ARE BILATERAL AND MULTILATERAL AID FOR TRADE COMPLEMENTARY? ACCOUNTS FROM AFRICA

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Abstract: We examine the impact of *aid for trade* (*AFT*) on bilateral trade costs of African Nations. Using a comprehensive bilateral trade cost data from Arvis *et al*. (2013) and focusing on *AFT* recipients in Africa spanning the years 2002-2010, we show that increased *AFT* reduces bilateral trading costs, more so for the recipient's trade with each other than recipients' trade with their donors. Despite differences in the magnitudes of the observed effects across recipients and the economic sectors considered, the trade costs reduction effect of *AFT* from bilateral and multilateral sources rises with increases in the amount of *AFT* from either sources, indicating complementarity in the effects.

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I. Introduction

The Doha round of World Trade negotiations emphasized the use of aid for trade (*AFT*) to overcome the supply side constraints limiting the participation of developing countries in global trade. To this effect, a total of $82,967.67 billion from bilateral ($44, 321.85) and multilateral sources ($37,424.09 billion) have been disbursed to African Nations between 2002 and 2011. Given the size of the financial resources devoted and the number of countries covered, an evaluation of the effectiveness of the initiative garners considerable interest among policy makers and development practitioners.

A number of studies indicate that increased *AFT* inflows correlate with increased trade performances of the recipients (Cadot et al., 2014; Petersson and Johansson, 2013; Vijil and Wagner, 2012). Several studies also show that the initiative had little impact on the recipients' trade (Nowak-Lemann et al., 2013, Cali and te Velde, 2011; Brenton and von Uexkul, 2009). A careful review of the literature suggests that by and large, changes in the trade performances are direct results of improvements in the trade facilitating infrastructure and reductions in the associated bilateral trading costs (Arvis et al., 2013). The effect of *AFT* on the trade performance of recipients may, thus, pivot on the degree to which it lowers their bilateral trade costs which vary across trading partners and economic sectors. Moreover, given the differences in the conditionality of aid originating from various sources, the presence and the degree to which the effects of *AFT* from bilateral and multilateral sources complement each other may also matter. Nonetheless, little information exists as to whether the effects of *AFT* from various sources are complementary.

Using a comprehensive bilateral trade cost data and a model that accounts for structural differences in the international trade arrangements of the recipients, we examine the effect of *AFT* on bilateral trade costs of African Nations, and the presence of complementarity in the

observed effects. Highlighting variations in the effects across recipients, economic sectors, and the sources, our study provides further insights on the functioning and effectiveness of *AFT*.

II. Model, Data, and Variables

We use the first comprehensive ad valorem tariff equivalent estimates of bilateral trade costs spanning the period 2002-2010 (Arvis *et al*., 2013) as our dependent variable series and estimate a mixed-effect model of the Rabe-Hesketh and Skrondal (2008) framework. Equation (1) below presents the specification.

$$ln \, TC_{ijt}^k = \left(\beta_0 + \zeta_{0i} + \zeta_{0j}\right) + \left(\beta_1 + \zeta_{1j}\right)X_{1ijt-1}^k + X_{2ijt}^{K'}\beta_2 + \varphi_t + \epsilon_{ijt} \tag{1}$$

$$i = 1,..,M, \text{regions} \quad j = 1,..,N_i, \text{recipients, and } t = 1,...,T_i, \text{time.}$$

TC_{ijt}^k denotes the bilateral trade costs (aggregate and sector-specific) facing the jth *AFT* recipient African Nation in the ith sub-region and trading with partner k, during the tth time period; X_{1ijt-1}^k is a vector consisting of aggregate and/or the bilateral and multilateral breakdown of *AFT* inflows to country j (lagged one year) and their interaction terms. X_{2ijt}^k is a vector of non-stochastic control variables hypothesized to affect bilateral trade costs between partners countries j and k. Considering the structural differences in trading arrangements and the corresponding variations in bilateral trading costs of different countries, we specify the disturbance term in equation (1) as a three-way error component and estimate the equation by employing a mixed-effects (random intercept and random coefficient) model. The coefficients β_j and φ_t are unknown parameters to be estimated. The coefficients ζ_{0i} and ζ_{0j} represent the corresponding region and within region, country-fixed effects, while ζ_{1j} reflects country *j* specific deviation of the effects of *AFT* on bilateral trade costs from the average, β_1. The control variables are

standard proxies often used to represent trade costs in the gravity model of trade (geodesic distance, language, colonial relationships, economic remoteness, lack of access to the sea, common membership in regional trade community, and common border). Data on *AFT* receipts and their breakdowns by sources are from the Credit Reporting System (CRS) of OECD (2014). All other variables are from CEPII (2014).

III. Empirical Results

Table 1 presents results from the estimation of equation (1) and the nested error structure of African nations' bilateral trade costs with their partners (recipients, donors, and all recipients) in which we include lagged aggregate *AFT* inflows. With the exception of the economic remoteness variable, all control variables are significant with the anticipated signs.

3.1) Does AFT reduce African Nations' bilateral trade costs? Across the specifications, we find that the lagged aggregate *AFT* variable has negative and statistically significant coefficients ranging from -0.0134 (agricultural products) to -0.0261 (manufactures). The estimates indicate that a 10% increase in *AFT* results in a 0.24% reduction in aggregate bilateral trade costs facing the typical African Nation, c*eteris paribus*. [1] Across sectors, the effect varies from 0.134% (agriculture) to 0.226% (manufacturing). Given the variation in the relative importance of the sectors and differences in the sector-specific trade constraints facing countries, the finding that an increased *AFT* inflow reduces trade costs both at the aggregate level and across the sectors strongly suggests that *AFT* has made significant inroads in reducing barriers that impede the trade performances of AFT beneficiaries in Africa.

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[1] The coefficient of the *AFT* on total trade costs is not bounded between the effects of *AFT* on trade costs for manufactures and agriculture as the ad valorem tariff equivalent of aggregate trade costs are not linear sum of trade costs for the manufactures and agricultural products.

Table 1: Mixed-Effects Model Estimates of the Effect of *AFT* on the Bilateral Trade Costs of AFT Beneficiaries in Africa and their Trade Partners and by Economic Sectors

VARIABLES	ln Total Trade Cost	ln Manf. Trade Cost	ln Agr. Trade Costs
ln Geodesic Distance$_{ij}$	0.149(0.00435)***	0.204(0.0047)***	0.0736(0.0061)***
ln Economic Remoteness $_{it}$	-0.0619(0.0747)	-0.139(0.0905)	-0.0625(0.0782)
ln Economic Remoteness $_{jt}$	0.211(0.00438)***	0.175(0.00478)***	0.119(0.00623)***
Trading Agreement $_{ijt}$	-0.306(0.00927)***	-0.311(0.0101)***	-0.207(0.0118)***
Common Border $_{ij}$	-0.499(0.0134)***	-0.512(0.0152)***	-0.304(0.0162)***
Colonial Relationship $_{ij}$	-0.459(0.0201)***	-0.426(0.0210)***	-0.385(0.0202)***
Common Language $_{ij}$	-0.145(0.0056)***	-0.162(0.0062)***	-0.099(0.0081)***
Landlocked $_{it}$	0.186(0.0422)***	0.218(0.0536)***	0.113(0.0446)**
Landlocked $_{jt}$	0.270(0.00673)***	0.277(0.00750)***	0.179(0.0111)***
ln ODA_AFT$_{it-1}$	-0.024(0.008)***	-0.026(0.012)**	-0.013(0.006)**
Constant	2.157(0.813)***	2.210(0.863)**	4.147(0.561)***
Random Intercepts:			
St. Dev. (Region, i=5)	0.067(0.0309)	0.055(0.0267)	0.0191(0.0107)
St. Dev.(Recipients, j=49)	0.271(0.1977)	0.264(0.0523)	0.1523(0.0333)
Random Coefficients:			
St. Dev. (ODA_AFT$_{it-1}$)	0.0485(0.0347)	0.0630(0.0103)	0.0155(0.0100)
St. Dev.(Residual)	0.4033(0.4000)	0.4064(0.0018)	0.3828(0.0024)
No. of Observations	30,287	25,801	12,698
Log-Likelihood	-17051	-14817	-6572
Wald Chi^2	13595	13384	3341

Robust standard errors in parentheses. "***", "**", and "*" denote significance at *p < 1%, p< 5%,* and *p < 10%,* respectively.

3.1.1) Does the effect of AFT vary across partners and economic sectors? Trade costs are

generally reference-country and trading partner-specific. For example, while African countries

generally face higher trade costs when trading with each other than when trading with developed

countries, there exists a considerable variation in the average trade costs facing each country. To

examine the direction and magnitude of the effect of *AFT* from bilateral and multilateral sources

among trading partners, we estimate equation (1) by restricting the partners' to donors only,

partners in Africa only, and all *AFT* beneficiaries. Table 2 provides a summary of the

corresponding coefficients.

Table 2: Summary of the Effects of Aid for Trade on Bilateral Trade Costs of *AFT* Recipient African Economies by Trading Partners and Economic Sectors.

	African Recipients Vs All Partners			African Recipients Vs African Partners			African Recipients Vs Donors		
	(a)	(b)	(c)	(a)	(b)	(c) Agr. Trade .Cost	(a)	(b)	(c)
	Total Trade Cost	Manf. Trade Cost	Agr. Trade Cost	Total Trade Cost	Manf. Trade Cost		Total Trade Cost	Manf. Trade Cost	Agr. Trade .Cost
	N=30,287	N=25,801	N=12,698	N=9,550	N=7,844	N=3,708	N=6,253	N=5,740	N=3,838
ODA_AFT$_{it}$	-0.0241***	-0.0261**	-0.0134**	-0.0322***	-0.0400***	0.00699	-0.0325***	-0.0367***	-0.0297***
	(0.00899)	(0.0115)	(0.00625)	(0.00976)	(0.0114)	(0.0109)	(0.0111)	(0.0131)	(0.00899)
ln MLT_AFT$_{it}$	-0.0127**	-0.0194**	-0.00826***	-0.0123**	-0.0219**	0.00301	-0.0125	-0.0172*	-0.0133**
	(0.00636)	(0.00909)	(0.00315)	(0.00574)	(0.00887)	(0.00594)	(0.00807)	(0.00994)	(0.00523)
ln DAC_AFT$_{it}$	-0.0208***	-0.0223**	-0.00823	-0.0346***	-0.0433***	0.0127	-0.0320***	-0.0373***	-0.0300***
	(0.00794)	(0.00944)	(0.00591)	(0.0102)	(0.0112)	(0.0122)	(0.0104)	(0.0127)	(0.00990)

Robust Standard Errors in Parentheses. "***", "**", and "*" denote significance from zero at *p < 1%, p< 5%,* and *P < 10%*, respectively.

The results in Table 2 clearly depict that a rise in *AFT* inflows to African nations is associated with a significant decrease in the costs of the typical recipient's trade with all partners (whether donor or recipient); however, the magnitudes of the effect vary across the partners considered and economic sectors. For example, while a 10% increase in the aggregate inflow of *AFT* to a typical African Nation reduces its total bilateral trading costs with a typical donor by 0.325%, the corresponding effect with a typical recipient in Africa is 0.40%. Sector wise, while the effects remain significant for manufactures across all partners (including those in Africa), *AFT* does not have a statistically discernible effect on the agricultural trade costs of the recipients with partners in Africa.

3.1.2) Are the effects of bilateral and multilateral AFT complementary? AFT inflows originate from bilateral and multilateral sources. While the overall goal of *AFT* from either source is the same, the primary emphasis, timing, and conditions of its extensions may vary. Some nations receive a significant amount of *AFT* from bilateral sources, while others benefit from a relatively large *AFT* inflows from multilateral sources. Thus, the extent to which the *AFT* recipients' trade performance improves may vary owing to differences in the extent to which efforts are coordinated (directly or indirectly). Given the design of *AFT*, this is particularly important as the implementation of *AFT* projects are at the discretion of the recipients. Using the interaction terms of *AFT* from bilateral and multilateral sources, we examine whether or not the effects are complementarity (e.g., if the effect of *AFT* from multilateral sources improves with a rise in the amounts of bilateral *AFT*) based on the patterns of the changes in the marginal effects of the corresponding variables computed at various levels of *AFT* from either of the sources. Table 3 presents the corresponding estimates.

Table 3: The Marginal Effects (Elasticity) of *AFT* from Bilateral and Multilateral Sources on Aggregate Trade Costs of African *AFT* Nations

Amounts of AFT from Multilateral Sources($Millions)	Marginal Effects of *AFT* from Bilateral Sources	Amounts of *AFT* from Bilateral Sources ($Millions)	Marginal Effects of *AFT* from Multilateral Sources
0.00	-0.00361(0.0114)	0.00	-0.01930(0.01320)
1.28	-0.00228(0.0109)	1.28	-0.02060(0.01250)*
1.65	-0.000953(0.0105)	1.65	-0.0220(0.0118)*
2.12	-0.000375(0.0100)	2.12	-0.02328(0.0110)**
2.72	-0.00170(0.00967)	2.72	-0.02460(0.0104)**
3.49	-0.00303(0.00935)	3.49	-0.0259(0.0098)***
4.48	-0.00436(0.00910)	4.48	-0.0273(0.00919)***
5.75	-0.00569(0.00891)	5.75	-0.0286(0.00863)***
7.39	-0.00701(0.00880)	7.39	-0.0299(0.00811)***
9.49	-0.00834(0.00877)	9.49	-0.0313(0.00764)***
12.18	-0.00967(0.00881)	12.18	-0.0326(0.00723)***
15.64	-0.0110(0.00893)	15.64	-0.0339(0.00691)***
20.09	-0.0123(0.00913)	20.09	-0.0352(0.00666)***
25.79	-0.0137(0.00939)	25.79	-0.0366(0.00651)***
33.12	-0.0150(0.00971)	33.12	-0.0379(0.00647)***
42.52	-0.0163(0.0101)	42.52	-0.0392(0.00653)***
54.60	-0.0176(0.0105)*	54.60	-0.0405(0.00669)***
70.11	-0.0190(0.0110)*	70.11	-0.0419(0.00695)***
90.02	-0.0203(0.0115)*	90.02	-0.0432(0.00729)***
115.58	-0.0216(0.0121)*	115.58	-0.0445(0.00770)***
148.41	-0.0229(0.0127)*	148.41	-0.0459(0.00818)***
190.57	-0.0243(0.0133)*	190.57	-0.0472(0.00871)***
244.69	-0.0256(0.0139)*	244.69	-0.0485(0.00928)***
314.19	-0.0269(0.0145)*	314.19	-0.0498(0.00988)***
403.43	-0.0283(0.0152)*	403.43	-0.0512(0.0105)***
518.01	-0.0296(0.0159)*	518.01	-0.0525(0.0112)***
665.14	-0.0309(0.0166)*	665.14	-0.0538(0.0119)***
854.06	-0.0322(0.0173)*	854.06	-0.0552(0.0126)***
1,096.63	-0.0336(0.0180)*	1,096.63	-0.0565(0.0133)***
1,408.10	-0.0349(0.0187)*	1,408.10	-0.0578(0.0140)***
1,808.04	-0.0362(0.0194)*	1,808.04	-0.0591(0.0147)***
2,321.57	-0.0375(0.0202)*	2,321.57	-0.0605(0.0155)***

Robust standard errors in parentheses. "***", "**", and "*" denote significance from zero at $p < 1\%$, $p < 5\%$, and $P < 10\%$, respectively.

Corroborating with the results in Table 2, the values in Table 3 show that, not only does a rise in the level of *AFT* from each sources corresponds with a fall in the aggregate bilateral trade costs, but also maintains marginal effects that are statistically significant. While negative (indicating that the marginal effect of a rise in *AFT* inflows from either of the sources is associated with a fall in aggregate trade costs), the corresponding marginal effects rise in absolute terms. The implication is that a rise in the amount of *AFT* inflows from one source (say, multilateral) marginally improves the trade cost reduction effect of *AFT* from another source (bilateral). We consider this finding as an evidence for the presence of complementarity in the effects of *AFT* from bilateral and multilateral sources. The results further show that the proportional effects of a rise in multilateral *AFT* remain statistically significant at all levels of bilateral *AFT,* and are higher than the corresponding effects of *AFT* from bilateral sources.

IV. Conclusion

The short-run effect of *AFT* on bilateral costs largely hinges on its ability to reduce bilateral trade costs. We provide the first direct test of the effects of *AFT* on bilateral trade costs of African nations and whether the effects are complementary. We find that a rise in *AFT* inflows to a typical African nation reduces bilateral trade costs of the given recipient with other countries both at the aggregate levels and across economic sectors, *ceteris paribus*.[2] The marginal trade cost reduction effects of a rise in *AFT* from either source (specifically multilateral sources) also improves with increases in the amount of *AFT* inflows from another source (e.g., bilateral), indicating complementarity in the effects of *AFT* from bilateral and multilateral sources.

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[2] Our results are also robust to alternative estimations (traditional; fixed and random effects panel) and the use of alternative trade costs measures (e.g. cost to export). The corresponding estimates are available upon request.

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