607***	-0.2897	-2.2141	-2.2507	-7.4743***	-7.4237***	-7.3947***
-0.7498	-1.7491	-1.4823	-7.3706***	-7.3187***	-7.3588***	-0.2446	-2.019	-2.2229	-9.0496***	-8.9910***	-9.0020***
-0.6888	-1.9413	-1.871	-7.6692***	-7.6114***	-7.6085***	-0.1383	-1.9184	-1.6466	-8.4154***	-8.3487***	-8.5252***
0.4087	-1.4344	-1.5834	-7.8719***	-7.8854***	-7.8334***	0.254	-3.7151***	-4.6145***	-9.0750***	-9.0442***	-8.9724***
0.6263	-1.1557	-2.6073	-10.8003***	-10.8210***	-10.7592***	-0.6328	-2.0674	-2.6501	-7.9349***	-7.8786***	-7.8115***
-1.3797	-1.4085	-2.7287	-8.3982***	-8.4704***	-8.4172***	-0.519	-2.4787	-2.7436	-7.4940***	-7.4379***	-7.3787***
-0.5117	-2.3059	-2.215	-7.3859***	-7.3222***	-7.2839***	-0.4135	-2.6515*	-3.5177**	-10.6536***	-10.5911***	-10.5082***
-1.4331	-0.8597	-1.9571	-10.1852***	-10.2702***	-10.1962***	-0.2731	-1.5505	-2.4176	-8.4854***	-8.4538***	-8.3964***
-1.1573	-1.5228	-2.852	-7.1665***	-7.1656***	-7.1308***	0.1438	-1.1364	-2.4696	-8.1149***	-8.1192***	-8.1270***
-0.4386	-2.0199	-3.2906*	-7.6008***	-7.5527***	-7.4911***	0.0482	-1.0167	-2.6981	-9.8120***	-9.8703***	-9.8524***
-1.0959	-1.3995	-3.0675	-4.1969***	-4.2698***	-4.1948***	-0.2491	-1.4517	-2.5293	-9.6934***	-9.6798***	-9.6061***
-1.2457	-1.3531	-2.4081	-8.0891***	-8.0952***	-8.0311***	-0.1895	-1.2489	-2.7031	-10.2454***	-10.2550***	-10.2253***
-0.5116	-2.3072	-2.4019	-8.6124***	-8.5446***	-8.4804***	-0.1451	-1.2508	-2.3643	-9.1045***	-9.1079***	-9.0558***
-0.8793	-1.3135	-0.903	-9.4878***	-9.4324***	-9.5058***	-0.1556	-2.148	-2.8549	-10.6170***	-10.5674***	-10.5083***
-1.3744	-1.6312	-1.9095	-7.9680***	-7.9592***	-8.0172***	-0.2211	-1.2259	-2.7863	-11.2483***	-11.1886***	-11.1025***
-1.3335	-1.5936	-4.3807***	-8.8812***	-8.9484***	-8.8492***	0.15	-1.0994	-2.4192	-12.1718***	-12.1836***	-12.0896***

-1.1779	-1.1906	-2.6758	-9.8199***	-9.8253***	-9.7750***	1.0064	-0.8111	-4.4665***	-8.8680***	-8.9546***	-8.9599***
-1.3174	-1.5991	-3.1247	-8.2422***	-8.2308***	-8.1661***	0.4519	-0.5099	-2.0995	-13.0008***	-13.0017***	-13.0783***
-0.6515	-2.8124*	-3.0786	-9.9864***	-9.9072***	-9.8222***	0.1609	-1.1103	-2.2338	-13.7080***	-13.7188***	-13.6027***
-1.2497	-1.6818	-2.9023	-8.9109***	-8.8977***	-8.8454***	0.0168	-1.7972	-2.9289	-15.0006***	-14.9452***	-14.8286***
-1.022	-1.1136	-2.5013	-9.1826***	-9.1782***	-9.1515***	-0.7082	-2.4103	-3.1345	-10.9514***	-10.8724***	-10.7874***
-1.2412	-1.1021	-1.9788	-9.3868***	-9.4255***	-9.3454***	-0.5061	-1.7344	-2.2373	-12.4001***	-12.3193***	-12.2330***
-1.393	-1.2448	-1.7196	-9.4536***	-9.5092***	-9.4694***	0.052	-1.2907	-2.1774	-12.6034***	-12.5708***	-12.5144***
-1.2875	-1.9518	-2.6208	-9.4723***	-9.4337***	-9.3652***	0.3484	-0.6997	-2.1593	-12.0719***	-12.0950***	-12.0818***
-1.0951	-1.656	-2.9901	-9.6214***	-9.5769***	-9.5095***	-0.4282	-1.3016	-1.998	-11.0170***	-10.9468***	-10.8379***

Note: a: \*: Significant at the 10%, \*\*: Significant at the 5%, \*\*\*: Significant at the 1%. b: Lag length based on the Akaike information criterion (AIC).

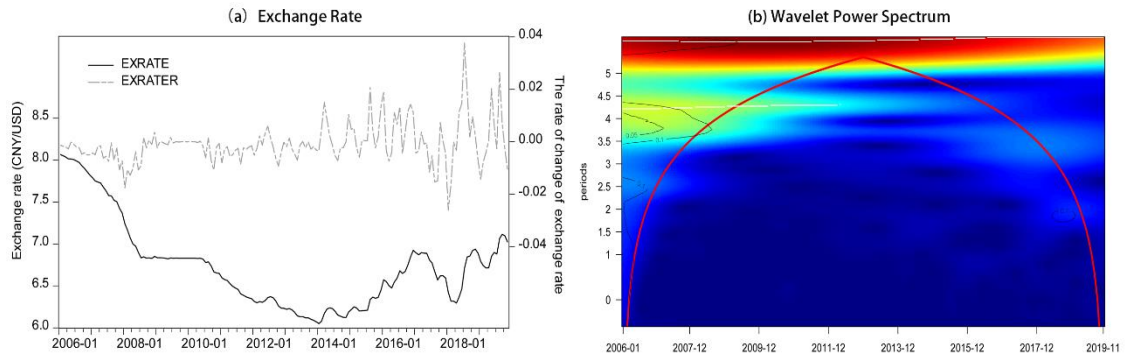


Figure S1: (a) Exchange rate between Chinese Yuan (CNY) and US dollar (USD) and its rate of change. (b) Wavelet Power Spectrum estimate of the exchange rate. In (b), the white lines show the maxima of the undulations of the wavelet power spectrum. The red contour designates the cone of influence, which indicates the region affected by edge effects. The back contour marks the 5% and 10% significance level estimated from Monte Carlo simulations. The color code for power ranges from blue (low power) to red (high power).

Note: The exchange rate between CNY and USD from 2006-2019 was obtained from the official website of macrotrends (<https://www.macrotrends.net/2575/us-dollar-yuan-exchange-rate-historical-chart>). The rate of change of exchange rate was calculated as  $EXRATER_t = \ln(EXRATE_t) - \ln(EXRATE_{t-1})$ .

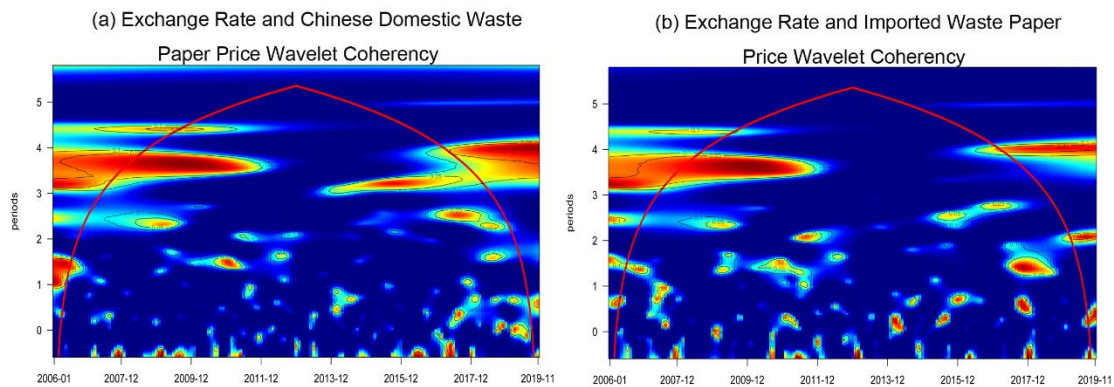


Figure S2: (a) Wavelet coherency between exchange rate and Chinese domestic waste paper price. (b) Wavelet coherency between exchange rate and imported waste paper price. Wavelet coherency ranges from blue (low coherency) to red (high coherency). The red contour designates the cone of influence, which indicates the region affected by edge effects. The back contour marks the 5% and 10% significance level estimated from Monte Carlo simulations.