7. EXPORT DETERMINANTS OF CHINA'S FDI IN AFRICA: EMPIRICAL EVIDENCE FROM OIL/MINERALS EXPORTING AFRICAN COUNTRIES

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Abstract

This paper investigated the determinants of China's FDI flow towards Africa's oil/minerals exporting countries from 2003 to 2017 using the UN-Comtrade Harmonized System (HS) nomenclature trade data and UNCTAD China's FDI data to examine the extent to which sector trade, institution and other variables determine China's FDI. The econometric approach employed for the outlined model is random effects, generalized least squares and instrumental variable two-stage least squares. For the trade variables, the findings indicate that oil/minerals have higher magnitude and a positive significance to support the effect on the FDI flow. In other words, China's FDI flow in Africa is inclined towards the extractive sector. Furthermore, the institutional quality finding is negative and significant to justify the upsurge of Chinese investment in weak politically stable regions.

Keywords: investment, trade, China, Africa, institutions, instrumental-variable (IV) estimation

JEL Classification: F21, F14, O53, O55, C26

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1. Introduction

The role of foreign direct investment (FDI) in the economic growth and development of Africa is indispensable. This is obvious in the concerted efforts of several African countries, which have experienced FDI boom, to improve their business climates, through a combination of reforms, resource mobilization, and improved environment to attract more FDI and maintain long-term bilateral relationships with foreign investors (Asiedu, 2006; UNCTAD, 2017). At the bilateral level, China's FDI in Africa has been on the increase for about two decades. Its pattern of FDI inflow to Africa, mostly from state-owned enterprises (SOE), tilts towards the extractive sectors. Due to China's quest to sustain its economic growth and development, that requires the mobilization of domestic energy, foreign energy and raw materials. Of the 53 African countries, the oil/minerals exporting nations are the major beneficiaries with about 42 per cent of China's total FDI (Broich and Szirmai, 2014; Shen and Fan, 2014; Taylor, 2015; Bing and Ceccoli, 2013; Zafar, 2007; Alabi *et al.*, 2011; Gold *et al.*, 2019; Gold and Devadason, 2018; Gold *et al*., 2015), making the resource-endowed African countries the top beneficiary of China's FDI inflows within the period from 2003 to 2017. China's incessant demand for Africa's resources, however, has led to divided opinions, partly to evaluate the inherent dangers and the developmental consequences of their engagement.

Considering the magnitude of China's FDI in Africa, studies with generalized findings and conclusions on specific case studies or selected countries on Sino-Africa relations are mostly the available ones, due to unavailability of acceptable FDI inflow data prior to the year 2003. Although these studies are indeed necessary, many appear not to be entirely relevant or applicable to other African countries. While econometric studies examining the trade specific sectors that determine China's FDI inflow to resource-exporting economies in Africa are lacking, of the few econometric studies, Gold *et al*. (2019) used UNCTAD FDI stock data from 2000 to 2015 to examine the determinants of China's FDI. The study left out FDI flow and only considered FDI stock. Kolstad and Wiig (2011)[5] used UNCTAD FDI inflow data. Other studies also focused on developed and all developing countries, Africa including, but Blonigen and Wang (2004), argue that pooling data from wealthy and developing countries is inappropriate and may lead to misleading results for empirical studies. Their argument was theoretically proven with strong reasons to explain that, factors driving FDI in developing countries differ from the factors that drive FDI in developed countries. Therefore, the sample for this study only included Africa's oil/minerals exporting countries that are the major beneficiary of China's FDI and for which FDI bilateral data are available in UNCTAD database. Second, FDI data span, 2003-2006 used for the analysis is too short to give reliable estimation (Cheng and Ma, 2010). Third, the political risk that is pointed as one of the significant institutional determinants of FDI into developing countries (Asiedu, 2006; Büthe and Milner, 2008; Sachs and Sievers, 1998) is not examined. Also, the use of proxies such as fuel export dummy, the share of ore and metal exports in total merchandise exports and GDP used in estimating natural resources (Biggeri and Sanfilippo, 2009; Buckley *et al*., 2007; Cheng and Ma, 2010) are only suggestive and do not sufficiently capture the actual share of a country's oil/minerals export.

To overcome these limitations, this paper examines the determinants of China's FDI flow to 18 African oil/minerals exporting nations from 2003 to 2017 with the use of a more comprehensive China-Africa bilateral UNCTAD FDI flow data to achieve more reliable

[5] *These studies were the pioneer attempt carried out with UNCTAD data that are in accordance with the OECD definition and the IMF guidelines.*

results. Also, the share of disaggregate oil/minerals, manufacturing and agriculture imports obtained from UN-Comtrade (2017) allow the issue of whether oil/minerals solely spurs the FDI flow to be addressed, and to identify how exports influence China's inflows of FDI. Specifically, the uniqueness of this study is that the political stability of the host countries is examined as the sole institutional determinant of FDI rather than focusing on any other perception, in order to help shed some light on the question of whether political instability determines more Chinese investment. This choice does not resolve the debate around China's engagement with politically unstable countries, rather, to find out the importance of stable polity in intensifying FDI. The rest of the paper is structured as follows. Section two discusses the literature review. Section three presents the methodology and outlines the data, methods and model, and Section four focuses on the empirical results and discussion. Section five concludes with further interpretive remarks and future research areas.

2. Literature Review

The theory of factor mobility was analyzed analogously as the theory of trade by means of the notion of inter-temporal comparative advantage in trade and production. As well, trade literature demonstrated that the foundation for cross-border factor mobility is the variation in factor endowment, development in technology, the penchant of the future and present consumption among countries and propensity to consume (Gold *et al.*, 2019; Oyejide *et al.*, 2009; Todaro, 1994). Therefore, a shortage of capital can be acquired or attracted from abundant economy abroad (Dunning, 1988; Kemp, 1964; MacDougall, 1960). In support, the neo-classical theorists argue that with time, the developing nations are expected to unite with the developed wealthier countries due to their better capacity for absorbing capital since needier nations develop faster on average than wealthier nations because of diminishing returns on capital (Udo and Obiora, 2006). Therefore, global capital mobility, through a multinational corporation (MNC), is seen as channel for foreign capital flows or foreign investments (Dunning, 1988; Krugman and Obstfeld, 2000). Based on the theories, African countries export oil/minerals to China in exchange for foreign currency. China, on the other hand, imports from Africa to sustain its growth process. As well, the presence of multinational corporations helps to extract the resource, since Africa lacks the required capacity in terms of capital and knowledge. Therefore, global capital mobility through multinational enterprises is seen as channel for foreign capital flows or foreign investments (Dunning, 1988; Krugman and Obstfeld, 2000; Gold *et al*., 2019).

The empirical literature on China-Africa FDI is twofold. The first part, which represents the large volume of studies, is qualitative (Renard, 2011; Kaplinsky and Morris, 2009; De Grauwe *et al*., 2012; Rasiah and Gachino, 2004), while few pioneer quantitative studies of Buckley *et al*. (2007); Cheung and Qian (2008), used approved China's outward FDI data to analyze African countries determinants of Chinese FDI. However, the data generated biased results as Dupasquier and Osakwe (2006) note that Chinese FDI was non-existent before the year 2000. Therefore, the actual Chinese FDI inflow was not captured. Cheng and Ma (2010) examined China's outward FDI flow and stock using a panel of 90-98 countries for flow and a sample of 125-150 host economies for the stock from 2003 to 2006. In the gravity model, neither institutional variable nor natural resources were measured to show the significant relationship between FDI, natural resources and the role of the institutions.

Specifically, Kolstad and Wiig (2011) used UNCTAD 2003-2006 data of Chinese outward FDI for 29 African countries and Rule of Law as the institutional index from Governance Indicator, World Bank Institute (WBI) (Kaufmann and Kraay, 2008) to carry out an

econometric analysis of Chinese FDI in Africa. The results showed that Chinese FDI to Africa has the image of "ravenous dragon" and is different from that of developed countries' FDI in Africa. The OLS employed indicated that the marginal effect of natural resources on FDI is positive and significant for low institutional development values. Kolstad and Wiig (2012) employed OLS estimator to analyze what determines Chinese outward FDI among 104 countries divided along OECD (25) and Non-OECD (79), using UNCTAD data of Chinese FDI flow and Rule of Law as the institutional variable from 2003 to 2006. Unlike the OECD countries, FDI which is determined by markets, Chinese FDI flow to non-OECD host countries is not only attracted by large markets but also determined by abundant natural resources. This shows that the determinant of China's FDI for the two categories of host economies differs, emphasizing petroleum as the primary interest of Chinese FDI to resource-rich countries. However, there is a substantial theoretical justification against combining developed (OECD) economies and developing (Non-OECD) economies in FDI studies, as the factors that determine FDI for the two categories of economies differ significantly (Blonigen and Wang, 2004).

Ross (2015) analyzed the determinants of China's outward FDI in Algeria, Egypt, Ghana, Kenya, Nigeria, Sudan, South Africa and Zambia from 2003 to 2012. Findings from the study showed that Chinese FDI is resource-seeking as it is determined by natural resources to sustain its economic growth, provision of infrastructure to ease China's investment and regulatory environment government-enforced in the host economies. Chen *et al.* (2016) analyzed why the private Chinese enterprises invest in small and medium private firms in 49 African countries from 1998 to 2012 using firm-level data of about 2000 Chinese firms obtained from MOFCOM. These Chinese private investments are categorized into 25 sectors and they provide the needed external capital for the region. Their results indicated that market size (GDP), availability of skilled manpower, natural resource deposits therein, politically stability in the host countries with high capital-intensive sectors were the major determinants of Chinese investment. However, the positive correlation between GDP and OFDI indicate that China's investment is market seeking (horizontal). Similarly, Chinese FDI is profit-seeking (vertical), as the results show that investments are determined by comparative advantage, they have over the host countries firms. In their other analysis in service sectors, the results showed that market size, abundant human capital, stage of development of the host country and institutions stimulate more service OFDI from China. Trade costs are not determinants of China's OFDI. It's evident from the literature that China's drive for FDI has been focused on resource endowment, GDP and Rule of Law as the institutional factor. However, political stability, which renders the economy and political framework less predictable and consistently makes a country less attractive to FDI is omitted (Büthe and Milner, 2008; Asiedu, 2006). Most important, the political stability is not the major emphasis of this analysis but examined alongside China's disaggregated oil/minerals, agriculture and manufacture imports and, on bilateral FDI inflow.

3. Methodology

3.1 Data and Variables Description

Since empirical literature pointed towards natural resources and energy as the determinants of China's FDI flow in Africa, 18 exporting oil/minerals countries derived from all African Union (AU) member countries were selected (International Energy Agency, 2016). Considering the susceptibility of China's FDI data, this study seeks to minimize inconsistency by using annual bilateral China's FDI flow data from 2003 to 2017 as the

dependent variable. The FDI data is obtainable from *UNCTAD* database (2017) and *Ministry of Commerce China (MOFCOM)* (2017) and is consistent with the IMF and the OECD standard collection methods. The data capture the relative attractiveness of individual African country as a host for China's FDI and explicitly allows for competition among them for a fixed share of FDI to be divided (Neumayer and Spess, 2005). The variable measures the sum of investment from a foreign capital owner to the host economy. To avoid missing trade data that is particular to the Sub-Saharan African countries, China's import from Africa is used, due to its accuracy, as it includes cost, insurance and freight (CIF), against the recorded free on board (FOB) African exporting data (He, 2013). The trade variables, China's imports-by-products-by-year-by-partner country (measured as the sum of total bilateral imports from Africa), obtainable from the UN-Comtrade (2017) Harmonized System (HS) products classification 1-99 nomenclature and categorized into agriculture (HS 1-24), oil/minerals (HS 25-27), and manufacturing (HS 28-99) sectors, are used. These trade variables help to identify whether exports of a sector attract more FDI than the other and to determine the importance of various exporting sectors.

For the institution variable, the political stability and absence of violence/terrorism index constructed by Kaufmann and Kraay (2008) for countries institutions ratings, which vary from -2.5 to 2.5, where higher number signify better institutions and lower number signify poor institutions, obtainable from World Bank Institute, *World Governance Indicators (WGI)* (2017), is used. These indicators measure the likelihood of political instability and politically motivated violence, ethnoreligious crisis, military intervention in the political process, including terrorism, to test the relative importance of the arguments surrounding China's investment in pariah's states and elite regimes. Other control variables are the GDP (indicators of market size), trade openness and inflation (a measure of macroeconomic instability), that are consistently found to be determinants of FDI flow (Asiedu, 2006; Chakrabarti, 2001; Blonigen, 2005; Neumayer and Spess, 2005; Kolstad and Wiig, 2011; Kolstad and Wiig, 2012; Rose-Ackerman and Tobin, 2005). Also, GDP per capita (economic performance), infrastructure quality (proxy by fixed telephone per 100 people), and school enrolment ratio (human capital) obtained from World Bank, *World Development Indicators* (2017) are added to measure their effect on FDI and to test the robustness of the main results.

3.2 The Model

The model specification and the choice of bilateral FDI flow as the dependent variable is based on Cheng and Ma (2010); Kolstad and Wiig (2012); Kolstad and Wiig (2011) and Neumayer and Spess (2005), who argue that FDI flow to host country abroad is a better measure of investment outflows. For this reason and to validate the intuitions of the previous sections, the panel equation to be estimated is as follows:

$$\begin{aligned} lnChineseFDIflow_{ijt} &= \beta_0 + \beta_1 lnGDP_{it} + \beta_2 lnInfl_{jt} + \beta_3 lnAGRICShr_{ijt} + \beta_4 lnOILShr_{ijt} \\ &+ \beta_5 lnMANUShr_{ijt} + \beta_6 lnFixPhone_{jt} + \beta_7 lnOPENSS_{jt} \\ &+ \beta_8 lnGDPperk_{jt} + \beta_9 lnSchenrol_{jt} + \beta_{10} POLSTAB_{jt} + \varepsilon_{ijt} \end{aligned} \quad (1.1)$$

where: *ln* represents the log of variables; $ChineseFDIflow_{ijt}$= China's FDI outflow to recipient country_j; GDP_{jt} = GDP for country j; $Infl_{jt}$ = inflation rate of country_j; $AGRICShr_{ijt}$ = agriculture share of country_i imports from country_j; $OILShr_{ijt}$ = oil/minerals share of country_i imports from country_j; $MANUShr_{ijt}$= manufacturing share of

country_i imports from country_j; $FixPhone_{jt}$ = fixed telephone subscriptions per 100 people in country_j; OPENSS_{jt}= trade openness; $GDPperk_{jt}$ = income per capita of country_j; $Schenrol_{jt}$ = school enrolment per 1,000 of country_j; $POLSTAB_{jt}$ = level of political stability and absence of violence; β = regression coefficients; t = time; ε_{ijt} = error term. As simple as the model look, first, it helps to identify which African sector exports and the institutional factor that can either restrain or spur Chinese FDI flow. Second, the use of the model helps to identify other parameters that increase the attractiveness of FDI flow from China. It is worth mentioning that due to the short time span of standard China's bilateral FDI data (the dependent variables) obtained from UNCTAD, there may be a little variation in the included variables.

3.3 Estimation Techniques and Summary Statistics

The pooled OLS, random effects (RE), GLS, and instrumental variables two-stage least squares (2SLS) econometric techniques were employed to estimate the model. All things being equal, pooled OLS should have been enough to estimate the model because of the minimal variation in the data set. In addition, time-invariant-country-specific variables such as colonial ties, geographical destinations, common colony, or language are not included in the panel model. However, it is assumed that the explanatory variables GDP and per capita income are possibly related to the FDI dependent variable. That is, they are affected by and may have affected the FDI flow, thereby creating endogeneity issue in the regression. This is the case since GDP and GDP per capita are theoretically the measures of economic growth and development, respectively, and there is consistent evidence that MNCs and other foreign investors tend to invest more in countries that are considered to be witnessing more of economic growth and development (Asiedu, 2002; Asiedu, 2006). Therefore, they can be used as the dependent variables as well as independent variables. One plausible approach to resolve the endogeneity issue is using simultaneous estimation techniques such as the instrumental variables two-stage least squares (2SLS). Still, the 2SLS approach is not devoid of shortcomings. The first shortcoming is that choosing appropriate instruments for developing country studies is a bit difficult, and the second shortcoming is that if care is not taken weak instruments that may lead to bias results may be chosen.

Considering the above-mentioned reasons, the dependent variable and all the explanatory variables in monetary values were transformed into natural logarithm and lag by 1 year, except for the institutional quality variable, which is an index. The use of log specification is to minimize skewness of the model distribution, control for all time-invariant country's factors, circumvent endogeneity issues in the model and to considerably improve the model fit (Wooldridge, 2003). Nevertheless, using natural logarithm specification alone may be too naïve an approach to circumvent potential endogeneity problems in the OLS regressions (Reed, 2015). Rather, the instrumental variable approach is by far superior to the use of suspected lagged variables. On this premise, the study follows Gold *et al.* (2019); Reed (2015) and Selaya and Sunesen (2012), and employs simultaneous estimation (instrumentation strategy) 2SLS techniques and lag FDI flow. GDP and GDP per capita which are the pre-determined contemporaneous variables are lagged and used as instruments with other variables not included in the 2SLS estimating models, such as GDP growth, population, total land area, landlock common language and colony. The appropriateness is confirmed through tests of overidentifying restrictions, Durbin-Wu-Hausman chi-sq. test and heteroskedasticity to test for the validity of the instrumental variables (Biggeri and Sanfilippo, 2009; Reed, 2015; Gold *et al*., 2019). Hence, the summary statistics for the variables specified in equation 1.1 is presented in Table 1.

Table 1

Summary Statistics*

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Foreign Direct Investment *(ChnFDIflow)*	216	74.309	345.819	-814.91	4807.86
Market size *(GDP)*	287	7.49e+10	1.07e+11	2.70e+09	4.64e+11
Inflation *(Infl)*	279	12.545	43.594	-9.798	513.907
Political Stability *(PolStaVln)*	270	-0.750	0.836	-2.581	0.814
Share of Agriculture *(IMAgric)*	288	2.89e+07	7.55e+07	0	4.56e+08
Share of Oil/minerals *(IMOIL)*	273	1.61e+09	4.55e+09	0	3.35e+10
Share of Manufacture *(IMMANU)*	288	8.99e+08	4.24e+09	0	3.86e+10
Infrastructure *(FixTelppl)*	288	3.768	4.727	0	20.334
Trade openness *(Topenez)*	268	87.984	44.365	25.042	351.106
GDP per capita *(AgdppK)*	287	2943.486	2911.965	194.169	11933.8
Human Capital *(Schooenrol)*	148	0.901	0.130	0.563	1.106

*Note: *The sample period is from 2003 to 2017.*

4. Empirical Results and Discussion

Tables 2, 3 and 4 report the econometric results for an unbalanced panel of 18 oil/minerals exporting African countries from 2003 to 2017. The pooled OLS and RE estimators are reported in Table 2. For consistency check, this study estimates GLS (indicated in Table 3), instrumental variables (IV) regressions 2SLS and 2SLS (with robust standard errors) and presents the results in Table 4. The choice between OLS and RE was based on the outcome of the Breusch and Pagan Lagrangian multiplier test in Table 2 (significant at 1%), this suggests that OLS and GLS are appropriate estimators for the model. The variance inflation factors (VIF) is 2.78 (Kutner *et al*., 2004; Neter *et al*., 1996). Also, the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity and Wooldridge test for autocorrelation in panel data are both insignificant, indicating the absence of heteroskedasticity and serial correlation in the regression and suggesting OLS as an appropriate estimator. However, He (2013) and Gold *et al*. (2019), argue that the OLS estimator introduces endogeneity into the regression specification, due to error term correlating with the lagged dependent variable. Although it is expected that the endogeneity problem is unlikely to matter, since Chinese FDI flow is still relatively small in Africa and the model does not contain any time-invariant variables that may drop during estimation.

Nevertheless, to address endogeneity problems that may arise due to the interplay of the dependent variable and some explanatory variables, all variables in monetary values were transformed into natural logarithm by one period. This is exceptional of the institutional variable and inflation, which is in index and rate, respectively to minimize skewness of its distribution and to considerably improve the model fit. Alternatively, to tackle endogeneity more adequately, instrumental variables (IV) two-stage least square (2SLS) estimation technique proposed by Anderson and Hsiao (1982) is adopted instead of relying on the naïve belief of using lagged variables to circumvent endogeneity and to achieve efficient and non-biased results. This approach is consistent with the study of Biggeri and Sanfilippo (2009) and Gold *et al.* (2019). Therefore, OLS and RE are reported as references to the results.

Table 2

Pooled OLS Regression and Random Effects Results for Chinese Bilateral Foreign Direct Investment Flow*

Dependent Variable: *ChnFDIflow*				
Explanatory Variables	Coefficients Regression OLS	P-value	Coefficients Random effects (RE)	P-value
LogGDP	0.713*** (3.51)	0.001	0.713*** (0.20)	0.000
Infl	0.046 (1.52)	0.134	0.047 (0.03)	0.128
PolStabVln	-0.641* (-1.81)	0.076	-0.641* (0.36)	0.071
logIMMANU	-0.006 (-0.07)	0.946	-0.006 (0.09)	0.945
logIMOIL	0.231** (2.62)	0.011	0.231*** (0.09)	0.009
logIMAgric	0.049 (0.64)	0.524	0.049 (0.77)	0.521
logFixTelppl	-0.440* (-1.78)	0.081	-0.441* (0.25)	0.075
logTopenez	1.187 (1.54)	0.129	1.187 (0.77)	0.123
logAgdppK	-0.165 (-0.56)	0.579	-0.166 (0.29)	0.577
logSchooenrol	4.071** (2.02)	0.047	4.072** (2.01)	0.043
Constant	-23.507*** (-3.62)	0.001	-23.507*** (6.49)	0.000
No. of Observations	70		70	
R-sq			0.581	
Adjusted R-sq	0.510			
Wald chi^2 (Prob > chi^2 in parentheses)			81.91 (0.00)	
LM test: X^2			1.000	

Note: All estimations are carried out with Stata 12 software. The OLS estimated t-values and Random effects z-values are in parentheses; Wald chi test p-values in bracket; all estimates are rounded up to three significant figures *p < 0.1; **p < 0.05; ***p < 0.01.*

The GLS provides more robust results, corrected for possible heteroskedasticity in the cross-section. the Wald Chi^2 value is moderate, and the R^2 value signifies the strong individual effects of the host countries. As expected, the share of oil/minerals, GDP of the host economies, political instability, openness, human capital yielded significant coefficients at 10 per cent level or better to support their effects on FDI flow. An indication that oil/minerals, macroeconomic policies, market size, the weak political stability of the host countries and human capital determines China's FDI flow, thereby confirming Dunning's eclectic analytical framework. In Table 3, the GLS results indicate a percentage increase in oil/minerals will lead to 0.23 per cent in FDI flow to confirm the theoretical underpinning of Chinese FDI been resource-seeking. The share of manufacturing is expected to be mixed, due to China's comparative advantage over Africa in manufacturing. While a negative coefficient is expected for the share of agriculture, since China's imports in this category represent 3 per cent of the total imports (Renard, 2011). However, agriculture and manufacturing are both insignificant, but have positive and negative coefficients, respectively, which indicates that both are not determinant.

The political stability results in Table 2 (OLS) and Table 3 (GLS) are expected to conform to theoretical and empirical expectations which simply state that political instability or political unrest in any nation affects the flow of goods, services and foreign investment. The coefficients of OLS and GLS are -0.641 and -0.627 and are significantly negative at 10 per

cent and 5 per cent levels, respectively, which indicates that China's investment in oil/minerals exporting countries in Africa is attracted to less politically stable countries. This result is consistent with the econometric findings of Shan *et al*. (2018) and aligns with the arguments of Alden (2005); Alden (2012) and Zafar (2007) about China's attraction/engagement with pariah states and politically unstable regions. The results on infrastructure are significantly negative at 10 per cent and 5 per cent in the reported OLS and GLS results. It suggests that the low level of infrastructure development tends to attract more outward Chinese FDI flow. That is, a per cent decrease in infrastructure will lead to more FDI from China, although the results are in divergence with Asiedu (2006); Kamara (2013) and Morisset (2000), but similar to Gold *et al.* (2019). It is not strange, as most developing oil/minerals exporting countries in Africa are plagued by relatively weak infrastructure for the improvement of which China provides funds in investment form or through loans/aid (Biggeri and Sanfilippo, 2009; Dupasquier and Osakwe, 2006).

The GDP is positive and significant at 1 per cent level with the same magnitude of 0.713 in both OLS and GLS results. An important feature of the host economy market size results is that the magnitude of the effects on Chinese FDI flow is greater than that of all other determinants in this study. The result is in line with the studies of Asiedu (2006); Chen *et al.* (2016); Gold *et al.* (2019) and Kolstad and Wiig (2011) and conform with *a priori* expectation. In other words, China's FDI is market-seeking and conforms to Dunning's theory. In the case of human capital, it is significantly positive at 5 per cent in both OLS and GLS results to support its relationship with FDI flow. It shows that strong human capital of the host economies encourages investors and reduces transaction costs. Although contrary to the findings of Biggeri and Sanfilippo (2009), it is in line with Chen *et al.* (2016) and Gold *et al*. (2019), where cheap labor enhances FDI but negates the existing argument about Chinese SOE paying little or no attention to local outsourcing (Bräutigam, 2009; Jauch, 2011). For *per capita* GDP, the effect on FDI flow is negative, but not significant in the OLS and GLS reported results. This variable relates to host countries' stage of development that is likely to play in the opposite direction of developed nations. *Per capita* GDP is expected to influence the choice of location for Chinese investment in Africa, but the results negate the conventional view. They show that the level of economic development does not have any effect on the Chinese FDI flow. The insignificance of *per capita* GDP is more surprising, but it is likely to be determined by two contrasting effects: on the one hand, higher *per capita* income is associated with higher costs, which makes the cost of exporting high. On the other hand, high *per capita* is associated with higher efficiency in handling internal logistics such as administrative procedures and transportation that reduces the cost.

Table 3

GLS Estimation Results for the Determinant of Chinese FDI Flow*

Dependent Variable: *ChnFDIflow*		
Explanatory Variables	**Coefficients (GLS)**	***P-value***
LogGDP	0.713*** (3.83)	0.000
Infl	0.046* (1.66)	0.098
PolStabVln	-0.641** (-1.97)	0.049
logIMMANU	-0.006 (-0.07)	0.941
logIMOIL	0.231*** (2.85)	0.004
logIMAgric	0.049 (0.70)	0.485
logFixTelppl	-0.441** (-1.94)	0.053
logTopenez	1.187* (1.68)	0.093
logAgdppK	-0.165 (-0.61)	0.544

Dependent Variable: *ChnFDIflow*		
Explanatory Variables	**Coefficients (GLS)**	***P-value***
logSchooenrol	4.071** (2.21)	0.027
Constant	-23.507*** (-3.95)	0.000
No. of Observations	70	
Adjusted R-sq		
Wald chi^2 (Prob > chi^2 in parentheses)	97.18 (0.00)	
LM test: X^2	1.000	

*Note: All estimations are carried out with Stata 12 software. The GLS z-statistics are in parentheses; Wald chi test p-values in bracket; all estimates are rounded up to three significant figures *p < 0.1; **p < 0.05; ***p < 0.01.*

Trade openness is significantly positive at 10 per cent level only in the GLS estimation. This conforms with the product life cycle theory (Vernon, 1966), which states that trade is a complement to FDI, and improvement in host countries trade liberalization policies will improve the business environment and boost FDI inflows. Thus, it suggests that the African countries are more open to trade, to export goods produced and services rendered. Hence, they attract more FDI flow from China. As expected, uncertainty in the macroeconomic environment discourages FDI flow. For instance, it is expected that, when inflation is low and stable, FDI will have more effect on the population and thus reflect economic stability to foreign investors (Dupasquier and Osakwe, 2006). Hence, inflation conforms to expectation with a positive and significant 10 per cent level in the GLS results. This result aligns with the findings of Biggeri and Sanfilippo (2009); Buckley *et al.* (2007) and Gold *et al.* (2019) to indicate that Chinese investment in the oil/minerals exporting regions in Africa is least affected or deterred by the economic environment.

Table 4

IV (2SLS) and IV (2SLS Robust Standard Errors) Results for Chinese FDI Flow*

Dependent Variable: *ChnFDIflow*				
Explanatory Variables	**Coefficients (2SLS)**	**P-value**	**Coefficients (2SLS robust)**	**P-value**
LogGDP	1.106*** (3.72)	0.000	1.106*** (3.97)	0.000
logAgdppK	-1.377** (-2.01)	0.044	-1.377** (-2.28)	0.023
Infl	0.064* (1.88)	0.061	0.063* (1.89)	0.059
PolStabVln	-1.057** (-2.43)	0.015	-1.057*** (-2.63)	0.008
logIMMANU	-0.259* (-1.65)	0.100	-0.259* (-1.79)	0.073
logIMOIL	0.282*** (2.89)	0.004	0.282*** (4.16)	0.000
logIMAgric	0.056 (0.69)	0.488	0.057 (0.64)	0.522
logFixTelppl	-0.311 (-1.13)	0.260	-0.3112 (-1.24)	0.216
logTopenez	1.179 (1.44)	0.150	1.179* (1.62)	0.106
logSchooenrol	2.500 (1.11)	0.265	2.500 (1.15)	0.249
Constant	-21.060*** (-2.78)	0.006	-21.060*** (-3.38)	0.001
No. of Observations	70		70	
Uncentered R2	0.855		0.855	
Sargan/Hansen J statistic	0.299		0.318	
Chi-sq. (2) P-val	0.861		0.85317	

Dependent Variable: *ChnFDIflow*				
Explanatory Variables	**Coefficients (2SLS)**	**P-value**	**Coefficients (2SLS robust)**	**P-value**
Wu-Hausman	2.388 (0.100)			
Durbin-Wu-Hausman	5.412 (0.066)			

Note:All estimations are carried out with Stata 12 software. The estimated z statistics for 2SLS and 2SLS (robust) are in parentheses; Hausman tests p-values in brackets; all estimates are rounded up to three significant figures *p < 0.1; **p < 0.05; ***p < 0.01.*

In Table 4, instrumental variables 2SLS and the 2SLS (with robust standard error) results are reported to solve the endogeneity issue in the regression and for robustness check. Although, stronger results are expected in 2SLS; since GDP and *per capita GDP* were used as instruments, yet the Hansen *J-statistics* and the Durbin-Wu-Hausman tests of overidentifying restrictions indicates that the instruments used in the equation are not overidentified. Hence, the instruments seem valid both theoretically and empirically in solving endogeneity. On oil/minerals, the results have a 0.28 per cent effect on FDI, with significantly positive 1 per cent level which suggests a complementary effect between FDI flow and oil/minerals. Also, the estimated coefficient of GDP, political instability and trade openness (though openness is insignificant in 2SLS result) are correctly signed and consistent with *a priori* expectation. These results are similar to the GLS results, even when it is expected that the estimated effects will be stronger. However, manufacturing, infrastructure, per capita GDP and human capital are the exceptions. For, instance, *per capita GDP* is insignificant and negative in both OLS and GLS results in Table 2 and Table 3, respectively, whereas, it is significantly negative at 5 per cent level with similar coefficients of -1.377 in both 2SLS and 2SLS (with robust standard error) results. This shows that the stage of economic development tends to be negatively correlated with China's FDI inflow. Although, it is expected that real *per capita GDP* will determine FDI, on the contrary, economic development or wellbeing of oil/minerals exporting African economies is not an important consideration for Chinese FDI flow. Likewise, manufacturing in both 2SLS and 2SLS (with robust standard error) is negatively significant at a 10 per cent level, with a similar estimated coefficient of -0.259. However, manufacturing imports is not significant, and is negative in the OLS and GLS results. This result is understandable, considering that China's manufacturing exports overshadowed that of African's manufacturing exports (Edwards and Jenkins, 2014; Murtala *et al*., 2017). Moreover, infrastructure and human capital that conform to *a priori* expectation in OLS and GLS results ceased to have any significant impact on China's FDI flow in the 2SLS and 2SLS (with robust standard error) results.

5. Conclusions

The unavailability of acceptable OECD and IMF China's bilateral FDI data before the year 2003 became a limitation, as empirical evidence that buttress many of the views on the determinants of Chinese FDI flow to Africa are limited. Instead, conjectures have become strong both in academia and among the media, thus, this has led to results and conclusions that are frequently generalized. On that note, this paper contributes to the empirical literature on the determinants of China's FDI flow. The study employs disaggregate China's imports based on the Harmonized System (HS) data classification from the UN-Comtrade and categorizes them into oil/minerals, manufacturing and agriculture. As well, a more comprehensive bilateral Chinese FDI flow data to Africa from 2003 to 2017 were obtained

from both UNCTAD and MOFCOM. To our knowledge, this study made the first attempt to classify China's imports into oil/minerals, manufacturing and agriculture sectors; and examine its effect on Chinese FDI flow solely on oil/minerals exporters and not on the entire world or the African continent. The richness of the information contained in the data set makes it possible to analyze, over an extended period, the importance of a comprehensive set of covariates and test the effects on the countries under study. To achieve the research objective, OLS, RE, GLS, instrumental variables 2SLS and 2SLS with the robust standard error were employed to identify the imports sector(s) and other salient variables that determine Chinese FDI.

From the empirical results, four inferences were drawn. First, China's FDI flow to host African countries is determined by market size, oil/minerals, human capital and liberalization policies enforced to attract investors. This gives a pointer to the fact that some of the key variables that determine Western countries and other South-South countries' FDI in Africa are not too different from what determines China's bilateral FDI flow to African oil/minerals exporting countries, except for political stability, a proxy used in measuring institutional quality. The political stability results show that China invests in politically unstable countries. However, the results from this study do not resolve, in totality, the debate on China investing in countries more democratic than itself. Considering that, a variable to measure democracy is left for future study. Second, Chinese investment in the oil/minerals regions in Africa is least affected or deterred by macroeconomic instability and economic environment. Third, the presence of infrastructure deficit contributes more towards FDI decisions into the economies. Fourth, the results show evidence supporting theories of multinational enterprises (Dunning, 1988) and the internationalization process of a firm (Johanson and Vahlne, 1977).

Based on these inferences, this study recommends a few policies for African governments that will make them benefit from China's appended interest in the region if implemented. The policies include capitalizing on China's constant demand for oil/minerals to develop the manufacturing sector and promote internalization of the host economies. Formulate and implement policies to sustain macroeconomic stability; strengthen the effective institutions to reinforce investors' confidence in the region and attract both domestic and foreign investors in the oil/minerals sector to achieve the desired knowledge transfer and capital to improve economic growth. Endeavour to utilize the oil/minerals proceeds to improve infrastructure and create an enabling environment conducive to get the region close to attaining its development objectives. Lastly, the limitation of this study hinges on the unavailability of time-series data to analyze the determinants on an individual country basis. In addition, this empirical study can be extended to accommodate other complex issues on what determines China's FDI flow. For instance, a further study on Middle-East oil-exporting nations and African oil-exporting nations is required to compare if determinants of Chinese FDI flow are similar in the two regions. As well, a further study on the role of host countries financial institutions in enabling foreign investments will be necessary to formulate clearer financial sector policies.

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