Chinese FDI and its effect on trade for the five African countries Angola, Nigeria, South Africa, Zambia and Zimbabwe

Master thesis 1 by Mikael Lagging

Lund University School of Economics and Management

Supervisor Katariina Nilsson Hakkala

Essay seminar 23-27/8 2021

LUND UNIVERSITY

Abstract

This thesis evaluates the effect of Chinese Foreign direct investment (FDI) on exports and imports for the five African countries: Angola, Nigeria, South Africa, Zambia and Zimbabwe using the gravitational model. The gravitational model will analyze how both inward FDI investments and Chinese investments impact import and export by using a sample of 166 partner countries over the period 2003-2012. The reverse causality effect will also be accounted for because of endogeneity in dependent variables. The results indicate that Chinese FDI have a weak or no impact on imports and exports of the African countries, which differs from previously reported research. However, more studies examining detailed trade data on product level and the potential connection with FDI are needed to further explain the complex relation between Chinese FDI and exports and imports to the five African countries.

1. Introduction

Attracting foreign direct investment (FDI) and international trade is crucial for a developing nation to commence economic growth and become an emerging market. FDIs provide the necessary capital to enhance the efficiency in productivity, evolve better infrastructure, create technology spillovers, and increase wages. In accordance, studies in Africa suggests that trade reforms could potentially boost trade flows in the region with better quality of transportation and improved communication infrastructure. China has in recent years played an increasingly pivotal role as an investor in African infrastructural development. Typical investments include hydropower, roads, and railways with up to 35 African partner nations. Chinese firms are highly competitive and in 2008 it was reported that 50% of public tenders for procurement of new work projects in Africa were awarded to these firms. Trade between the two continents rose from 10.6 billion US dollars in 2000 to 148.96 billion in 2016. However, concerns have arisen with the ever-increasing Chinese presence in the region. Are Chinese trade incentives mutually beneficial for both parties? Commodities trade flow numbers suggest an imbalance in trade with China exporting manufactured and capital-intensive commodities, whereas Africa exports natural resources. The theory of the resource curse suggests countries dependent on minerals, hydrocarbons and oil miss out on innovations and sufficient development in the manufacturing sector, which is the strongest factor for economic growth. Previous studies from other regions suggest that Chinese exports significantly increase when China engages in FDI. If this is true, is this also the case in Africa? Does Chinese FDI negatively impact on exports and imports for African countries?

This master study will investigate the effect of Chinese FDI on exports and imports in five African countries: Angola, Nigeria, South Africa, Zambia and Zimbabwe. A gravitational model will be used to analyze how inward FDI investments and Chinese investments impact export and import flows of the African countries. The reversed causality effect is also measured because of endogeneity in dependent variables. Trade leads to more FDI, when trading partners seek to decrease transport costs, making trade more efficient. These studies results indicate that Chinese FDI impact both imports and exports negatively for the five African countries, which differs from previously reported research, where both Broadman in 2007 and Abeliansky and Martinez-Zarzoso in 2019 noted Chinese FDI having positive effect on trade in Africa.

The paper is structured in nine sections starting with a brief background describing varies links between FDI and trade, trade patterns between China and the five specified countries. The study continues with a theory part, outlining potential problems associated with narrowed export focus where a resource curse can change a countries trade patterns in both a short- or long run perspective. The gravitational model is described and how it can help understand the fundaments affecting trade. This initial section is followed by a chapter highlighting previous research in the field, were FDI links with trade has been measured through different regression methods and in varies regions. A chapter is also included about data and descriptive statistics followed by empirical specification, where all variables included in the gravitational model are explained as well as how the regression analysis has been tested. In section seven, estimation results from various regression specifications are presented and carefully discussed. This results section is followed by a discussion on the impact of Chinese FDI on trade as well as by a conclusion.

2. Background

2.1 Development through foreign direct investment (FDI) and trade

Attracting foreign direct investment (FDI) and international trade are key components for a developing country to emerge and commence economic growth (Rao and Dhar 2018). FDI and trade offer the host country opportunities for growth and development either directly or indirectly through financial capital and transfer of technology. FDI supplies the necessary tools which contributes to higher average wages, higher productivity and more domestic investment in host country (Dunning and Lundan 2008). Indirect spillover and linkage effects of FDI are increased demand for intermediate inputs, intentional knowledge transfer to local partners, labor mobility and demonstration effects (Halaszovich and Kinra 2020). Increasing knowledge transfer and financial capital were also found to be positive consequence of international trade (Araújo and Salerno 2015).

A country can be integrated in the global economy by both FDI and tradelinks with other countries. It is relevant for an emerging economy to have sufficient and efficient logistics systems for trade, which "facilitate the mobility of products, ensuring their safety and speed as well as providing cost reductions when trading among countries" (Marti et al. 2014 a, b). Examples of efficient infrastructure include ports, customs regulations and information technology. Studies in Africa have suggested that trade facilitation reforms could potentially boost trade flows in the region (Iwanow and Kirkoatrik 2009). The same findings indicated that aside from regulatory reformation, quality of transportation and communication infrastructure need to be upgraded to strengthen trade performance. Logistics systems have been proven to facilitate international trade and recent findings also underline the importance of infrastructure as a pivotal component to stimulate trade. Logistics infrastructure increase the mobility of products as well as reduce the cost of transportation, thus diminishing the loss on trade activities.

FDI in comparison with contract-based international business activities, i.e., trade, ensures and constitutes a long-term engagement between a firm and host country. The firm gets exposed to a great risk but also a large profit potential, if it can reap earnings from the investment (dunning and Lundan 2008). Foreign investors in sub-Saharan Africa often are confronted with high business transaction costs caused by accountability and capacity issues, defective factor markets, inadequate financial institutions, weak judiciaries, irregular contract enforcement and poor infrastructure. Infrastructure needs include hydroelectric dams, public transport, roads, public schools, jails, hospitals, telecommunication, public housing, and factories (Zongwe 2010). While sharp contrasts exist between African countries, the issue of infrastructural deficiencies stagnate economic growth in many African nations.

2.2 Chinese FDI and trade with Zimbabwe, Zambia, Angola, Nigeria and South Africa

China plays a vital role in infrastructure development in Africa by investing in hydropower generation, roads and railways. Up to 35 African countries are engaged in major infrastructure agreements with China, and the biggest recipients are Angola, Ethiopia, Nigeria and Sudan. Chinese firms are highly competitive and in 2008 it was reported that they were awarded 50% of all new public works project in Africa. In Africa some states present foreign investors with a variety of risk when the countries suffer from political instability. The Chinese government is tackling this problem by backing and insuring Chinese firms interested in FDI. Hence, Chinese firms often display a greater risk tolerance than other potential investors (Zongwe 2010), and often focus FDI towards the African mining sector.

China is a top investor in Zimbabwe's tobacco sector, were the country stood for 1.6 billion US dollars annual in the revival and expansion of leaf tobacco production. Furthermore, China has also invested steadily in Zimbabwe's energy sector, expanding the countries two major power plants with 2 billion US dollars (Xinhua 2021) and China also invested in infrastructure projects in sectors including transportation, telecommunications, manufacturing and energy (Xinhua 2020). China have a keen interest in Zimbabwe mining and alloy smelting company, one of the country's largest chrome-mining company and China also invest heavily in gold, platinum and diamonds, giving them major influence over Zimbabwe's mineral industry in general (Chinembiri 2020).

In 2006 to 2007, China exported products worth 105 million US dollars and 215 million US dollars to Zimbabwe and Zimbabwe exported 237 million US dollars to China in 2010. Major exports to China from Zimbabwe include iron and steel, salts and Sulphur, tobacco, machinery and mechanical appliances, ore slag and ash and agricultural products. The principal main imports from China are, machinery and mechanical appliances, vehicles, organic chemicals articles of iron or steel and plastic and chemical products (Vhumbunu 2018).

Since 2014, 19 infrastructure projects have been built in Zambia with Chinese loans amounting to 9 billion dollars. China's primary ambition in Zambia is the copper industry. The country being the world's largest consumer of copper fits perfectly with Zambia being the second largest producer of copper. Trade between the two nations has grown between 2003 and 2009 and during the same period 98% of the investment targeted the mining and manufacturing sector in Zambia. Zambia reliance on copper as its primary commodity has weakened the economy when is fails to diversify its export portfolio (Orr 2020). In 2008 trade with China accounted for 19.7 percent of Zambia's total trade with the world, making China the second largest trading partner. In 2012 and 2013, Zambia imported products with a worth of 928 million US dollars and 950 million US dollars respectively from china and exported products worth of 1.8 billion dollars and 2.3 billion dollars in 2013 to China (Haggai 2017).

Reviewing 17 years of Chinese investments in Angola, Chinese officials in Angola proclaimed that they had helped to build and repair roadways, railways, social houses, schools and hospitals. China has a fundamental role in Angola's economy since being the major creditor and biggest commercial partner. Since 2007, China has been an important partner in terms of crude oil export. As total crude oil exports decrease in Angola, the percentage to China continues to rise. In 2018, 65% of crude oil exports were distend to the great country in the east and in the first quarters of 2019, that percentage increased to 68 percent (Ferreira 2019).

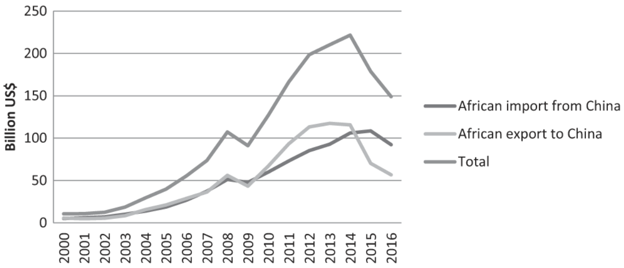
Angola's main exports are diamonds, oil, timber, and other important mineral resources. Since 2008, Angola has been the top oil producer in Africa and in 2009 oil stood for 85 percent of total GDP, a total of 95% of exports. In the late 1980s, with the signing of the first Chinese and Angolan trade agreement in 1984 and trade commission in 1988, bilateral trade has increased ever since. In 2017, bilateral trade exceeded 120 billion US and Angola is China's largest trading partner on the African continent. The single most important commodity for the Sino-African economic relationship has been crude oil (Zhao 2011).

Nigeria received 70 percent of the total 87 billion US dollars from China to West Africa. Out of this amount 80 percent went to the oil industry. Many African countries are dependent on industrial import from China in exchange for their low value primary produce (Raji and Ogunrinu 2018). Five percent of Chinese FDI stocks in Africa and 4.6 percent of FDI inflow in 2019 went to Nigeria. Trade data since 2003 has increased from 1.86 US billion dollars to 20 billion US dollars in 2019. Nigeria sells crude oil to China and in return Nigeria buys manufactured goods (Oshodi and Uzodike 2021). In addition to the oil sector, Nigeria is one of Africa's most important telecom marketing providers hosting the two biggest firms in the sector on the continent. The two Chinese companies Huawei and ZTE is dominating Nigerian telecom market. Chinese are also invested in infrastructure projects such as construction of railways, hydropower plants, roads and airports across the country (Bogale 2017).

South Africa is the largest recipient of Chinese FDI in Africa with total inflow of 2.3 billion USD in 2009 and 4.1 billion USD in 2011. Chinese investments are spread across varies sectors such as finance, mining and infrastructure. The mineral sector is the major area were Chinese investors contribute with FDI. Biggest investment in the sector is buying 25% share of Wesizwe, South African Platinum Mining Company and Chinese investors also owns share in two other major mining companies. The major non-mineral sector of Chinese investment in South Africa is the finical sector where 20% share of the South African's standard bank was bought by Chinese state bank for 5.6 billion USD in 2007 (Bogale 2017). Since 2001, bilateral trade with China has grown rapidly with imports worth less than 1.1 billion US dollars in 2001 to imports worth 14.2 billion US dollars in 2011. Exports to China increased from 0.5 billion US dollars to 12.4 billion US dollars over the same period. South Africa exports mainly raw materials, whereas china exports manufactured products (Edwards and Jenkins 2014).

2.3 Overall Sino-African trade

The total trade between China and Africa has increased at an exponential rate. Trade in 2000 amounted to 10.6 billion US dollars and reached 148.96 billion in 2016. In 2015 African trade with China resulted in 70.26 billion US dollars in exports and 108.54 billion US dollars in imports. In 2016 imports from China decreased by 19.3%, but imports remained greater than exports (Guan, Kwee, Ip and Sheoung 2019).



Source(s): National Bureau of Statistics of China

Figure 1. Development of Sino-African trade (2000-2016)

China has engaged in trade with most of the African countries, yet some being more favored than others. As seen in Table 1, South Africa was the greatest African trading partner with China in 2016 with a trade volume of 35.08 billion US dollars, followed by Angola with 15.65 billion US dollars, and Egypt with 10.99 billion US dollars. South Africa's total exports to China amounted to 22.23 billion US dollars whereas total imports were 12.85 billion (Guan, Kwee, Ip and Sheoung 2019).

Table 1. Top 10 Sino-African trade partners (2016)

Country	Total trade (billion USD)	Import (billion USD)	Export (billion USD)
South Africa	35.08	12.85	22.23
Angola	15.65	1.68	13.97
Egypt	10.99	10.44	0.55
Nigeria	10.62	9.72	0.91
Algeria	7.98	7.65	0.33
Ghana	5.98	4.67	1.31
Kenya	5.69	5.59	0.10
Tanzania	3.88	3.57	0.32
Ethiopia	3.63	3.21	0.42
Morocco	3.63	3.08	0.55
Dem. Rep. of the Congo	3.08	0.99	2.08
Congo	3.07	0.74	2.33
		Source	National Bureau of Statistics of China

Sino-African trade as share of total Chinese world trade is relatively modest. In 2016, the total volume of Chinese imports and exports to the world was 3685.55 billion US dollars. Africa stood for merely 4.04% of the total Chinese trade, in comparison with 52.83% for Asia, 15.35% for North America, and 5.89% for Latin America.

2.4 Overall Sino-African trade by commodities

Main imported commodities from China to Africa in 2016 included electrical machinery, vehicles, nuclear reactors, iron and steel and articles of iron and steel, which accounted for most imports from China (Guan, Kwee, Ip and Sheoung 2019).

Table 2. Top 12 African import commodities from China in 2016

Commodity	Import amount (billion USD)	%
Electrical machinery and equipment	12.76	21.34
Nuclear reactors, machinery	11.86	19.84
Articles of Iron and Steel	3.54	5.92
Vehicles other than railway	3.23	5.41
Iron or steel	2.56	4.28
Plastics and articles	1.95	3.26
Rubber	1.37	2.28
Articles of apparel and clothing accessories	1.30	2.18
Furniture; bedding	1.21	2.03
Footwear, gaiters	1.19	1.99
Man-made filaments	1.10	1.85
Organic chemicals	1.07	1.78
	Source	UN comtrade

China primarily has imported mineral fuels, ores slag, mineral oils, and ash. In 2016 these commodities accounted for 62% of the total export of commodities to China, totaling 7 billion US dollars (Guan, Kwee, Ip and Sheoung 2019).

Table 3. Top 12 African export commodities to China in 2016

Commodity	Export amount (billion USD)	%
Ores, slag and ash	5.18	45.40
Mineral fuels, mineral oils	1.89	16.56
Iron and steel	1.26	11.02
Pulp of wood or of other fibrous material	0.28	2.47
Oil seeds and oleagionous fruits	0.27	2.35
Pearls, precious, precious metals	0.25	2.18

Wood and articles of wood	0.24	2.14
Nickel	0.22	1.93
Wool, fine or coarse animal hair	0.21	1.87
Copper	0.19	1.63
Raw hides and skins and leather	0.12	1.07
	Source	UN comtrade

There is a clear imbalance in trade for 2016, with African countries importing manufactured goods such as machinery, nuclear resources, vehicles etc. and exported natural resources to China. African countries have restricted the exports of natural resource to stave this imbalance (Karapinar 2010). However, many African countries still heavily rely on exporting natural resources for a trade surplus (Habiyaremye 2015). African countries, such as Algeria, Ghana, Liberia, and Nigeria, focus on exporting minerals and oils, with these commodities accounting for 80% of their total exports in some years. Other countries, such as Kenya, Egypt, Morocco, and Tanzania, also exceed 50%.

Table 4. The percentage share of exports of minerals and oils on their total exports to China in the 8 African countries from 2007 to 2016.

Country	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)
Algeria	99.8	98.84	99.57	99.74	99.80	99.77	99.53	99.06	96.84
Egypt	43.00	62.72	60.78	68.46	66.85	78.78	72.86	70.54	56.60
Ghana	6.75	52.37	30.64	69.37	79.74	49.35	62.15	83.12	87.73
Kenya	25.91	5.27	8.97	23.74	18.14	11.55	45.91	58.18	66.14
Liberia	96.90	54.36	73.90	24.05	78.14	78.15	87.27	79.03	31.35
Morocco	20.59	24.78	46.58	40.84	51.72	38.36	35.10	42.57	49.47
Nigeria	90.63	95.22	92.21	92.30	93.01	91.92	83.59	67.52	68.84
Tanzania	69.95	66.28	64.31	70.21	55.46	27.23	30.92	26.05	36.93

3. Theory

3.1 The resource curse

There are differences between the long- and short-term effects when unfolding the natural resource curse mechanism. In the long-run, natural resource dependence affects the structure of the economy and potentially creates output-gaps. However, in the short-run economic impacts are more volatile and can generate both positive and negative effects on the output and revenues generated. Typical natural resources that countries are dependent on include minerals, hydrocarbon, and agriculture dependence. Mining and hydrocarbons are referred to as point-source resources, when being geographically concentrated and more capital-intensive. They include precious metals, oil, and other minerals.

One major long-lasting mechanism of the natural resource curse is rent-seeking behavior. It leads to different investment capacity and crowds out productive sectors (Henry 2019). Natural resource and human capital have a negative association when natural resources increase non-wage income and as a consequence private actors and public actors are much less keen on investing in human capital accumulation (Atkinson and Hamilton 2003). Gylfason in 2001 reported that expected years of schooling are inversely proportional to the share of natural resources in an economy.

In a long-run perspective, Dutch-disease effects arise when manufacturing sector and the rest of the non-resource GDP is negatively affected by the shift in focus, potential terms of trade shocks and surges in the real exchange rates (Frankel and Romer 1999). Countries with resource focused trade miss out on innovations taking place in the manufacturing sector, which is the strongest driver of growth (Kaldor 1966). The commodity price volatility creates less favorable investment environment and production through higher exchange rate fluctuation and lower investment (Gylfason 2001). These mechanisms are more likely to occur in poor financial environments such as the sub-Saharan region (Aghion et. Al. 2009; Van der Ploeg and Poelhekke 2009; De V. Cavalcanti et. al. 2015)

Impacts of the natural resource dependence are more ambiguous in the short-term as they could lead to either positive or negative impact on output. When discovering oil fields, offshore gas reserves or a ledge of gold have a positive impact on natural resource endowment. This in turn makes the country more dependent on the newly discovered resource, but with the prospect of increased national output (Henry 2019). Volatility of commodity prices on international markets affects trade balances by means of changing royalties on natural resources and eventually also on national output.

In 2016 Havranek compiled 43 studies and noted that that natural resource dependence affects economies differently depending on the quality of the countries' institutions. The curse is verified for economies with poor institutions, whereas strong institutions turn the curse into a blessing where natural resource endowments feed a sustainable growth circle (Henry 2019).

3.2 Gravitation model

The gravity model was first used by Tinbergen in 1962 and has since become a technique commonly used in the study of international trade to identify driving variables and how they correlate with trade routes (Anderson 1979; Gómez-Herrera 2013). The gravitation model assumes the level of bilateral trade (gravity) is determined by economic masses of countries and distance between them, which is similar to the Newtonian gravity model (Symes et al. 2018). These models have been extended with more explaining variables such as institutional distance, common language and contiguous border (Anderson and Wincoop 2003). Considered to be a stable model, the gravity model has been an effective and popular tool to determine the countries' trade volume between one another (Chaney 2013). Compared with other trade models, its main comparative advantage is the enabling of real data usage to assess the sensitivity of trade flows.

The original equation is expressed as in Equation (1):

$$T_{ij} = \beta \left(\frac{Y_i Y_j}{D_{ij}} \right) (1)$$

T denotes the value of trade between country i and j, Y is the value of total nominal GDP of country i and j respectively, D is the distance between the economic center of country i and j, and β is the gravitational constant.

The logarithm form of the equation (1) can be expressed by equation (2):

$$\ln T_{ij} = \beta_0 + \beta_1 Y_i + \beta_2 Y_j - \beta_3 D_{ij} + \varepsilon_{it} (2)$$

Equation (2) can be interpreted that trade is positively affected by the economic mass measured in GDP and negatively affected by the distance between two trading countries (Guan et. al. 2019). More about the gravitational model and the estimation model used in this master thesis will be described in chapter 6.

4. Previous research

4.1 FDI and trade with the gravity model

Gravity models have been used to estimate FDI and bilateral trade as well as to evaluate whether they correlate with each other. In particular, Brouwer et al. in 2008, investigated a sample of 28 European countries over the period of 1990 to 2004 and found a positive and significant correlation between bilateral FDI and bilateral trade, when FDI was included as an explanatory variable. However, in this study FDI had missing data (50%) and the endogeneity problem of the FDI variable or reverse causality was not taken into consideration. Egger in 2001 estimated a system of simultaneous equations for trade and FDI using data on intra-EU bilateral flows from 1988 and 1996, with endogeneity of both exports and FDI variables in the regression. Indeed, the result showed that bilateral exports are a significant and positive increasing function of outward FDI stocks in the long-run (Abeliansky and Martinez-Zarzoso 2019).

Chen et al. in 2012 analyzed the correlation between outward FDI and exports for 15 Taiwanese manufacturing industries over 1991 to 2007 with a result showing the existence of complementarity between FDI and exports. The result was obtained with both fixed and random effect in panel data. Both Cheung and Qian in 2009 who analyzed the effect of Chinese exports as a determinant of Chinese outward FDI, using the lagged value of exports to mitigate the endogeneity problem. Cheung and Qian found that the relationship is positive and gets stronger when the receiving economies are developing nations (Abeliansky and Martinez-Zarzoso 2019).

Recent studies use African firm data to investigate relationship between FDI and trade in Africa. Broadman in 2007 found positive links between FDI and trade among Chinese firms in Africa, when using firm level data from World Bank Africa Asia Trade Investment (WBAATI) survey and World Bank’s developed business case studies of Chinese firms in Africa. The attraction of investment on infrastructure and related services seems to have a positive “spillover” effect on the continent. Intangible assets, such as transfer of managerial skills and technology transfer, which usually accompanies FDI, further stimulates the effect on trade (Abeliansky and Martinez-Zarzoso 2019).

Abeliansky and Martinez-Zarzoso in 2019 demonstrated in their study of 167 partner countries with China from 2003 to 2012 that Chinese exports were significantly higher when China engaged in FDI. Chinese Outward FDI is positively correlated with Chinese exports and the same applies to imports. Through different regressions in the gravitational model, Abeliansky and Martinez-Zarzoso observed a positive and significant effect of FDI on export and imports. Increasing FDI to a host country by 10% generated increased exports by 2.14 percent and imports by 1.12 per cent. Each dollar of extra FDI yields approximately 4.63 US dollars higher exports and 2.09 US dollar higher imports. The study also showed that China invests around 52% more if host country has signed a BIT agreement (Abeliansky and Martinez-Zarzoso 2019).

5. Data and descriptive statistics

Bilateral FDI data is from UNCTAD (2015), trade data from COMTRADE (2015) and gravity variables, distance between the capital cities from each trading partner and the capital city of the African countries (Ln Distance), previous colonial relationship (Colony), and common language spoken by at least 9% of the population (Comlang), shared border (Contig) and common colonizer are all variables from CEPII. Gross Domestic Production (GDP) and population are both from the World Development Indicators (2015), while the dummy variable China represent FDI from China. The regional trade agreement (RTA) dummy is from De souse and the bilateral investment treaty dummy variable (BIT) is created by information from UNCTAD (2015). BIT-contracts in force are used and not signed agreements, since relevant date is the one in which the agreement enters into force, same goes for the RTA variable. The sample contains five African countries (Angola, Nigeria, South Africa, Zambia and Zimbabwe) with 166 partner countries (see table A1 in the Appendix) covering the years 2003 to 2012. Summary statistics for all variables included in the regression analysis are shown in Table 1.

Table 1. Summary statistics

VARIABLE	MEAN	SD	MIN	MAX	N
LN EXPORTS	14.75726	4.217166	0	24.27288	4,651
LN IMPORTS	14.40813	4.112725	0	23.40429	5,757
LN GDP	24.61141	2.272294	18.31789	30.41585	10,258
LN POPULATION	16.10313	1.847293	9.813836	21.02389	10,258
LN DISTANCE	8.674449	.6990688	5.546152	9.835044	10,267
LN FDI	3.572232	2.261438	-.6931472	9.728658	887
CHINA	.0082549	.0904853	0	1	10,418
COLONY	.0115905	.1070388	0	1	10,267
CONTIG	.035843	.1859076	0	1	10,267
COMLANG_OFF	.2708678	.4444296	0	1	10,267
COMCOL	.1652868	.3714573	0	1	10,267
RTA	.0070071	.0834187	0	1	10,418
BIT	.0709349	.2567284	0	1	10,418

Graphical scatter plots of the data show that both exports and imports are positively correlated with FDI to the five African partner countries.

Figure 1. Exports and FDI from 166 countries to the five African countries.

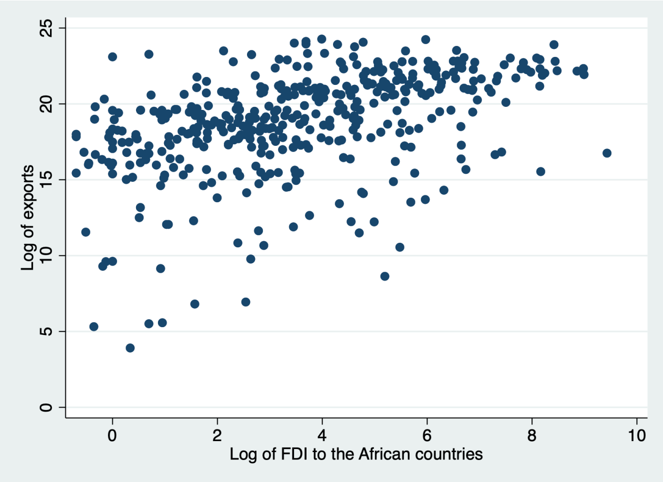
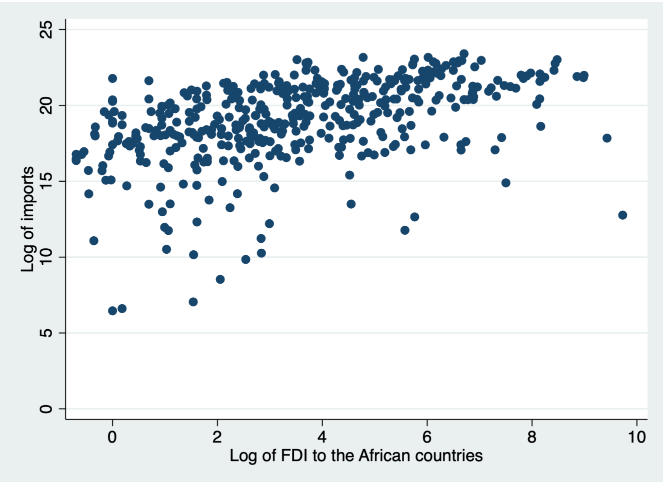


Figure 2. Imports and FDI from 166 countries to the five African countries.



6. Empirical specification

6.1 Regression analyses

Estimating three gravity equations in which outward FDI, exports and imports are endogenous explanatory variables entering as lagged variables. The regression models are specified as follows:

$$lnX_{jt} = \alpha_0 + \alpha_1 \ln(\max\{1, FDI_{jt-1}\} + \alpha_2 China * \ln(\max\{1, FDI_{jt-1}\} + \alpha_3 NFDI_{jt-1} + \alpha_4 lnM_{jt-1} + \alpha_5 lnGDP_{jt} + \alpha_6 lnPop_{jt} + \alpha_7 lnDist_{jt} + \alpha_8 colony_j + \alpha_9 comcol_j + \alpha_{10} comlang_j + \alpha_{11} contig_j + \alpha_{12} RTA_{jt} + \sum_{t=1}^{T-1} \delta_t + \sum_{i=1}^{I-1} \rho_i + u_{jt} \quad (1)$$

$$lnM_{jt} = \beta_0 + \beta_1 \ln(\max\{1, FDI_{jt-1}\} + \beta_2 China * \ln(\max\{1, FDI_{jt-1}\} + \beta_3 NFDI_{jt-1} + \beta_4 lnX_{jt-1} + \beta_5 lnGDP_{jt} + \beta_6 lnPop_{jt} + \beta_7 lnDist_{jt} + \beta_8 colony_j + \beta_9 comcol_j + \beta_{10} comlang_j + \beta_{11} contig_j + \beta_{12} RTA_{jt} + \sum_{t=1}^{T-1} \theta_t + \sum_{i=1}^{I-1} \vartheta_i + \mu_{jt} \quad (2)$$

$$\ln(\max\{1, FDI_{jt}\}) = \gamma_0 + \gamma_1 lnX_{jt-1} + \gamma_2 lnM_{jt-1} + \gamma_3 lnGDP_{jt} + \gamma_4 lnPop_{jt} + \gamma_5 lnDist_{jt} + \gamma_6 colony_j + \gamma_7 comcol_j + \gamma_8 comlang_j + \gamma_9 contig_j + \gamma_{10} BIT_{jt} + \sum_{t=1}^{T-1} \pi_t + \sum_{i=1}^{I-1} \varphi_i + \nu_{jt} \quad (3)$$

J denotes partner country and *t* denotes the year. δ_t , θ_t, and π_t are time dummies, while ρ_i, ϑ_i and φ_i are regional dummies. Time dummies account for common trends in export, imports and FDI and regional dummies account for multilateral resistance factors. Giving the existences of zeros in the outward FDI variable, the variable NFDI is created as a dummy to account for all the absent FDI data. The effect of FDI is specified in the following way:

$$\alpha_1 \ln(\max\{1, FDI_{jt}\} + \alpha_2 NFDI_{jt} = \left\{\{\alpha_1 \, ln\, FDI_{jt} \text{ when } FDI_{jt} > 0\} \middle| \alpha_2 \, when\, FDI_{jt} = 0\right\}$$

$\alpha_1(\beta_1)$ measures the elasticity when FDI is positive and $\alpha_2(\beta_2)$ modifies the constant term when FDI is zero. FDI_{jt-1} is the lagged outward FDI from the partner countries to the five African countries (*j*) and at period *t*-1 and NFDI is a dummy variable taking the value one if FDI flows are zero in African country *j* and time *t*. Explaining variable Chinese outward FDI (China*ln(max{1, FDI_{jt-1}})) is also created to measure the impact of Chinese FDI to the five African countries and how it affects exports and imports.

Furthermore, error term (ε_{jt}) has been added as a random disturbance. Ordinary least squares (OLS) is used to show the best line fitted showing the connection between the dependent variables Exports (1) and Imports (2) and the explaining variables outward FDI, exports, imports, GDP, population, distance, contig, common language, common colony, RTA, BIT and a China dummy. OLS minimizes the sum of squared errors and under certain assumptions about the error term, parameter estimates enable the conduction of hypothesis testing and enables the draw of inferences.

Three sufficient conditions about the error terms when estimating the gravity model with OLS:

1. The error terms (e_{tj}) must have mean zero and be uncorrelated with the explanatory variables (the orthogonality assumption).
2. The error terms (e_{tj}) must be drawn from an independent normal distribution with fixed variance (the homoskedasticity assumption).
3. None of the explanatory variables is a linear combination of other explanatory variables (The full rank assumption).

If all of the above assumptions are hold, then OLS estimates are consistent, unbiased, and efficient. Consistency means OLS coefficient converge to the population values as the sample size increases. Unbiased means the OLS coefficient estimates are not different from the population values even though a small sample. Efficiency means that there is no other linear combination that produces smaller standard errors for the estimated coefficients.

When regressing a gravity model two specified options are of importance. The first option is creating robust error terms, when there is belief that the second OLS assumption is violated. The second option which is frequently used is making a variable clustered, thus making it possible for the error terms to be correlated for the defined variable. Failure in stating clusters for a specified variable can end up in understated standard errors. Errors are likely to be correlated by country pair in the gravity model, hence making the variable “distance” clustered is important when it is identical in both directions.

6.2 The Poisson Pseudo-Maximum Likelihood Estimator

The Poisson pseudo-maximum likelihood estimator provides a consistent estimator of the original nonlinear gravity model. It is the same as running a type of nonlinear least squares on the original equation. The Poisson estimator is consistent with fixed effects, which can be entered as a dummy variable in the OLS regression. It is particular important in the context of the gravity model were most theory-consistent models require the inclusion of the fixed effects by exporter and by importer. Second, the Poisson estimator naturally includes observations for which the observed trade value is zero. Such observations are otherwise dropped from the OLS model, because of the logarithm of zero being undefined. It is relevant in the gravity model when all countries do not trade all products. Thirdly, the coefficients from the Poisson model is straightforward, and follows the same pattern as under regular OLS. The coefficient can be interpreted for any independent variable as simple elasticities (Shepherd 2016).

Taking logarithms of the nonlinear standard gravity model makes a linearized form whereas presumed error terms are in logarithms too:

$$X_{ij}^{K} = \frac{Y_i^k E_j^k}{Y^k} \left(\frac{\tau_{ij}^k}{\Pi_i^k P_j^k}\right)^{(1-\sigma_k)} e_{ij}^k$$

$$log\, X_{ij}^k = log\, Y_i^k + log\, E_j^k - log\, Y^K\, (1-\sigma_k)[log\, \tau_{ij}^k - log\, \Pi_i^k - log\, P_j^K] + \log e_{ij}^k$$

The mean of $\log e_{ij}^k$ depends on higher moments of error terms and its variance. If the error terms are heteroskedastic, then the expected value depends on one or more explanatory variables because it is included in the variance term. This violates the first assumption of the OLS, hence a biased or inconsistent estimator. Heteroskedasticity cannot be dealt with applying a robust covariance matrix estimator, since it affects both the parameter estimates and the standard errors (Shepherd 2016).

7. Results

The main results using an OLS regression analysis is presented in table 2 following results from the PPML estimations in table 3. An OLS regression analysis without lagged non-receiving FDI values are presented in column 1-3 in table 2, followed by an OLS regression analysis with non-receiving FDI values in column 4-5 and in the last three columns (6-8) OLS regressions without non-receiving FDI value and a new FDI value variable, where zeros have been switched with 1.

Specifications	Column (1) – (3): No lagged NFDI values.	Column (4)-(5): Included lagged NFDI values.	Column (6)-(8) No lagged NFDI values and new FDI values were 0 has been replaced with 1.

Table 2. Results with OLS regression with standard errors being clustered by country pairs

	(1) Logarithmic value of Exports (ln Exports)	(2) Logarithmic value of Imports (ln Imports)	(3) Logarithmic value of FDI $(ln(max\{1, FDI_{jt}\})$	(4) Logarithmic value of Exports (ln Exports)	(5) Logarithmic value of Imports (ln Imports)	(6) Logarithmic value of Exports (ln Exports)	(7) Logarithmic value of Imports (ln Imports)	(8) Logarithmic value of FDI $(ln(max\{1, FDI_{jt}\})$
Logarithmic value of lagged FDI $(ln(max\{1, FDI_{jt-1}\})$	.099 (.153)	.163 (.118)		.120 (.158)	.143 (.122)			
Logarithmic value of changed lagged FDI from 0 to 1 $(ln(\max\{1, new\ FDI_{jt-1})$						.140 (.130)	.012 (.090)	
Logarithmic value of lagged Chinese FDI $(China * ln(max\{1, FDI_{jt-1})$	-.315 (.277)	-.165 (.202)		-.315 (.276)	-.162 (.202)			
Logarithmic value of lagged Chinese FDI $(China * ln(max\{1, new\ FDI_{jt-1}\})$						-.503** (.245)	-.198 (.187)	
Dummy variable for receiving no FDI $(NFDI_{jt-1})$				.155 (1.38)	-.993 (1.45)			
Logarithmic value of lagged Exports $(Ln\ Exports_{jt-1})$		.200** (.084)	.109* (.065)		.198** (.084)		.186*** (.050)	.096 (.047)
Logarithmic value of lagged Imports $(Ln\ Imports_{jt-1})$	.420*** (.131)		-.019 (.066)	.420*** (.132)		.306*** (.099)		-.038 (.056)
Logarithmic value of the GDP $(lnGDP_{jt})$	.887*** (.239)	1.60*** (.186)	.502* (.279)	.906*** (.242)	1.60*** (.186)	.902*** (.185)	1.57*** (.149)	.462 (.189)
Logarithmic value of the population $(ln\ Population_{jt})$	-.115 (.280)	-.728*** (.237)	-.280 (.282)	-.127 (.279)	-.739*** (.237)	-.042 (.243)	-.635*** .204	-.236 (.192)
Logarithmic value of the distance between capitals $(ln\ Distance_j)$	-1.15* (.667)	-.795 (.557)	-.731 (.484)	-1.17* (.665)	-.825 (.561)	-1.18** (.557)	-.867** (.426)	-.003 (.345)
Dummy variable for being a former colony $(Colony_j)$	1.50 (.946)	-.211 (.939)	.682 (1.14)	1.53 (.947)	-.277 (.961)	-.180 .8876389	-1.27* (.683)	.927 (.975)
Dummy variable for sharing Common Colonizer (comcol)	-1.92* (.977)	-.259 (.754)	-1.17 (.782)	-1.93* (.978)	-.302 (.765)	-1.79** (.802)	-.063 (.601)	-.974 (.497)
Dummy variable for sharing Common language $(Comlang)$	.527 (.741)	.320 (.738)	.473 (.598)	.530 (.742)	.314 (.743)	.917 (.640)	.606 (.558)	.904 (.494)
Dummy variable for sharing Common border (contig)	1.65 (1.11)	3.19*** (.863)	-2.14** (.893)	1.67 (1.10)	3.17*** (.866)	1.59 (1.06)	2.60 (.802)	-.099 (.810)
Dummy variable for having a regional trade agreement (RTA_{jt})	omitted	omitted		omitted	omitted	omitted	omitted	
Dummy variable for having a bilateral investment treaty (BIT_{jt})			-.068 (.488)					-.078 (.529)
Observation	211	238	199	211	238	385	433	364
R-squared	0.31	0.51	0.17	0.31	0.51	0.30	0.49	0.20
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Continental Dummies	YES	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in the parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Respectively, column 1 reports result for exports, column 2 reports result for imports and column 3 reports results for FDI without lagged NFDI. Firstly, a positive ($\alpha_1 = 0.099$, $p>0.1$)

non-significant effect can be seen on export when increasing FDI and outward FDI from China has a negative effect on exports (α_2 = -0.315, p>0.1) without significant effect. Imports in previous period affect exports positively (α_5 = 0.420, p<0.01) with statistical significance. All the explanatory variables are logarithmic; hence FDI affect exports positively by 0.1% without statistical significance, FDI from China affect exports negatively with -0.3% and imports affect exports positively by 0.4%, both without statistical significance. In model 2, FDI affect imports positively (β_1 = 0.163, p>0.1) and Chinese FDI affects imports negatively (β_2 = -0.165, p>0.1) , but the estimates are not statistically significant. Exports affect imports positively (β_4 = 0.200, p<0.05) with a statistically significant effect. Again, due to logarithmic variables, FDI affects imports positively with 0.2%, Chinese FDI affect imports negatively with -0.2% and exports affect imports with 0.2%. In model 3, exports affect FDI positively (γ_1 = 0.109, p<0.1) with a statistically significant effect and imports affect FDI negatively (γ_2 =-0.019, p>0.1) without a significant effect.

The lagged NFDI variable is added in column 4 and 5 showing a positive (α_3 = 0.155, p>0.1) non-significant effect on exports and a negative (β_3 = -0.993, p>0.1) non-significant effect on imports. No change in parameter estimation for lagged FDI, lagged Chinese FDI, lagged exports and lagged imports. In Column 6 to 8, FDI has been changed from 0 to 1 to not be dismissed when being logged and lagged NFDI is yet again not taken in account for. All parameter estimations keep previous value, except Chinese FDI which affects exports negatively (β_2 = -0.503, p<0.05) with significant effect.

As regard to the control variable GDP is positive and significant (in all columns except 8) as the gravity model predicts. The population variable is negative in all columns, with significance in column 2, 5 and 7, which is not excepted. The gravity model should predict the size of both destination market and sending market affect imports and exports positively if being high. Indications from the time-invariant variables, sharing common language and having a common border affect both imports, exports and FDI positive but not always in the case of common border were some estimations are negative with statistically significance. Sharing common colonizer affect imports, exports and FDI negatively in all regressions, with statistical significance in column 1, 4, 6 and being a former colony is negative with significance in column 7. The variable RTA (regional trade agreement) has been omitted in all columns due to collinearity. Distance has a negative significant effect in columns 1, 4, 6 and 7, which is expected when long distance affects poorly on trade. The BIT dummy in column 3 and 8 has an unexpected negative effect on FDI, however without significant effect.

In table 3 main results from the Poisson Pseudo-Maximum Likelihood Estimator are presented, due to observed FDI values of zeros. The same variables are being used in all columns as in table 2.

Specifications	Column (1) – (3): No lagged NFDI values.	Column (4)-(5): Included lagged NFDI values.	Column (6)-(8) No lagged NFDI values and new FDI values were 0 has been replaced with 1.

Table 3. Results with the Poisson Pseudo-Maximum Likelihood Estimator

	(1) Logarithmic value of Exports (ln Exports)	(2) Logarithmic value of Imports (ln Imports)	(3) Logarithmic value of FDI ($ln(max\{1, FDI_{jt}\})$)	(4) Logarithmic value of Exports (ln Exports)	(5) Logarithmic value of Imports (ln Imports)	(6) Logarithmic value of Exports (ln Exports)	(7) Logarithmic value of Imports (ln Imports)	(8) Logarithmic value of FDI ($ln(max\{1, FDI_{jt}\})$)
Logarithmic value of lagged FDI ($ln(max\{1, FDI_{jt-1}\})$)	.020 (.090)	-.057 (.113)		.034 (.094)	-.064 (.113)			
Logarithmic value of changed lagged FDI from 0 to 1 ($ln(\max\{1, new\ FDI_{jt-1}\})$)						.024 (.066)	-.043 (.114)	
Logarithmic value of lagged Chinese FDI ($China * ln(max\{1, FDI_{jt-1}\})$)	-.562*** (.155)	-.271 (.266)		-.561*** (.156)	-.259 (.266)			
Logarithmic value of lagged Chinese FDI ($China * ln(max\{1, new\ FDI_{jt-1}\})$)						-.449** (.183)	-.426* (.220)	
Dummy variable for receiving no FDI ($NFDI_{jt-1}$)				.466 (1.06)	-1.67** (.827)			
Logarithmic value of lagged Exports ($Ln\ Exports_{jt-1}$)		.136 (.095)	-.017 (.085)		.123 (.097)		.146** (.066)	-.017 (.085)
Logarithmic value of lagged Imports ($Ln\ Imports_{jt-1}$)	.284** (.132)		.076 (.052)	.280** (.134)	.	.118 (.114)		.076 (.052)
Logarithmic value of the GDP ($lnGDP_{jt}$)	.790*** (.174)	.990*** (.185)	.127 (.218)	.794*** (.174)	.986*** (.183)	.862*** (.163)	.873*** (.208)	.126 (.217)
Logarithmic value of the population ($ln\ Population_{jt}$)	-.187 (.234)	.180 (.264)	-.019 (.300)	-.186 (.233)	.169 (.263)	.255* (.143)	.133 (.133)	-.018 (.298)
Logarithmic value of the distance between capitals ($ln\ Distance_j$)	-1.12*** (.403)	-.301 (.494)	-.334 (.471)	-1.11*** (.410)	-.307 (.490)	-1.32*** (.364)	.007 (.379)	-.332 (.470)
Dummy variable for being a former colony ($Colony_j$)	-.673 (.598)	1.30 (.885)	1.96*** (.712)	-.612 (.626)	1.27 (.885)	-1.41** (.630)	-.307 (.707)	1.96*** (.711)
Dummy variable for sharing Common Colonizer (comcol)	-1.72*** (.660)	.356 (.833)	-2.76*** (.730)	-1.67** (.675)	.302 (.837)	.265 (.564)	.773 (.546)	-2.72*** (.719)
Dummy variable for sharing Common language ($Comlang$)	-.597 (.527)	-2.52*** (.901)	-.056 (.629)	-.622 (.537)	-2.52*** (.900)	-.596 (.540)	-1.28* (.735)	-.056 (.627)
Dummy variable for sharing Common border (contig)	-.116 (.784)	2.69** (1.19)	-4.89*** (1.42)	-.105 (.797)	2.68** (1.19)	-2.18*** (.561)	1.29** (.519)	-4.83*** (1.40)
Dummy variable for having a regional trade agreement (RTA_{jt})	omitted	omitted		omitted	omitted	omitted	omitted	
Dummy variable for having a bilateral investment treaty (BIT_{jt})			-.056 (.503)					-.055 (.502)
Observation	442	425	364	442	425	857	805	364
R-squared	.15	.65	.06	.15	.65	.38	.38	.06
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Continental Dummies	YES	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in the parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Same as before column 1 reports the result of exports, column 2 the result of imports and column 3 results of FDI. FDI affect exports positively (α_1 = 0.020, p>0.1) without significant effect and FDI from China effect exports negatively (α_2 = -0.562, p<0.01) with significant effect. Imports affect exports positively ($\alpha_5 = 0.284$, $p<0.05$) with significant effect. Again, due to logarithmic values FDI affect exports positively with 0.02%, FDI from China affects exports negatively by -0.6%, and higher imports in previous period affect exports positively by 0.3%. Comparing the results from the Poisson Pseudo-Maximum Likelihood Estimator with the result from the OLS regression with robust standard errors, all parameter values stay the same except Chinese FDI affecting exports negatively with a statistically significant effect. In column 2, FDI affects imports negatively ($\beta_2 = -0.057$, $p>0.1$) without a statistically significant effect and FDI from China affects imports negatively ($\beta_2 = -0.271$, $p>0.1$) without a statistically significant effect. Higher exports in previous period affect imports positively ($\beta_4 = 0.136$, $p>0.1$) without a significant effect. When comparing the results with the OLS regression with robust standard errors, all coefficients keep the same value except for column 2 were FDI affects import negatively. In column 3, exports affect FDI negatively ($\gamma_1 = -0.017$, $p>0.1$) without significant effect and imports affect FDI positively ($\gamma_2 = 0.076$, $p>0.1$) without significant effect. The results are different from the OLS estimation were imports affects FDI positive without significance and exports affect FDI negatively without significance.

Same as in table 2 the lagged NFDI variable is added in column 4 and 5 showing a positive ($\alpha_3 = 0.466$, $p>0.1$) non-significant effect on exports and a negative ($\beta_3 = -1.67$, $p<0.05$) significant effect on imports. No change in parameter estimation for lagged FDI, lagged Chinese FDI, lagged exports and lagged imports except for FDI affecting import negatively without significance and receiving FDI from China affecting exports negatively is significant. Again, FDI has been changed from 0 to 1 in column 6 to 8 to not be dismissed when being logged and lagged NFDI is again not taken in account for. All parameter estimations keep previous value, except in column 7 were receiving FDI from China affect imports negatively ($\beta_2 = -0.426$, $p<0.1$) with significant effect and import affecting export in column 6, FDI affecting imports in column 7 and export affecting FDI in column 8 have all a change in coefficient value, but without significant effect.

When measuring the control variable GDP for the Poisson Pseudo-Maximum Likelihood Estimator, it is both positive and significant in all columns except 3 and 8. The population variable is positive with significance in column 6 and both positive and negative in all other columns however without significance. Different from before, time variant indications variables affect both imports, exports and FDI positively and negatively with significant effect.

Sharing a common colonizer affect exports, imports and FDI negatively in column 1, 3, 4 and 8 with significant effect and being a former colony is positive with significance for column 3 and 8 and negative with significance in column 6. Having a regional trade agreement have yet again been omitted due to collinearity as in table 2. Variable distance has a negative effect in column 1, 4 and 6 with significant effect, still meaning the long distance affects trade poorly between nations far from each other and the BIT variable is negative again without significance.

In table 4 results from an OLS regression with fewer variables are presented in column 1-3, followed by an OLS regression with value 1 instead of missing values in FDI (being 0 when logged) without a Chinese FDI dummy and in columns 6-8 the Chinese FDI dummy is added in the OLS regression again and missing values in FDI is still the logarithmic value of 1.

Specification	Column (1) – (3): Fewer Variables included. Lagged FDI, lagged Chinese FDI, lagged Exports, lagged Imports, GDP, Distance, RTA and BIT.	Column (4)-(5): Putting missing values in FDI as 1 without any Chinese FDI dummy.	Column (6)-(8): Putting missing values in FDI as 1.

Table 4. Results with OLS regression with standard errors being clustered by country pairs

	(1) Logarithmic value of Exports (ln Exports)	(2) Logarithmic value of Imports (ln Imports)	(3) Logarithmic value of FDI ($ln(max\{1, FDI_{jt}\})$)	(4) Logarithmic value of Exports (ln Exports)	(5) Logarithmic value of Imports (ln Imports)	(6) Logarithmic value of Exports (ln Exports)	(7) Logarithmic value of Imports (ln Imports)	(8) Logarithmic value of FDI ($ln(max\{1, FDI_{jt}\})$)
Logarithmic value of lagged FDI ($ln(max\{1, FDI_{jt-1}\})$)	.115 (.151)	.159 (.114)						
Logarithmic value of changed lagged FDI from 0 to 1 ($ln(\max\{1, new\ FDI_{jt-1}\})$)				.028 (.090)	-.080 (.069)	.058 (.095)	-.068 (.071)	
Logarithmic value of lagged Chinese FDI ($China * ln(max\{1, FDI_{jt-1}\})$)	-.405 (.245)	-.477** (.216)						
Logarithmic value of lagged Chinese FDI ($China * ln(max\{1, new\ FDI_{jt-1}\})$)						-.304 (.250)	-.143 (.206)	
Dummy variable for receiving no FDI ($NFDI_{jt-1}$)								
Logarithmic value of lagged Exports ($Ln\ Exports_{jt-1}$)		.183** (.074)	.072 (.062)		.195*** (.025)		.196*** (.025)	.024** (.012)
Logarithmic value of lagged Imports ($Ln\ Imports_{jt-1}$)	.463*** (.126)		.017 (.067)	.161*** (.030)		.161*** (.030)		.001 (.012)
Logarithmic value of the GDP ($lnGDP_{jt}$)	.785*** (.143)	1.11*** (.118)	.263** (.119)	.921*** (.098)	1.48*** (.084)	.915*** (.098)	1.48*** (.084)	.210*** (.044)
Logarithmic value of the population ($ln\ Population_{jt}$)				-.143 (118)	-.414*** (.099)	-.136 (.119)	-.409*** (.099)	-.080** (.035)
Logarithmic value of the distance between capitals ($ln\ Distance_j$)	-1.03* (.543)	-.826 (.515)	-.077 (.358)	-1.20*** (.253)	-1.23*** (.255)	-1.20*** (.252)	-1.23*** (.255)	-.029 (.064)
Dummy variable for being a former colony ($Colony_j$)				1.71 (1.01)	.262 (.932)	1.71* (1.01)	.260 (.933)	2.17** (.866)
Dummy variable for sharing Common Colonizer (comcol)				-2.48*** (.431)	-.464 (.344)	-2.47*** (.432)	-.457 (.344)	-.102 (.088)
Dummy variable for sharing Common language ($Comlang$)				1.43*** (.350)	1.28*** (.299)	1.42*** (.351)	1.27*** (.299)	.277** (.128)
Dummy variable for sharing Common border (contig)				2.07*** (.639)	1.56* (.860)	2.08*** (.638)	1.57* (.861)	.029 (.210)

Dummy variable for having a regional trade agreement (RTA_{jt})	omitted	omitted		2.53* (1.30)	-.636* (.385)	2.55* (1.30)	-.635 (.385)	
Dummy variable for having a bilateral investment treaty (BIT_{jt})			.140 (.510)					.397 (.271)
Observation	211	238	199	2368	2317	2368	2317	2079
R-squared	0.28	0.45	0.11	0.27	0.45	0.27	0.45	0.18
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Continental Dummies	YES	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in the parenthesis, *** p<0.01, ** p<0.05, * p<0.1

Column 1 reports results for exports with fewer variables, column 2 reports result for imports with fewer variables and column 3 reports results for FDI with fewer variables. A positive ($\alpha_1 = 0.115$, $p>0.1$) non-significant effect can be seen on export when increasing FDI and FDI from China has a negative effect on exports ($\alpha_2 = -0.405$, $p>0.1$) but the effect is not statistically significant. Imports have a statistically significant positive effect on ($\alpha_5 = 0.463$, $p<0.01$). In column 2, FDI affect imports positively ($\beta_1 = 0.159$, $p>0.1$) but is not statistically significant and, Chinese FDI has a statistically significant negative effect on imports ($\beta_2 = -0.477$, $p<0.05$) , which is different from table 2 where the effect was not statistically significant. Exports affect imports positively ($\beta_4 = 0.183$, $p<0.05$) with a statistically significant effect. Lastly in column 3, exports affect FDI positively ($\gamma_1 = 0.072$, $p>0.1$) without a statistically significant effect and imports affect FDI positively ($\gamma_2 =0.017$, $p>0.1$) without a statistically significant effect.

In column 4-5 the Chinese FDI dummy has been taken away from the OLS regression and all missing FDI values have been replaced with zeros. There is no major change in parameter estimation for lagged FDI, lagged exports and lagged imports. In Column 6 to 8, Chinese FDI has been added again keeping all missing variables as zeros. Chinese FDI affects exports negatively ($\alpha_2 = -0.204$, $p>0.1$) without significant effect, Chinese FDI affects imports negatively ($\beta_2 = -0.143$, $p>0.1$) without significant effect and exports affect FDI positively ($\gamma_1 = 0.024$, $p<0.05$) with significant effect.

In table 5, the results of the Poisson Pseudo-Maximum likelihood estimator are presented yet again due to observed FDI values of zeros and same as table 4, columns 1-3 have fewer variables included, columns 4-5 have missing FDI value as 1 (being 0 when logged) and no Chinese FDI dummy and columns 6-8 have added the Chinese FDI dummy again and keep missing FDI values as 1.

Specification	Column (1) – (3): Fewer Variables included. Lagged FDI, lagged Chinese	Column (4)-(5): Putting missing values in FDI as 0 without any Chinese FDI dummy.	Column (6)-(8): Putting missing values in FDI as 0.

	FDI, lagged Exports, lagged Imports, GDP, Distance, RTA and BIT.		

Table 5. Results with the Poisson Pseudo-Maximum Likelihood Estimator

	(1) Logarithmic value of Exports (ln Exports)	(2) Logarithmic value of Imports (ln Imports)	(3) Logarithmic value of FDI ($ln(max\{1, FDI_{jt}\})$)	(4) Logarithmic value of Exports (ln Exports)	(5) Logarithmic value of Imports (ln Imports)	(6) Logarithmic value of Exports (ln Exports)	(7) Logarithmic value of Imports (ln Imports)	(8) Logarithmic value of FDI ($ln(max\{1, FDI_{jt}\})$)
Logarithmic value of lagged FDI ($ln(max\{1, FDI_{jt-1}\})$)	.040 (.088)	-.116 (.121)						
Logarithmic value of changed lagged FDI from 0 to 1 ($ln(\max\{1, new\ FDI_{jt-1}\})$)				-.082 (.090)	-.171* (.100)	-.064 (.092)	-.163 (.101)	
Logarithmic value of lagged Chinese FDI ($China * ln(max\{1, FDI_{jt-1}\})$)	-.599*** (.163)	-.044 (.432)						
Logarithmic value of lagged Chinese FDI ($China * ln(max\{1, new\ FDI_{jt-1}\})$)						-.496*** (.155)	-.277* (.168)	
Dummy variable for receiving no FDI ($NFDI_{jt-1}$)								
Logarithmic value of lagged Exports ($Ln\ Exports_{jt-1}$)		.153** (.078)	-.048 (.078)		.126*** (.023)		.126*** (.023)	-.039 (.095)
Logarithmic value of lagged Imports ($Ln\ Imports_{jt-1}$)	.337** (.136)		.084* (.046)	.094*** (.030)		.094*** (.030)		.093* (.048)
Logarithmic value of the GDP ($lnGDP_{jt}$)	.633*** (.146)	1.02*** (.310)	.184 (.149)	.786*** (.113)	.929*** (.127)	.784*** (.114)	.925*** (.127)	.707*** (.157)
Logarithmic value of the population ($ln\ Population_{jt}$)				.270* (.160)	-.171 (.112)	.272* (.160)	-.168 (.113)	-.323 (.223)
Logarithmic value of the distance between capitals ($ln\ Distance_j$)	-.649** (.276)	-.154 (.470)	-.038 (.268)	-.958*** (.224)	-.415* (.218)	-.958*** (.224)	-.412* (.219)	-.361 (.377)
Dummy variable for being a former colony ($Colony_j$)				.211 (.499)	.356 (.412)	.214 (.500)	.358 (.412)	2.20*** (.703)
Dummy variable for sharing Common Colonizer (comcol)				-1.02** (.458)	-.411 (.374)	-1.02** (.458)	-.410 (.374)	-1.88** (.864)
Dummy variable for sharing Common language ($Comlang$)				.388 (.358)	-.269 (.378)	.381 (.359)	-.273 (.378)	.067 (.377)
Dummy variable for sharing Common border (contig)				.604 (.537)	1.32** (.604)	.608 (.535)	1.33** (.608)	-2.62** (1.33)
Dummy variable for having a regional trade agreement (RTA_{jt})	omitted	omitted		.203 (.549)	-1.21*** (.321)	.206 (.549)	-1.21*** (.324)	
Dummy variable for having a bilateral investment treaty (BIT_{jt})			.246 (.507)					.357 (.558)
Observation	442	425	364	5581	4511	5575	4511	2079
R-squared	0.09	0.39	0.02	0.20	0.16	0.20	0.16	0.06
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Continental Dummies	YES	YES	YES	YES	YES	YES	YES	YES

Note: Standard errors in the parenthesis, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

As previous stated, column 1 reports the result of exports with fewer variables, column 2 the result of imports with fewer variables and column 3 results of FDI with fewer variables. FDI affect exports positively (α_1 = 0.040, p>0.1) without significant effect and Chinese FDI effect exports negatively (α_2 = -0.599, p<0.01) with significant effect. Imports affect exports positively (α_5 = 0.337, p<0.05) with significant effect. In column 2, FDI affects imports negatively (β_1 = -0.116, p>0.1) without significant effect and FDI from China affects imports negatively (β_2 = -0.044, p>0.1) without significant effect. Exports in previous period affect imports positively (β_4 = 0.153, p<0.05) with significant effect. In column 3, exports affect FDI negatively (γ_1 = -0.048, p>0.1) without significant effect and imports affect FDI positively (γ_2 = 0.084, p<0.1) with significant effect.

Column 4 and 5 are showing that FDI have a negative (α_3 = -0.082, p>0.1) non-significant effect on exports and a negative (β_3 = -0.171, p<0.1) significant effect on imports. No major change in parameter estimation for lagged exports or lagged imports. In column 6 and 7 Chinese FDI affect both exports and imports negatively (α_2 = -0.496, p<0.01, β_2 = -0.277, p<0.1) with significant effect and imports affect FDI positively (γ_1 = 0.093, p<0.1) with significant effect.

When measuring the control variable GDP is both positive and significant in all columns except 3. The population variable is positive with significance in column 4 and 6. Having a common border is positive and significant in column 5 and 7, but negative and significant in column 8 and sharing common language is both positive and negative without significance. Sharing a common colonizer affect exports, imports and FDI negatively in column 4, 6 and 8 with significant effect, and being a former colony is again positive with significant effect in column 8. Having a regional trade agreement affects imports negatively in column 5 and 7 with significant effect. Variable distance has a negative effect in column 1, 4, 5, 6 and 7 with significant effect, and the BIT variable is positive without significance in column 3 and 8.

8. Discussion

Both the OLS regression and the Poisson Pseudo-Maximum Likelihood Estimator demonstrate negative coefficient estimation when receiving FDI from China in both exports and imports. However, both models show different values on the parameters' estimate. The R^2 value in both cases are not higher than 0.65 which could point towards a missing explanatory variable Z. This variable Z could furthermore explain the complexity of the impact of Chinese FDI on imports and export for South Africa, Nigeria, Zimbabwe, Zambia and Angola. Examples of explanatory variables could include the efficiency of institutions in recipient country, specified input commodities imported from China, the corruption level in the recipient country and which types of sectors are being favored when receiving FDI investments.

The results of the negative effect of Chinese FDI in the models are not in line with what Brouwer and others noted in 2008, when estimating samples of 28 European countries. They found a positive correlation between bilateral trade and bilateral FDI when using FDI as explanatory variable. However, models in this study have considered the endogeneity problem when using lagged explanatory variables, which Brouwer and others did not do. Furthermore, this study includes 166 partner countries with different regional and cultural background. Egger, however, did show with a system of simultaneous equations with endogeneity for both exports and FDI that there indeed is a positive and significant result between FDI and exports in the long run for intra-EU bilateral flows. Same goes here as previously stated, more countries were included in this study which may have contributed to a different answer.

When focusing on China specifically, Chen and others in 2012 studied Taiwanese manufacturing firms and using lagged variables when mitigating the endogeneity problem and indeed got complimentary positive results between FDI and exports. Other recent studies confirm the same notion, i.e., China conducts FDI with countries whom they trade with. So how is it that FDI from all partner countries affect imports and exports positively, whereas FDI specifically from China do not?

The negative impact from receiving FDI from China could be secondary to imbalanced trade. During 2016 African countries imported manufactured goods such as machinery, nuclear resources, vehicles etc. whereas China imported natural resource. However, the models have not considered any specified commodities when counting for trade patterns for the five specified African countries and their partners. Therefore, it might be of interest to include data on specified commodities imported from China to the five African countries in this study and interpret the results.

Receiving FDI from China could also affect trade poorly due to the theory of the natural resource curse. If South Africa, Nigeria, Angola, Zambia and Zimbabwe are dependent on exporting natural resources to China, the manufacturing sector and the rest of the non-resource GDP sector may be negatively affected. The model in this study shows that FDI from other host countries affect imports and exports positively, which could explicitly point toward these host countries being keener on trading manufactured goods and investing accordingly. It could also point towards other host countries encouraging trade with likeminded nations, whereas Chinese FDI makes the African countries more efficient in importing and exporting commodities which only China prefers. Important to stress with regards to the resource curse is also that this theory is verified for economies having poor institutions. Hence, adding a measure of the institution quality for the five African countries could potentially help elucidate this matter.

The negative results can also be due to a change in the overall skilled labor force ratio between industries in the five African countries. Maybe Chinese FDI make skilled professionals more drawn to sectors favoring natural resources, hence impacting poorly on exports and imports in other industries by depleting its skilled labor force. Furthermore, it is hard to distinguish which specific sector is affected negatively by Chinese investments. Thus, it is possible that Chinese investments help some industry sectors more than others, such as the mineral industry or crude oil industry, at the expense of the manufacturing sector, for example. Moreover, it is also important to not forget the impact of the financial crises in Africa. Prices on exports fell in 2008, 2009 and 2010 which could be why the regression analysis shows a negative impact on export and imports of Chinese FDI.

It is important to bear in mind the problem with missing values in the FDI data. Adding zeros is one way of trying to resolve the problem, but the question still remains whether there are FDI values missing in the UNCTAD data. A solution for future studies could be to try and run regressions on what commodities Zambia, Zimbabwe, Angola, South Africa and Nigeria import from China and see if the same commodity sectors receive FDI. Are some sectors more preferred than others?

9. Conclusion

This study demonstrates that the models used can be interpreted differently. There are indications of Chinese FDI being negative for exports and imports, with both OLS regression and the Poisson Pseudo-Maximum Likelihood Estimator showing this with seemingly constant parameter estimations in both models. However, to explain the complex correlation between Chinese FDI and exports and imports for the African countries Angola, Nigeria, South Africa, Zimbabwe, and Zambia further, more studies examining detailed trade data on product level and the potential connection with FDI are desirable and warranted.

10. References

10.1 Printed copies

1. Abeliansky, A. L., and Martinez-Zarzoso, I., (2019). "The relationship between the Chinese "going out" strategy and international trade", Economics: the open-access, open-assessment E-journal, Vol. 13, pp. 1-18.
2. Aghion, P., Bacchetta, P., Ranciere, R., Rogoff, K., (2009). "Exchange rate volatility and productivity growth: the role of financial development". J. Monet. Econ. 56 (4), pp. 494–513.
3. Anderson, J.E., (1979). "A theoretical foundation for the gravity equation", The American Economic Review, Vol. 69 No. 1, pp. 106-116.
4. Anderson, J.E. and Van Wincoop, E., (2003), "Gravity with gravitas: a solution to the border puzzle", The American Economic Review, Vol. 93 No. 1, pp. 170-192.
5. Araújo, B., César, S., Mario, S., (2015). "Technological strategies and learning-by-exporting: the case of Brazilian manufacturing firms 2006–2008". Int. Bus. Rev. 24, pp. 725–738.
6. Atkinson, G., Hamilton, K., (2003). "Savings, growth and the resource curse hypothesis". World Dev. 31 (11), pp. 1793–1807.
7. Bogale, B., (2017). "Chinese Foreign Direct Investment in Africa: The Case of South Africa and Nigeria" in Developing Country Studies, Vol.7, pp 69-71.
8. Broadman, H.G., (2007). "Africa's silk road: China and India's new economic frontier". The World Bank, Washington DC.
9. Brouwer, J., Paap, R. and J. Viaene, (2008). "The trade and FDI effects of EMU enlargement". Journal of International Money and Finance, 27, pp. 188–208.
10. Chalapati Rao, K.S., Dhar, B., (2018). "India's Recent Inward Foreign Direct Investment - An Assessment". Institute for Studies in Industrial Development.
11. Chaney, T., (2013). "The gravity equation in international trade: an explanation", Review of World Economics, Vol. 142 No. 1, pp. 92-121.
12. Chen, Y., Hsu, W. and Wang C., (2012). "Effects of outward FDI on home-country export competitiveness: The role of location and industry heterogeneity". Journal of Chinese Economic and Foreign Trade Studies, 6(1), pp. 56–73.
13. Cheung, Y. and Qian X., (2009). "Empirics of China's outward direct investment". Pacific Economic Review, 14(3), pp. 312–341.

14. De, V., Cavalcanti, T.V., Mohaddes, K., Raissi, M., (2015). "Commodity price volatility and the sources of growth". J. Appl. Econom. 30 (6), pp. 857–873.
15. Edwards, L. and Jenkins, R., (2014). "The Competitive Effects Of China On The South African Manufacturing Sector" in Development Policy Research Unit, pp.3-12.
16. Egger, P., (2001). "European exports and outward direct investment: a dynamic panel data approach". Weltwirtschaftliches Archive, 137(3), pp. 427–449.
17. Frankel, J.A., Romer, D.H., (1999). "Does trade cause growth?". Am. Econ. Rev. 89 (3), pp. 379–399.
18. Gomez-Herrera, E., (2013). "Comparing alternative methods to estimate gravity models of bilateral trade", Empirical Economics, Vol. 44, pp. 1087-1111.
19. Guan, Z., Kwee, J., Ip, F. and Sheoung, P., (2020), "Determinants of bilateral trade between China and Africa: A gravity model approach", Journal of Economic Studies, Vol 47 No.5, pp. 1015-1038.
20. Gylfason, T., (2001). "Natural resources, education, and economic development". Eur. Econ. Rev. 45 (4), pp. 847–859
21. Habiyaremye, A., (2015). "Is Sino-African trade exacerbating resource dependence in Africa?", Structural change and Economic dynamics, Vol. 37, pp. 1-12.
22. Haggal, K., (2017). "Understanding Sino-Zambia Trade Relations: Determinants and Policy Implications" in The International Journal of Multi-Disciplinary Research, pp.1-2.
23. Halaszovich, T.F., and Kinra, A., (2020). "The impact of distance, national transportation systems and logistics performance on FDI and international trade patterns: Results from Asian global value chains", Transport Policy 98, pp. 35-47.
24. Havranek, T., Horvath, R., Zeylanov, A., (2016). "Natural resources and economic growth: a meta-analysis". Prague World Develop. 88.
25. Iwanow, T., Kirkpatrick, C., (2009). "Trade Facilitation and manufactured exports: is Africa different?" World Dev. 37 (6), pp. 1037-1050.
26. Kaldor, N., (1966). "Marginal productivity and the macro-economic theories of distribution: comment on Samuelson and Modigliani". Rev. Econ. Stud. 33 (4), pp. 309–319.
27. Karapinar, B., (2010). "Export restrictions on natural resources: policy options and opportunities for Africa", World Trade Institute, University of Bern.
28. Marti, L., Puertas, R. Garcia, L., (2014a). "Relevance of trade facilitation in emerging countries' exports". J. Int. Trade Econ. Dev. 23 (2), pp. 202-222.

29. Marti, L., Puertas, R. Garcia, L., (2014b). ”The importance of the logistics performance index in international trade”. Appl. Econ. 46 (24), pp. 2982-2992.
30. Shepherd, B., (2016). “The Gravity Model of International Trade: A User Guide” by United Nations ESCAP, pp. 17-37.
31. Soloaga, I., Wilson John, S., (2006). “Moving forward Faster: Trade Facilitation Reform and Mexican Competitiveness”.
32. Symes, W.S., McGrath, F.L., Rao, M. and Roman, L.C., (2018). “The gravity of wildlife trade”, Biological Conservation, Vol. 218, pp. 268-276.
33. Tilo F. Halaszovich and Aseem Kinra (2020). “The impact of distance, national transportation systems and logistics performance on FDI and international trade patterns: Results from Asian global value chains”, Transport Policy 98, pp. 35-47.
34. UNCTAD, 2014a. World Investment Report 2014: Investing in the SCGs- an Action Plan.
35. UNCTAD, 2014b. Trade and Development Report, vol. 2 (New York and Geneva).
36. Van der Ploeg, F., Poelhekke, S., (2009). ”Volatility and the natural resource curse”. Oxf. Econ. Pap. 61 (4), pp. 727–760.
37. Vhumbunu, C.H., (2018). “China-Zimbabwe Trade Relations in the 21st Century: An Analysis of the Trends, Patterns and Prospects”, International Journal of China Studies, Vol. 9, pp. 236-238.
38. Wilson, John S., Mann, C. L., Otsuki, T., (2005). “Assessing the benefits of trade facilitation: a global perspective.” World Econ. 28 (6), pp. 841-871 (June).

10.2 Electronic copies

1. Chinembiri, V., (2020). “Tensions Flare Between Zimbabwe Miners and Chinese Investors” in Global Press Journal, address https://globalpressjournal.com/africa/zimbabwe/tensions-flare-zimbabwe-chrome-miners-chinese-investors/ downloaded 2/7-2021.
2. Ferreira, L. (2019). “Chinese investment in Angola exceeds $20 billion” in CGTN, address https://news.cgtn.com/news/2019-09-27/Chinese-investment-in-Angola-exceeds-20-billion--KkluSMHALC/index.html, downloaded 3/7-2021.
3. Orr, W., (2020). “The Curse of the White Elephant: The Pitfalls of Zambia’s Dependence on China” in Global Risk Insights, address

https://globalriskinsights.com/2020/12/the-curse-of-the-white-elephant-the-pitfalls-of-zambias-dependence-on-china/ downloaded 3/7-2021.

4. Oshodi, A-G.,T. and Uzodike, U.O., (2021). "Fifty years, five problems – and how Nigeria can work with China in future" in The Conversation, address https://theconversation.com/fifty-years-five-problems-and-how-nigeria-can-work-with-china-in-future-157254, downloaded 3/7-2021.
5. Zhao, S., (2011). "The China-Angola Partnership: A Case Study of China's Oil Relations in Africa" in China Briefing, address https://www.china-briefing.com/news/the-china-angola-partnership-a-case-study-of-chinas-oil-relationships-with-african-nations/ downloaded 2/7-2021.
6. Xinhua, (2021). "Zimbabwe welcomes more Chinese investment: minister" in CGTN Africa, address https://africa.cgtn.com/2021/02/12/zimbabwe-welcomes-more-chinese-investment-minister/ downloaded 2/7-2021.
7. Xinhua, (2020). "China's investment key to Zimbabwe's economic development: minister", address http://www.xinhuanet.com/english/2020-02/27/c_138823881.htm, downloaded 2/7-2021.
8. Bilateral Investment Treaties was obtained from: https://investmentpolicy.unctad.org/#iiaInnerMenu, downloaded 3/5-2021.
9. Distance between capital cities, and dummies taking the value of 1 if countries were ever in colonial relationship, same for being former colony, have a common spoken language of at least 9% of population and a common border retrieved from: http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele.asp, downloaded 3/5-2021.
10. Exports and imports were retrieved from https://comtrade.un.org, downloaded 3/5-2021.
11. Gross domestic product (GDP in current US$) and population were retrieved from World Development Indicators: https://datatopics.worldbank.org/world-development-indicators/, downloaded 3/5-2021.
12. Outward foreign direct investment data (in US$) were retrieved from https://unctad.org/topic/investment/investment-statistics-and-trends, downloaded 3/5-2021.
13. Regional Trade Agreement's data was obtained from: http://jdesousa.univ.free.fr/data.htm#RegionalTradeAgreements, downloaded 3/5-2021.

11. Appendix

Table A1. List of Countries

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

Note: Reporting countries (*), rest partner countries.