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Macroeconomic Determinants of Foreign Aid Inflows in North African Countries

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Abstract: This study examined the determinants of foreign aid inflows in North African countries using panel data (1989-2019) analysis. The study also explored the influence of the complementarity between trade openness and foreign direct investment on foreign aid inflows in North African countries using the same data set. Several gaps, divergent, mixed and conflicting views in the literature prompted the author to investigate this topic to contribute towards the discourse. Trade openness (fixed effects, fully modified ordinary least squares), the complementarity between trade openness and foreign direct investment (pooled ordinary least squares), personal remittances (dynamic ordinary least squares, pooled ordinary least squares), population growth (pooled ordinary least squares) and government consumption expenditure (fixed effects, fully modified ordinary least squares, pooled ordinary least squares) were found to have had a significant positive influence on foreign aid inflows into North African countries. Foreign direct investment (pooled ordinary least squares) and economic growth (fixed effects, fully modified ordinary least squares, pooled ordinary least squares)'s negative impact on foreign aid inflows into North African countries was found to be significant. To attract more foreign aid, North African countries are advised to implement trade openness, personal remittances inflow, population growth and government consumption expenditure enhancement policies. A study on threshold regression analysis of the determinants of foreign aid inflows in North African countries adds value in as far as erudite policy making is concerned.

Keywords: Foreign Aid; Panel Data; North Africa; Determinants

JEL Classification: B22

1. Introduction

1.1. Background

According to Shleifer (2009), United Nations and majority of developed countries avail aid to poor, developing and less developing nations to curtail poverty and spur economic growth. Clunies-Ross et al (2009) argued that foreign aid enables poor

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countries to engage not only in poverty reduction initiatives but also in long term economic growth activities which are self-sustaining. The same authors noted that foreign aid is an external push that helps the poor and less developing nations to bridge the capital deficiency gap that normally trigger the poverty vicious cycle.

On the contrary, the over-reliance on external assistance in the form of foreign aid promotes laziness among the people, which is economically counterproductive in the medium to long term (Knack. 2001). Mosley et al (1987) propagated an argument that there is no way foreign aid can achieve its objectives of poverty alleviation and spurring economic growth if certain macroeconomic variables do not exist in the recipient country. Majority of empirical literature on foreign aid-led poverty reduction hypothesis noted that poverty alleviation is enhanced by foreign aid. These include but are not limited to Mahembe and Odhiambo (2019), Mahembe and Odhiambo (2017), Almeida (2018), Okoronkwo et al (2016), Ugwuanyi et al (2017), Mahembe (2019), Bourguignon and Platteau (2017), Shina (2018), Amanda (2019), Boye (2019), Seedee (2018) and Zafar et al (2017).

Consistent with Rabehajaina et al (2022) and Akarsu (2019), examining the determinants of foreign aid is necessary to enable easy formulation of foreign aid led poverty reduction policies. The challenge is that there is no single list of theoretical variables that influence foreign aid (see Table 1). The few empirical researchers who examined the determinants of foreign aid also produced results which are mixed, divergent, inconclusive and far from showing consensus (refer to Table 2). These empirical researchers also suffer from methodological deficiencies. Firstly, they assumed wrongly that the foreign aid function is linear in nature. Secondly, the data they used is now outdated. Thirdly, the fact that foreign aid is influenced through different channels was completely ignored. A dedicated study on the subject matter (determinants of foreign aid) using North African countries does not exist to the author's best knowledge. This is even though North African countries is a bloc that receives the biggest share of foreign aid in Africa. Fourthly, majority of them examined the determinants of foreign aid outflows. This study fills in all these gaps.

1.2. Contribution of the Paper

This study filled in the gaps which exists in the literature on the determinants of foreign aid. This is the first study to the author's best knowledge to exclusively investigate the macroeconomic determinants of foreign aid inflows. Most empirical studies examined the determinants of foreign aid outflows, yet this study exclusively delved on foreign aid inflows determinants. No empirical study has so far examined the determinants of foreign aid inflows in North African countries. This study is the first of its kind to explore whether the impact of trade openness on foreign aid inflow happens directly or through a channel (foreign direct investment). It is the first study to the best knowledge of the author to examine if foreign aid inflows in North African

countries are influenced by the complementarity between trade openness and foreign direct investment. This study used the very recent data set (1989-2019). Unlike most existing empirical research on the determinants of foreign aid, this study correctly considered the fact that the influence of macroeconomic variables on foreign aid occurs through channels, not in a direct manner.

1.3. Structure of the Remaining Sections

Theoretical literature on the determinants of foreign aid was discussed in Section 2 whilst Section 3 dealt with relevant empirical literature. Section 4 graphically presented the foreign aid inflow trends for North African countries for the period ranging from 1989 to 2019. Section 5 is the research methodology (data, econometric models and proxies used description). Section 6 presented, discussed and interpreted the results of the study. Section 7 summarized the paper whilst the list of references is presented in Section 8.

2. Theoretical Literature Review

Table 1 shows that theoretical literature does not have a single list of factors that determine foreign aid inflows.

Table 1. Theoretical Rationales of the Explanatory Variables

Explanatory variables	Theoretical views	Impact
Trade openness (OPEN)	High levels of trade openness promote increased economic growth-based activities in the country, brings foreign currency into the economy through promoting international trade and brings social efficiency. This reduces the need for seeking and begging for foreign aid inflows into the country (Ali and Isse. 2006: 245).	**-**
Population growth (PG)	Gillis et al (1992)'s argument supported the population bias theory which says that some donors prefer to direct their aid to countries with less population so that the foreign aid makes a more visible and quantifiable impact. Maizels and Nissanke (1984) argued that some foreign donors channel their aid to more populous countries to gain political, economic and cultural influence. Population growth is therefore expected to influence foreign aid either way.	+/-

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Economic growth (GROWTH)	Foreign aid normally is more directed towards slow economic growth and poor countries so that they augment their meagre financial resources to promote education, health, infrastructural development, food security and small-scale business development initiatives (Ali and Isse. 2006: 245). Countries experiencing high economic growth therefore are expected to receive less foreign aid.	-
Personal remittances received (REMIT)	Given the fact that education and health access are the key reasons for channelling aid to less financially strong economies, the availability of more private sources (personal remittances flow) for funding health and education sectors has a downward influence on the inflow of foreign aid (Kpodar and Goff. 2012: 4). The same study also argued that the increase in human capital development directly because of personal remittances inflow takes away some barriers to foreign aid's effectiveness (Kpodar and Goff. 2012: 5).	+/-
Foreign direct investment (% of GDP)	According to Ali and Isse (2006), foreign direct investment enhances productive and institutional ventures in the recipient country, hence most likely to reduce and or drive out foreign aid on a government to government arrangements. Consistent with Kpodar and Goff (2012: 5), foreign direct investment enhances human capital development, which in turn promotes the efficiency of foreign aid. Foreign aid efficiency is one of the factors which attracts donors, in line with Kpodar and Goff (2012)'s argument earlier on enunciated.	+/-
Government consumption expenditure (GCONS)	In line with Ali and Isse (2006), government consumption expenditure represents the size of the government receiving the foreign aid. Theoretically, their study argued that foreign aid is directed to governments therefore an increase in government consumption expenditure amplify the size of foreign aid inflows.	+

Source: Author

The theoretical influence of macroeconomic determinants of foreign aid inflows is mixed, divergent and conflicting, hence necessitating further investigations on the subject matter.

3. Empirical Literature Review

Table 2. Determinants of Foreign Aid from an Empirical Literature View Point

Author	Unit of analysis	Approach	Findings
Ali and Isse (2006)	151 countries	Panel data analysis	Foreign direct investment and government consumption increased foreign aid inflows whilst financial development (private credit), trade openness, number of schooling years and economic growth led to a decline in foreign aid dependency.
Uzonyi and Rider (2016)	Developing countries	Ordinary least squares	High economic growth, population growth and trade openness were found to have necessitated increased foreign aid inflows.
Fan and Yuehua (2008)	China	Descriptive statistics	Economic growth reduced foreign aid whilst government consumption and trade openness were found to have increased foreign aid inflows.
Asiedu et al (2013)	Developing countries	Panel data analysis	Mexico City policy reduced family planning aid whereas highly populated areas and increased fertility rates enhanced more family planning aid inflows.
Akarsu (2019)	Developing countries	Panel data analysis	Migration flows, trade openness, economic growth was found to have attracted more foreign aid inflows.
Gang and Khan (1990)	India	Ordinary least squares	The lag of foreign aid, and trade balance were found to have significantly enhanced foreign aid inflows.
Kim and Oh (2012)	154 recipient countries	Panel data analysis	Economic growth increased foreign aid inflows across all the recipient group of countries. In the middle-income group of countries, increased economic growth had a negative impact on foreign aid inflows.
Morris (2010)	Sub-Saharan African countries	Multivariate panel regression	Whilst war on terror reduced foreign aid inflows, foreign aid was positively influenced by strengthened security environment.
Furuoka (2017)	Africa	Panel data analysis	Foreign aid's self-interest, population size, governance quality and quality of intuitions played a major role in influencing foreign aid inflows.
Usman (2010)	Pakistan	Descriptive statistics	Democracy, imports from United Kingdom, United States and Japan and

			geo-politics were the major factors that enhanced foreign aid inflows into Pakistan.
Rabehajaina et al (2022)	Developing countries	Panel data analysis	Recipient requirements influenced foreign aid inflows from United States and United Kingdom. Corruption and economic self-interests at home determined foreign aid inflows from United Kingdom and France.
Amusa et al (2016)	Sub-Saharan Africa	Panel data analysis	Population growth, income levels, needs of the recipients and motives of the donor had a huge influence on foreign aid distribution.
Dreher et al (2016)	Africa	Panel data analysis	Foreign aid inflows into Africa were influenced by economic interests and foreign policy considerations.
Marek (2007)	Sub Saharan Africa	Fixed effects	Nations characterized by poor education and health levels attracted more foreign aid inflows.
Hoeffler and Outram (2008)	Developing countries	Multi-regression analysis	Democracy, economic growth and human rights were found to have had an insignificant impact on foreign aid inflows.
Alesina and Dollar (1998)	Developing countries and middle-income countries	Literature review analysis	Political alliances and colonial past were the major factors that were found to influence foreign aid.
Kim (2016)	136 recipient countries	Panel data analysis	Political and economic strategies of Korea determined the flow of aid from Korea towards Bangladesh, Vietnam and Iraq.
Ji and Lim (2018)	141 recipient countries	Panel data analysis	Undernourishment, depth of food deficits, food inadequacy rates and political circumstances were found to be significant factors influencing foreign aid inflows.
Briggs (2015)	Africa	Descriptive analysis	The level of poverty did not influence foreign aid inflows into Africa.

Source: Author

The empirical literature on the determinants of foreign aid inflows are very scant. Majority of empirical literature on the subject matter investigated the determinants of foreign aid outflows and not inflows. It is also evident that there is no agreeable list of factors that have an influence on foreign aid inflows. The results on the influence of the variables on foreign aid is quite conflicting, divergent, mixed and

shows that there is no agreement on a single list of variables that determine foreign aid inflows. This study fills in these gaps.

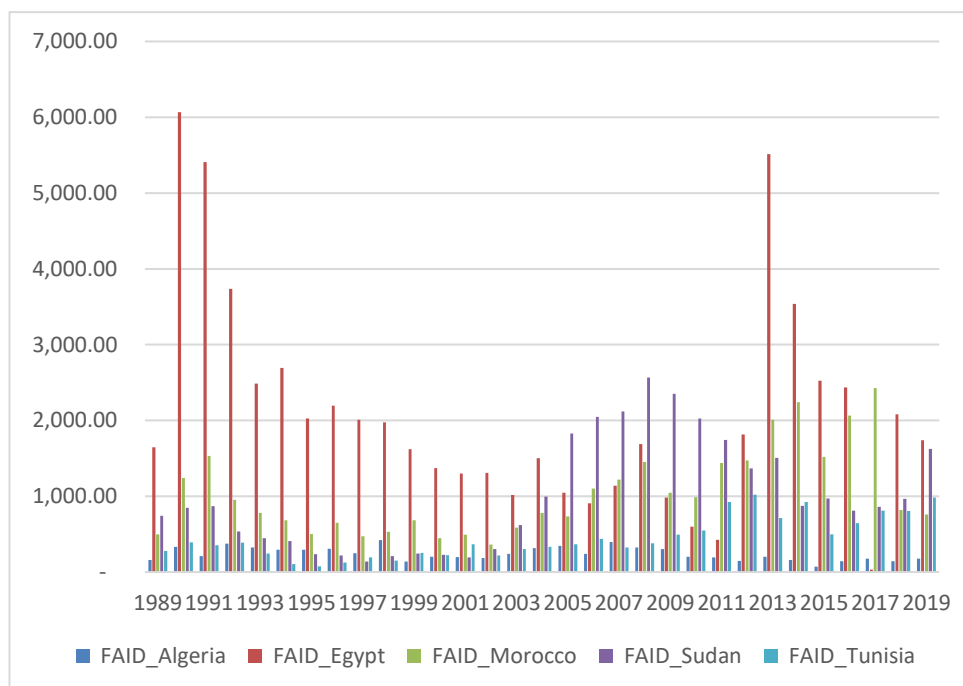## 4. Foreign Aid Trends in North African Countries (1989-2019)

Figure 1. Net Official Development Assistance and Official Aid Received (US$ Millions) Trends for North African Countries
Source: Author

Algeria's foreign aid increased from US$158.21 million in 1989 to US$295.49 million in 1994, decreased by 53.30% during the five-year period from 1994 to 1999 and went up by a massive 129.72% during the subsequent five-year time frame, from US$137.98 million to US$316.97 million. A marginal 4.60% decline in foreign aid was observed during the period ranging from 2004 to 2009 whilst foreign aid for Algeria experienced another decrease of 46.88% during the subsequent five-year period, from US$302.39 million in 2009 to US$160.62 million in 2014. The five-year period from 2014 to 2019 was characterised by a 9.40 increase in foreign aid inflows into Algeria, representing an increase from US$160.62 million in 2014 to US$175.72 million in 2019.

Egypt's foreign aid inflows went up from US$1 644.20 million in 1989 to US$2 692.20 million in 1994, declined by 39.82% during the period from 1994 to 1999

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before experiencing another decrease of 7.25% during the subsequent five-year period, from US$1 620.25 million in 1999 to US$1 502.84 million in 2004. Another decline to the tune of 34.61% in foreign aid inflows during the period from 2004 to 2009 was observed. Egypt's foreign aid inflows massively went up from US$982.74 million in 2009 to US$3 537.60 million in 2014 before experiencing a decline by 50.80% during the subsequent five-year period to end the year 2019 at US$1 740.59 million.

Tunisia's foreign aid inflow declined by 62.20%, from US$279.89 million in 1989 to US$105.79 million in 1994. Tunisia then experienced growth in foreign aid inflows in all the five-year periods from 1994 to 2019. Tunisia's foreign aid inflows went up by (1)139.56% (from US$105.79 million in 1994 to US$253.43 million in 1999), (2) 31.67% (from US$253.43 million in 1999 to US$333.69 million in 2004, (3) 47.95% (from US$333.69 in 2004 to US$493.69 million in 2009), (4) 86.90% (from US$493.69 million in 2009 to US$922.70 million in 2014) and (5) 6.65% (from US$922.70 million in 2014 to US$984.03 million in 2019).

Morocco's foreign aid inflows increased by 36.95% during the period from 1989 to 1994, plummeted from US$683.52 million in 1994 to US$681.94 million in 1999 before experiencing a 14.47% growth during the subsequent five-year period. Morocco's foreign aid inflow went up from US$780.60 million in 2004 to US$1 045.96 million in 2009, experienced a massive 114.17% growth during the five-year period ranging from 2009 to 2014 before going down by 66.17% during the subsequent five-year period, from US$2 240.15 million in 2014 to US$757.86 million in 2019.

Foreign aid inflows into Sudan went down (1) from US$741.92 million in 1989 to US$408.29 million in 1994 and (2) from US$408.29 million in 1994 to US$246.34 million in 1999 before experiencing a massive 303.74% increase during the subsequent five-year period (from US$246.34 million in 1999 to US$994.58 million in 2004). Sudan's foreign aid inflow increased by 136.53% during the five-year period from 2004 to 2009, declined from US$2 352.47 million in 2009 to US$874.68 million in 2014 before going up by 85.74% during the subsequent five-year period to end the year 2019 at US$1 624.67 million.
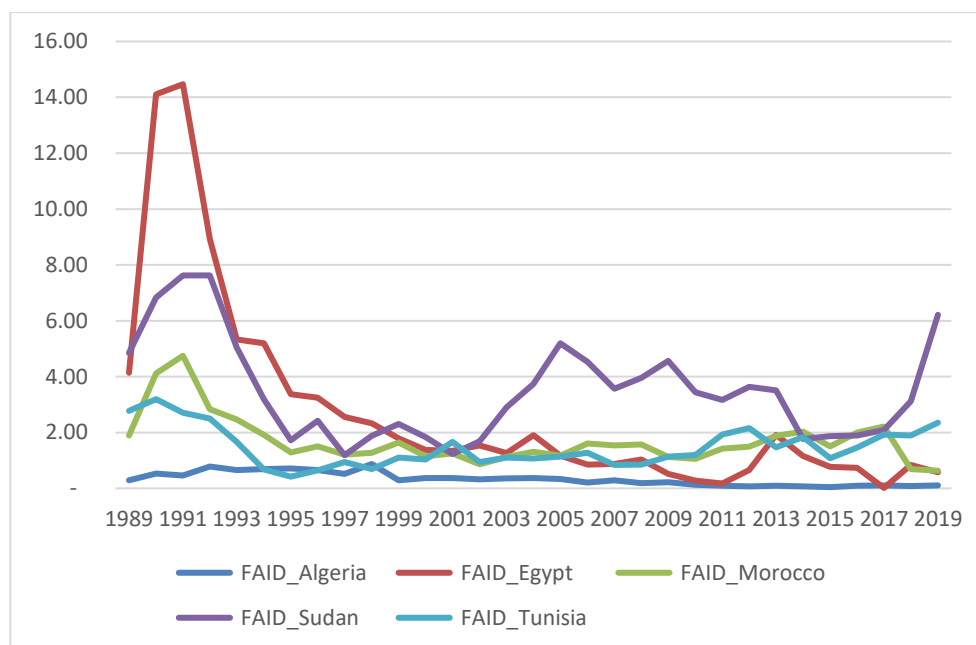
Figure 2. Net Official Development Assistance and Official Aid Received (% of GDP) Trends for North African Countries
Source: Author

Algeria's foreign aid inflows went up from 0.28% of GDP in 1989 to 0.69% of GDP in 1994, declined by 0.41 percentage points during the period from 1994 to 1999 before marginally going up by 0.09 percentage points during the subsequent five-year period to end the year 2004 at 0.37% of GDP. The 2 five-year periods (2004-2009 and 2009-2014) saw Algeria's foreign aid inflow declining by 0.15 percentage points each period before an increase of 0.03 percentage points during the five-year period, from 0.08% of GDP in 2014 to 0.10% of GDP in 2019. For Egypt, its foreign aid inflow increased by 1.05 percentage points during the period from 1989 to 1994 before going down by 3.40 percentage points during the subsequent five-year period, from 5.19% of GDP in 1994 to 1.79% of GDP in 1999. A 0.12 percentage points increase in foreign aid inflows for Egypt was observed during the five-year period between 1999 and 2004 whilst Egypt's foreign aid inflows declined from 1.91% of GDP in 2004 to 0.52% of GDP in 2009. Egypt's foreign aid inflows went up by 0.64 percentage points during the subsequent five-year period (from 2009 to 2014) before experiencing a 0.58 percentage points decline, from 1.16% of GDP in 2014 to 0.57% of GDP in 2019.

Morocco's foreign aid inflows increased from 1.90% of GDP in 1989 to 1.92% of GDP in 1994 before experiencing declines to the magnitude of (1) 0.28 percentage points (from 1.92% of GDP in 1994 to 1.64% of GDP in 1999), (2) 0.33 percentage

points (from 1.64% of GDP in 1999 to 1.31% of GDP in 2004) and (3) 0.18 percentage points (from 1.31% of GDP in 2004 to 1.13% of GDP in 2009). A 0.91 percentage points increase in foreign aid inflows into Morocco was observed during the period from 2009 to 2014 whilst Morocco's foreign aid inflows declined from 2.03% of GDP in 2014 to 0.63% of GDP in 2019.

Sudan's foreign aid inflows went down from 4.85% of GDP in 1989 to 3.19% of GDP in 1994, experienced another decline of 0.89 percentage points during the five-year period from 1994 to 1999 before experiencing a 1.43 percentage points growth during the subsequent five-year period, from 2.31% of GDP in 1999 to 3.73% of GDP in 2004. Foreign aid inflows of Sudan went up by 0.82 percentage points during the period from 2004 to 2009, plummeted from 4.56% of GDP in 2009 to 1.77% of GDP in 2014 before increasing by 4.45 percentage points during the subsequent five-year time frame to finish the year 2019 at 6.21% of GDP.

Tunisia's foreign aid inflow declined from 2.77% of GDP in 1989 to 0.68% of GDP in 1994, went up by 0.43 percentage points during the period from 1994 to 1999 before marginally increasing by 0.03 percentage points during the subsequent five-year period (from 1999 to 2004). Foreign aid inflows into Tunisia went up from 1.07% of GDP in 2004 to 1.14% of GDP in 2009, increased by 0.70 percentage points during the period from 2009 to 2014 before further going up by 0.52 percentage points during the subsequent five-year period, from 1.84% of GDP in 2014 to 2.35% of GDP in 2019.

5. Research Methodology

Three sub-sections covered under the research methodology include data description and sources, econometric models and the proxies (measures) of the variables used in this study.

5.1. Data Description and Sources

North African countries' panel data ranging from 1989 to 2019 was used in this study. The data was extracted from World Development Indicators.

5.2. Economic models

Research work done by Ali and Isse (2006), Briggs (2015), Ji and Lim (2018), Kim (2016), Alesina and Dollar (1998), Hoeffler and Outram (2008), Marek (2007), Dreher et al (2016), Amusa et al (2016) and Rabehajaina et al (2022) was quite pivotal in the decision to include the explanatory variables in equation 1 below.

FAID=f (OPEN, FDI, REMIT, GROWTH, POP, GCONS)
                    (1)

Equation 2 below is an econometric format of the general model specification (equation 1).

$$\text{FAID}_{it} = \beta_0 + \beta_1 \text{OPEN}_{it} + \beta_2 \text{FDI}_{it} + \beta_3 (\text{OPEN}_{it} \cdot \text{FDI}_{it}) + \beta_4 \text{REMIT}_{it} + \beta_5 \text{GROWTH}_{it} + \beta_6 \text{POP}_{it} + \beta_7 \text{GCONS}_{it} + \mu + \varepsilon \qquad (2)$$

Table 3. Interpretations of Equation 2 Signs

β_0	Intercept term
ε	Error term
FDI_{it}	Foreign direct investment net inflows in country i at time t
i	Country
FAID_{it}	Foreign aid in country i at time t
OPEN_{it}	Trade openness in country i at time t
REMIT_{it}	Personal remittances in country i at time t
GROWTH_{it}	Economic growth in country i at time t
POP_{it}	Population growth in country i at time t
μ	Time invariant and unobserved country specific effect
GCONS_{it}	Government consumption in country i at time t
β_1 to β_7	Explanatory variables' co-efficients
t	Time

Source: Author

In line with Kpodar and Goff (2012)'s view, equation 2 introduced the complementary variable (trade openness x foreign direct investment) as one of the explanatory variables affecting foreign aid in North African countries. Their reasoning is that foreign direct investment which increases in an economy characterised by high trade openness normally leads to enhanced economic growth hence consequently reducing the need for foreign aid inflows. Econometric estimation methods used for final data analysis (estimating equation 2) include fixed effects, pooled ordinary least squares (pooled OLS), dynamic ordinary least squares (DOLS) and fully modified ordinary least squares (FMOLS).

5.3. Measures Used

The selection of proxies for the variables (shown in Table 6) was influenced by empirical studies done by Usman (2010), Morris (2010), Kim and Oh (2012), Akarsu (2019), Asiedu et al (2013), Fan and Yuehua (2008), Uzonyi and Rider (2016) and Furuoka (2017). Moreover, data availability also played a major role in the choice of proxies used.

Table 4. Variables, Proxies and Data Sources

Variable	Proxies	Source of data
Foreign aid (FAID)	Net official development assistance and official aid received (% of GDP)	World Development Indicators
Foreign direct investment (FDI)	Net foreign direct investment inflows (% of GDP)	World Development Indicators
Trade openness (OPEN)	Total trade (% of GDP)	World Development Indicators
Personal remittances (REMIT)	Personal remittances received (% of GDP)	World Development Indicators
Economic growth (GROWTH)	Gross domestic product per capita	World Development Indicators
Population growth (POP)	Population growth (annual %)	World Development Indicators
Government consumption expenditure (GCONS)	Government final consumption expenditure (% of GDP)	World Development Indicators

Source: Author

6. Main Data Analysis

Pre-estimation diagnostics and main data analysis constitutes this section.

6.1. Pre-Estimation Diagnostics

Table 5. Correlation Analysis

	FAID	OPEN	FDI	REMIT	GROWTH	POP	GCONS
FAID	1.00						
OPEN	-0.27***	1.00					
FDI	-0.04	0.12	1.00				
REMIT	0.28***	0.23***	0.23***	1.00			
GROWTH	-0.49***	0.62***	-0.03	-0.14*	1.00		

POP	0.43***	-0.77***	-0.21	-0.25***	-0.52***	1.00	
GCONS	-0.33***	0.47***	-0.01	-0.09	0.49***	-0.58***	1.00

***/**/* represents 1%, 5% and 10% significant level respectively
Source: E-Views

A significant negative correlation was observed between the following variables: (1) Trade openness and foreign aid, (2) personal remittances and foreign aid, (3) economic growth and foreign aid and (4) government consumption expenditure and foreign aid. These results are supported by literature but their shortcoming is that they do not show the direction of causality. The correlation between population growth and foreign aid was found to be positive and significant, results of which are supported by literature. A non-significant negative correlation between foreign aid and foreign direct investment was observed. All the correlations between variables are below 70% in absolute terms, an indication that multi-collinearity problem does not exist, consistent with Stead (2007).

Table 6. Descriptive Statistics

	FAID	OPEN	FDI	REMIT	GROWTH	POP	GCONS
Mean	1.94	57.35	2.14	4.16	2 153.04	1.83	14.68
Median	1.31	55.93	1.71	4.32	1 743.15	1.87	16.13
Maximum	14.47	114.34	9.42	14.58	5 592.22	3.78	25.27
Minimum	0.01	1.22	0.01	0.06	260.51	0.75	4.84
Standard. deviation	2.15	25.80	1.78	2.65	1 300.07	0.62	4.12
Skewness	3.11	-0.15	1.61	0.68	0.67	0.61	-0.45
Kurtosis	16.19	2.49	6.67	4.00	2.61	3.50	2.56
Jarque-Bera	1 374.07	2.29	153.44	18.31	12.44	11.26	6.47
Probability	0.00	0.32	0.00	0.00	0.00	0.00	0.04
Observations	155	155	155	155	155	155	155

Source: E-Views

The range for variables such as trade openness and economic growth exceeded 100, an indication that outliers existed in the data set (Tsaurai. 2017). Standard deviation for economic growth data was found to exceed 100, results which further support that outliers exist in the economic growth data. The data set for all the variables are skewed to the right except for trade openness and government consumption expenditure, an indication that the data set is generally abnormally distributed. Apart from trade openness and government consumption expenditure data, all the remaining variables had the probability of their Jarque-Bera criterion equal to zero.

The results further support the view that the data is not normally distributed, see Aye and Edoja (2017).

Table 7. Panel Root Tests –Individual Intercept

Level				
	LLC	IPS	ADF	PP
FAID	-0.27	-1.16	15.10	11.95
OPEN	0.36	0.59	7.31	6.54
FDI	-3.44***	-3.06***	26.70***	40.40***
REMIT	-0.48	-0.98	11.63	11.35
GROWTH	-0.72	1.16	3.98	6.45
POP	-7.27***	-6.60***	59.76***	12.88
GCONS	1.84	1.56	5.55	4.76
First difference				
FAID	-4.06***	-6.46***	58.35***	106.00***
OPEN	-7.70***	-6.83***	61.69***	95.10***
FDI	-7.55***	-8.79***	81.82***	148.56***
REMIT	-5.09***	-6.25***	55.80***	92.28***
GROWTH	-4.35***	-4.46***	38.36***	63.29***
POP	-4.24***	-4.38***	43.50***	9.33***
GCONS	-4.24***	-5.13***	46.20***	96.53***

Source: E-Views

Table 7 shows that the data set is stationary at first difference. The abbreviations LLC, ADF, IPS and PP respectively stands for (Levin. Lin. and Chu (2002), Augmented Dick Fuller, Im. Pesaran. and Shin (2003) and Phillip Peron Fisher Chi Square. All the data set was only found to be stationary at first difference (see Table 7), consistent with Aye and Edoja (2017). These results allowed the analysis to move to the next stage, which is panel co-integration investigation using Johansen Fisher Panel Co-integration test (see Table 8 for results).

Table 8. Johansen Fisher Panel Co-integration Test

Hypothesised No. of CE(s)	Fisher Statistic (from trace test)	Probability	Fisher Statistic (from max-eigen test)	Probability
None	249.0	0.0000	169.1	0.0000
At most 1	158.9	0.0000	90.84	0.0000
At most 2	82.82	0.0000	47.64	0.0000
At most 3	45.17	0.0000	20.17	0.0277
At most 4	31.77	0.0004	21.31	0.0191
At most 5	19.11	0.0389	15.25	0.1230
At most 6	19.42	0.0353	19.42	0.0353

Source: Author's compilation from E-Views

In line with Sghaier and Abida (2013), at most six co-integrating vectors were observed among the variables employed in this study. Such evidence of the existence of a long run relationship between variables allowed final data analysis to proceed.

6.2. Final Data Analysis

Table 9. Determinants of Foreign Aid - Main Data Analysis

	Fixed effects	FMOLS	DOLS	Pooled OLS
OPEN	0.25*	0.42**	0.38	-0.29**
FDI	-0.29	-0.16	-0.28	-1.20***
OPEN. FDI	0.07	0.02	-0.03	0.37***
REMIT	-0.03	-0.01	0.24***	0.46***
GROWTH	-0.99***	-1.15***	-0.39	-0.54***
POP	-0.13	-0.20	0.08	1.26***
GCONS	1.19***	1.74***	1.28	1.50***
Adjusted R-squared	0.6415	0.6146	0.8341	0.5992
F-statistic	26.05	74.26	89.03	69.37
Prob (F-statistic)	0.0000	0.0000	0.0000	0.0000

Source: E-Views

Pooled OLS approach noted that trade openness's effect on foreign aid inflows was negative but non-significant, consistent with Ali and Isse (2006)'s view that economic growth associated with high levels of trade openness reduces the need for seeking and begging for foreign aid. Fixed effects and fully modified ordinary least squares (FMOLS) produced results which show that trade openness's influence on foreign aid inflows into North African countries was significantly positive whilst the dynamic ordinary least squares (DOLS) shows that foreign aid inflows were non-significantly enhanced by trade openness. These results contradict the available theoretical and empirical evidence.

Foreign direct investment had an insignificant negative influence on foreign aid inflows under the fixed effects, FMOLS and DOLS approaches whilst pooled OLS shows a significant negative correlation running from foreign direct investment towards foreign aid inflows. These results agree with Ali and Isse (2006), whose research work noted that foreign direct investment improves institutional and productive ventures in the recipient country, thereby reducing the need and driving out foreign aid.

FMOLS and fixed effects shows that the complementarity between trade openness and foreign direct investment had a non-significant positive impact on foreign aid inflows whilst pooled OLS indicated that foreign aid inflows were positively and significantly affected by the combination of foreign direct investment and trade

openness. These results mean that the complementarity variable (trade openness x foreign direct investment) enhanced foreign aid inflows under the pooled OLS, consistent with Kpodar and Goff (2012) whose study observed that trade openness enhances foreign direct investment, which in turn improves the effectiveness and efficiency of foreign aid inflow into the recipient countries.

Personal remittances had an insignificant negative effect on foreign aid inflows under the FMOLS and fixed effects approaches, in line with Kpodar and Goff (2012) whose study argued that the availability of personal remittances as a private financial source has a downward impact on foreign aid inflows. On the other hand, the pooled OLS and DOLS noted that personal remittances' impact on foreign aid inflows was positive and significant, consistent with Kpodar and Goff (2012)'s argument that personal remittances enhances human capital development, which in turn helps to remove the barriers to the effectiveness of foreign aid in the recipient countries.

Fixed effects, pooled OLS and FMOLS produced results which show that foreign aid inflows were significantly reduced by economic growth whilst DOLS shows that economic growth had a non-significant negative influence on foreign aid inflows. These results indicate that economic growth in the recipient countries reduces foreign aid inflows, results which resonates with Ali and Isse (2006), whose study argued that foreign aid is normally channelled towards countries whose economic growth rates is quite low in order to augment meagre financial resources for health and education promotion programmes.

A non-significant negative influence of population growth on foreign aid inflows was observed under the FMOLS and fixed effects, in line with Gillis et al (1992)'s argument supported the population bias theory which says that some donors prefer to direct their aid to countries with less population so that the foreign aid makes a more visible and quantifiable impact. Pooled OLS indicates that population growth's positive impact on foreign aid inflows was significant whilst DOLS shows that foreign aid inflows was positively affected by population growth in a non-significant manner. The results agree with Maizels and Nissanke (1984) argued that some foreign donors channel their aid to more populous countries to gain political, economic and cultural influence.

Government consumption expenditure's positive influence on foreign aid inflows was found to be significant under the pooled OLS, fixed effects and FMOLS. DOLS econometric estimation technique shows that government's consumption expenditure had a non-significant positive influence on foreign aid inflows. These results indicate that government consumption expenditure increases foreign aid inflows into the recipient countries, in line with Ali and Isse (2006) whose study argued that since foreign aid is directed to governments, an increase in government consumption expenditure amplify the size of foreign aid inflows.

7. Conclusion

This study examined the determinants of foreign aid inflows in North African countries using panel data (1989-2019) analysis. The study also explored the influence of the complementarity between trade openness and foreign direct investment on foreign aid inflows in North African countries using the same data set. Several gaps, divergent, mixed and conflicting views in the literature prompted the author to investigate this topic to contribute towards the discourse. Trade openness (fixed effects, FMOLS), the complementarity between trade openness and foreign direct investment (pooled OLS), personal remittances (DOLS, pooled OLS), population growth (pooled OLS) and government consumption expenditure (fixed effects, FMOLS, pooled OLS) were found to have had a significant positive influence on foreign aid inflows into North African countries. Foreign direct investment (pooled OLS) and economic growth (fixed effects, FMOLS, pooled OLS)'s negative impact on foreign aid inflows into North African countries was found to be significant. To attract more foreign aid, North African countries are advised to implement trade openness, personal remittances inflow, population growth and government consumption expenditure enhancement policies. A study on threshold regression analysis of the determinants of foreign aid inflows in North African countries adds value in as far as erudite policy making is concerned.

Reference

Akarsu, G. (2019). Determinants and welfare impacts of foreign aids. *IGI Global Publisher of Timely Knowledge, Global Challenges in Public Finance and International Relations.*

Alesina, A. & Dollar, D. (1998). Who gives foreign aid to whom and why? *National Bureau of Economic Research Working Paper Series* Number 6612.

Ali, A.M. & Isse, H.S. (2006). An empirical analysis of the determinants of foreign aid: A panel approach. *International Advances in Economic Research,* 12 (2), pp. 241-250.

Almeida, L.C.R.C. (2018). *The effectiveness of foreign aid on poverty reduction: The role of the political regime.* Unpublished Masters of Economics, Universidade Do Porto.

Amanda, A. A. (2019). *The role of foreign aid in poverty alleviation and economic development in Malawi.* Unpublished Masters in Development Studies, Nelson Mandela University.

Amusa, K.; Monkam, N. & Viegi, N. (2016). The political and economic dynamics of foreign aid: A case study of United States and Chinese aid to Sub-Sahara Africa. *Economic Research Southern Africa Working paper* 595.

Asiedu, E.; Nanivazo, M. & Nkusu, M. (2013). Determinants of foreign aid in family planning. *United Nations University Wider Working Paper* Number 2013/118.

Aye, G. C. & Edoja, P. E. (2017). Effect of economic growth on CO2 emission in developing countries: Evidence from a dynamic panel threshold regression model. *General and Applied Economics*. https://doi.org/10.1080/23322039.2017.1379239

Bourguignon, F. & Platteau, J. (2017*). Does aid availability affect effectiveness in reducing poverty? A review article, *World Development,* 90, pp. 6-16.

Boye, R. A. (2019*). Impact of foreign aid on poverty reduction in Ghana.* Unpublished Masters Thesis, University of Ghana.

Briggs, R.C. (2015). Does foreign aid target the poorest? *Aid Data Working Paper Number 13.*

Clunies-Ross, A.; Forsyth, D. & Huq, M. (2009). *Development economics (1st ed.).* Berkshire: McGrawHill Higher Education.

Dreher, A.; Fuchs, A.; Parks, B.; Strange, A. M. & Tierney, M. J. (2016). Apples and dragon fruits: The determinants of aid and other forms of state financing from China to Africa. *University of Heidelberg, Department of Economics Discussion Paper Series* Number 620.

Fan, H. & Yuehua, T. (2008). Determinants of official development assistance in the Post-Cold war period. *The Chinese Journal of International Politics,* 2 (2), pp. 205-227.

Furuoka, F. (2017). Determinants of China's and Japan's foreign aid allocations in Africa. *African Development Review,* 29 (3), pp. 376-388.

Gang, I. N. & Khan, H.A. (1990). Some determinants of foreign aid to India, 1960-1985. *World Development,* 18 (3), pp. 431-442.

Gillis, M.; Perkins, D. H.; Roemer, M. & Snodgrass, D. R. (1992). *Economics of Development.* New York: W. W. Norton and Company.

Hoeffler, A. and Outram, V. (2008). Need, merit or self-interest – What determines the allocation of aid? Oxford University Centre for the study of African economies. *Working Paper Number WPS/2008-19.*

Im, K.S.; Pesaran, M.H. & Shin, Y. (2003). Testing unit roots in heterogeneous panels. *Journal of Econometrics,* 115(1), pp. 53-74.

Ji, S. & Lim, S.S. (2018). An empirical analysis of the determinants of agricultural official development assistance. *Agricultural Economics,* 64, pp. 206-215.

Kim, E.M. & Oh, J. (2012). Determinants of foreign aid: The case of South Korea. *Journal of East Asian Studies*, 12 (2012), pp. 251-273.

Kim, S. (2016). Trends and the determinants of Korea's official development aid (ODA) allocation. *International Institute of Social Studies*. Master of Arts in Development Studies.

Knack, S. (2001). Aid dependence and the quality of governance: Cross-country empirical tests. *Southern Economic Journal*, 68 (2), pp. 310–329.

Kpodar, K. & Goff, M.L. (2012). Do remittances reduce aid dependency? *International Monetary Fund Development Policies Working Paper* Number 34.

Levin, A.; Lin, C. F. & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics,* 108(1), pp. 1-24.

Mahembe, E. & Odhiambo, N. (2017). On the link between foreign aid and poverty reduction in developing countries. *Revista Galega de Economia,* 26 (2), pp. 113-132.

Mahembe, E. & Odhiambo, N. (2019). Foreign aid and poverty reduction: A review of international literature. *Cogent Social Sciences,* 51 (1), pp. 1-15.

Mahembe, E. (2019). *Development aid and its impact on poverty reduction in developing countries: A dynamic panel data approach.* Unpublished Doctoral Thesis in Economics, University of South Africa.

Maizels, A. & Nissanke, M. (1984). Motivations for Aid to Developing Countries. *World Development* 12(9), pp. 879–900.

Marek, H. (2007). Determinants of multilateral official development assistance: Evidence from a panel study of countries in Sub-Saharan Africa. *Munich Personal RePEc Archive Number 24243*.

Morris, B. M. (2010). The determinants of U.S. foreign aid allocation to Sub-Saharan Africa in the pre-terror and post-terror security environments. *UNLV University Libraries, Theses, Professional Papers and Capstones,* p. 836.

Mosley, P.; Hudson, J. & Horrell, S. (1987). Aid, the public sector and the market in less developed countries. *The Economic Journal*, 97 (September 1987), pp. 616-641.

Okoronkwo, O.O.V.; Nnenna, P. & Eyitayo, A. (2016). The impact of foreign aid on poverty reduction/alleviation programmes in Lagos State, Nigeria. *Journal of Research and Development, 2* (12), pp. 40-49.

Rabehajaina, N.; Assoe, K. & Sedzro, K. (2022). Determinants of large shifts in official development aid allocation by major countries. *Theoretical Economic Letters,* 12 (1), pp. 172-194.

Seedee, R (2018). *The Impact of Foreign Aid on Extreme Poverty: A Case Study of Liberia's Development Complexities* (1980-2018). Unpublished Masters Thesis, East Tennessee State University.

Shina, A. A. (2018). Foreign Aid and Poverty Level: Does Public Investment Matter in Sub-Saharan African Countries? *Global Journal of Management and Business Research: B Economics and Commerce,* 18 (1), pp. 1-10

Shleifer, A. (2009). Peter Bauer and the failure of foreign aid. *Cato Journal*, 29(3), pp. 379–390.

Stead, R. (2007). *Foundation quantitative methods for business*. Prentice Hall. England.

Tsaurai, K. (2017). The dynamics of foreign direct investment in BRICS countries. *Journal of Economics and Behavioural Studies,* 9 (3), pp. 101-112.

Ugwuanyi, Boniface; Ezeakau, U.; Chijindi, H. & Ibe, I.G. (2017). The impact of official aid on poverty reduction: Empirical evidence from Nigeria (1981-2014) using the ARDL and Bounds Test approach*, European Journal of Sustainable Development,* 6 (2), pp. 111-120.

Usman, W. (2010). *Determinants of foreign aid with the use of IMF compliance conditionality index: Case study of Pakistan (1973-2006).*

Uzonyi, G. & Rider, T. (2016). Determinants of foreign aid: Rivalry and domestic instability. *International Interactions,* 43 (2), pp. 272-299.

Zafar, S.; Zafar, S. Z.; Rana, A.A.; Aslam, E.; Idrees, Q.; Iqbal, M.; Afzal, W. & Islam, F. (2017). Contribution of foreign aid in the reduction of poverty: A case study of Pakistan (1986-2015), *International Journal of Scientific and Engineering Research*, 8 (1), pp. 1377-1386.