

Measurement and Analysis of Investment Convenience Level in African Countries

Jingxia Yue

School of Economics and Management, Beijing Jiaotong University, China, 100044

jingxiayueyue@163.com

Jingxia Yue

Keywords: Africa, Investment Facilitation, Foreign Direct Investment.

Abstract. The implementation of the “Belt and Road Initiative” provides investment support and trade facilitation for the African economy. The level of investment facilitation in African countries is crucial for China’s direct investment to them. This paper selects five first-level indicators of infrastructure quality, political and legal environment, information technology application, financial service quality and macroeconomic environment, expanding 29 secondary indicators to establish an index evaluation system on this basis, and then uses principal component analysis science to calculate the level of investment facilitation in African countries. It is estimated that the level of investment facilitation in Africa's main countries is quite different, South Africa has the highest level, followed by Mauritius and Morocco; Lesotho, Mauritania and Chad are in the third place; the rest are at intermediate levels, but Uganda and Nigeria are below the average level of investment facilitation in African countries. Thus continue to deepen the "One Belt, One Road" cooperation, deepen the interconnection between China and Africa, enhance the level of investment facilitation in African countries, and promote China's direct investment in Africa.

Introduction

The implementation of the “Belt and Road Initiative” provides investment support and trade facilitation for the African countries, and gets mutual benefit and win-win results. In 2017, China’s direct investment in Africa reached US\$4.1 billion. Promoting investment and trade facilitation is one of the “Top Ten Cooperation Plans” proposed by Xi Jinping at the Johannesburg Summit of the China-Africa Cooperation Forum. Under the background of the new round of changes in the global investment system rules, the level of investment facilitation has been gradually improved. Improving the investment environment has regarded as a way to reduce transaction costs and improve investment efficiency. There has been no clearly accepted definition of investment facilitation so far. Investment facilitation is defined in the 2008 APEC Investment Facilitation Action Plan (IFAP) as an action by the government to attract foreign investment and maximize its management efficiency at all stages of the investment cycle. Narrowly defined investment facilitation refers only to a series of actions and practices adopted by individual government entities to attract foreign investment, while broad investment facilitation comprehensively refers to the convenience of infrastructure, government regulation, capital market, economic environment, technology and so on.

Most scholars have combined investment convenience and trade facilitation to study them as a kind of “Additive Game” (Cui Riming and Huang Yingwei, 2016; Liu Zhen et al., 2018). There are many similarities between investment facilitation and trade facilitation, but the differences cannot be ignored. In recent years, investment facilitation has gradually become the focus of negotiations in the field of economic and trade cooperation, which has aroused widespread concern and in-depth research in the academic community.

The content research is mainly the factor research. Scholars generally recognize that the role of infrastructure for investment facilitation improvement cannot be ignored (Guo Li, 2010; R.M. Aldaba, 2013). Some scholars have turned the research perspective to the political and legal system environment of the host country. The stable, continuous, fair and just institutional environment

helps to reduce investment barriers and guarantees daily operations and rights maintenance (Zhao Mingliang and Yang Yuxin, 2015). In terms of methods research, in the calculation of investment facilitation level, the previous literature mainly used principal component analysis, grey correlation analysis, analytic hierarchy process and weighting method.

In summary, academic research on investment facilitation is relatively rich, but there is less literature on the level of investment facilitation in African countries. With the implementation of the “Belt and Road Initiative” and the intensification of Sino-US trade disputes, research on investment convenience in African countries has become more and more important. Therefore, what is the level of investment facilitation in major African countries? From which dimensions should we measure and improve? This paper makes up for the shortcomings of previous research, selects the main national data of Africa in 2010-2017, and establishes five first-level indicators, which are infrastructure quality, political and legal environment, information technology application, financial service quality and macroeconomic environment. And then expands 29 secondary indicators on the basis. The indicator system of the level indicator uses principal component analysis to measure the level of investment facilitation.

Estimation of the Level of Investment Facilitation in Major African Countries

Construction of the Indicator System

Although investment facilitation has been thought highly of by many countries, it has not been uniformly recognized by its definition so far, so it lacks a completely standard indicator system for measurement. This paper follows Wilson (2003) basic idea of trade facilitation evaluation system, and comprehensively considers the differences between trade facilitation and investment facilitation, then establishes infrastructure quality, political and legal environment, information technology application, financial service quality, and macroeconomic environment. It uses the principal component analysis to completely calculate the level of investment facilitation, which is both scientific and complete.

The 29 secondary indicator data cited in this paper are all from the Global Competitiveness Report of the World Economic Forum over the years (see Table 1 for details). In order to facilitate comparison and measurement of investment facilitation values, this paper standardizes the raw data and obtains the value. The range is between 0-1 (see Table 1 for details).

Table 1. Index System for Measuring Investment Facilitation Level

First-level indicators	Second-level indicators	First-level indicators	Second-level indicators
Infrastructure Quality(Q)	Highway Infrastructure (Q ₁)	Information Technology application(E)	Availability of new technology (E ₁)
	Railway Infrastructure (Q ₂)		Enterprise Technology Absorption (E ₂)
	Port Infrastructure (Q ₃)		Number of Internet Users (E ₃)
	Aviation Infrastructure (Q ₄)	Financial Services Quality (F)	Available Financial Services (F ₁)
	Communication Power Infrastructure (Q ₅)		Affordable Financial Services (F ₂)
The Difficulty of Financing in Securities Market (F ₃)			
Difficulty of obtaining loans (F ₄)			
Political law Environment(P)	Government Stability (P ₁)	Macroeconomics Environment(B)	Availability of Venture Capital (F ₅)
	Policy Instability (P ₂)		Bank Robustness (F ₆)
	Corruption Index (P ₃)		Domestic Market Scale (B ₁)
	Unconventional Payment and Bribery (P ₄)		Impact of FDI Rules on Enterprise Investment (B ₂)
	Judicial independence (P ₅)		Inflation Rate (B ₃)
	Partiality in Government Decision-making (P ₆)		Salary and productivity (B ₄)
	Burden of Government Regulations (P ₇)		Foreign Direct Investment and Technology Transfer (B ₅)
	Transparency of Government Decision-making (P ₈)	Investor Protection (B ₆)	
			Commodity Market Efficiency (B ₇)
Data source: World Economic Forum Global Competitiveness Report (2011-2018).			

Data Processing and Weight Determination

Due to the secondary indicator data inevitably correlate with each other, and in order to avoid the subjectivity of direct weighting in previous studies, this paper uses KMO test by SPSS software, the result is 0.876, which is applied to principal component analysis. After that we recombine the two primary indicators with strong correlations to generate six principal components of F1-F6, and extract more than 80% of the information of 29 secondary indicators. Therefore, using it to determine the weight is both scientific and reasonable.

Using factor analysis in principal component analysis, the variance is maximized and rotated. The coefficients of each index in different linear combinations are obtained by dividing the number of loads by the root of the corresponding characteristic roots. Finally, the principal component expression is obtained as follows:

$$F_1 = 0.24Q_1 + 0.07Q_2 + 0.19Q_3 + 0.22Q_4 + 0.19Q_5 - 0.1P_1 - 0.1P_2 - 0.08P_3 + 0.22P_4 + 0.22P_5 + 0.13P_6 + 0.13P_7 + 0.23P_8 + 0.24E_1 + 0.23E_2 + 0.13E_3 + 0.24F_1 + 0.23F_2 + 0.23F_3 + 0.17F_4 + 0.2F_5 + 0.22F_6 + 0.08B_1 + 0.19B_2 - 0.01B_3 + 0.16B_4 + 0.23B_5 + 0.14B_6 + 0.24B_7 \tag{1}$$

$$F_2 = -0.06Q_1 + 0.35Q_2 + 0.18Q_3 + 0.18Q_4 + 0.16P_1 + 0.26P_2 - 0.31P_3 - 0.16P_4 - 0.09P_5 - 0.33P_6 - 0.4P_7 - 0.19P_8 + 0.08E_1 + 0.1E_2 + 0.14E_3 + 0.16F_1 + 0.09F_2 + 0.19F_3 + 0.01F_4 - 0.05F_5 + 0.11F_6 + 0.32B_1 - 0.16B_2 - 0.09B_3 - 0.07B_4 + 0.02B_5 + 0.11B_6 - 0.04B_7 \tag{2}$$

$$F_3 = -0.06Q_1 + 0.08Q_2 - 0.19Q_3 + 0.11Q_5 + 0.12P_1 + 0.21P_2 + 0.08P_3 + 0.01P_4 + 0.26P_5 + 0.19P_6 + 0.05P_7 - 0.05P_8 - 0.2E_1 - 0.26E_2 + 0.31E_3 - 0.09F_1 - 0.19F_2 + 0.14F_3 + 0.37F_4 + 0.25F_5 - 0.26F_6 + 0.29B_1 - 0.12B_2 + 0.26B_3 + 0.05B_4 - 0.2B_5 + 0.14B_6 + 0.04B_7 \quad (3)$$

$$F_4 = -0.83Q_1 - 0.06Q_2 + 0.15Q_3 + 0.09Q_4 + 0.18Q_5 + 0.44P_1 + 0.37P_2 + 0.23P_3 + 0.23P_4 - 0.01P_5 + 0.21P_6 + 0.01P_7 + 0.03P_8 + 0.08E_1 + 0.09E_2 + 0.07E_3 - 0.08F_1 + 0.01F_2 - 0.08F_3 - 0.07F_4 - 0.13F_6 - 0.22B_1 - 0.25B_2 - 0.52B_3 - 0.08B_4 - 0.06B_5 - 0.06B_6 - 0.01B_7 \quad (4)$$

$$F_5 = -1.5Q_1 - 0.39Q_2 - 0.25Q_3 - 0.16Q_4 - 0.32Q_5 + 0.03P_1 + 0.28P_2 + 0.16P_3 + 0.07P_4 + 0.15P_5 - 0.2P_6 - 0.09P_7 + 0.07P_8 - 0.03E_1 + 0.09E_2 + 0.09E_3 + 0.14F_1 + 0.01F_2 + 0.1F_3 - 0.12F_4 - 0.2F_5 + 0.03F_6 + 0.08B_2 - 0.08B_3 + 0.12B_4 + 0.03B_5 + 0.53B_6 + 0.19B_7 \quad (5)$$

$$F_6 = -0.22Q_1 + 0.11Q_2 - 0.08Q_3 + 0.1Q_4 - 0.22Q_5 + 0.36P_1 + 0.25P_2 + 0.23P_3 - 0.07P_4 - 0.2P_5 + 0.18P_6 + 0.16P_7 + 0.01P_8 - 0.01E_1 + 0.08E_2 - 0.29E_3 + 0.04F_1 + 0.07F_2 + 0.02F_3 - 0.16F_4 + 0.11F_5 + 0.01F_6 + 0.3B_1 + 0.12B_2 + 0.23B_3 + 0.34B_4 + 0.26B_5 - 0.21B_6 - 0.02B_7 \quad (6)$$

According to the above six principal component expressions, on the premise of guaranteeing no loss of information, the original 29 indicators can be replaced by them. Therefore, the index coefficients can be regarded as the weighted average of the coefficients of the six principal components in the linear combination, and the system of the comprehensive scoring model can be obtained. By normalizing the data, a comprehensive evaluation model of investment facilitation in major African countries is obtained.

$$F = 0.26Q_1 + 0.22Q_2 + 0.43Q_3 + 0.51Q_4 + 0.37Q_5 - 0.08P_1 - 0.02P_2 - 0.2P_3 + 0.43P_4 + 0.44P_5 + 0.2P_6 + 0.15P_7 + 0.42P_8 + 0.51E_1 + 0.49E_2 + 0.34E_3 + 0.54F_1 + 0.48F_2 + 0.53F_3 + 0.36F_4 + 0.41F_5 + 0.45F_6 + 0.29B_1 + 0.31B_2 - 0.06B_3 + 0.32B_4 + 0.47B_5 + 0.35B_6 + 0.5B_7 \quad (7)$$

Conclusion

Based on the above comprehensive evaluation model, the level of investment facilitation in major African countries is calculated (see Table 2). It can be seen that the level of investment facilitation in the main African countries is significantly different, with the highest level of investment facilitation, South Africa, followed by Mauritius and Morocco; the last is Lesotho, Mauritania and Chad; and the rest are at intermediate levels, but other countries such as Uganda and Nigeria are lower than the average level of investment facilitation in African countries. South Africa's 2010-2017 average GDP is 1.5152 billion US dollars, ranking first in Africa. The Morocco is \$103 billion; the average GDP of Mauritania and Lesotho is \$4.9 billion and \$2.6 billion respectively. It can be seen that the level of investment facilitation in a country is closely related to its level of economic and trade development. Mauritius's higher level of investment facilitation is mainly due to its stable political environment and open and developed economic market.

Table 2. Investment Facilitation Level and Ranking of Major African Countries

Country	2010	2011	2012	2013	2014	2015	2016	2017	Average
South Africa	0.96	0.99	1	0.98	0.97	1	0.9	0.9	0.96
Mauritius	0.9	0.88	0.92	0.93	0.91	0.89	0.9	0.9	0.9
Morocco	0.88	0.87	0.9	0.9	0.88	0.87	0.86	0.86	0.88
Namibia	0.88	0.86	0.86	0.85	0.86	0.87	0.88	0.88	0.87
Rwanda	0.82	0.84	0.86	0.86	0.86	0.87	0.86	0.87	0.86
Kenya	0.82	0.82	0.83	0.85	0.84	0.85	0.85	0.86	0.84
Tunisia	0.91	0.9	0.82	0.79	0.77	0.74	0.77	0.76	0.81
Egypt	0.82	0.79	0.76	0.74	0.76	0.78	0.84	0.84	0.79
Cote d'Ivoire	0.69	0.72	0.72	0.77	0.83	0.81	0.84	0.88	0.78
Ghana	0.76	0.76	0.8	0.78	0.74	0.75	0.76	0.77	0.76
Senegal	0.75	0.76	0.76	0.77	0.77	0.76	0.76	0.76	0.76
Zambia	0.77	0.79	0.78	0.77	0.77	0.73	0.7	0.69	0.75
Cape Verde	0.75	0.75	0.73	0.74	0.74	0.74	0.73	0.73	0.74
Uganda	0.74	0.74	0.71	0.71	0.71	0.73	0.71	0.71	0.72
Nigeria	0.73	0.73	0.73	0.71	0.72	0.72	0.69	0.69	0.72
Tanzania	0.71	0.7	0.69	0.68	0.68	0.71	0.71	0.72	0.7
Ethiopia	0.69	0.67	0.68	0.68	0.71	0.73	0.7	0.71	0.7
Mali	0.67	0.71	0.68	0.67	0.67	0.66	0.66	0.66	0.67
Mozambique	0.71	0.69	0.69	0.68	0.67	0.66	0.64	0.63	0.67
Malawi	0.73	0.7	0.69	0.68	0.65	0.62	0.61	0.59	0.66
Madagascar	0.63	0.61	0.66	0.65	0.63	0.63	0.63	0.63	0.63
Zimbabwe	0.66	0.66	0.65	0.62	0.61	0.61	0.62	0.62	0.63
Lesotho	0.62	0.64	0.63	0.66	0.65	0.58	0.54	0.53	0.61
Mauritania	0.57	0.64	0.58	0.56	0.56	0.52	0.51	0.5	0.55
Chad	0.55	0.54	0.5	0.5	0.51	0.5	0.5	0.49	0.51
average	0.75	0.75	0.75	0.74	0.74	0.73	0.73	0.73	0.74

References

- [1] Cui Riming, Huang Yingwei. Research on the evaluation index system of national trade and investment facilitation along the “Belt and Road”. *International trade issues*, 2016 (09):153-164(in Chinese).
- [2] Liu Zhen, Qiu Zhiping, Zhu Limeng. Temporal and spatial characteristics of national investment and trade facilitation along the Maritime Silk Road and its impact on trade. *Economic Geography*, 2018, 38 (03):11-20 (in Chinese).
- [3] Guo Li. Analysis of the implementation path of Sino-Russian direct investment facilitation. *Russian Central Asian Eastern European Market*, 2010, (12): 5-11 (in Chinese).
- [4] Aldaba R.M. Getting Ready for the ASEAN Economic Community 2015: Philippine Investment Liberalization and Facilitation. *Discussion Papers*, 2013, (3).
- [5] Zhao Mingliang, Yang Yuxin. Resolving the excess capacity of China's steel industry under the “Belt and Road” strategy: trade base, investment opportunities and realization mechanism. *Journal of East China Normal University (Philosophy and Social Sciences)*, 2015, 47(04): 84-92, 169-170 (in Chinese).
- [6] Wilson J S, Mann C L, Otsuki T. Trade Facilitation and Economic Development: A New Approach to Quantifying the Impact. *The World Bank Economic Review*, 2003, 17(3), 367-389.