

# Effects of aviation liberalization and level of democracy on air connectivity and related economic consequences: Evidence from Africa

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**Abstract**—The link between air connectivity and democracy has received some attention recently, with a study by the International Air Transport Association showing that there is a clear correlation between air connectivity and democracy in various regions of the world. This paper investigates the triangular relationships between air connectivity, democracy and aviation liberalization and economic consequences of their interactions. It adds value to literature by demonstrating the direct effects of democracy on liberalization and quality of air connectivity in Africa. The PLS-SEM result shows that democracy has a weak positive correlation with both aviation liberalization and air connectivity. However, the level of democracy has no significant direct effects on quality of air connectivity and aviation liberalization in Africa. At the country level, South Africa, Morocco, Egypt and Ethiopia are the top four countries possessed better air connectivity in the region but have been experiencing different cultures of democracy. This could imply that either the infant democracy in the region is unable to influence air connectivity or the direct effect of democracy on the aviation market is minimal. Moreover, liberalization significantly affects the quality of air connectivity and has reasonable indirect effects on the economic development of the continent. Furthermore, the positive impact of connectivity on economic development, on average, is more noticeable in the countries of former French colonies than British counterparts. In general, the study suggests that in the assessment of liberalization efforts and air connectivity in Africa, perhaps, the level of democracy may not be considered as a foremost component.

**Keywords**-Air connectivity; Democracy; Aviation liberalization; Economic development; Africa; PLS-SEM

## I. INTRODUCTION

International Air Transport Association [1] indicates that democracy has a positive correlation with air connectivity. It emphasized those countries with more democratic institutions tend to be much better connected to the world by air transport than authoritarian regimes. However, the link between democracy and air connectivity has not been empirically explored in previous studies. We, therefore, in an attempt to fill this gap, investigate the effects of democracy and air

liberalization on air connectivity and their interaction effects on economic development in Africa.

The African continent has some unique features regarding political framework, economic structure, social and cultural constructs. Air transport development could be the aggregate outcome of interaction effects among these features. However, the focus of this paper is limited to the triangular relationships between air liberalization, democracy and air connectivity. The paper also examines the economic consequences of these triangular relationships.

The continent has some features in common and some unique features specific to geographic location and inherited ‘legacies’ from their former colonialists. These regional disparities and inherited heritages from colony may have their own effects on the relationship between the latent variables employed in this paper (air liberalization, trade openness, democracy, air connectivity and economic development). This paper has tried to verify whether there is a significant difference across the five African regions regarding the interactions between the aforementioned latent variables. Additionally, the paper has tried to investigate the disparities among four different groups of African countries depending on their colonial background.

This study adds to the extant literature in two ways: (1) it empirically investigates the effect of democracy on air services liberalization and connectivity and the effects of the latter on economic development in the African context. (2) It employs a modelling framework that enables the measurement of complex relationships or indirect effects, namely a Partial Least Square Structural Equation Modelling.

## II. METHODS AND STUDY FRAMEWORK

There are five latent variables with their respective indicators involved in the study framework building process—aviation liberalization, air connectivity, trade openness, economic development, and democracy. The latent variables and their indicators are well described and presented.

Table 1: List of latent variables and their indicators

Latent variable	Indicator	Variable name	Data Source
Liberalization	Foreign scheduled airlines	airlines	ICAO DATA+
	Available seats	seats	ICAO DATA+
	Alliance member	alliance	SRS Analyser
	Size of bilateral agreements	bilateral	WASA-ICAO
	International destinations	destin	SRS Analyser
Connectivity	Number of routes	route	SRS Analyser
	Flight frequency	flights	SRS Analyser
Trade openness	Average tariff rate	tariff	UNCTAD
	Import/GDP	import	UNCTAD
	Export/GDP	export	UNCTAD
	Total trade/GDP	trade	UNCTAD
Development	Income index	income	UNDP
	Life expectancy index	life	UNDP
	Education index	educ	UNDP
	Urban concentration	urban	UNDP
Democracy	Freedom House Index	freedm	Freedom house
	Polity Index	polity	CSP
	Democracy Index	dindex	EIU

Partial Least Square Structural Equation Modelling (PLS path modeling) has employed to estimate the relationships between the variables and predict the model. The development of recent enhancements to the model make it a full-fledged estimator to SEM that can deal with confirmatory and explanatory researches [2]. It is also a suitable method for a research depending on secondary data allowing flexibility needed for interplay between theory and data. Moreover, this method is quite useful for less developed or still developing theories [3].

PLS path models consists of three components—the structural model, the measurement model and the weighting scheme [4]. Structural model describes the relationship between latent variables and their sequence of constructs [5]. The sequence of constructs in structural model is based on substantive theory, logic, empirical trends and practical experiences observed by the researcher [3], which helps to identify exogenous and endogenous latent variables. *Democracy* is exogenous variable and the rest four latent variables are endogenous. Furthermore, the structural model could be expressed as vector equation:

$$Y = Y\beta + \epsilon \tag{1}$$

Where  $Y$  denotes the matrix for scores of latent variables,  $\beta$ 's are coefficients of matrix and  $\epsilon$  represents vector error terms that are assumed to be centered (i.e.,  $E|\epsilon| = 0$ ).

Weighting scheme is a related concept that used to estimate each latent variable as a weighted sum of its neighboring latent variables [4] [6]. It differs in the way the relation is defined. Weighting scheme takes into account the causal order within the structural model [7].

The measurement model shows the relationship between observed variables and their latent variables. It could be formative or reflective constructs. Moreover, the model

construct of this study is reflective measurement and it could be expressed with as follows:

$$X = \lambda_x Y + \epsilon \tag{2}$$

Where  $X$  denotes vector values of observed variables,  $\lambda$  represents factor loading on latent variables,  $Y$  is vector scores for latent variables, and  $\epsilon$  indicates vector error terms.

Furthermore, there are 424 observations employed in study ranging from the year 2011 to 2018 for 53 African countries. The time period of observation was chosen based on the simultaneous availability of data for all indicators. Data was extracted from eight different subscribed and open sources (see Table 1).

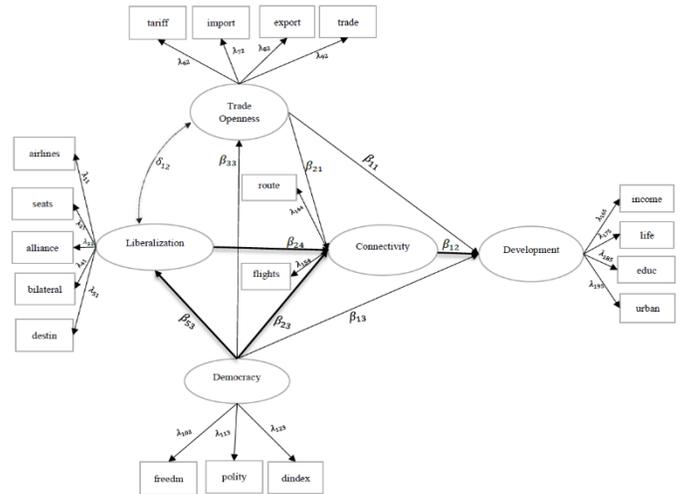


Figure 1: The hypothesized PLS path modeling and nomological network of the relationships

### III. RESULT AND DISCUSSION

The estimations of triangular relationships between democracy, air liberalization and air connectivity and economic consequences of their interactions require different types of theoretical constructs and suitable estimation techniques. PLS-SEM is a suitable technique to develop and analysis a complex model relationship for this purpose. PLS-SEM can also perform an impactful conceptual path analysis and report meaningful analysis results. The main contribution of this paper is the conceptualization and estimations of the aforementioned triangular relationships and the economic impacts of their interactions in Africa by using PLS path modeling.

Since the assessment of measurement model was sufficiently satisfactory, this subsection assess and present the structural model outcomes. Table 2 shows that the explanatory and

predictive powers of the model are assessed and substantiated. The next step is to examine the relevance of the path coefficients and their statistical significance. The path coefficient estimates are essentially standardized regression coefficients that can be assessed concerning their sign and absolute size [7] [8]. They can be interpreted as the magnitude of change in the dependent variable due to a unit change in an independent variable, *ceteris paribus*. The statistical significance of the path coefficient has checked at 5% significance level and regarded as significance when the respective p-value is below the pre-defined cutoff (0.05).

As indicated in Table 2, the path coefficient estimates for the hypothesized relationships are all significant at a 5% significance level except the effect of the two latent variables on Connectivity, Trade openness and Democracy.

Table 2: Standardized path coefficients and their statistical significance

Variable	Liberalization	Trade openness	Connectivity	Development
Liberalization			<b>0.949</b> (0.000)	
Trade openness			<b>0.004</b> (0.758)	<b>0.482</b> (0.000)
Democracy	<b>0.139</b> (0.005)	<b>0.457</b> (0.000)	<b>0.016</b> (0.389)	<b>0.084</b> (0.041)
Connectivity				<b>0.479</b> (0.000)
		Adjusted $R^2$	0.903	0.475
		GoF = 0.542	$Q^2 = 0.315$	

p-values in parentheses

In the assessment of structural model, it is important to examine and interpret the total effect of the exogenous construct on endogenous construct. Total effect is the sum of the direct and all indirect (overall) effects. The total effect has shown in Figure 2 alongside direct and indirect effects.

The indirect effect of aviation liberalization on economic development via improving air connectivity ( $0.949 \times 0.479 = 0.454$ ) is a significant empirical evidence that indicate a country with better democratic institutions and effective trade openness has a higher quality of air connectivity. However, the empirical findings in Figure 2 and Table 2 indicate that the level of democracy and trade openness have neither direct nor indirect significant effects on the quality of air connectivity in Africa. However, both democracy and trade openness have a weak positive correlation with air connectivity.

The result of this study revealed that air liberalization has a significant positive effect ( $\beta=0.949$ ,  $p=0.000$ ) on the quality of air connectivity. Moreover, the liberalized aviation market

would have a significant and positive indirect effect ( $\beta= 0.454$ ) on economic development in Africa via promoting air connectivity. This result is in line with the findings of [9] [10].

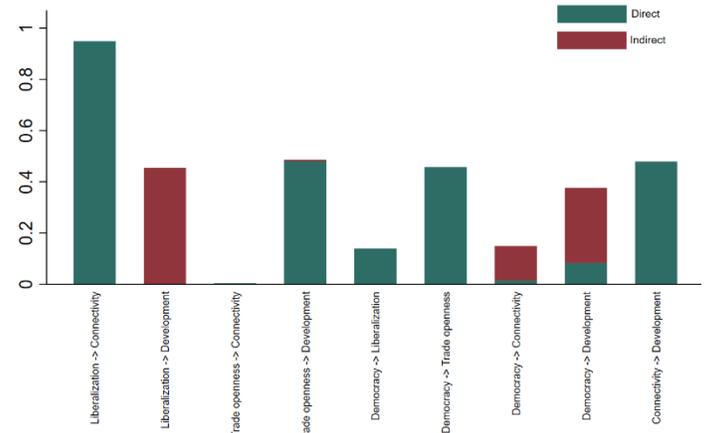


Figure 2: Direct, indirect and total Effects

Furthermore, this study has investigated the disparities among African countries regarding the relationship between aviation liberalization and air connectivity depending on the region (i.e., geographical location) and colonial heritage. The countries with higher scores of liberalization have had better air connectivity. With the exception of South Africa, North African countries top the African continent in terms of connectivity and liberalization scores followed by East African countries. We may list many factors for these disparities but their strategic location could be a plausible factor---North African airports are closer to Europe<sup>1</sup> and East African airports have been connecting Sub-Saharan African countries with Middle East and South East Asian countries.

Similarly, the relationship between aviation liberalization and air connectivity could be examined depending on the heritage of former imperialist. The direct effect of air liberalization on air connectivity is almost consistent across all imperial groups--positive and significant. In general, from this discussion it could be possible to suggest that regardless of geographic location or colonial heritage, the more aviation market liberalized the better quality of air connectivity and positive contribution for economic growth of the country.

An important component of this study was to construct and investigate the effect of different levels of democracy on

<sup>1</sup> Europe is the top partner (about 70% of Africa's passenger-km-performed in 2018) of in terms of air connectivity [11].

aviation liberalization and air connectivity. Table 2 shows that level of democracy has no direct significant effect on quality of air connectivity. Similarly, the direct effect of democracy on aviation market liberalization is insignificant margin although statistically significant. However, democracy has a weak positive correlation with both aviation liberalization( $r=0.139$ ) and air connectivity( $r=0.149$ ). As stated earlier, [1] it has also highlighted that air connectivity and democracy have clear positive correlation. Due to the correlation between the stated latent construct are weak, countries with higher democracy score may not necessarily entertain better air connectivity. For instance, countries like Botswana, Ghana and Seychelles have better democratic institutions but do not have competitive air connectivity in the continent.

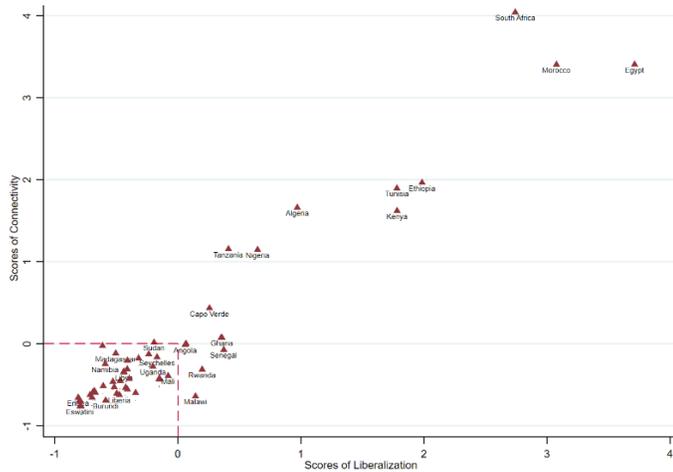


Figure 2: Scores of Connectivity and Liberalization for the year 2018

Furthermore, some countries that possess better air connectivity (Egypt, Ethiopia and Algeria) experienced lower level of democracy. On the other hand, countries like South Africa, Tunisia and Kenya have better democratic institutions and competitive air connectivity in Africa. This empirical result could imply the following two cases--- either democracy has a limited role in determining the quality of air connectivity or the lower level of democracy in Africa unable to make a significant effect on air connectivity. In other words, in the assessment of air connectivity in Africa, perhaps level of democracy may not considered as a key determinant.

Table 2 reveals that air connectivity has a positive and significant effect on economic growth of African countries. They have also a positive and significant correlation. Obviously, an improved air connectivity strengthens the country's economy by advancing the productivity of businesses, giving access to wider marketplaces within shorter travel time and facilitating for tourism flows. The impact of air connectivity on economic development could vary with

geographic location and colonial heritages of countries. For instance, the comparison has made for former French and British colonies because these countries occupy majority of Africa combined together and have strong post-colonial ties with their former colonies. The former French colonies are the group of countries where the positive effect of connectivity on economic growth is more noticeable than former British counterparts are. In better performing economies there would be more other factors determining the economic growth in addition to the quality of air transport. Some scholars, [12] [13] [14], have suggested that former British colonies economically perform significantly better on average than their French counterparts. The marginal effect of air transport growth on economic activities has less noticeable for relatively better performing economies [15]. Although the plausible rationale behind this disparity requires further studies, one can apparently observe that the 'legacies' of former imperialists has been manifested in aviation market liberalization efforts, quality of air connectivity, culture of democratic practice and economic development of the continent.

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