Response to the referee 3

We are indebted to forward our sincerest gratitude for your evaluation of our manuscript and constructive suggestions. Our responses are indicated in italics.

1. This is quite an interesting paper, adding some valuable knowledge on how border and transport efficiency interact with institutional and other factors to determine trade performance for African countries.

   Indeed, Africa has numerous infrastructural challenges, including thick border compared to other regions. Many Regional integration initiatives aim to address these challenges with the objective of increasing trade incidence and performance. This paper could therefore add value in these initiatives, in addition to the various trade facilitation measures by bilateral and multilateral donors.

   Response: *We are thankful for the positive comments and detailed evaluation of the paper.*

2. The paper also focuses on the quality of institutions. These are major causes of Non-Tariff Barriers to trade, and source of inefficiency in facilitating trade. While it is relatively easier to fix a road or a border post once for all and be able to measure its impact on trade flows, but it is extremely challenging to fix attitude and practices of officials or control incidence of erratic policy decisions (such as export bans and regulatory measures) that have bearing on trade performance. It is therefore important to address both hard and soft infrastructure issues and explore their interactive effects. Recent research appears to suggest that, the benefits of improving procedures and operational efficiency in facilitating transit trade are much bigger than benefits resulting from improvement of transport infrastructure. It may be useful, as an extension to this research, to consider decomposing the effects arising from hard as opposed to soft infrastructure on trade performance.

   Response: *We are grateful for your suggestions. We have repeated the exercise using physical, communication and soft infrastructure indicators separately. The results are reported in Table 1a, Table 1b and Table 2 below. We will discuss the results and include them in the appendix of the revised manuscript if we are not delimited by page limit.*

Table 1a: The impacts of separate physical infrastructure indicators on trade flow of African countries (twostep Heckman).

Variable	I (a) Outcome	I (b) Selection	II(a) Outcome	II(b) Selection	III(a) Outcome	III(b) Selection
$lngdpc_{it}$	0.897*** (0.044)	0.217*** (0.015)	1.104*** (0.035)	0.291*** (0.014)	0.957*** (0.033)	0.107*** (0.009)
$lngdpc_{jt}$	0.785***	0.250***	0.702***	0.339***	1.033***	0.233***

	(0.025)	(0.007)	(0.025)	(0.009)	(0.026)	(0.005)
$lnpop_{it}$	1.285***	0.305***	1.511***	0.392***	1.568***	0.238***
	(0.047)	(0.015)	(0.038)	(0.014)	(0.042)	(0.009)
$lnpop_{jt}$	1.293***	0.295***	1.317***	0.368***	1.476***	0.260***
	(0.031)	(0.009)	(0.032)	(0.010)	(0.032)	(0.005)
$lndis_{ij}$	-0.752***	-0.101***	-0.649***	-0.097***	-0.699***	-0.037***
	(0.040)	(0.015)	(0.045)	(0.017)	(0.036)	(0.009)
$Comrelig_{ij}$	0.123	1.340***	3.422***	0.991**	2.618***	0.629***
	(0.750)	(0.334)	(0.866)	(0.399)	(0.728)	(0.215)
$comcol_{ij}$	0.971***	0.053*	0.959***	0.063*	0.778***	0.080***
	(0.082)	(0.031)	(0.094)	(0.037)	(0.075)	(0.020)
$colrel_{ij}$	0.722***	-0.617***	1.894***	-0.192	0.371	-0.610***
	(0.265)	(0.156)	(0.257)	(0.212)	(0.256)	(0.087)
WTO_i	0.579***	0.464***	0.485***	0.431***	1.285***	0.425***
	(0.084)	(0.025)	(0.085)	(0.028)	(0.081)	(0.016)
WTO_i	2.161***	0.420***	0.364***	-0.069*	1.105***	0.195***
	(0.113)	(0.041)	(0.100)	(0.042)	(0.063)	(0.016)
$lnarea_j$	-0.165***	-0.015**	-0.248***	-0.028***	-0.143***	0.000
	(0.017)	(0.006)	(0.018)	(0.007)	(0.015)	(0.004)
$lnarea_i$	-0.411***	-0.105***	-0.033	-0.025***	-0.293***	-0.050***
	(0.046)	(0.017)	(0.022)	(0.009)	(0.023)	(0.006)
$lnentrycost_{it}$		-0.545***		-0.664***		-0.291***
		(0.057)		(0.047)		(0.026)
lan_{ij}	1.337***	0.385***	1.173***	0.511***	1.709***	0.367***
	(0.074)	(0.030)	(0.079)	(0.034)	(0.071)	(0.018)
Sea_i	2.390***	0.572***	1.338***	1.024***	3.028***	0.612***
	(0.083)	(0.044)	(0.085)	(0.052)	(0.089)	(0.028)
RTA_{ij}	1.703***	0.208***	2.855***	0.520***	1.065***	0.186***
	(0.094)	(0.033)	(0.093)	(0.031)	(0.066)	(0.016)
$ln(rail_{it})$	0.313***	0.088***				
	(0.028)	(0.013)				
$ln(road_{it})$			0.053	0.067***		
			(0.034)	(0.015)		
$ln(air_{it})$					0.197***	0.055***
					(0.014)	(0.003)
_cons	-5.503***	-3.339***	-6.538***	-5.003***	-9.695***	-2.840***
	(0.819)	(0.288)	(0.629)	(0.208)	(0.593)	(0.103)

Mills ratio	2.166***	1.038***	4.646***
	(0.200)	(0.153)	(0.212)
No. ob	42,319	49,190	52,859
Cencered	18,067	17,894	19,143

Note: *** significant at 1%, ** significant at 5%, *significant at 10%, standard error in parenthesis, i=1,…, 44 and j=1,…,173 indicate the reporter and partner country, respectively. All specifications include time fixed effects and MRT corrections for bilateral trade cost variables.

Table 1b: The impacts of communication infrastructure on trade flow of African countries (twostep Heckman).

Variable	Iv(a) Outcome	iv(b) Selection	v (a) Outcome	v(b) Selection
$lngdpc_{it}$	1.129***	0.179***	1.101***	0.184***
	(0.029)	(0.008)	(0.023)	(0.006)
$lngdpc_{jt}$	0.926***	0.249***	0.932***	0.253***
	(0.019)	(0.004)	(0.019)	(0.004)
$lnpop_{it}$	1.680***	0.310***	1.708***	0.325***
	(0.029)	(0.007)	(0.029)	(0.006)
$lnpop_{jt}$	1.409***	0.271***	1.420***	0.276***
	(0.023)	(0.004)	(0.023)	(0.004)
$lndis_{ij}$	-0.583***	-0.020**	-0.593***	-0.021***
	(0.026)	(0.008)	(0.026)	(0.008)
$Comrelig_{ij}$	1.012*	0.036	0.638	-0.029
	(0.545)	(0.177)	(0.539)	(0.176)
$comcol_{ij}$	0.706***	0.077***	0.691***	0.067***
	(0.054)	(0.016)	(0.053)	(0.016)
$colrel_{ij}$	0.792***	-0.554***	0.767***	-0.566***
	(0.179)	(0.072)	(0.178)	(0.073)
WTO_i	1.123***	0.418***	1.113***	0.419***
	(0.057)	(0.013)	(0.057)	(0.013)
WTO_i	0.484***	0.067***	0.675***	0.125***
	(0.047)	(0.014)	(0.046)	(0.014)
$lnarea_j$	-0.173***	-0.002	-0.175***	-0.003
	(0.011)	(0.003)	(0.011)	(0.003)
$lnarea_i$	-0.273***	-0.048***	-0.311***	-0.061***
	(0.015)	(0.005)	(0.014)	(0.004)
$lnentrycost_{it}$		-0.306***		-0.289***
		(0.019)		(0.019)
lan_{ij}	1.691***	0.426***	1.711***	0.437***
	(0.052)	(0.014)	(0.052)	(0.014)
Sea_i	1.309***	0.249***	1.283***	0.250***
	(0.044)	(0.012)	(0.044)	(0.012)
RTA_{ij}	3.334***	0.778***	3.301***	0.779***
	(0.067)	(0.023)	(0.067)	(0.023)
$Ln(ict\_mob_{it})$	0.063***	0.030***		
	(0.017)	(0.005)		
$Ln(ict\_tel_{it})$			0.164***	0.044***
			(0.014)	(0.004)
_cons	-8.841***	-3.532***	-8.419***	-3.525***
	(0.446)	(0.082)	(0.441)	(0.079)
Mills ratio		3.590***		3.587***
No. ob		(0.139)		(0.139)
Cencered		83,168		82,678

	34,195	33,696

Table 2: The impacts of separate soft (border and transport efficiency) infrastructure indicators on trade flow of African countries (twostep Heckman).

Variable	Iv(a) Outcome	iv(b) Selection
$lngdpc_{it}$	1.139***	0.185***
	(0.027)	(0.006)
$lngdpc_{jt}$	0.994***	0.240***
	(0.024)	(0.004)
$lnpop_{it}$	1.719***	0.311***
	(0.036)	(0.007)
$lnpop_{jt}$	1.489***	0.262***
	(0.029)	(0.005)
$lndis_{ij}$	-0.526***	-0.005
	(0.032)	(0.008)
$Comrelig_{ij}$	0.409	0.099
	(0.663)	(0.191)
$comcol_{ij}$	0.729***	0.056***
	(0.065)	(0.017)
$colrel_{ij}$	0.600***	-0.558***
	(0.222)	(0.076)
WTO_i	1.398***	0.432***
	(0.063)	(0.014)
WTO_i	0.612***	0.092***
	(0.054)	(0.014)
$lnarea_j$	-0.179***	-0.003
	(0.013)	(0.003)
$lnarea_i$	-0.170***	-0.031***
	(0.018)	(0.005)
$lnentrycost_{it}$		-0.216***
		(0.021)
lan_{ij}	1.874***	0.431***
	(0.065)	(0.016)
Sea_i	0.736***	0.101***
	(0.062)	(0.016)
RTA_{ij}	3.383***	0.727***
	(0.083)	(0.024)
$tradedocument_{it}$	-0.037***	-0.026***
	(0.012)	(0.003)

tradetime$_{it}$	-0.034***	-0.007***
	(0.002)	(0.001)
_cons	-11.477***	-3.887***
	(1.219)	(0.272)
Mills ratio	4.435***	
No. ob	(0.179)	
Cencered	70,255	
	29,602	

Note: *** significant at 1%, ** significant at 5%, *significant at 10%, standard error in parenthesis, *i*=1,..., 44 and *j*=1,...,173 indicate the reporter and partner country, respectively. All specifications include time fixed effects and MRT corrections for bilateral trade cost variables.

3. On methodology, the paper employs simple analytical framework but with quite a comprehensive estimations for robustness and sensitivity analysis. However, utilizing principal component analysis, the results show that almost all variables are significant. From a non-technical perspective, it is not clear what implications are; in terms of estimation/analytical strategy or the drivers of results. Are we saying these factors are more important or are equally important to the standard factors? It would be useful to provide more analytical context to nuance what is driving the results out of host of other factors.

   Response: Thank you for noting this important point. Even though we have reported the principal component analysis results in the Appendix B Table 7, we have not discussed about the relative contribution of each variable included to each principal component. The principal component of each infrastructure and institutional quality index is calculated based on variables which are most strongly correlated with each principal component. That is variables with larger magnitude of eigenvalues and farther from zero in either direction have more contribution to newly created indices. Certainly, this will be included in the revised version.

4. In conclusion, I recommend the paper for publication, and advise the author to consider extending the research along the lines of my comments.
   Response: Thank you.