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The relationship between the Chinese 'going out' strategy and international trade

Ana Lucia Abeliansky and Inmaculada Martínez-Zarzoso

Abstract
This study is the first to estimate a system of simultaneous gravity equations for Chinese exports, imports and foreign direct investment (FDI) using a sample of 167 countries over the period 2003–2012. The main results indicate that trade and outward FDI are complementary. In particular, the authors show that outward Chinese FDI is related to higher exports and imports and that China trades more with countries hosting Chinese FDI. Results are also robust to the use of instrumental variables. Therefore, Chinese investment seems to foster trade.

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Keywords International trade; foreign direct investment; China

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1 Introduction

During the late 1990s, China started its "going out" strategy with an intense program of outward foreign direct investment (FDI).[1] According to UNCTAD statistics, Chinese outward FDI stock was about 33 billion USD in 2003, reaching almost 614 billion in 2013, which translates into a 30 percent nominal annual growth rate. A timely question is whether this increase is related to Chinese exports and imports, in line with the idea that trade and FDI could be complements.

Recent investment agreements with China have raised concerns in the partner economies alleging that China's intention was to extract natural resources and could in turn force the host countries to re-orient their production to low value added products and extraction of natural resources (The Economist, 2013). However, recent trade figures show that China has been increasingly investing in manufacturing activities and has gradually abandoned its focus on the extraction and mining sectors.

Meanwhile, given the close connections of the Chinese (business) community, it is to be expected that Chinese investment will generate an increase in demand – and in turn of imported products – mainly of intermediate inputs, high-tech goods and machinery needed to produce final manufacturing products in the host countries. Considering the deep connections between the Chinese ethnicity and business (Rauch and Trindade, 2002), Chinese exporters could profit from this increase in demand. Moreover, contrary to the traditional economic theory assuming that trade and FDI are substitutes (Mundell, 1957), Schmitz and Helmberger (1970), among others, have theoretically shown that trade and FDI could be complements under certain assumptions. More recently, also the models referenced in Antràs and Yeaple (2014) indicate that FDI and trade should complement each other. Furthermore, the bulk of empirical evidence in regions worldwide points to the complementarity effects between FDI and exports (Brouwer et al., 2008; Egger, 2001; Chen et al., 2012; Cheung and Qian, 2009).

This paper departs from earlier literature in two main regards. Firstly, it investigates the trade-FDI link for the Chinese case in recent years, paying particular attention to the characteristics of the destination countries, to the presence of zeroes and to simultaneity issues. Secondly, it focuses on the effect of FDI not only on total exports, but also on Chinese imports. In particular, we estimate a gravity model of trade augmented with FDI and a model of FDI augmented with trade to investigate reverse causality issues. We consider exports and imports separately and test two main hypotheses. On the one hand, we hypothesize that China trades more in both directions with countries hosting Chinese FDI than with those without Chinese FDI presence. On the other hand, we expect that in countries where China is active in FDI, higher levels of FDI are associated with higher Chinese exports and imports. For instance, China might invest in resource rich countries to extract natural resources, which could eventually be exported to China.

[1] The “going out” strategy started in 1999 with the main purpose that Chinese firms profited from the booming world trade, and, at the same time, from China’s admission to the World Trade Organization (in 2001). The USCC Staff Research Report (2011, p.5) defines this strategy as follows: “The essence of the “going global” strategy is to promote “the international operations of capable Chinese firms with a view to improving resource allocation and enhancing their international competitiveness”. Among other advantages, companies were granted tax rebates, and foreign exchange and financial assistance (USCC Staff Research Report, 2011).

The main results support both hypotheses. More specifically, we find that China exports more to destinations in which it is active in FDI and that higher FDI stocks are associated with increases in trade. In particular, an increase of 10 percent in FDI stocks increases exports (imports) by about 2.1 percent (1.1 percent).

The rest of the paper is structured as follows. Section 2 presents a review of the closely related literature. Section 3 describes the data and presents some stylized facts. Section 4 specifies the model, shows and discusses the main results and presents some robustness checks. Finally, Section 5 concludes.

2 Trade and FDI in the gravity model

Gravity models have been considered the workhorse of international trade in the recent decades and are a widely accepted empirical tool (Head and Mayer, 2014). These models have also been used to estimate the determinants of bilateral FDI and some authors estimate FDI and trade models simultaneously. In particular, Brouwer et al. (2008) estimated gravity models of trade and FDI separately for a sample of 28 European countries over the period 1990 to 2004 and find a positive and significant correlation between bilateral FDI and bilateral trade, when FDI is included as explanatory variable in the gravity model of trade. However, the authors do not tackle the problems related to missing data in FDI (around 50 percent), endogeneity of the FDI variable or reverse causality. In contrast to these authors, Egger (2001) estimated a system of simultaneous equations for trade and FDI using intra-EU bilateral flows from 1988 to 1996, allowing for the endogeneity of both exports and FDI variables in the system. He finds that, in line with the theoretical models of Helpman (1984) and Markusen and Maskus (1999), bilateral exports are an increasing function of outward FDI stocks. However, the effect is only statistically significant in the long run.

Chen et al. (2012) analyzed the relationship between outward FDI and exports of 15 Taiwanese manufacturing industries over the period from 1991 to 2007. The main results, obtained using random and fixed effects estimators, show the existence of complementarity between FDI and exports. Most of the abovementioned studies use lagged FDI values to control for the endogeneity of FDI in the trade equation, whereas lagged exports are used in the FDI equation. The reverse causality issue is also considered in Cheung and Qian (2009) who analyze the effect of Chinese exports as a determinant of Chinese outward FDI, also using the lagged value of exports to mitigate the endogeneity problem. They find that this relationship is positive and gets stronger when the host economies are developing countries. Also focusing on China, Caporale et al. (2015) analyzed China's trade with North America, Asia and Europe and its relationship with inward FDI. They found a positive relationship, stronger for the period after China joined the WTO. Their main concern is the endogeneity due to time-invariant variables, but they fail to account for the reverse causality problem that could arise by the inclusion of FDI in this setting. We differ from this study given that we focus on outward FDI and how it correlates with exports, and imports, plus employing econometric methods that aim to consider the correlation of the determinants of the different variables, and simultaneity issues. Moreover, we include all available countries for which there is data, regardless of the continent they belong to. A second

paper focused on China's trade is Yang and Martinez-Zarzoso (2014), which assessed the effect of the ASEAN-China trade agreement on sectoral trade. The authors found mainly net trade creation effects, but did not consider FDI as a control variable in their gravity model focusing exclusively on trade flows.

Some recent studies use firm level data to investigate the relationship between FDI and trade in Africa. In particular, Broadman (2007) using firm level data of the World Bank Africa Asia Trade Investment (WBAATI) survey and the World Bank's newly developed business case studies of Chinese firms in Africa, find that there are positive links between FDI and trade among Chinese firms involved in Africa. In particular, the attraction of investment for infrastructure and related services development seems to create "spillovers" on the continent. Moreover, intangible assets, such as technology transfer and transfer of managerial skills, which usually accompany FDI, also act as vehicles stimulating trade. Similar evidence is shown in Chen and Tang (2014). Applying propensity score matching techniques to compare firms that have similar characteristics ex-ante, the authors show that Chinese firms engaged in outward FDI export 0.6 log points more than firms that do not invest abroad. These results show that horizontal FDI from China complements firms' trade, consistent with the idea that exporting entails high fixed costs and that FDI helps reduce those fixed costs.

3 Data and stylized facts

We use bilateral FDI data from UNCTAD (2015), trade data from COMTRADE (2015) and gravity variables, namely distance between the capital cities (lnDist), colonial relationship (Colony),[2] common legal origin (Comleg),[3] and common language that is spoken by at least 9% of the population (Comlang)[4] from CEPII. Gross Domestic Product (GDP)[5] and population are from the World Development Indicators (2015), while the regional trade agreement (RTA) dummy is from De Sousa (2012)[6]. The bilateral investment treaty dummy variable (BIT) is created with information obtained from UNCTAD (2015). We use BIT ratification instead of BIT signature since the relevant date is the one in which the agreement enters into force; the same applies for the RTA variable. The sample includes 167 partner countries (see Table A1 in the Appendix) and cover the years from 2003 to 2012. Summary statistics for all the variables included in the analysis are shown in Table 1.

[2] Colony takes the value of 1 only for Mongolia.

[3] Legal origin is shared with 33 countries, most of them in Asia, Eastern and Central Europe.

[4] The variable takes the value of 1 for Mongolia and Singapore.

[5] Exports, imports, FDI and GDP data are measured in current US$.

[6] http://jdesousa.univ.free.fr/data.htm

Table 1. Summary Statistics

Variable	mean	p50	sd	min	max	N
Ln Exports	20.346	20.432	2.364	11.992	26.588	1481
Ln Imports	18.824	19.137	3.802	2.303	25.994	1471
Ln GDP	24.116	23.882	2.282	18.466	30.414	1481
Ln Population	15.796	15.933	1.844	9.909	20.936	1481
Ln Distance	9.030	9.076	0.497	7.063	9.858	1481
Ln FDI Stock	3.895	4.064	2.212	-0.693	9.746	1166
RTA	0.061	0	0.240	0	1	1481
Common Colony	0.006	0	0.078	0	1	1481
Common Legal System	0.176	0	0.381	0	1	1481
Common Language	0.012	0	0.110	0	1	1481
BIT	0.562	1	0.496	0	1	1481

Note: RTA denotes regional trade agreement and BIT bilateral investment agreement. They are computed for column (2) of Table 2.

Graphical inspection of the data shows that Chinese exports are significantly higher in destinations where China is also engaged in FDI (Figure 1) and Chinese outward FDI is positively correlated with Chinese exports (Figure 2), the same applies to imports (Figures 3 and 4).

Figure 1.Chinese Exports by FDI status

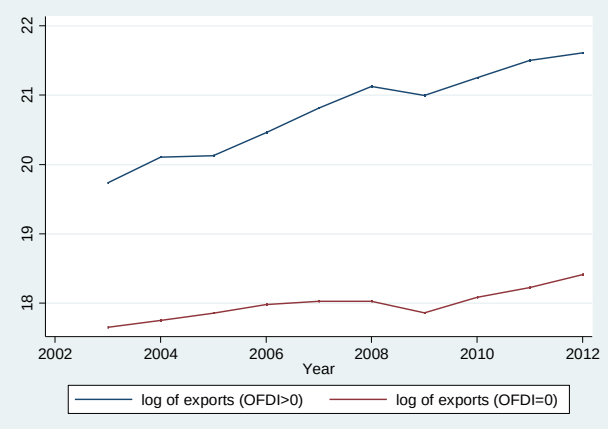


Figure 2.Chinese Exports and FDI

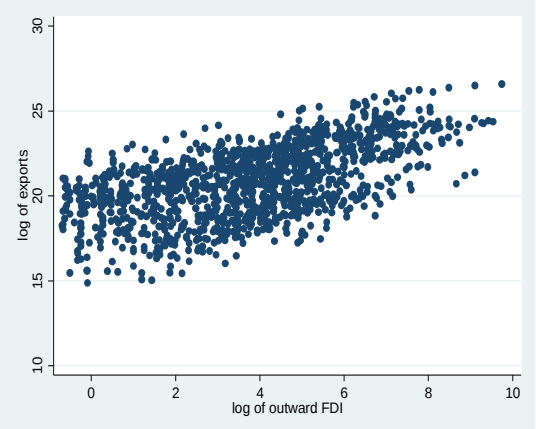


*Figure 3.*Chinese Imports by FDI status

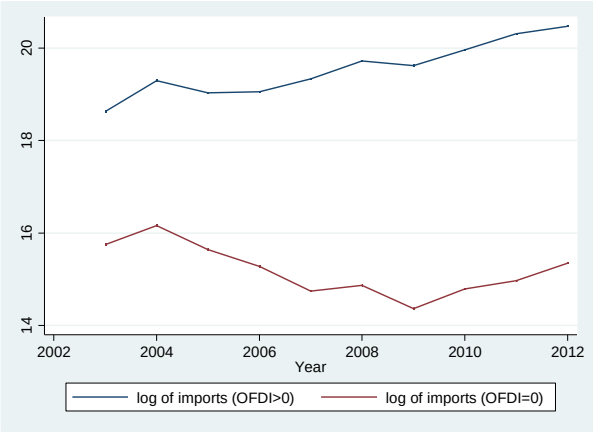
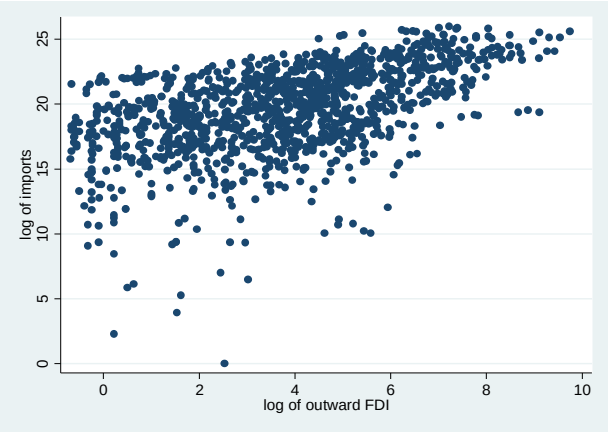


*Figure 4.*Chinese Imports and FDI



4 Model specification and estimation results

4.1 Model specification

We estimate a system of seemingly-unrelated gravity equations in which FDI, exports and imports are the endogenous variables and enter with one lag as explanatory variables. The model is specified as follows:

$$lnX_{jt} = \alpha_0 + \alpha_1 \ln(\max\{1, FDI_{jt-1}\}) + \alpha_2 \,\mathrm{NFDI}_{jt-1} + \alpha_3 \ln M_{jt-1} + \alpha_4 \ln GDP_{jt} + \alpha_5 \ln Pop_{jt} + \alpha_6 \ln Dist_{jt} + \alpha_7 Colony_j + \alpha_8 Comleg_j + \alpha_9 Comlang_j + \alpha_{10} RTA_{jt} + \sum_{t=1}^{T-1} \delta_t + \sum_{i=1}^{I-1} \rho_i + u_{jt} \quad (1)$$

$$lnM_{jt} = \beta_0 + \beta_1 \ln(\max\{1, FDI_{jt-1}\}) + \beta_2 \mathrm{NFDI}_{jt-1} + \beta_3 \ln X_{jt-1} + \beta_4 \ln GDP_{jt} + \beta_5 \ln Pop_{jt} + \beta_6 \ln Dist_{jt} + \beta_7 Colony_j + \beta_8 Comleg_j + \beta_9 RTA_{jt} + \beta_{10} Comlang_j + \sum_{t=1}^{T-1} \theta_t + \sum_{i=1}^{I-1} \vartheta_i + \mu_{jt} \quad (2)$$

$$\ln(\max\{1, FDI_{jt}\}) = \gamma_0 + \gamma_1 lnX_{jt-1} + \gamma_2 \ln M_{jt-1} + \gamma_3 \ln GDP_{jt} + \gamma_4 \ln Pop_{jt} + \gamma_5 \ln Dist_{jt} + \gamma_6 Colony_j + \gamma_7 Comleg_j + \gamma_8 Comlang_j + \gamma_9 BIT_{jt} + \sum_{t=1}^{T-1} \pi_t + \sum_{i=1}^{I-1} \varphi_i + v_{jt} \quad (3)$$

where j denotes the partner country and t the year. δ_t, θ_t and π_t are time dummies, while ρ_i, ϑ_i and φ_i are regional dummies. Regional dummies account for multilateral resistance factors and the time dummies account for common trends in Chinese exports, imports and FDI. Given the existence of zeros in the FDI variable,[7] we follow Martinez-Zarzoso et al. (2017) and Wagner (2003) and create a dummy to account for the absence of FDI and another variable to measure the impact of the level of the observed FDI. The effect of FDI is then specified in the following way:

$$\alpha_1 \ln(\max\{1, FDI_{jt}\}) + \alpha_2 \,\mathrm{NFDI}_{jt} = \begin{cases} \alpha_1 \ln FDI_{j,t} & when \;\; FDI_{j,t} > 0 \\ \alpha_2 & when \;\; FDI_{j,t} = 0 \end{cases} \quad (4)$$

[7] The amount of zero values for outward FDI is 23% for exports and 24% for imports.

Thus, $\alpha_1(\beta_1)$ measures the elasticity where FDI is positive and $\alpha_2(\beta_2)$ modifies the constant term when FDI is zero. $FDI_{j,t-1}$ denotes the lagged value of outward Chinese FDI stock in country j and period *t*–1 and NFDI is a dummy variable that takes the value of one when the FDI stock is zero in country *j* and time *t*.

4.2 Main results

The main results using equations (1)–(3) are shown in Table 2. Column 1 reports the results for exports (eq.1), column 2 for imports (eq.2) and column 3 for FDI (eq. 3). We observe a positive and statistically significant effect of FDI on exports and imports. For instance, increasing FDI to a host country by 10 percent, increases Chinese exports by 2.14 percent and imports by 1.12 percent (column 1 and 2, Table 2). We can use this elasticity to calculate how much export (imports) should increase per dollar of FDI according to our results. Each dollar of additional FDI yields on average an additional USD 4.63 of exports (USD 2.09 of imports).[8] The results in column 3 indicate that increases in the volume of exports and imports also foster Chinese FDI outflows significantly.

Concerning the no-FDI dummy (NFDI), the coefficient, which is –0.214 in column 1 (–0.397 in column 2), should be interpreted as follows. Logged exports (imports) when FDI is positive exceed logged exports (imports) when FDI is zero by 0.214*lnFDI+0.214 (0.112*ln FDI+0.397). In Figure 5 and Figure 6 we can observe the "excess" of log exports or imports, for the amount invested, compared to a scenario of no investment. For smaller amounts of FDI, the presence of FDI generates higher "excess returns" for imports than for exports, but the situation is the opposite for investments above 6 millions of USD.

As regards the control variables, the coefficient of the GDP of China's trading partners is positive and statistically significant, in the export and import equations (columns 1 and 2) as the gravity model predicts. The population coefficient is positive for Chinese exports and FDI and negative for imports, indicating that the size of the destination market is associated to higher exports and more FDI but with a reduction of Chinese imports. Among the time-invariant gravity variables, colony, sharing a common legal origin and sharing a common language show the expected positive effect on imports and FDI, but the effect in not always statistically significant, e.g. in the export equation for the former two variables. It is interesting to notice that Chinese exports are explained mainly by market size variables (GDP and population) and common language of ethnic groups, while imports are more sensitive to historical and cultural links (colonial relationship and sharing a common legal origin) and regional trade agreements. Distance has an unexpected positive effect on imports, which indicates that imports are higher from far away destinations, perhaps indicating that the continental dummies do not fully capture multilateral resistance factors.[9]

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[8] These figures are obtained using the sample means of exports, imports and FDI (i.e. (Mean exports/Mean FDI)*α_1).

[9] In auxiliary regressions that include interactions of the distance variable with the continental dummies, results show that the positive distance effect obtained in the import regression is mainly driven by the interactions with the Africa and Latin America dummy variables.

Table 2. Results with Seemingly Unrelated Regressions

	(1) Ln Exports	(2) Ln Imports	(3) Ln (max{1, FDI_{jt}}
Ln (max{1, FDI_{jt-1}}	0.214***	0.112***	
	(0.018)	(0.036)	
$NFDI_{jt-1}$	-0.214**	-0.397***	
	(0.074)	(0.151)	
Ln $Exports_{jt-1}$		0.428***	0.664***
		(0.051)	(0.042)
Ln $Imports_{jt-1}$	0.084***		0.118***
	(0.012)		(0.021)
Ln GDP_{jt}	0.533***	1.131***	-0.132**
	(0.031)	(0.063)	(0.061)
Ln $Population_{jt}$	0.072***	-0.119**	0.109***
	(0.024)	(0.049)	(0.042)
Ln $Distance_{j}$	-0.053	1.181***	-0.750***
	(0.109)	(0.217)	(0.183)
RTA_{jt}	-0.037	1.457***	
	(0.119)	(0.239)	
$Colony_{j}$	0.0374	4.409***	1.765***
	(0.337)	(0.665)	(0.572)
$Comleg_{j}$	-0.039	0.792***	0.417***
	(0.087)	(0.172)	(0.153)
Common $Language_{j}$	0.823***	0.275	0.826**
	(0.239)	(0.483)	(0.395)
BIT_{jt}			0.416***
			(0.116)
Observations	1,471	1,471	1,471
R-squared	0.844	0.771	0.596
Year Dummies	YES	YES	YES
Continental Dummies	YES	YES	YES

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The default for the continental dummies is Africa.

Figure 5. FDI and Exports

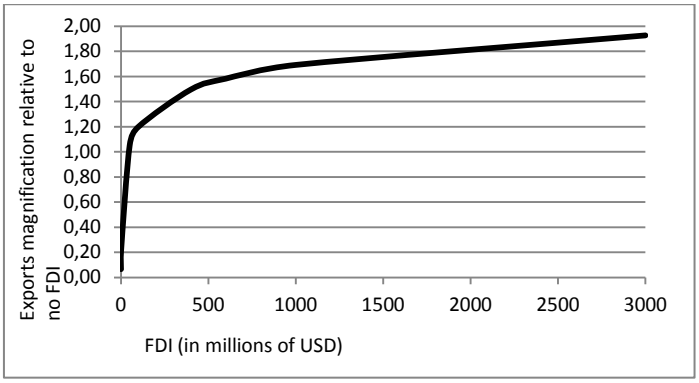
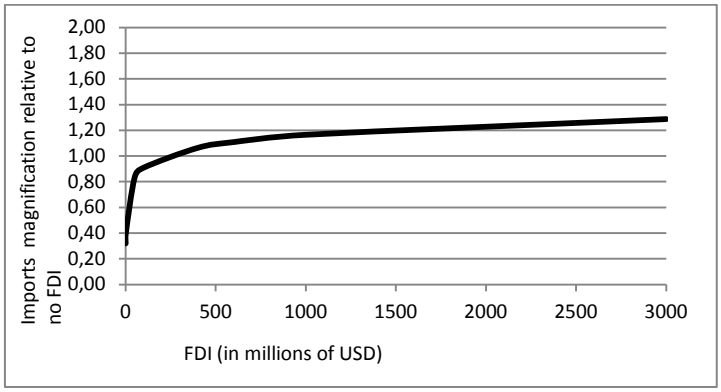


Figure 6. FDI and Imports



Concerning the RTA dummy, it indicates that entering into trade agreements promotes Chinese imports in the period considered. Finally, the BIT dummy in equation (3) has a positive and significant coefficient indicating that China invests around 52 percent more in host countries with whom it has signed a BIT than in non-signatory countries.

In Table 3 we can see the correlation matrix of the residuals. Since the null hypothesis of no correlation among the residuals is rejected, the SUR methodology improves the estimation over the Ordinary Least Squares.

Summarizing, the main results show that both hypotheses are confirmed. China exports less to (import less from) destinations with zero FDI, and an increase of 10 percent in FDI stocks increases exports by 2.1 percent (imports by 1.1 percent).

Table 3. Correlation Matrix of Residuals

	Ln Exports	Ln Imports	Ln FDI
Ln Exports	1		
Ln Imports	–0.107	1	
Ln FDI	–2.204	–0.083	1

Breusch-Pagan test of independence: chi2(3) = 88.128, Pr = 0.000

4.3 Robustness

As a robustness test, we estimate independently each equation (outward FDI, exports and imports) and instrument the two variables that are potentially endogenous (as instruments in each specification we use the corresponding variable lagged two periods). The Hansen test statistics (see last row of Table 4) indicate that the overidentifying restrictions are valid. Moreover, we estimated a Dynamic OLS model and the results also corroborate the main findings obtained in the paper.[10]

[10] Results are available upon request. Unfortunately, given the short time span of the data, unit root tests could not be conducted. Hence, the results from these models should be interpreted with caution.

Table 4. Results with Instrumental Variables

	(1)	(2)	(3)
	Ln Exports	Ln Imports	Ln (max{1, FDI_{jt}}
Ln (max{1, FDI_{jt-1}}	0.149***	0.0917***	
	(0.0175)	(0.0338)	
Ln Exports $_{jt-1}$		0.333***	0.459***
		(0.0756)	(0.0551)
Ln Imports $_{jt-1}$	0.0828***		0.107***
	(0.0203)		(0.0310)
Ln GDP_{jt}	0.600***	1.279***	0.103
	(0.0429)	(0.0748)	(0.0741)
Ln $Population_{jt}$	0.0739***	-0.0788	0.117***
	(0.0260)	(0.0600)	(0.0453)
Ln Distance $_{j}$	-0.187*	1.149***	-0.598***
	(0.101)	(0.243)	(0.168)
RTA_{jt}	-0.0127	1.561***	0.739***
	(0.0891)	(0.178)	(0.181)
Colony $_{j}$	0.173	4.800***	2.490***
	(0.173)	(0.310)	(0.269)
Comleg $_{j}$	0.0439	0.906***	0.420***
	(0.0810)	(0.152)	(0.161)
Common Language $_{j}$	0.984***	0.330	0.597*
	(0.110)	(0.224)	(0.330)
BIT_{jt}			0.448***
			(0.129)
Observations	1,299	1,325	1,299
R-squared	0.847	0.781	0.608
Year Dummies	YES	YES	YES
Continental Dummies	YES	YES	YES
Instrumented variable 1			
F-test	1956.37	1956.84	11188.71
Kleibergen-Paap rk Wald Statistic	229.640	330.812	229.487
Hansen J-Statistic (P-value)	0.233	0.438	0.433
Instrumented variable 2			
F-test	282.57	1026.20	258.23
Kleibergen-Paap rk Wald Statistic	229.640	330.812	229.487
Hansen J-Statistic (P-value)	0.233	0.438	0.433

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The default for the continental dummies is Africa.

Finally, we estimated the model using a between estimator[11] and the main results are shown in Table 5. Some authors argue that the estimated elasticities could be interpreted as long-run

[11] We have estimated three independent regressions with country fixed effects. Results are included in the appendix (Table A2) and show that the coefficients are imprecisely estimated, most likely due to the lack of sufficient within-country variation over time. For this reason, and also to be able to estimate the coefficients of the variables that vary by destination/origin, we refrain from using this as the main specification. The main limitation of using continental

Table 5. Main Results with Between Estimator (1)–(3) and Between-SUR Estimator (4) to (6)

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln Exports	Ln Imports	Ln (max{1, FDI_{it}}	Ln exports	Ln Imports	Ln (max{1, FDI_{it}}
Ln (max{1, FDI_{jt-1}}	0.165***	0.0818		0.349***	0.167	
	(0.0607)	(0.138)		(0.0688)	(0.143)	
$NFDI_{it-1}$	-0.285	-0.471		-0.0458	-0.535	
	(0.381)	(0.697)		(0.311)	(0.632)	
Ln $Exports_{it-1}$		0.257	0.426***		0.597***	0.686***
		(0.199)	(0.132)		(0.155)	(0.104)
Ln $Imports_{it-1}$	0.0816		0.111	0.155***		0.129**
	(0.0528)		(0.0675)	(0.0399)		(0.0550)
Ln GDP_{it}	0.590***	1.310***	0.0576	0.395***	0.972***	-0.251*
	(0.121)	(0.209)	(0.182)	(0.0945)	(0.183)	(0.145)
Ln $Population_{it}$	0.0751	-0.0526	0.126	0.0649	-0.118	0.0635
	(0.0766)	(0.168)	(0.108)	(0.0696)	(0.137)	(0.0965)
Ln $Distance_{j}$	0.0384	1.970***		0.00175	1.243**	-0.776*
	(0.349)	(0.704)		(0.310)	(0.605)	(0.410)
RTA_{jt}	-0.0195	1.162	-0.799*	-0.174	1.936**	
	(0.331)	(0.798)	(0.429)	(0.424)	(0.848)	
$Colony_{j}$	0.312	4.937***	2.003***	-0.516	4.148**	1.100
	(0.500)	(0.944)	(0.619)	(0.977)	(1.889)	(1.318)
$Comleg_{j}$	0.0234	0.861*	0.396	-0.137	0.730	0.213
	(0.226)	(0.437)	(0.402)	(0.251)	(0.490)	(0.354)
Common $Language_{i}$	0.927**	0.261	1.181	0.588	-0.275	0.618
	(0.365)	(0.763)	(1.372)	(0.698)	(1.388)	(0.908)
BIT_{it}			0.597*			0.424
			(0.342)			(0.271)
Observations	1,481	1,485	1,481	167	167	167
R-squared	0.865	0.817	0.644	0.863	0.817	0.629
Continental FE	YES	YES	YES	YES	YES	YES
Partner	ALL	ALL	ALL	ALL	ALL	ALL

Standard errors in parentheses. Columns (1) to (3) have robust (jack-knife) standard errors.*** p<0.01, ** p<0.05, * p<0.1. Columns (1) to (3) are the results of running a between estimator and columns (4) to (6) from running a SUR regressions but using time-averages of the variables of interest. The default for the continental dummies is Africa.

fixed effects could be that we are not accounting for all the unobserved heterogeneity that is time invariant and country specific, which could be correlated with the error term in the estimated model. The main results are robust in Table A3, where we have estimated a feasible generalized least squares model with continental dummies and country RE, allowing for panel specific autocorrelation.

effects (Stern, 2010). Basically, the model is estimated for the time-averages of the variables and it does not make a priori assumptions concerning the nature of the time effects. Hence, in real world data situations, with this estimator we are likely to obtain estimates that are robust to misspecification of dynamics.

The first part of Table 5 shows the results obtained when the three equations (for exports imports and FDI) are considered independent, whereas the second part shows the results when we allow for unrestricted correlation between the error terms of the three equations (BE-SUR). The main results indicate that higher Chinese FDI induces higher exports from China in the long-run (column 1, Table 5), and the same can be said with respect with higher exports inducing higher outward FDI (column 3, Table 5). However, the coefficient of lagged imports (exports) is not statistically significant in column 1 (column 2), but turns significant and positive when accounting for the correlation across error terms in column 4 (column 5). Results in column 6 also confirm that higher imports (exports) from China attract more FDI from the same country (column 4) in the long-run. The estimated coefficients are higher in magnitude when the BE-SUR estimator is used, indicating a downward bias in the estimations shown in the first part of Table 5.

5 Conclusions

In the 2000s, China has been actively investing abroad, becoming the third largest investor in the world. Many have challenged the benefits of the Chinese investments in the local economies. For instance, Adisu et al. (2010) find that Chinese investments have negatively impacted internal trade. However, other authors highlight also some benefits as for example increasing trade and investment in a continent that was systematically marginalized in the past from international flows of goods and capital (Zafar, 2007).

In this paper, using a system of seemingly unrelated gravity equations for exports, imports and FDI we show that FDI appears to be complementary to Chinese exports and imports. These results are also robust to an instrumental variable approach. Chinese FDI – despite being correlated to higher imports from China – is also associated to higher exports to China.

The findings are of relevance to the wider FDI literature in that some evidence of the complementarity between FDI and trade is found for the Chinese case. This supports the general view that FDI and trade are mutually reinforcing channels and also sources of economic development and prosperity.

Future work entails the analysis of different product groups to investigate the potential heterogeneity of the relationships and to extend the analysis to trade in services.

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Appendix

Table A1. List of Countries

Afghanistan	Canada	Gambia	Kuwait	Niger	Sri Lanka
Albania	Cape Verde	Georgia	Kyrgyzstan	Nigeria	Suriname
Algeria	Central African Republic	Germany	Laos	Norway	Swaziland
Angola	Chad	Ghana	Latvia	Oman	Sweden
Antigua and Barbuda	Chile	Greece	Lebanon	Pakistan	Switzerland
Argentina	Colombia	Grenada	Lesotho	Palau	Tajikistan
Armenia	Comoros	Guatemala	Liberia	Panama	Tanzania
Australia	Congo	Guinea	Libya	Papua New Guinea	Thailand
Austria	Congo, Democratic Republic	Guinea-Bissau	Lithuania	Paraguay	Togo
Azerbaijan	Costa Rica	Guyana	Luxembourg	Peru	Tonga
Bahamas	Croatia	Haiti	Madagascar	Philippines	Trinidad and Tobago
Bahrain	Cyprus	Honduras	Malawi	Poland	Tunisia
Bangladesh	Czech Republic	Hungary	Malaysia	Portugal	Turkey
Belarus	Denmark	Iceland	Maldives	Qatar	Turkmenistan
Belgium	Djibouti	India	Mali	Romania	Uganda
Belize	Dominica	Indonesia	Malta	Russian Federation	Ukraine
Benin	Dominican Republic	Iran	Mauritania	Rwanda	United Arab Emirates
Bhutan	Ecuador	Ireland	Mauritius	Samoa	United Kingdom
Bolivia	Egypt	Israel	Mexico	Sao Tome and Principe	United States
Bosnia and Herzegovina	El Salvador	Italy	Moldova	Saudi Arabia	Uruguay
Botswana	Equatorial Guinea	Ivory Coast	Mongolia	Senegal	Uzbekistan
Brazil	Eritrea	Jamaica	Morocco	Seychelles	Vanuatu
Brunei	Estonia	Japan	Mozambique	Sierra Leone	Venezuela
Bulgaria	Ethiopia	Jordan	Namibia	Singapore	Vietnam
Burkina	Fiji	Kazakhstan	Nepal	Slovakia	Yemen
Burundi	Finland	Kenya	Netherlands	Slovenia	Zambia
Cambodia	France	Kiribati	New Zealand	South Africa	Zimbabwe
Cameroon	Gabon	Korea, South	Nicaragua	Spain	

Table A2. Results with Fixed Effects Estimator

	(1) Ln Exports	(2) Ln Imports	(3) Ln (max{1, FDI_{it}}
Ln (max{1, FDI_{it-1}}	-0.0234	-0.0724	
	(0.0208)	(0.0532)	
$NFDI_{it-1}$	-0.0772	-0.0176	
	(0.0549)	(0.162)	
Ln $Exports_{it-1}$		0.164	0.0108
		(0.139)	(0.109)
Ln $Imports_{it-1}$	0.000133		-0.0295
	(0.0133)		(0.0299)
Ln GDP_{it}	0.850***	0.350	0.681**
	(0.114)	(0.259)	(0.315)
Ln $Population_{jt}$	0.457	0.785	0.215
	(0.382)	(0.682)	(0.788)
RTA_{jt}	-0.155*	-0.0585	
	(0.0786)	(0.139)	
BIT_{jt}			-0.428
			(0.281)
Constant	-6.781	-4.421	-15.09
	(5.881)	(9.744)	(12.28)
Observations	1,481	1,485	1,481
R-squared	0.799	0.312	0.564
Year Dummies	YES	YES	YES

Standard errors in parenthesis, clustered at the country-level.*** p<0.01, ** p<0.05, * p<0.1.

Table A3. Results with Feasible Generalized Least Squares (with continental dummies and country RE allowing for panel specific autocorrelation)

	(1) Ln exports	(2) Ln imports	(3) Ln (max{1, FDI_{it}}
Ln (max{1, FDI_{jt-1}}	0.0359***	0.0280**	
	-0.00705	-0.0131	
$NFDI_{jt-1}$	-0.0843***	-0.0621	
	-0.0248	-0.0452	
Ln $Exports_{it-1}$		0.258***	0.147***
		(0.0340)	(0.0231)
Ln $Imports_{it-1}$	0.0286***		0.0212***
	(0.00594)		(0.00809)
Ln GDP_{it}	0.790***	1.148***	0.318***
	(0.0195)	(0.0457)	(0.0471)
Ln $Population_{jt}$	0.116***	0.126***	0.238***
	(0.0191)	(0.0443)	(0.0435)
Ln $Distance_{j}$	-0.284***	0.682***	-0.220
	(0.0837)	(0.170)	(0.196)
$Colony_{i}$	0.956***	3.932***	3.406***
	(0.128)	(0.280)	(0.267)
$Comleg_{j}$	0.103**	0.842***	0.528***
	(0.0523)	(0.120)	(0.164)
Common $Language_{i}$	1.638***	1.707***	2.308**
	(0.215)	(0.147)	(1.103)
RTA_{jt}	-0.0417	0.260***	
	(0.0388)	(0.0724)	
BIT_{jt}			0.204***
			(0.0790)
Constant	1.659*	-21.99***	-7.857***
	(0.864)	(1.778)	(1.952)
Observations	1,481	1,485	1,481
Number of countries	167	167	167

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Additional Material – Data sources

(retrieved in 2015, therefore some discrepancies might arise due to updates in the data if downloaded as of now)

- Exports and imports were retrieved from https://comtrade.un.org/ (as reported by China).

- Outward foreign direct investment stock data (in US$) were retrieved from https://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics-Bilateral.aspx. Reporter country is China.

- Gross Domestic Product (GDP, in current US$) and population were compiled from the World Development Indicators, retrieved from http://datatopics.worldbank.org/world-development-indicators/.

- Distance between capital cities, and dummies that take the value of 1 if the two countries where ever in colonial relationship, have a common legal origin or if a language is spoken by at least 9% of the population in both countries were retrieved from:
http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele.asp, especially from the GeoDist dataset

- Regional Trade Agreement's data was obtained from:
http://jdesousa.univ.free.fr/data.htm#RegionalTradeAgreements

- Bilateral Investment Treaties was obtained from:
https://investmentpolicyhub.unctad.org/IIA/CountryBits/42#iiaInnerMenu

Tables 2 and 3

Results in these tables were obtained using the Stata command "sureg", options "small dfk cor".

Table 4

Results in this table were obtained using the (user written) Stata command "ivreg2", options "first robust".

Table 5

Results in this table were obtained using the Stata command "xtreg", options "be vce(jack)" (first three columns) and using the Stata command "sureg", options "small dfk cor" for the last three columns.

Appendix Table A2

Results in this table were obtained using the Stata command "xtreg", options "fe clust(countries)". Here "countries" denote the partner countries of China.

Appendix Table A3

Results in this table were obtained using the Stata command "xtgls", options "panels(h) corr(psar1) force".

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