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Effects of African aviation liberalisation on economic freedom, air connectivity and related economic consequences

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ABSTRACT

This article investigates the effects of air transport liberalisation on economic freedom and air connectivity, and the extended effects on economic development. A PLS path modelling estimator, applied to annual data for 52 countries over the period 2011–2019, shows that aviation liberalisation promotes economic freedom and improves air connectivity. The results also reveal that the economic contribution of air transport liberalisation varies across African countries and regions, relative to their levels of economic freedom and air connectivity. It is concluded that removing barriers to trade using air transport, combined with institutions that support economic freedom and the quality of air connectivity, may foster countries' economic development.

1. Introduction

Despite growing interest in the relationship between economic policy and economic development, little empirical evidence has been produced on the relationship between economic freedom, sectoral policy, and economic development. Extant research focuses on the impact of economic freedom on GDP growth, and several studies conclude that economic freedom promotes economic growth (e.g. De Haan and Sturm, 2000; De Haan. Lundstrom and Sturm, 2006; Brkić et al., 2020). For instance, De Haan et al. (2006) show that economic freedom may transform the structure of economic institutions by ensuring property rights, rightful courts, enforcement of contracts, and low barriers to trade, which in turn enables sustained economic growth. Thus, the impact of economic freedom on economic performance has been examined mainly from a macroeconomic perspective.

This study takes a sectoral-level approach to investigate the role of air liberalisation in promoting economic freedom and enhancing air connectivity, and the extended effects on economic development. Aviation openness may amplify the positive effects of economic freedom on economic development by facilitating access to foreign markets, introducing more competition into the business, and allowing for better rationalisation of that freedom (Piermartini and Rousová, 2013). Liberalisation may also improve the quality of air connectivity by removing constraints on service capacity, pricing, route entry, and cooperative arrangements between airlines (Lumbroso, 2019). Hence, economic freedom and air connectivity may be considered as means through which liberalisation improves economic development. Quantifying these channels may assist policymakers in designing better policy objectives.

Not only is robust empirical evidence on the relationship between liberalisation, economic freedom, and air connectivity scarce, particularly for Africa, but also many empirical studies of the economic effects of air transport liberalisation in Africa (Abate, 2016; Njoya, 2016; Tolcha et al., 2020) have used 'traditional' regression techniques, which analyse the research questions using only observed explanatory (predictor, independent) variables or proxy variables. This paper is the first to examine the relationship between aviation liberalisation and economic freedom using partial least squares (PLS) path modelling.

Some African countries that have taken steps to liberalise their aviation sector in recent years have economies that are considered to be 'repressed'. This raises the question of whether removing barriers to trade and allocating resources through markets in selected sectors promotes economic freedom. Another question is whether the economic benefits of aviation liberalisation and the resulting increases in air connectivity differ in countries with different levels of economic freedom. This article discusses possible connections between aviation liberalisation, economic freedom, and economic development. Its two key contributions to the extant literature are its empirical investigation of the effects of air service liberalisation on air connectivity and economic freedom, and the extended effects on economic development in

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Africa, and its employment of a PLS structural equation modelling (SEM) framework to measure complex relationships and indirect effects.

In the remainder of this article, Section 2 introduces basic concepts relating to the relationships between economic freedom, aviation liberalisation, and economic development; Section 3 documents the methodology and data used in the study; Section 4 presents and discusses the results; and Section 5 draws some conclusions.

2. Air transport liberalisation, economic freedom, and economic development

The link between aviation liberalisation and economic development is supported by theoretical and empirical evidence. Theoretically, air liberalisation brings robust outcomes in terms of new routes, more frequent flights, better connections, and lower fares (Lumbroso, 2019). This is consistent with economic theory, which predicts that removing restrictions on trade has significant effects on growth. A range of empirical evidence shows that liberalising air transport markets has positive impacts on economic development (Abate, 2016; Burghouwt and De Wit, 2015). It is also commonly understood that economic freedom and economic development are closely related. Hall and Lawson (2013) conclude that increased economic freedom stimulates economic growth.

However, the association between aviation liberalisation and economic freedom is far less clear; hence, this section aims to conceptualise this link. Fundamental elements of economic freedom include free personal choice, protection of private property, and freedom of exchange (Gwartney and Lawson, 2003). It measures the extent to which rightly acquired property is protected and individuals are free to engage in voluntary transactions (De Haan and Sturm, 2000). These elements suggest that governments play an important role in this system: in an economically free society, fundamental functions of government include protecting private property and enforcing contracts (De Haan et al., 2006).

It is important to distinguish economic freedom from political liberty. Political liberty refers to citizens' free participation in the political process, fair and competitive elections, and alternative parties being allowed to participate freely (Acemoglu and Robinson, 2012), whereas economic freedom refers to the extent to which people are individually and collectively free to undertake economic activities of their choice, regardless of the political structure (Gwartney and Lawson, 2003). This implies that citizens seek to exercise economic freedom within the existing political framework. However, Castro and Martins (2021) suggest that the environment of economic freedom may vary relative to the corresponding government ideology.

The interaction between aviation liberalisation and economic freedom has received little research attention, perhaps because regulatory frameworks for liberalising civil aviation are relatively recent (Lumbroso, 2019), and because implementations of air transport liberalisation vary considerably across different regions. However, Wang and Heinonen (2015) find a significant correlation between air transport liberalisation and economic freedom. They explain that economic institutions that provide freer business and trade environments are also characterised by more open aviation markets. Economic freedom both supports and demands air transport liberalisation. Thus, this interaction may increase demand for domestic and international travel and trade, which may gradually foster economic development. This concept is illustrated in Fig. 1.

According to the institutionalist approach, the trend toward liberalisation is influencing countries' economic freedom (Acemoglu and Robinson, 2012). Air transport liberalisation may encourage the development of economic institutions and other organisations by increasing their international exposure, because countries that satisfy the legal requirements and institutional conditions specified in air service agreements (ASAs) thereby also augment their citizens' economic freedom (Piermartini and Rousová, 2013). Furthermore, liberalisation

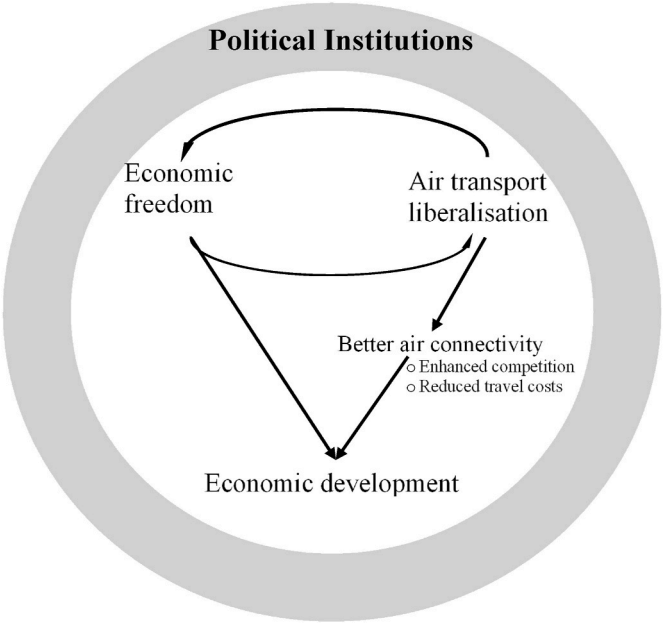

Fig. 1. Links between economic freedom, air transport liberalisation, and economic development.

may facilitate cross-border transactions, promote competition, improve efficiency, reduce travel costs, and induce gradual reforms to economic institutions (Wang and Heinonen, 2015). For instance, Wynn-Williams (2009) argues that China's gradual and progressive aviation reforms have transformed economic freedom, resulting in far-reaching economic development. It might therefore be claimed that economic freedom is necessary to reap the expected economic benefits of liberalisation.

3. Methods and study framework

3.1. Variables and study framework

The framework for this study involves four latent variables – aviation liberalisation, economic freedom, air connectivity, and economic development – with their respective indicators, using 468 observations from 52 countries for the period 2011–2019. This time interval was chosen based on the simultaneous availability of data for the indicators. Contextual definitions and delineations of the variables are presented in this subsection.

Various indicators can be used to indicate a country's level of economic development. Because the general aim of economic development is to improve the nation's wellbeing, we employ four indicators of the population's quality of life: income index, life expectancy, education index, and poverty rate. The income index is a good indicator of standards of living, measured as the annual income of the average citizen based on purchasing power parity in USD (Shah, 2016). It is calculated based on gross national income per capita, with a minimum value of $100 and a maximum of $75,000. A country's economic development may also be reflected in average life expectancy, which indicates the achievement of long and healthy lives and is measured by life expectancy at birth. Evidence indicates that sustainable economic growth ultimately improves life expectancy (Khan et al., 2016). Education is another component of wellbeing that may shed light on a country's level of economic development and quality of life. The education index estimates relative levels of education in terms of adult literacy rates and combined gross enrolment rates (Gasper2013), with higher levels indicating accumulation of better human capital and quality of wellbeing (Ogundari and Awokuse, 2018). The poverty rate may also indicate the status of a country's economic development by revealing the proportion

of families living below a specific poverty threshold, which relates to the overall health of the economy (Nakabashi, 2018).

Economic freedom comprises freedom of personal choice, voluntary exchange, freedom to compete, and protection of people and property (Gwartney and Lawson, 2003). It implies that individual choices determine what goods and services are produced, and how (Balliew et al., 2019). Two indicators commonly used to measure economic freedom are those of the Fraser Institute and the Heritage Foundation. The Heritage Foundation takes 10 elements into account, whereas the Fraser Institute uses 17 measures to rate countries' economic freedom (De Haan et al., 2006); however, Balliew et al. (2019) conclude that the results of the two specifications are very similar and indicate similar trends in economic freedom. Both approaches group the indicators into four broad areas: rule of law, government size, regulatory efficiency, and open markets (De Haan and Sturm, 2000). In this study, these four elements are represented by property rights, government integrity, business freedom, and trade freedom, respectively. The indicators were chosen based on the simultaneous availability of data across observations. Data from The Heritage Foundation were extracted because they were available for the countries included in the study.

Property rights are a central element of economic freedom, referring to the protection of people and their rightfully acquired property (Gwartney and Lawson, 2003). Government integrity refers to the consistency with which a country's legal system secures these rights and rule of law prevails through an independent judiciary and an impartial court system (Balliew et al., 2019). The market exchange system will operate smoothly if a country's legal system secures property rights, enforces contracts, and enables mutually agreeable dispute settlements (Ott, 2016). Individuals' and businesses' incentives to engage in productive activities will be eroded if they lack confidence that contracts will be enforced and the fruits of their productive efforts protected (Gwartney and Lawson, 2003). Trade freedom is a measure of market openness across national boundaries. A low level of trade freedom implies limited international transactions, reduced convertibility of currencies and volumes of trade, and delayed passage of goods through customs (Azman-Saini et al., 2010). Business freedom refers to the extent to which regulatory restraints and bureaucratic procedures limit market competition and operations. In countries that score highly on the business freedom index, the market determines prices, and firms are fairly free to enter into business activities (Brkić et al., 2020). In this study, economic freedom, estimated using these four indexes, and its relationship with aviation liberalisation are analysed in a structural model.

Air connectivity measures the extent of flight services offered by an airport or system of airports (ITF, 2018; Burghouwt and Redondi, 2013). Although choosing metrics to assess air connectivity is challenging, frequency of flights, available seat kilometres, and diversity of destinations/routes are key indicators (Arvis and Shepherd, 2015). The higher the number and distance of flights and routes, the better the connectivity (Allroggen et al., 2015). In this study, total flight frequency, available seat kilometres, and number of routes per year are used to estimate each country's level of air connectivity. Flight frequency refers to the total number of scheduled passenger flights, excluding cargo, charter, and emergency flights.

A country's level of aviation liberalisation is determined by the design of ASAs with other countries. The WTO (2006) identifies seven key elements of ASAs that indicate aviation market openness: grants of rights, capacity clauses, tariff approvals, withholding, designation, statistics, and cooperative arrangements. Grants of rights refer to rights to provide air transport services between two countries (Piermartini and Rousová, 2008; ITF, 2019). In this study, such rights are proxied by the number of scheduled airlines of another country delivering air transport services to the focal country. The country's number of bilateral agreements and number of international destinations are also employed as proxies for the level of air liberalisation. Bilateral agreements are signed between countries, not between airlines. Higher numbers of bilateral agreements and diverse international destinations indicate a more liberalised aviation market (Zhang and Zhang, 2002; Surovitskikh and Lubbe, 2015) (see Table 1).

3.2. Method – PLS path modelling

PLS-SEM is used to estimate relationships between the variables and predict the model. This is a fully-fledged SEM estimator suited to research that depends on secondary data (Hair et al., 2019). It also allows sufficient flexibility for interplay between theory and data (Venturini and Mehmetoglu, 2019).

PLS path models consist of three components: the structural model, the measurement model, and the weighting scheme (Benitez et al., 2020). The structural model describes the relationships between latent variables and their sequence of constructs. The sequence of constructs in a structural model is based on substantive theory, logic, empirical trends, and the researcher's practical observations (Hair et al., 2016), which help to identify exogenous and endogenous latent variables. In this study, liberalisation is an exogenous variable, and the remaining three latent variables are endogenous. The structural model can be expressed as a vector equation (Equation (1)).

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

where Y denotes the matrix of scores for the latent variables, β is the coefficient of the matrix, and ε represents vector error terms that are assumed to be centred (i.e. $E|\,\varepsilon\,| = 0$).

The measurement model shows relationships between observed variables and their latent variables. These may be formative or reflective constructs. The model construct for this study is a reflective measurement and can be expressed as a single matrix equation (Equation (2)):

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

where X denotes the vector value of observed variables, λ represents the factor loading on the latent variables, Y is the vector score for the latent variables, and ε is the vector error term.

Similarly, the weighting scheme is a related concept that helps to estimate a score for each latent variable as the weighted sum of its neighbouring latent variables (Venturini and Mehmetoglu, 2019). This relationship is defined differently, as it takes account of the causal order within the structural model (Henseler, 2010). This concept is used to examine regional disparities in the specified variables between African countries.

Table 1
List of variables, indicators, and data sources.

Latent variable	Indicator	Variable name	Data source
Liberalisation	Foreign scheduled airlines	Airlines	ICAO DATA+
	Size of bilateral agreements	Bilateral	WASA-ICAO
	International destinations	Destinations	SRS Analyser
Connectivity	Flight frequency	Flights	SRS Analyser
	Total available routes	Routes	SRS Analyser
	Available seat kilometres	Seats	SRS Analyser
Economic freedom	Property rights	Property rights	Heritage Foundation
	Government integrity	Gov't integrity	Heritage Foundation
	Business freedom	Business freedom	Heritage Foundation
	Trade freedom	Trade freedom	Heritage Foundation
Development	Income index	Income index	UNDP
	Life expectancy	Life expectancy	UNDP
	Education index	Education	UNDP
	Poverty rate	Poverty rate	UNDP

4. Results and discussion

This section begins by presenting descriptive analyses and preliminary findings. We constructed indexes for the four latent variables using 14 different indicators. The index scores for the variables vary between countries.

As shown in Fig. 2, Egypt, South Africa, Morocco, and Ethiopia score better for air liberalisation and quality of air connectivity. These countries have better air transport networks within the continent and their own competitive carriers (Scotti et al., 2017). Tunisia, Morocco, South Africa, and Egypt have higher scores for economic development and economic freedom.

In general, African countries exhibit high inequalities in air connectivity and liberalisation levels, but lower disparities in economic freedom and economic development. Fig. 3 shows the distributional characteristics and levels of scores for the variable. These indicate outlier countries above the upper quartile relating to connectivity and liberalisation.

This variation may also be witnessed across geographical regions of Africa, and to some extent in relation to their colonial backgrounds. However, as depicted in Fig. 4, regional disparities are greater than the average scores relating to colonial backgrounds. The northern African region scores more highly for air liberalisation, connectivity quality, and average economic development. Many factors may account for this better performance, but strategic location is one plausible explanation. North African airports are closer to Europe, and Europe accounts for about 70% of Africa's passenger kilometres and is a top partner in terms of air connectivity (ICAO, 2020). The Southern African region scores better for economic freedom, and on average, the Central Africa region has the lowest scores for the all variables.

Linear relationships between the specified variables are shown in Fig. 5. Economic development is significantly correlated with the other three variables, and the correlation between liberalisation and connectivity is strong ($r = 0.91$). Section 4.2 presents the effect of liberalisation on economic freedom and air connectivity, and its overall effect on economic development through improving connectivity and motivating economic freedom.

4.1. Assessment of measurement model

To produce a plausible estimation of the inner (structural) model, the outer (measurement) model must have acceptable validity and reliability thresholds. Assessing the reflective measurement model involves evaluating convergent, composite, discriminant, and indicator reliability (Hair et al., 2019).

Convergent validity measures the extent to which the manifested variables belong to a single latent variable and indicate the same construct (Benitez et al., 2020). The average variance extracted (AVE), which is widely used to assess convergent validity, indicates the extent to which the latent variable explains variance in the observed variables. An AVE value of 0.5 or more, meaning that at least half of the indicator's variance may be represented by the corresponding latent variable, suggests acceptable empirical evidence for convergent validity (Henseler, 2010). In this study, all AVE values are above this threshold (see Appendix, Table A3).

Composite reliability assesses the correlation between construct scores and latent variables (internal consistency reliability), and can be dependably measured using Dijkstra-Henseler's ρ_A (Dijkstra and Henseler, 2015).[1] In this study, the values of ρ_A are greater than 0.7; hence, the construct scores can be considered to have reliable internal consistency (see Table A3).

Discriminant validity evaluates the extent to which theoretically different concepts are empirically distinct from other constructs in the model. Heterotrait-monotrait (HTMT), a recently developed metric of discriminant validity (Henseler et al., 2015), is considered to be a suitable and reliable option. A lower HTMT value indicates better discriminant validity and suggests that the constructs are sufficiently statistically distinct from other constructs in the model. Henseler et al. (2015) propose that HTMT values of less than 0.9 provide reasonable empirical evidence for considering the constructs to be distinct and discriminant validity present. The results in Table A1 show that the HTMT values are within the desired threshold and the model exhibits no discriminant validity problem.

Factor loading estimates can be used to assess indicator reliability. It is recommended that loadings should be above 0.707, indicating that the corresponding latent variable explains more than 50% of the indicator's variance, and hence assuring adequate item reliability (Hair et al., 2019). Fig. 6 presents the factor loading estimates with threshold references. The loadings are significant at the 1% level, and hence the measures can be considered to be reliable. The dashed line indicates the established threshold (0.707) often used to assess quality of fit.

4.2. Assessment of the structural model

Having established that the measurement model is satisfactory, the structural model can be assessed. This includes evaluating the model's predictive relevance and relationships between the constructs. However, before making a detailed assessment of the structural model, it is advisable to check for multicollinearity to avoid biased estimation results. Ideally, to avoid multicollinearity, the variance inflation factor (VIF) should be less than 3 (Khan et al., 2019). The results in Table A2 show that all values are around the lower bounds of VIF, so there is no evidence of a multicollinearity problem in the model.

Assessment of the structural model focuses primarily on the coefficient of determination (R^2), the predictive relevance of the model (Q^2), the goodness of fit (*GoF*), and the path coefficient estimates and their statistical significance (Henseler, 2018; Hair et al., 2019). The coefficient of determination evaluates the model's predictive accuracy by measuring the overall effect size and variance explained in the endogenous construct of the inner path model. As a guideline, substantial, moderate, and weak explanatory power of R^2 are bounded by values of 0.75, 0.5, and 0.25, respectively (Hair et al., 2019). Table 2 reveals that the adjusted R^2 of the *Development* and *Connectivity* variables are 0.45 and 0.83, respectively. Given that economic development is determined by multiple factors, the stated latent variables represent a satisfactory coefficient of determination.

Q^2 statistics are used to assess the predictive quality of a PLS path model. For Q^2 to provide adequate predictive relevance for a particular endogenous latent construct, its value must be greater than zero (Hair et al., 2019). As shown in Table 2, the Q^2 value is 0.365, which can be interpreted as acceptable and providing substantial empirical evidence of the adequacy of the model's predictive relevance for the constructs.

Goodness of fit is used to evaluate whether the complete model sufficiently explains the empirical data. A goodness-of-fit value of 0.10 is regarded as providing weak global validation of the path model's fit, 0.25 as medium validation, and 0.36 as strong validation (Hussain et al., 2018). Its value in this study is 0.580, indicating substantial validation of the path model's fit.

Having assessed and substantiated the model's explanatory and predictive powers, the next step is to examine the relevance and statistical significance of the path coefficients. Path coefficient estimates are essentially standardised regression coefficients, and can be assessed in terms of their sign and absolute size (Henseler et al., 2016). They are interpreted as the magnitude of change in the dependent variable due to a unit change in an independent variable, ceteris paribus. As indicated in Table 2, the path coefficient estimates are significant at the 1% significance level.

[1] Dillon-Goldstein's ρc and Cronbach's α are liberal and conservative alternatives, respectively (Hair et al., 2019).

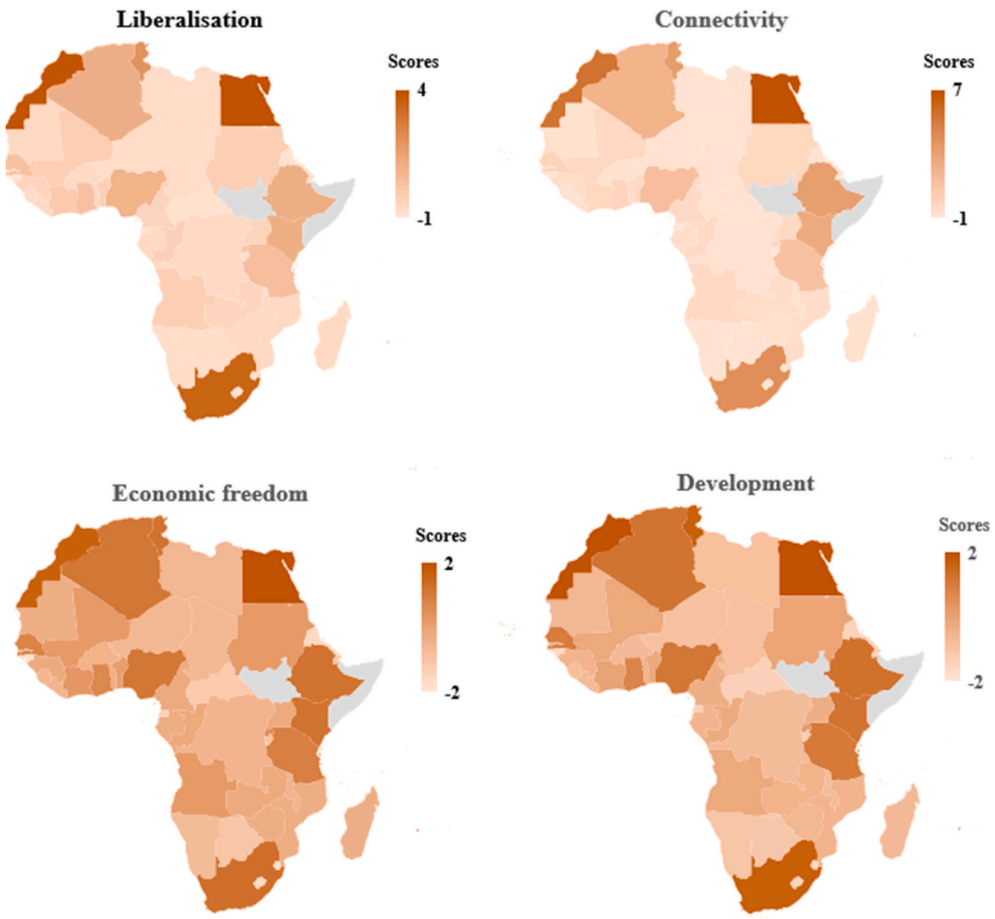

Fig. 2. Scores of the country for each variable.

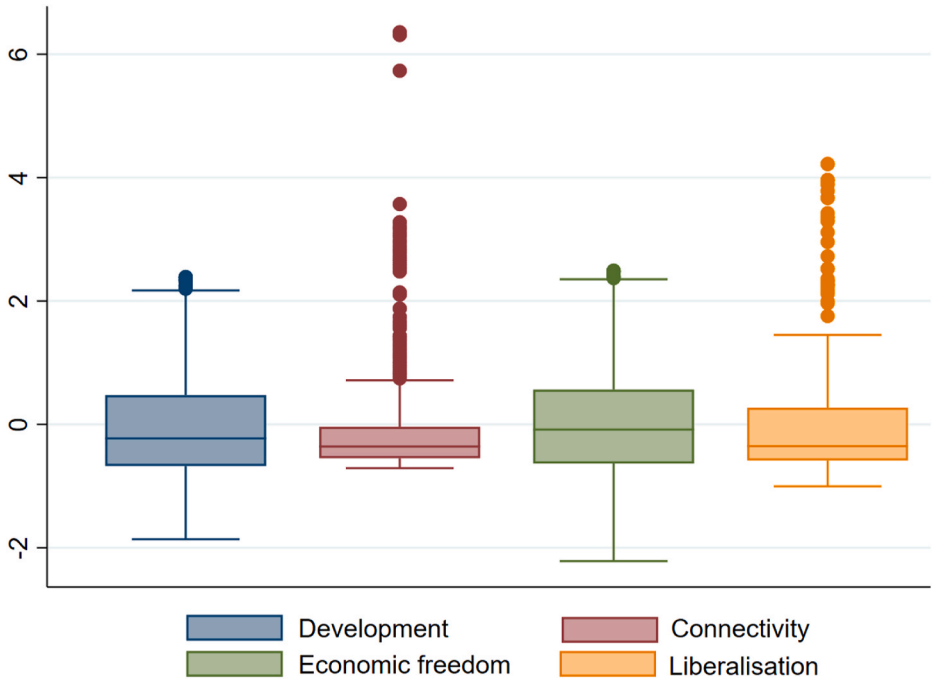

Fig. 3. Distributional characteristics of variables.

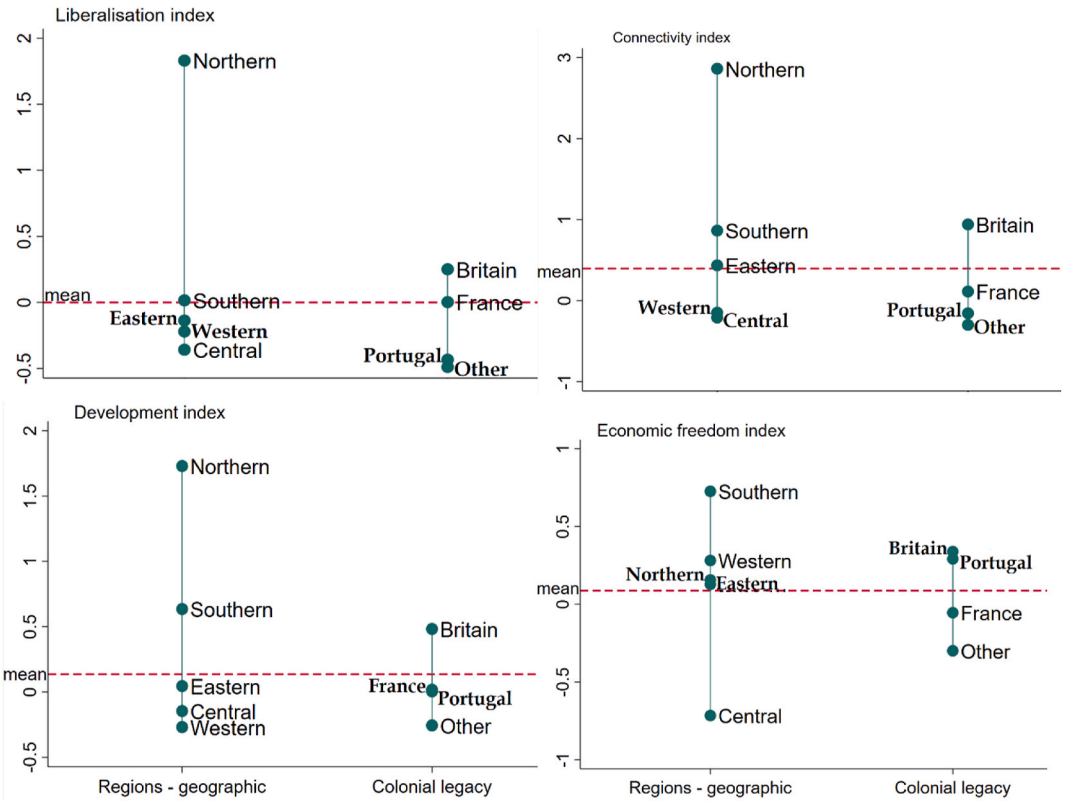

Fig. 4. Disparities in index scores across regions and colonial backgrounds.

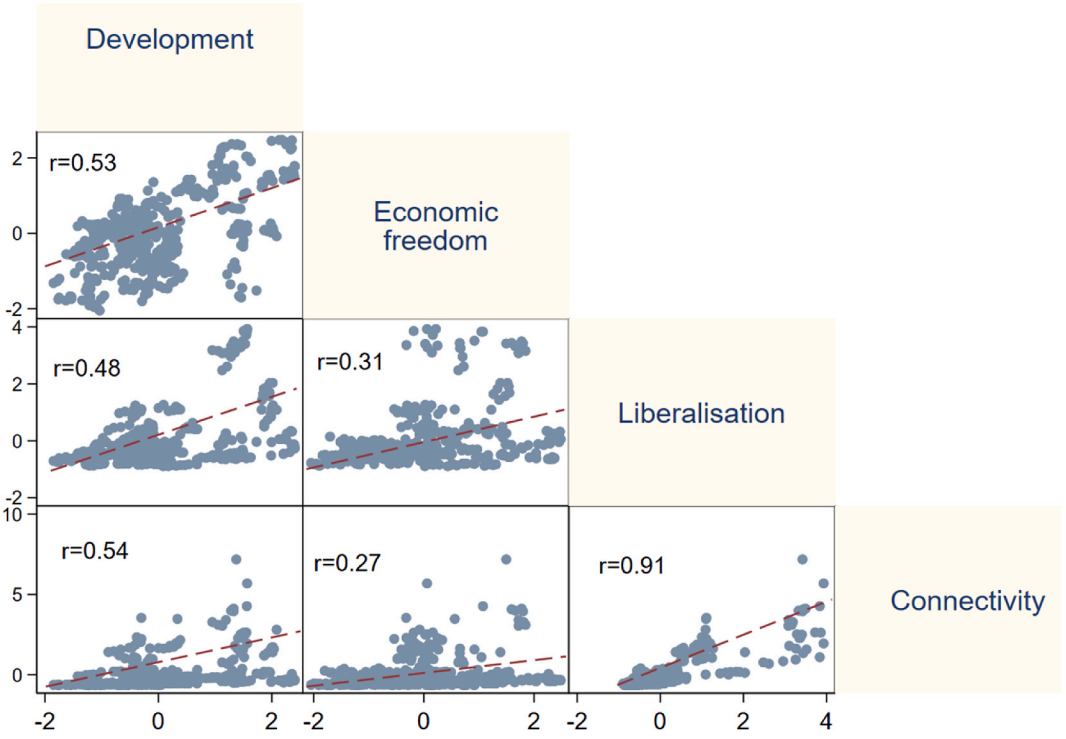

Fig. 5. Linear relationships between the variables.

Assessing the path coefficients provides the necessary estimation results to answer the research questions. The empirical findings show that aviation market liberalisation enhances the level of economic freedom. This impact may potentially result from relaxing operational access and aeropolitical restrictions. Airlines may be more motivated to establish services in liberalised aviation markets and in environments with more economic freedom, based on international agreements that specify agreed standards to which states must adhere (Wang and

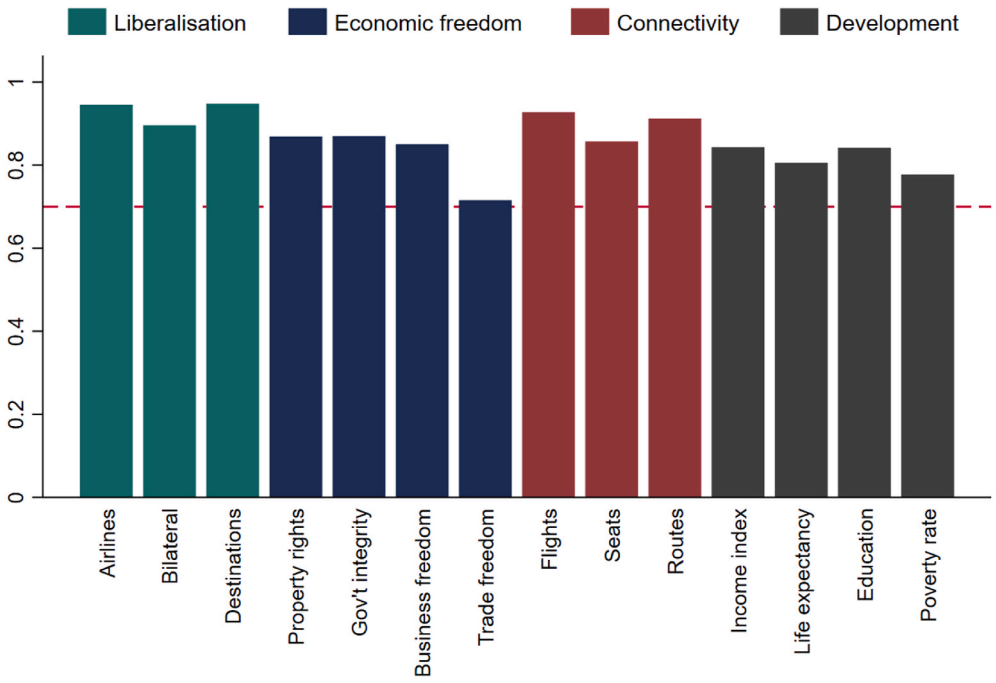

Fig. 6. Measurement model: Standardised loadings.

Table 2
Standardised path coefficients and their statistical significance.

Variable	Economic freedom	Connectivity	Development
Liberalisation	**0.311** (0.000)	**0.914** (0.000)	
Economic freedom			**0.414** (0.000)
Connectivity			**0.432** (0.000)
	Adjusted R^2	0.83	0.45
	$GoF = 0.58$	$Q^2 = 0.365$	

Note: p-values in parentheses.

Heinonen, 2015). Accordingly, countries will be motivated to strengthen institutions for contract enforcement and improve economic freedom.

The total effect of aviation liberalisation on economic development through improving air connectivity and promoting economic freedom ($0.31*0.41 + 0.43*0.91 = 0.52$) is indicated in Fig. 7. Liberalisation leads to substantial economic development because it improves connectivity and increases competition, thereby reducing fares and stimulating travel growth (Lieshout et al., 2016). Airlines must optimise their network configurations and pricing strategies to survive increased competition, and thus improve their production efficiency (Bilotkach and Hüschelrath, 2019). Progressive liberalisation enables better transport and logistics services that may positively affect employment opportunities, trade, and tourism (Fageda, 2016). These effects are not consistent across countries, and the benefits vary with levels of economic freedom and quality of connectivity.

4.3. Discussion

A few studies (e.g. Button et al., 2015a; Abate, 2016; Njoya, 2016)

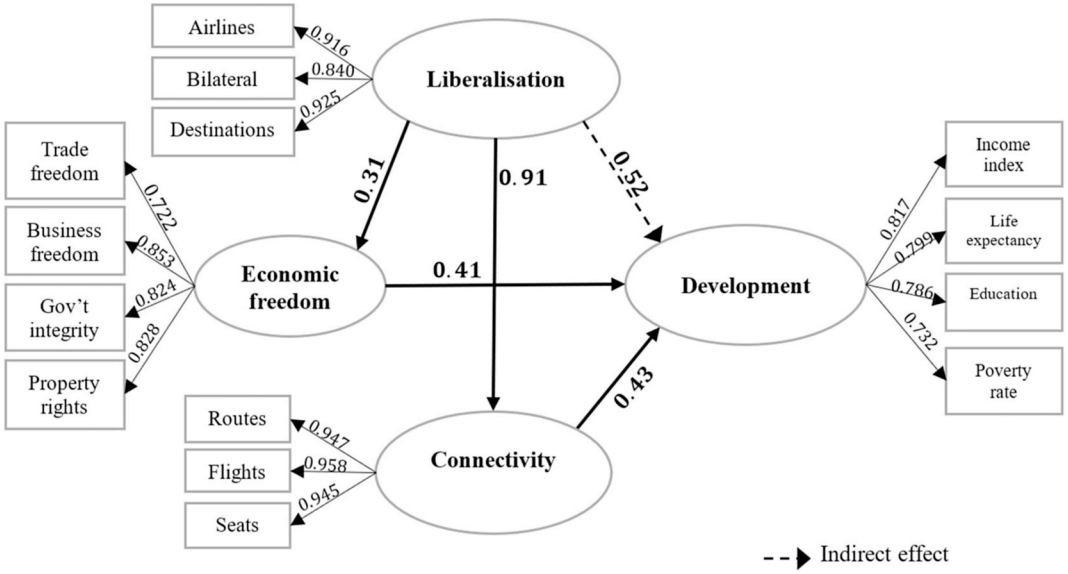

Fig. 7. Estimated structural model.

provide empirical evidence of the economic contributions of air liberalisation in Africa. In this study, a model of the relationship between air liberalisation and economic development via economic freedom and air connectivity is built and tested. This section discusses the effects of liberalisation on economic freedom and connectivity, and the overall effects on economic development.

First, the empirical results reveal a link between air liberalisation and economic freedom. The cross-country analysis of 52 African countries indicates that a one percentage point increase in a country's liberalisation score improves economic freedom by 0.31%. This implies that economic freedom is likely to have highly visible effects where markets enjoy a large degree of air liberalisation. Edlund (2017) argues that existing ASAs may place pressure on governments to facilitate the establishment of strong institutions and implement agreements between national governments to ensure that firms are fairly treated, enjoy equal opportunities, and are able to access the market as intended. Moreover, liberalisation decreases transaction costs and stimulates competition, which encourages entrepreneurs to demand producer-friendly institutions (Farhadi et al., 2015). Improvements to economic freedom may also increase individuals' and companies' confidence in economic institutions and encourage further productivity.

Second, the results reveal a significant relationship between levels of economic freedom and economic development. This empirical finding indicates that improving the level of economic freedom by one per cent increases a country's economic development by 0.41%. The direction of this relationship is in line with previous studies, but its magnitude differs slightly between countries, which may partly be explained by wide variations in African countries' GDP. Similar studies indicate that a single-unit increase in the economic freedom index leads to a 1.22 percentage point increase in growth in MENA countries (Panahi et al., 2014), and that in Middle East and East Asian countries, a one-unit increase in the economic freedom index leads to a 1.61% increase in growth (Razmi and Refaei, 2013). Among other factors, voluntary exchange, protection of people and property, and free competition as a consequence of embracing the market are explanatory factors for changes in growth and national incomes through investment and trade activities (Balliew et al., 2019). Regions with higher levels of economic freedom receive more foreign direct investment, which enhances their economic progress (Ajide and Eregha, 2015). Similarly, Bennett (2014) observes that institutions guaranteeing economic freedom can be expected to have positive effects on economic development.

Third, the results reveal a substantial relationship between air connectivity and air transport liberalisation. A one-unit change in the level of air liberalisation increases a country's air transport connectivity by 0.91%. This effect is revealed in various ways, as liberalisation removes constraints on route entry, service capacity, pricing, and cooperative arrangements among airlines (Fu et al., 2010). The results indicate that regardless of a country's geographical location, aviation market liberalisation improves air connectivity and contributes positively to economic development. This finding is in line with those of Button et al. (2015b) and InterVISTAS (2014), which indicate a positive relationship between air services liberalisation and connectivity in Africa.

Fourth, improved connectivity in turn increases economic activities and facilitates economic development. Increased connectivity enables investments, goods, and human capital to flow more freely across borders, which may enhance returns on investment (Bottini and Morphet, 2015). The findings of this study show that a one-unit change in connectivity increases economic development by 0.43%. Improved air connectivity strengthens a country's economy by improving business productivity (Fageda, 2016), giving access to wider markets with shorter travel times, and facilitating tourism. A recent study similarly identifies the wider economic impacts of enhanced air connectivity in Kenya (Njoya et al., 2020).

Finally, the results show that liberalising the aviation market significantly improves countries' economic development, indicating that a 1% increase in liberalisation improves economic development by 0.52%. The study reveals that air liberalisation enhances economic development through two main channels: reinforcing economic freedom and strengthening air connectivity. The potential economic benefits of aviation liberalisation include additional GDP generated by increased demand for travel and resulting additional job opportunities. Given the large size and poor land transport infrastructure of the African continent, liberalisation enables air transport to operate as an ideal means of harmonising supply chains, thereby improving the overall efficiency of the economy. This function is even more important for time-sensitive and high-value internationally traded items, acting as an indispensable tool for implementing just-in-time procurement and production strategies. Button (2020) also concludes that deregulating African skies would increase competition and enable air transportation logistics to pursue broader and better planned supply chain coordination.

The relationships between the variables are not uniform across African countries and regions. For instance, comparison of the findings by regional economic community and colonial background shows that the effect of liberalisation on economic freedom is more evident in the Northern African region and in former French colonies (see Appendix, Figures A1 and A2). However, liberalisation has a comparatively significant positive effect on connectivity, regardless of these factors.

5. Conclusion

This study investigates and quantifies the effects of air transport liberalisation on economic freedom, air connectivity, and economic development in Africa. It also examines the significance of economic freedom and air connectivity in disseminating the economic contributions of liberalisation. PLS path modelling is applied to a sample from 52 African countries. This study is novel in that, unlike previous studies of air transport liberalisation, it assesses the role of liberalisation in promoting economic freedom and improving air connectivity. Although the effects of air transport liberalisation on air connectivity and economic growth are now recognised, there has been little rigorous assessment of the link between liberalisation, economic freedom, and economic development.

This empirical investigation reveals important results. First, air service liberalisation has a significant and positive effect on economic freedom. It is important to examine the impacts on economic freedom when analysing economic conditions for liberalising air services. These include regulatory set-ups that facilitate countries' cross-border economic interactions. Second, as shown in previous studies, air liberalisation has a substantial effect on the quality of air connectivity. A liberal aviation policy leads to better air connectivity and generates economic growth in African countries, regardless of their geographical location or colonial heritage. The analysis clearly shows that economic freedom and air connectivity are viable channels through which the economic effects of liberalisation are spread.

The significant and positive links between aviation liberalisation, economic freedom, and air connectivity suggest that African governments should continue to embrace more market-oriented economic institutions, as market-oriented economies are generally more willing to open up their aviation markets to foreign companies. In recent years, reducing restrictions on air transport services in various African countries has helped foster connectivity and economic development. InterVISTAS (2014) indicates that Ethiopia's pursuit of more liberal aviation policies has contributed to the success of Ethiopian Airlines and improved the country's connectivity. From a policymaker's perspective, regime changes toward open skies in Africa and adoption of economic freedom policies are likely to improve connectivity and economic development.

Future directions might include examining data over a more extended period and incorporating additional variables that are likely to affect connectivity and economic development, such as airfares, cargo volumes, frequency of emergency flights, and quality of infrastructure. This would enable more accurate investigations of the role of

liberalisation in economic freedom, connectivity, and associated economic development. Another interesting question relates to the specification of the air liberalisation index. According to Dobruszkes and Graham (2016), air transport liberalisation is rarely measured accurately, and analysing its impact is challenging. Finally, adopting an alternative approach to SEM, such as model implied instrumental variables (MIIVs), might further verify the economic contributions of air liberalisation.

Appendix

Table A1
Discriminant validity test: Heterotrait–monotrait (HTMT) ratio

	Liberalisation	Economic freedom	Connectivity	Development
Liberalisation	1.000	0.097	0.835	0.221
Economic freedom	0.097	1.000	0.073	0.282
Connectivity	0.835	0.073	1.000	0.296
Development	0.221	0.282	0.296	1.000

Table A2
Multicollinearity check (VIFs)

Variable	Economic freedom	Connectivity	Development
Liberalisation	1.000	1.000	
Economic freedom			1.079
Connectivity			1.079

Table A3
Assessment of measurement model: Validity and reliability analysis

Criterion	Liberalisation	Connectivity	Economic freedom	Development
AVE $>$ 0.5	0.800	0.902	0.653	0.615
Cronbach's α $>$ 0.7	0.874	0.946	0.826	0.791
Dillon-Goldstein's $\rho_c > 0.7$	0.923	0.965	0.882	0.864
Dijkstra-Henseler's $\rho_A > 0.7$	0.883	0.947	0.865	0.793

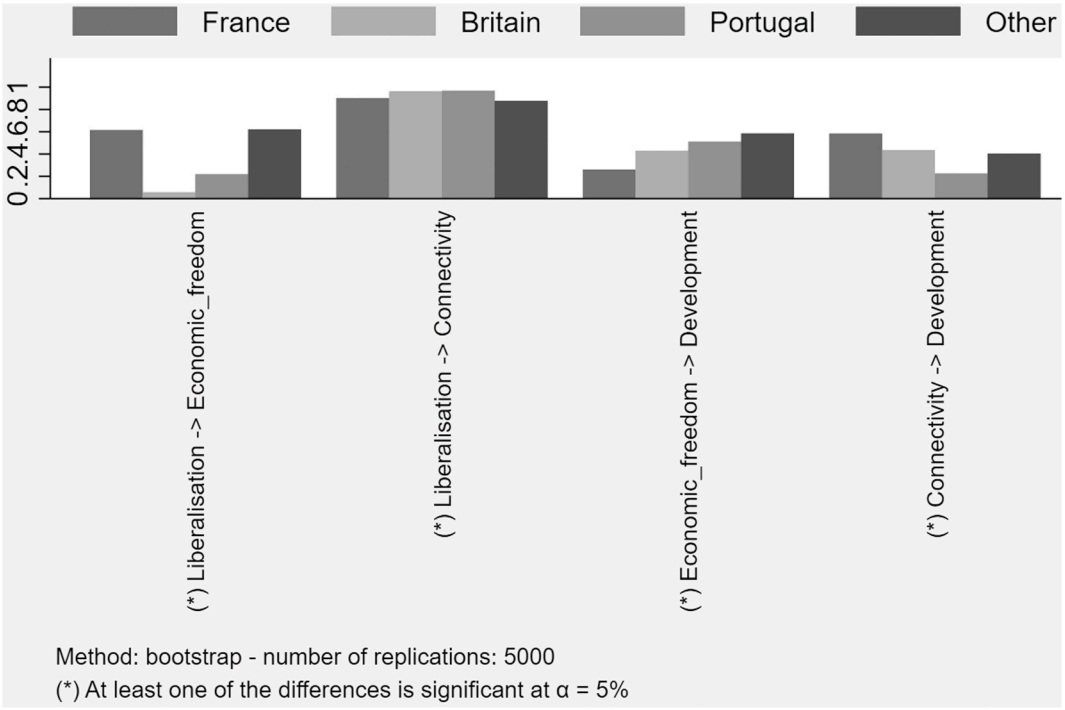

Fig. A1. Path coefficient comparison across groups of formerly colonised countries

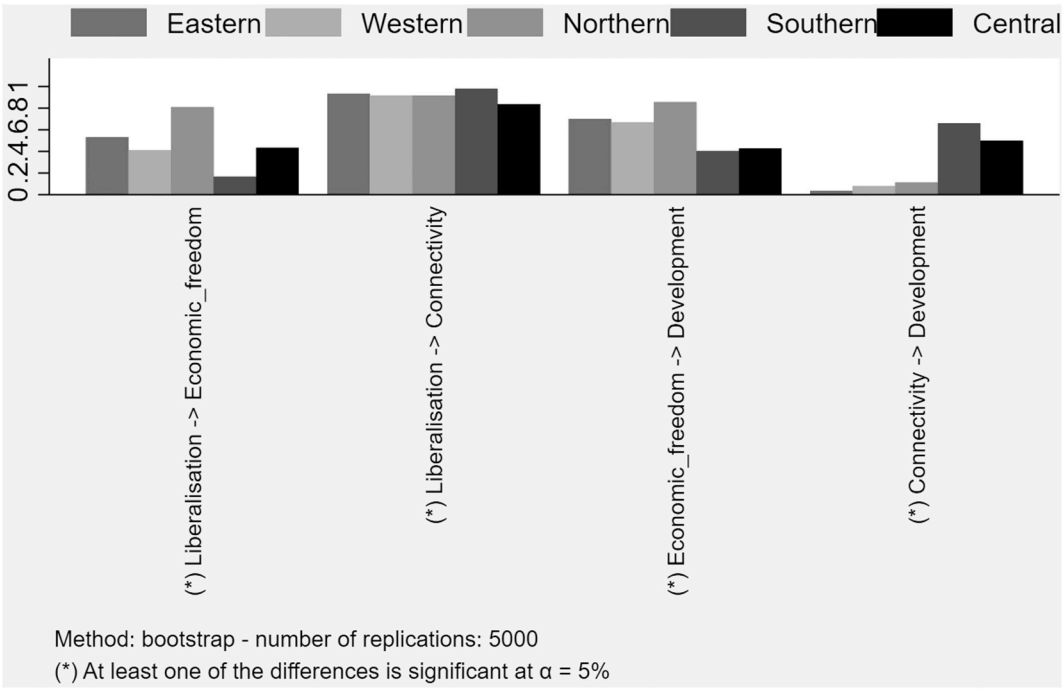

Fig. A2. Path coefficient comparison across geographical groups of countries

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