

WC-BEM 2012

Development aid, openness to trade and economic growth in Least Developed Countries: bootstrap panel Granger causality analysis

Rifat Baris Tekin ^a

^a*Marmara University Department of Economics, Kuyubasi, Goztepe, Istanbul 34722, Turkey*

Abstract

This study examines causal relations among development aid, openness to trade and economic growth in the Least Developed Countries (LDC), for the period between 1970 and 2010. The variables under scrutiny are real per capita GDP, openness to trade ratio and total net Official Development Assistance as share of national income. By making use of a new Granger causality testing approach properly taking into account cross-sectional dependence and heterogeneity issues, this paper finds no significant causality relation among foreign aid, openness to trade, and economic growth in a panel of African LDCs.

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Keywords: Economic growth, openness to trade, development aid, Least Developed Countries, Granger causality

1. Introduction

Today, there exist 48 countries that are classified as ‘Least Developed Countries’ (LDC) by the United Nations (UN). Countries in the UN list of LDCs are among the poorest countries of the world, suffering from extreme underdevelopment, economic backwardness, poverty, and hunger (see UNCTAD 2010). The international community has long been providing development assistance to this group of low-income developing countries. Since the first “United Nations Conference for the Least Developed Countries”, organized in 1980 in Paris, UN “Programme of Actions” (PoAs) served as the main framework for international development assistance provided to LDCs. Successive UN PoAs depended chiefly on bilateral and multilateral official development assistance to LDCs. In addition to official development aid, UN PoAs also foresaw a wide set of other policy measures for ensuring economic growth and development in this group of countries. These policies include, most significantly, promotion of Foreign Direct Investment (FDI), debt restructuring for the heavily indebted LDCs, as well as support for trade liberalization through aid-for-trade, export capacity building and trade facilitation schemes. Although successive UN Conferences placed the emphasis increasingly on external aid and trade liberalization, there is, for the time being, no clear sign of success. Broadly speaking, international development assistance provided under the UN PoAs for more than three decades has a poor record; only 3 countries have managed to graduate out of the UN’s list of LDCs despite all efforts. The effectiveness of development aid in the case of LDCs, therefore, emerges as an important research question; not only from a purely academic point of view, but also for policy purposes.

In an attempt to shed light on aid effectiveness in LDCs, this paper aims to study possible causality relations between economic growth per capita and official development assistance (ODA) flows. A second objective of this paper is to test for potential causality relations between openness to trade and economic growth per capita in LDCs;

which is, again, an important issue for policy purposes since all successive UN PoAs commonly foresaw trade liberalization, in itself, as a means to enhance economic growth in this group of countries.

2. Literature Review

2.1. Development aid and economic growth

Standard economic theory suggests a positive relation between foreign aid and economic growth. Development aid, in this line of thinking, adds to the recipient country's stock of physical capital and enhances economic growth, contributing significantly to the productive capacity of the recipient economy (see Minoiu and Reddy, 2010, for a review of theoretical literature). This view suggests a positive causal relation between foreign aid and economic growth per capita. There are, however, other theoretical explanations which refute this view, claiming that foreign aid is negatively related to economic growth. In this line of thinking, development aid is ineffective, and might even be harmful for recipient countries as aid crowds out domestic savings by accelerating consumption expenditures, distorts relative prices, and reduces productivity and international competitiveness.

The effectiveness of foreign aid in sustaining economic growth and development has long been a major research topic in applied economics. Empirical evidence on this issue, however, remains mixed. Several studies provided empirical evidence in support of aid effectiveness, at least in certain macroeconomic environments and under certain conditions (see Burnside & Dollar, 2000; and Minoiu & Reddy, 2010). Others, however, failed to find a significant relationship between development aid and economic growth (see Boone, 1994, and Easterly, Levine, & Roodman, 2004, among others). Studies such as Bobba & Powell (2007), or Gong & Zou (2001), on the other hand, suggest that foreign aid might have a negative impact on economic growth.

2.2. Openness to trade and economic growth

The relationship between openness and economic growth is also a widely researched area in applied economics. The theoretical framework that formally relates openness to trade to economic growth is provided by Grossman & Helpman (1991). In this framework, openness to trade is seen as having a positive impact on economic growth primarily by facilitating technology spillovers, which, in turn, would increase productivity, international competitiveness, and export revenues. Other theoretical explanations in the line of the Singer-Prebisch thesis, on the other hand, suggest that trade openness might have a negative impact on growth, particularly in the case of low-income developing countries. By and large, this alternative view is based on the idea that the structural characteristics of low-income developing countries tend to reverse the terms of trade at their disadvantage. Theoretically, therefore, causality between openness to trade and economic growth can run on both directions (see Vlastou 2010).

Empirical evidence on the relation between openness to trade and economic growth remains to be inconclusive; the literature is full of mixed findings. Studies such as Bahmani-Oskooee & Niroomand (1999) or Edwards (1992) suggest a positive impact of openness to trade on economic growth, while others found no significant impact of openness on growth (see, Levine et al. 1992, Harrison & Hanson, 1999). In a recent study focusing on the relationship between openness and growth in 34 African countries for the period between 1960 and 2003, Vlastou (2010) found evidence that openness to trade has a negative impact on growth. Vlastou (2010) further found that the causality runs from openness to growth, and not in the opposite direction.

3. Data and Methodology

3.1. Data

The data set comprises annual measures on 27 African Least Developed Countries: Angola, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Gambia, Guinea,

Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Senegal, Sierra Leone, Somalia, Sudan, Togo, Uganda, United Republic of Tanzania, and Zambia. Although the LDCs all around the world face similar economic and developmental problems and have been subject to the same development assistance programs for many decades, substantial differences still exist between different geographical groups. We therefore exclusively focus on African LDCs, rather than the full set of LDCs, in order to have a more homogenous sample. The selection of this sample of African LDCs was made due to data availability.

The variables employed in estimations are as follows: real Gross Domestic Product (GDP) per capita, openness to trade ratio (OPENNESS) defined as the total share of international trade in GDP, and real total net Official Development Assistance (ODA). ODA includes all types of official financial aid flows with concessional financial terms from all donors, i.e. only loans that have a grant element of at least 25 per cent are included. ODA, compared to other available alternatives, provides a better measure of foreign development aid. Following the convention in applied literature in the field, the data are employed in constant US Dollars (year 2000) and constant exchange rates. All data are taken from the UNCTAD statistical database, available on <http://unctadstat.unctad.org>. All variables are used in natural logarithms.

3.2. Methodology: Testing for Granger Causality in Panel Data

The Granger causality test is a useful device to determine whether the lags of a variable, say, x_{it} contribute to the better forecasting of y_{it} when the lagged values of x_{it} are introduced into the regression of y_{it} on the lagged values of y_{it} . In the panel data context, Granger non-causality can be tested by making use of a finite order panel VAR model in the following form, where a random variable can be expressed as a function of its own past values and past values of other variables in the system:

$$\begin{bmatrix} y_{1,it} \\ y_{2,it} \\ y_{3,it} \end{bmatrix} = \begin{bmatrix} \alpha_{1,i} \\ \alpha_{2,i} \\ \alpha_{3,i} \end{bmatrix} + \begin{bmatrix} \Gamma_{11} & \Gamma_{12} & \Gamma_{13} \\ \Gamma_{21} & \Gamma_{22} & \Gamma_{23} \\ \Gamma_{31} & \Gamma_{32} & \Gamma_{33} \end{bmatrix} \begin{bmatrix} z_{1,it} \\ z_{2,it} \\ z_{3,it} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,it} \\ \varepsilon_{2,it} \\ \varepsilon_{3,it} \end{bmatrix} \quad i=1,2,\dots,N \quad t=1,2,\dots,T. \quad (1)$$

Where z_{1it} , z_{2it} and z_{3it} represent the lagged values of y_{1it} , y_{2it} and y_{3it} respectively, the terms α_i 's stand for individual effects which can be eliminated by taking the first difference of equation 1. The hypothesis that y_2 does not Granger cause y_1 can be tested by the null hypothesis $H_0: \Gamma_{12}=0$.

However, testing for Granger non causality this way might result in inconsistent estimates; primarily because the correlation between lagged values of dependent variable and the disturbance terms are not properly taken into account (see Kar et al., 2011: 688-689). In the presence of correlated disturbances with the lagged values of dependent variable, estimation by within estimator would be inconsistent when T and N are small and it is consistent when T and N tend to infinity. A first alternative is to use Generalized Method of Moments (GMM) estimators, as long as T is big enough. However, the GMM estimators might still yield inconsistent parameters, unless slope coefficients are homogeneous (Pesaran et al., 1999). Hurlin (2008) provides another alternative approach for testing causality which controls for heterogeneity in panel data, but this approach cannot properly cope with the problem of cross-sectional dependency. This study proceeds with a third alternative approach for testing Granger causality in panel data, recently developed by Kónya (2006). In this new approach the VAR above is rewritten as SUR (seemingly unrelated regressions) models which have different predetermined variables whose only possible link is contemporaneous correlation within the systems (Kónya, 2006: 981). This framework is suitable for testing one-period ahead, direct causality relations in a bivariate setting. An extension into a trivariate setting of this framework is also possible, where the third variable enters into the model as an auxiliary variable that will not be directly involved in the Granger causality analysis. In this study, we employ trivariate systems; estimations are done by the SUR estimator proposed by Zellner (1962). A linear time trend is introduced in all models, in an attempt to mitigate the omitted variable bias. Prior to estimation the optimal lag structure is determined following the procedure proposed in Kónya (2006: 982-983). For the details and exposition of the estimation and testing procedures, see Konya (2006), Kar et al. (2010), and Tekin (2012).

4. Empirical Results

The results of our first trivariate model, where GDP is the independent variable, ODA and OPENNESS are the dependent variables, are provided in the first two columns of Table 1. Our first observation is that the bootstrap critical values are considerably higher than the chi-square critical values usually applied with the Wald test. Considering OPENNESS as the auxiliary variable in the model, and focusing solely on ODA and GDP relations, we first test for aid effectiveness. The Granger causality test results for the null hypothesis that ODA does not cause GDP are shown in the first column of Table 1. At the 10% level of significance, only for 2 countries in our sample, i.e. Democratic Republic of the Congo and Uganda, we find evidence that total official development assistance Granger-causes growth in GDP per capita. This finding suggests that only in these two LDCs, development aid is effective; i.e. there is direct, one-period-ahead Granger causality from ODA to economic growth. It should be noted that the signs of the regression coefficients involved in the causality tests are both positive in the cases in which we identify a significant causal relation from foreign aid to GDP per capita. We have no cases in which foreign aid has a significant negative causality relation with growth per capita.

The second column of Table 1 presents bootstrap critical values and test statistics for the same trivariate model, where ODA is taken as the auxiliary variable in the model, and the focus is exclusively on OPENNESS and GDP relations. When we test for the hypothesis that OPENNESS does not cause GDP, we fail to reject the null hypothesis in all LDCs in the sample, with the exception of four countries: Burkina Faso, Malawi, Sierra Leone and Zambia. It should be noted that in two of these four cases, (for Burkina Faso and Zambia) the coefficient is found to be negative. Our findings, therefore, provide some support to Vlastou (2010) who found a negative causal relation from openness to growth in the case of Sub-Saharan African countries.

The third and fourth columns of Table 1 summarize the findings of our second model, in which OPENNESS is the independent variable and ODA and GDP are the dependent variables. The first column gives test statistics and bootstrapped critical values when ODA is taken as the auxiliary variable in the system and the focus is on GDP and OPENNESS relations. As can be seen from the table, Guinea and Sudan are the only LDCs in which there is evidence of Granger causality from economic growth to openness to trade. Both coefficients are positive. For the remaining countries we fail to find a significant causality relation between the two variables.

The fourth column of Table 1 suggests that in only three African LDCs, Mali, Sudan and Zambia, ODA Granger causes OPENNESS. In all these cases the coefficient is found to be negative, indicating a negative causal relation between ODA and OPENNESS. This finding suggests that development aid might have a negative impact on export revenues, probably because of the reversal of the terms of trade. In the remaining 24 LDCs there is no evidence that development aid contributes significantly (positively or negatively), and Granger cause openness to trade. We therefore find no clear evidence for a significant causality direction from development aid to openness to trade in African LDCs. This finding suggests that UN PoAs not only did fail in generating economic growth in African LDCs but also failed to reach at one of their major targets, i.e. to enhance openness to trade through development assistance.

Table 1

Countries	Test stat.	Bootstrap critical values			Test stat.	Bootstrap critical values			Test Stat.	Bootstrap critical values			Test Stat.	Bootstrap critical values		
		10%	5%	1%		10%	5%	1%		10%	5%	1%		10%	5%	1%
Angola	9,38	95,35	120,38	184,39	7,78	11,93	17,43	33,08	0,01	20,04	28,54	56,63	1,74	43,54	59,34	98,34
Benin	1,34	37,01	47,03	72,89	4,83	21,39	27,98	42,82	10,14	20,50	28,93	55,91	3,30	34,34	45,25	73,34
Burkina Faso	2,83	40,07	54,02	92,64	14,38*	13,39	18,36	31,57	2,42	12,30	17,92	33,24	5,34	29,56	42,11	75,84
Burundi	0,72	11,13	16,57	34,32	0,93	17,57	25,08	48,43	3,02	7,08	10,73	19,05	9,61	15,86	23,25	41,30

Cent. Afr. Rep.	1,89	13,06	19,34	36,65	4,54	18,32	26,24	51,25	8,33	10,82	15,98	28,79	0,36	11,71	17,16	32,01
Chad	2,79	7,71	10,93	20,25	0,76	15,47	22,48	43,38	5,01	7,72	11,15	20,71	0,69	7,70	12,87	21,24
Comoros	0,40	19,81	28,15	48,65	0,61	58,04	74,81	118,06	5,41	18,87	27,52	50,99	0,06	20,60	33,00	52,97
Dem. R. Congo	31,68*	26,15	35,40	57,22	17,97	44,53	57,50	87,78	0,13	18,46	26,92	53,98	5,14	19,48	33,12	57,04
Djibouti	1,37	17,32	25,02	46,68	3,88	20,34	29,31	53,56	3,52	18,72	27,92	52,29	0,47	15,19	25,94	44,29
Gambia	0,19	35,94	45,75	70,49	0,65	40,51	52,18	80,81	2,82	13,21	19,38	37,08	0,19	26,49	38,08	57,96
Guinea	3,95	89,46	112,04	176,99	1,56	3,99	5,72	10,78	21,10*	18,37	26,84	51,38	0,16	41,68	52,41	81,09
Liberia	0,27	12,91	19,06	34,74	0,14	11,18	16,00	28,39	4,58	18,07	27,29	53,63	0,36	13,41	19,24	35,42
Madagascar	0,56	35,73	47,79	77,64	0,33	17,77	24,88	42,11	0,12	10,96	15,85	30,27	12,63	13,88	20,31	37,29
Malawi	4,41	68,10	82,12	122,15	105,67***	6,51	9,24	16,64	0,17	26,46	37,07	68,00	1,13	8,11	11,85	21,91
Mali	1,18	3,06	4,35	7,59	0,64	33,02	41,97	65,16	1,20	13,54	20,08	39,87	13,94**	9,11	13,44	26,52
Mauritania	1,33	41,45	53,76	91,44	19,84	46,97	60,01	94,20	0,13	12,10	17,79	34,29	5,78	23,94	34,34	63,42
Mozambique	21,83	29,52	40,81	76,10	0,32	13,82	20,51	36,64	0,75	17,56	25,13	46,44	1,51	25,24	35,85	63,19
Niger	3,90	23,63	33,19	61,66	3,14	24,96	34,11	61,78	0,01	13,62	19,50	37,07	16,94	34,76	47,65	81,27
Rwanda	1,13	8,10	13,12	29,33	9,00	39,47	52,15	88,37	2,12	15,09	22,65	41,48	12,65	16,27	24,20	47,27
Senegal	2,56	37,64	50,02	82,24	7,11	33,73	44,05	71,85	2,66	13,61	20,59	37,25	14,52	20,69	30,59	55,41
Sierra Leone	0,88	11,24	16,39	31,10	36,16***	12,42	17,99	32,88	4,40	11,98	17,62	33,91	7,73	16,78	25,32	46,42
Somalia	0,39	30,14	40,58	65,03	2,98	7,40	11,04	20,40	4,10	22,05	31,76	58,97	1,44	21,24	28,60	47,56
Sudan	0,27	30,73	40,70	68,79	0,86	11,28	16,39	30,84	19,96**	9,35	13,30	24,91	10,77	8,63	12,86	23,62
Togo	0,75	31,43	41,09	63,43	1,43	30,44	39,05	63,75	16,98	21,83	32,88	59,72	4,50	21,33	27,83	46,85
Uganda	51,81**	21,74	29,69	52,85	16,11	19,52	27,96	55,54	0,03	10,71	16,26	33,11	0,06	16,88	25,76	49,09
Tanzania	8,92	18,51	26,07	46,28	20,88	32,39	44,96	85,17	0,58	13,50	19,71	38,16	3,41	23,23	33,55	62,31
Zambia	8,22	11,85	17,58	33,29	63,79***	14,32	21,39	41,50	0,01	14,96	21,35	39,22	17,26*	16,23	23,63	43,42

5. Conclusion

This study tested for causality among development aid, openness to trade and economic growth in African Least Developed Countries, by making use of a newly developed Granger causality testing procedure for panel data sets. We failed to find strong empirical evidence in neither of the causality directions studied. Our findings clearly refute effectiveness of development aid provided to the group of LDCs considered. What is noteworthy is that this study has found no case in which development aid has a negative impact on economic growth per capita. We therefore conclude that, generally, aid is growth-neutral in African LDCs.

When it comes to openness to trade-economic growth nexus, our findings suggest that openness to trade is also growth-neutral, in general. In two of the 4 cases in which we found a significant causality from openness to growth,

we found a negative coefficient. We therefore conclude that openness to trade might have a growth-depressing impact in some African LDCs, as suggested by Vlastou (2010). In our study of the causality relations between development aid and openness to trade, we observed that in all the cases in which there is a significant causality relation, the coefficient was negative. This finding suggests that development aid has a negative impact on international trade, probably because of the reversal of the terms of trade to the disadvantage of LDCs. The famous ‘Dutch Disease’, therefore, seems to be a potential reason for why development aid does not help LDCs at all in sustaining economic growth.

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