



Vyacheslav Lyashenko
D.Sc. (Economics), Professor,
Institute of Industrial Economics of the
National Academy of Sciences of Ukraine
2 Gelyabov Str., Kyiv, 03057, Ukraine
slaval.aenu@gmail.com
ORCID ID: <https://orcid.org/0000-0001-6302-0605>

UDC 339.13(6):519.2



Nataliya Osadcha
D.Sc. (Economics), Professor,
University of Customs and Finance
2/4 Vernadsky Str., Dnipro, 49000, Ukraine
nosadcha86@gmail.com
ORCID ID: <https://orcid.org/0000-0001-5066-2174>



Olga Galyasovskaya
PhD Student (Economics),
University of Customs and Finance
2/4 Vernadsky Str., Dnipro, 49000, Ukraine
olya20068@ukr.net



Oksana Knyshek
PhD (Economics), Associate Professor of the Department of
Accounting, Audit, Analysis and Taxation,
University of Customs and Finance
2/4 Vernadsky Str., Dnipro, 49000, Ukraine
knyshek.oksana@gmail.com
ORCID ID: <https://orcid.org/0000-0002-1463-582X>

Marketing prospects of small developed African countries assessment for traditional Ukrainian exports

Abstract. Basing on the relevant modeling practice and theory, the article affirms the main prospects of trade relations between Ukraine and the most developed countries of East Africa, which are the major markers for goods and commodities produced by Ukrainian enterprises. By conducting an analysis of development intensity via its relative value and using the Rasch model adapted to the analysis of foreign trade relations, the authors evaluate the attractiveness of commodity importers in Africa. It has been substantiated that there exists a need for further promotion of trade and selection of potential trade partners from economically developed African countries through the analysis of export and import transactions between Ukraine and selected African countries over the last 6 years. Based on the evaluations done by the adapted Rasch model, we have specified that Djibouti, the Seychelles, Tunisia, and Mauritius are promising trade partners for Ukraine in East Africa. Based on the results of the analysis of the export-import transactions dynamics and the market capacity of East Africa countries, we propose to create the «Ukraine-Africa» Trade House as a pilot project for changing the export structure, reorienting Ukraine's industrial priorities for a new geography - to the countries of the African continent in general, and small in particular, with the use of modern integrated information technologies.

Keywords: Trade Relationship; Import; Export; Commodity Importers; East Africa; Ukraine; Adapted Rasch Model; Attractiveness; Evaluation; Trade Policy

JEL Classification: F17; C19; C53; F47

DOI: <https://doi.org/10.21003/ea.V166-04>

Ляшенко В. І.

доктор економічних наук, професор, Інститут економіки промисловості, Національна академія наук України, Київ, Україна

Осадча Н. В.

доктор економічних наук, професор, кафедра менеджменту ЗЕД, Університет митної справи та фінансів, Дніпро, Україна

Галюсовська О. В.

аспірант, Університет митної справи та фінансів, Дніпропетровськ, Україна

Книшек О. О.

кандидат економічних наук, доцент, кафедра обліку, аудиту, аналізу і оподаткування,

Університет митної справи та фінансів, Дніпро, Україна

Оцінка маркетингових перспектив ринку малих розвинутих країн Африки для традиційного експорту з України

Анотація. У статті теоретично та шляхом моделювання підтверджено перспективи торгівельних відносин України з найбільш розвинутими країнами Східної Африки, які є достатньо ємним ринком збуту для українських підприємств, і проведено оцінку привабливості товарних імпортерів країн Африки за допомогою методу аналізу інтенсивності розвитку країн (за допомогою відносної величини динаміки) та адаптованої моделі Раша. Проаналізовано динаміку експортно-імпортних операцій України з країнами Африки за останні шість років. Обґрунтовано необхідність подальшої торгівлі та вибору потенційних партнерів із економічно розвинутих країн Африки. В ході дослідження вперше надано пропозиції щодо використання показників динамічного розвитку країн Східної Африки та адаптованої моделі Раша для аналізу зовнішньоторговельних відносин. Визначено країни Східної Африки, які є вигідними торговими партнерами для України, а саме: Джибуті, Сейшельські Острови, Туніс і Маврикій.

На основі оцінок, зроблених за допомогою адаптованої моделі Раша, ми визначили, що Джибуті та Сейшели - перспективні торгові партнери для України.

Ключові слова: торгівельні відносини; імпорту; експорту; товарні імпортери; Східна Африка; Україна; адаптована модель Раша; привабливість; оцінка; торгівельна політика.

Ляшенко В. И.

доктор экономических наук, профессор, Институт экономики промышленности, Национальная академия наук Украины, Киев, Украина

Осадчая Н. В.

доктор экономических наук, профессор, кафедра менеджмента ВЭД, Университет таможенного дела и финансов, Днепр, Украина

Галысовская О. В.

аспирантка, Университет таможенного дела и финансов, Днепр, Украина

Книшек О. А.

кандидат экономических наук, доцент, кафедра учета, аудита, анализа и налогообложения, Университет таможенного дела и финансов, Днепр, Украина

Оценка маркетинговых перспектив рынка малых развитых стран Африки для традиционного экспорта из Украины

Аннотация. В статье теоретически и путем моделирования подтверждены перспективы торговых отношений Украины с наиболее развитыми странами Восточной Африки, которые являются достаточно емким рынком сбыта для украинских предприятий. Проведена оценка привлекательности товарных импортеров стран Африки с помощью метода анализа интенсивности развития стран (используется относительная величина динамики) и адаптированной к анализу внешне-торговых отношений модели Раша. Обоснована необходимость дальнейшей торговли и выбора потенциальных партнеров из экономически развитых стран Африки на основе анализа динамики экспортно-импортных операций Украины со странами Африки за последние шесть лет. Определены страны Восточной Африки, которые являются выгодными торговыми партнерами для Украины, а именно: Джибути, Сейшельские Острова, Тунис и Маврикий.

Ключевые слова: торговые отношения; импорт; экспорт; товарные импортеры; Восточная Африка; Украина; адаптированная модель Раша; привлекательность; оценка; торговая политика.

1. Introduction

Ukraine is among countries that need to booster export-oriented production and to intensify aimed at searching for new sales markets. Now, when Ukraine has lost markets in the post-Soviet space and faced difficulties in promoting its goods on the EU markets, the country should expand into new markets where there is a clear need for goods produced in Ukraine which do not fall under restrictions related to non-tariff barriers to trade. According to the National Export Strategy, Ukraine should consider opportunities for developing stronger relationships with countries in Africa, Asia and Latin America, which could become an important focus of its foreign policy [8]. Developing new markets in Africa will provide an opportunity for Ukrainian producers to enter one of the largest economic regions with a population of about 1 billion, which, according to estimates, is expected to double by 2035 and, potentially, triple by 2050. The same applies to the associated trade and sea routes.

An analysis of global value chains shows that there are several factors that are viewed to be an essential precondition for trade expansion with regard to African countries. They include: «1) a relatively low income level per capita in African countries leads to the increasing demand for food and manufactured goods required for infrastructural development in the context of urbanisation and economic diversification; 2) a low income level per capita in African countries determines the demand for relatively cheap undifferentiated products which can be instantly imported from Ukraine; 3) goods/products which are imported into markets in Africa meet lower standards than goods/products which go to the European Union, which may provide an opportunity for Ukrainian producers to have a transition period to harmonise their goods/products with global quality standards; 4) the economic management system of Ukraine and the development path of Ukrainian industries are similar to those in Africa» [19, 23-24]. Hence, the economic development of Ukraine will stimulate economic development of African countries and vice versa. This clearly necessitates the need to conduct an analysis of trade relationships between Ukraine and selected African countries in order to determine the most reliable trade partners on the continent of Africa.

2. Brief Literature Review

Theoretical and practical aspects of the assessment of foreign trade are highlighted by foreign scholars and scientists. For example, K. Chen studied problematic issues related to expansion into international markets [1]. According to the researcher, companies that operate on developing markets have more competitive advantages than companies that do business in developed countries where they need to gain competitive advantages through standardisation. A study by Thabang Mokoaleli-Mokoteli, an African scholar, focuses on protection of interests of investors and elimination of investment risks [2].

He claims that deviations from rules established on developing markets between the observance of protection of investors in general and the observance of protection of investors at the corporate level may be significant; consequently, firms that operate on such markets seek an external auditor. This will allow Ukrainian audit companies to provide their services to African firms. Olawumi D. Awolusi researched impacts of direct foreign investments on the development of nations [3]. R. Safarov and O. Panishchev produced numerical modelling on the basis of the Rasch Model [6]. Georg Rasch had developed a new approach to psychometric issues. All the developments by G. Rasch are based on mathematics, thus they have no correlation with teaching and psychology, as well as with measuring one particular personality trait. The metric system introduced by G. Rasch can be applied to explore any issue of interest, for instance intellect, investments, sales markets or managing companies. By means of the model developed by G. Rasch, it is possible to evaluate attractiveness of national markets [7]. A systemic approach to application of Rasch analysis in the social sciences is given by William J. Boone, John R. Staver, and Melissa S. Yale (2014) [17]. The concept of latent variables which allow us to solve specific tasks relevant to monitor the situation with social and economic systems was studied by prominent scholars such as S. Barkalov, Yu. Kireev and S. Moiseev [9-10]. As follows, both domestic and foreign scholars devoted no attention to the issues of trade relationships between Ukraine and countries of East Africa, as well as to the application of the Rasch model to identify priority partners in view of trade relationships between Ukraine and countries of East Africa.

3. The purpose of the article is to evaluate trade relationships between Ukraine and countries of East Africa by means of the adapted Rasch model.

4. Results

Ukraine and African countries do not compete with one another in the global market. Ukraine is already an observer state at the African Union. It has demand for African products, and African countries, in their turn, demand Ukrainian goods and commodities, especially machinery, equipment and services. According to the 2016 dataset, the total trade between Ukraine and African countries had a turnover of USD 4.42 billion, of which USD 3.87 billion was exports from Ukraine. Ukraine maintains a surplus in trade with African countries. However, the intensity of such export-import transactions is showing a downward trend. This is because of the current economic and political crisis in Ukraine.

The infographics about exports/imports of goods, shown in Figure 1 and Figure 2, indicates that (where d_{dyn} is a relation between the attained level in numerical values and the baseline level) [15], i.e. the growth rate of exports/imports of goods to/from African countries, showed a downward trend over the 2012-2016 period.

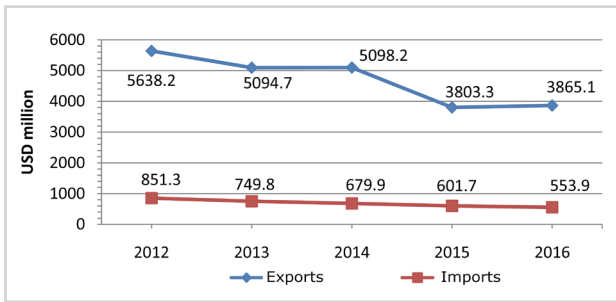


Fig. 1: Volume of exports/imports of goods to/from African countries over the 2012-2016 period
Source: Compiled by the authors based on [13]

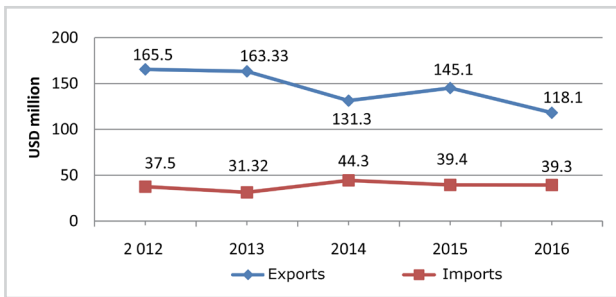


Fig. 2: Volume of exports/imports of services to/from African countries over the 2012-2016 period
Source: Compiled by the authors based on [13]

As compared to 2015, the relative dynamic value of Ukrainian exports in 2016 was $d_{dyn} = 1.02$ demonstrating that exports of Ukrainian goods to African countries had an upward trend. However, when analysing the relative dynamic value of Ukrainian exports in 2016 as compared to 2012, we noticed that it had a downward trend with its $d_{dyn} = 0.69$. A similar pattern was observed with regard to Ukraine's imports: the relative dynamic value of imported goods gradually decreased with $d_{dyn} = 0.69$ for imports of goods in 2016, if compared to the year 2012. Thus, a comparison between the turnover for 2015 and the turnover for 2016 suggests that the export and import transactions regarding both Ukraine and African countries had an upward trend. Yet, starting from 2012, the turnover had been negatively impacted, as illustrated by the dynamic value of exports/imports of services. In 2016, the major consumers of Ukrainian goods and commodities in African countries were Egypt (with its specific weight equal to 58.44% of the total Ukrainian exports to African countries), Algeria (6.07%), Libya (6.43%), Morocco (6.94%) and Tunisia (5.76%) [13]. Ukraine's main exports to African countries in 2016 are shown in Table 1.

Specific weight of export products by product codes was as follows: grain crops (39.37%), ferrous metals (31.65%), fats and oils of animal or plant origin (6.22%), etc. (Table 1).

Ukraine's main imports from African countries in 2016 (Table 2) were ores, slags and cinders which mainly included Guinean bauxites, as well as solid mineral fuels; oil and oil refinery products with a predominant share of South African high quality low sulphur thermal coal and oil [14, 159]. Guinea and South Africa are among the leading countries in terms of the volume of goods relating to the abovementioned subgroups

(corresponding to 17.2% of Ukrainian exports for Guinea and 21.3% of Ukrainian Exports for South Africa) [11]. Due to increasing import capacity and enhancing export potential, African countries are considered to be potential trading partners of Ukraine. Ukraine can also export machinery, equipment and vehicles. Based on an analysis of Ukraine's exports/imports of goods to/from African countries, we can observe an upward trend in trade relationships and ascertain that African countries are promising for trade. However, for further development of trade we must conduct a prospective analysis of marketing attractiveness of African markets. To evaluate marketing attractiveness, it is essential to select the most attractive destinations and the most developed countries. According to Global Economic Prospects, Djibouti, Egypt, Eritrea, Lesotho, Liberia, Mauritius, the Seychelles and Tunisia are among the importing countries [15]. Based on the data from the International Monetary Fund [16], let us consider the economic growth indicators relevant to potential trade partners among the countries of East Africa by means of economic modeling (Table 3). To conduct a prospective analysis of marketing attractiveness of African markets, we use the following two methods: development intensity analysis by means of the relative dynamic value (traditional method) and the Rasch model adapted to evaluate latent variables which cannot be measured explicitly but evaluated via mathematical models on the basis of observable data [7], which will make it possible to transform measurements done with the use of dichotomous and sequential processing scales into linear measurement and analyse the obtained qualitative data by using quantitative methods. On the completion of the analysis we compare the results obtained

Tab. 1: Ukraine's main exports to African countries

Product code	Product subgroup	USD thousand	Specific weight of export products, %
02	Meat and edible meat offal	62,148.67	1.61
04	Milk and milk products, eggs; natural honey	27,425.91	0.71
10	Grain crops	1,521,600.91	39.37
11	Products of the milling industry	26,984.56	0.7
15	Fats and oils of animal or plant origin	240,393.87	6.22
17	Sugar and sugar confectionery	61,527.66	1.59
27	Solid mineral fuels	10,258.33	0.27
30	Pharmaceuticals	424.57	0.01
31	Fertilisers	35,536.3117	0.92
72	Ferrous metals	1,223,325.93	31.65
73	Ferrous metals products	9,870.53	0.26
76	Aluminum and articles thereof	2,508.29	0.065
84	Nuclear reactors, boilers, machinery	23,180.34	0.6
85	Electric machines	42,390.51	1.1
88	Aircraft	8,413.93	0.22

Source: Compiled by the authors based on [13]

Tab. 2: Main imports from African countries to Ukraine

Product code	Product subgroup	USD thousand	Specific weight of export products, %
08	Fruits and nuts	26,800.75	4.84
09	Coffees and teas	13,464.45	2.43
18	Cocoa and cocoa products	80,461.09	14.53
24	Tobacco and tobacco substitutes	60,097.304	10.85
26	Ores, slags and cinders	191,787.53	34.63
27	Solid mineral fuels; oil and oil refinery products	49,521.06	8.94

Source: Compiled by the authors based on [13]

from the application of the above methods. The comparative analysis of the countries should be done based on the following criteria: economic growth, GDP per capita at purchasing power parity, inflation rate, population size, Index of Economic Freedom and Trade Risk Index.

For research purposes, we form group of countries according to their GDP per capita at purchasing power parity, where Group 1 is represented by countries with GDP estimated at over USD 10,000, and Group 2 is represented by countries with GDP estimated at less than USD 10,000. Thus, Group 1 consists of Egypt, Mauritius, the Seychelles and Tunisia. The countries' GDP tends to increase, and the

relevant countries have a larger population. Group 2 is composed of Djibouti, Lesotho and Liberia. Over the past 7 years, the countries' GDP has been increasing, although the countries have a smaller population (Table 3). Based on the economic growth indicators, let us conduct a prospective analysis of marketing attractiveness of selected African markets.

The increased economic growth indicators and declining inflation rate are the main criteria in selecting countries viewed as trade partners. The development intensity analysis is conducted by means of the relative dynamic values of economic growth according to the following formula: $d_{dyn} = y_t/y_0 \rightarrow \max$. For research purposes, we chose the values of the year 2016 compared to the values of the year 2010. In 2016, if compared with 2010, economic growth in Djibouti increased by 1.86 times; it decreased by 0.74 times in Egypt, by 0.38 times in Lesotho, by 0.33 times in Liberia, by 0.8 times in Mauritius, by 0.82 in the Seychelles and by 0.43 times in Tunisia. Based on the development intensity analysis, we have obtained the relative dynamic values by the six mentioned criteria for each of the selected countries.

According to the results of the conducted development intensity analysis, the most promising potential trade partners are the Seychelles (Group 1), Djibouti (Group 2) and Lesotho (Group 2). These are mostly East African countries.

To model trade relationships between Ukraine and the selected countries in East Africa, we will use the Rasch model and adapt it so that we can evaluate marketing attractiveness of potential commodity importers among African countries. Subsequently it can be used to conduct an analysis of trade relationships with other countries. The choice of the Rasch model results from the fact that it has distinct advantages over other existing valuation models when it is necessary to evaluate the quality of objects in different areas of science, including evaluation of attractiveness of existing objects, i.e. potential commodity importers among African countries in the case at hand. By using the Rasch model, we can transform measurements done with the use of dichotomous and sequential processing scales into linear measurement and analyse the obtained qualitative data by using quantitative methods. In cases where the Rasch model is linear, it is possible to apply a wide range of statistical calculations to conduct data analysis. The Rasch model is a probability model. The evaluation of country attractiveness does not depend on a set of criteria of applicable to the evaluation; it represents characteristics of the very country. Evaluation results are objective, i.e. they depend neither on those who measure, nor on the measuring instrument. Along with the evaluation of country attractiveness, the model provides the evaluation of the compliance with the criteria set to assess countries. Herewith, the evaluation of the compliance with the criteria depends neither on the years under evaluation for each country, nor on the countries themselves; it represents individual properties of the criteria [16]. In the present case, to adapt the Rasch model to the evaluation of marketing attractiveness of potential importers among African countries, we should single out objects according to which the evaluation will be done (the 2010-2016 period), use indicative

Tab. 3: Economic growth indicators relevant to potential importers of Ukrainian goods among African countries

Factors affecting marketing attractiveness	Year	Djibouti	Egypt	Lesotho	Liberia	Mauritius	Seychelles	Tunisia
Economic growth, %	2010	3.49	5.14	6.25	6.1	4.38	5.95	3.51
	2011	4.47	1.82	7	8.2	4.08	7.89	-1.92
	2012	4.84	2.19	5.47	7.99	3.5	6.61	4
	2013	5	2.11	2.02	8.7	3.36	6.05	3
	2014	6	2.23	4.54	0.7	3.74	3.32	2.87
	2015	6.5	4.2	1.61	0.0	3.47	3.5	0.99
	2016	6.5	3.8	2.4	2.0	3.5	4.9	1.5
d_{dyn}		1.86	0.74	0.38	0.33	0.8	0.82	0.43
GDP per capita at purchasing power parity, USD	2010	2,699.23	10,102.1	2,405.31	697.91	15,938.42	20,365.12	10,437.09
	2011	2,782.97	10,071.21	2,545.4	732.63	16,561.77	22,556.58	10,123.12
	2012	2,879.2	10,067.08	2,652.73	770.32	17,093.32	23,812.88	10,409.21
	2013	2,982.99	10,050.03	2,672.86	817.18	17,628.83	24,791.39	10,600.0
	2014	3,120.04	10,048.57	2,659.63	803.66	18,255.87	25,218.41	10,782.1
	2015	3,279.12	10,249.96	2,770.2	784.58	18,864.11	25,524.96	10,769.93
	2016	3,351.62	12,113.09	3085.41	881.8	20,442.57	27,230.0	11,651.96
d_{dyn}		1.2	1.2	1.21	1.2	1.23	1.21	1.15
Inflation rate, %	2010	4	11.3	3.6	7.3	2.9	-2.4	4.4
	2011	5.1	10.1	5	8.5	6.5	2.6	3.5
	2012	3.7	7.1	6.1	6.8	3.9	7.1	5.1
	2013	2.4	9.4	4.9	7.6	3.5	4.3	5.8
	2014	2.9	10.1	5.3	9.8	3.2	1.4	4.9
	2015	2.1	10.4	3.2	7.7	1.3	4.0	4.9
	2016	3.0	10.23	8.6	8.6	1.5	-0.8	3.7
d_{dyn}		0.75	0.91	2.39	1.18	0.52	0.33	0.84
Population size, million people	2010	0.83	82.04	2.01	3.96	1.25	0.9	10.55
	2011	0.84	83.79	2.03	4.08	1.25	0.9	10.67
	2012	0.85	85.66	2.06	4.19	1.26	0.9	10.78
	2013	0.86	87.61	2.08	4.29	1.26	0.9	10.89
	2014	0.88	89.58	2.11	4.4	1.26	0.9	11.0
	2015	0.89	91.51	2.14	4.5	1.26	0.9	11.11
	2016	0.99	92.81	1.94	4.4	1.26	0.93	11.22
d_{dyn}		1.2	1.13	0.97	1.1	1.01	1.03	1.06
Index of Economic Freedom (0-100)	2010	31.9	74	63.5	53.8	85.6	33.4	53.5
	2011	59.6	74	63.6	53.8	88.0	33.4	53.5
	2012	59.6	74	69.1	53.8	87.9	33.4	58.1
	2013	59.6	73.8	69.1	61.4	87.9	33.4	58.1
	2014	54.8	71.4	68.6	64.1	88.6	33.4	61.8
	2015	54.8	70.0	64.6	74.4	88.4	44.0	61.2
	2016	54.6	70.6	85.8	72.8	88.6	83.4	62.2
d_{dyn}		1.71	0.95	1.35	1.35	1.04	2.5	1.16
Trade Risk Index (1 - low risk; 7 - high risk)	2010	5	5	5	5.7	2.7	4	5
	2011	5	5	5	5.7	2.7	4	5
	2012	5	5.5	5	5.7	2.7	4	5
	2013	5	6	4.8	6	2.8	4	4.7
	2014	5	6	4	7	2	6	4
	2015	5	5	4	7	2	6	3
	2016	5	5	4	6	2	5	4
d_{dyn}		1	1	0.8	1.05	0.74	1.25	0.8

Source: Compiled by the authors based on [16]

variables (criteria) and describe the relationship between the objects. Let us first evaluate each country separately (see results in Table 4). Then, we sum the obtained values up and compare the evaluation result for each country. The less the obtained value is, the higher level of attractiveness we get, as the calculation is aimed at the minimum value of the criteria in the present case. The search engine for the values of marketing attractiveness of countries is shown in Figure 3.

It is expedient to consider the modeling process to be a combination of appropriate and controlled actions performed to realise the goal: we determine and describe valuation objects at the first stage and define criteria needed to evaluate country attractiveness at the second stage. Here, N - countries under evaluation: A_1, A_2, \dots, A_N ; L - evaluation criteria: K_1, K_2, \dots, K_L . Further, we mark U_{ij} - evaluation of the i -object with the j -criterion. The relevant criteria may be of various nature and have different dimensions. To put

Tab. 4: Evaluation of marketing attractiveness of importing countries on the basis of the development intensity analysis

Countries	Djibouti	Egypt	Lesotho	Liberia	Mauritius	Seychelles	Tunisia
d_{dyn} (2016/2010)	7.72	5.93	7.1	6.23	5.33	7.14	5.45

Source: Compiled by the authors based on the previously obtained results

a variety of values in coherence with a single scale, we perform a normalisation procedure, as a result of which all normalised evaluations by u_{ij} -criteria accept the value from the range (0; 1). We use minimisation criteria as an algorithm for normalisation (the less the obtained value is, the higher level of attractiveness we get) [10]:

$$u_{ij} = \frac{\max_i(U_{ij}) - U_{ij}}{\max_i(U_{ij}) - \min_i(U_{ij})} \quad (1)$$

Let us assume that the actor accepts the n -object with the j -criterion at the u_{nj} level, as a result of which the value is ranged from 0 to 1. The simplest value of attractiveness of the object can be calculated by the formula given below [10]:

$$X_n = \sum_{j=1}^L x_{nj} \quad (2)$$

Further, we use the probability approach, under which the probability P_{nj} is calculated by the formula introduced by Georg Rasch who obtained it while evaluating latent values [10]. We interpret such probabilities as normalised evaluations of the objects by the u_{ij} criteria. To put it into practice, it is required to determine the set of evaluations in terms of attractiveness of objects by the θ_i period and the degree of compliance with the β_j criteria based on the existing evaluations of the objects by the u_{ij} criteria which were obtained through empirical enquiry by means of expert assessment from the viewpoint of the actors.

According to the Rasch model adapted to evaluate latent variables, the evaluations θ_i and β_j are obtained by maximum likelihood estimation (MLE). However, according to the dichotomous Rasch model, the P_{ij} probabilities can take only two values: either 0 or 1, which does not correspond to the model presented in the article where the P_{ij} probabilities can take the values of a continuous spectrum from 0 to 1. Therefore, it is proposed to use the least squares method, the application of which is detailed in the works by S. Barkalov, Yu. Kireev and S. Moiseev [9; 10]: the values θ_i and β_j are selected so as to ensure that the sum of the squared deviations between the empirical data u_{ij} and the calculated probability was smallest.

Further, we limit to the minimum the residual sum:

$$S(\theta_i, \beta_j) = \sum_{i=1}^m \sum_{j=1}^n (u_{ij} - P_{ij})^2 = \sum_{i=1}^m \sum_{j=1}^n \left(u_{ij} - \frac{e^{\theta_i - \beta_j}}{1 + e^{\theta_i - \beta_j}} \right)^2 \rightarrow \min. \quad (3)$$

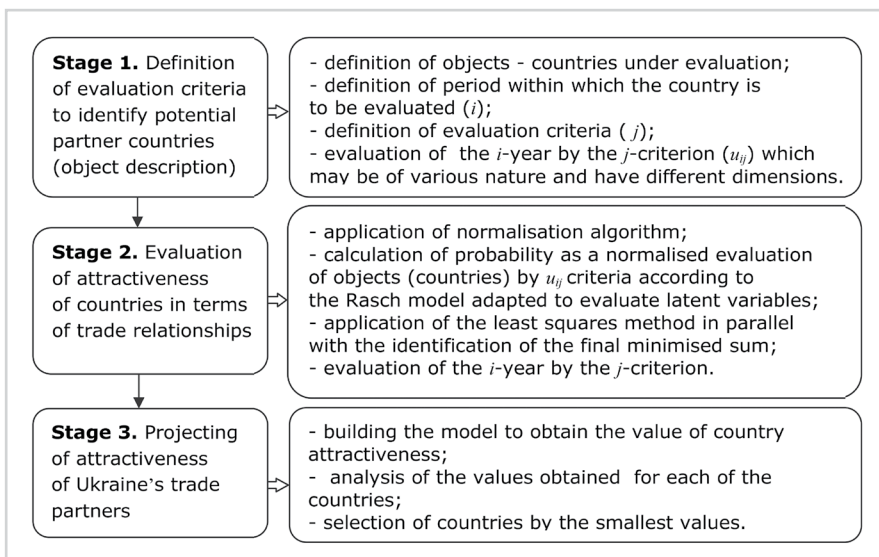


Fig. 3: Stages of building the model to obtain the value of country attractiveness
Source: Compiled by the authors

The values θ_i and β_j , obtained by the abovementioned model, are evaluated by linear scales; their starting point is undetermined.

At Stage 3, we project attractiveness of trade partners. In such a case, we apply normalising conditions, i.e. inherent values to calculate the value of country attractiveness.

Another possibility is to use the formula (4) proposed by the authors. In this case, if we summarise the values θ_i and β_j , we get the value of attractiveness of the studied country to further establish trade relationship with that country:

$$\Pi_{np} = ((\sum_i \theta_i) + (\sum_j \beta_j)) \geq 0 \quad (4)$$

The proposed model assumes that all criteria are equally important for the actors. However, if we conduct an expert assessment under real conditions, the importance of values is generally different, which should be considered when evaluating attractiveness of objects.

The classical models of expert assessment accept the importance of criteria for the actors by determining the value upon each criterion.

The calculations for (3) and (4) can be done by using different software products, for example by Solver, a Microsoft Excel add-in program [9].

Further, we calculate criteria of country attractiveness by year, summarise and compare them. In the case of minimisation criteria, the less the obtained value is, the higher level of attractiveness we get.

After that, we compare them and the value for each of the selected countries, obtained on conducting the development intensity analysis.

Djibouti, an East African country, is the first from the list shown in Table 3. To illustrate the above, let us consider the calculations for Djibouti step by step. As objects (A) we choose the years from 2010 to 2016, for which we have defined the criteria mentioned above, namely:

- K₁ - GDP per capita at purchasing power parity, USD;
- K₂ - Economic growth, %;
- K₃ - Inflation rate, %;
- K₄ - Population size, million people;
- K₅ - Index of Economic Freedom, points;
- K₆ - Trade Risk Index.

The evaluation of marketing attractiveness of Djibouti as an importing country is shown in Table 5.

Further, we normalise the data, resulting in a table containing outgoing data needed to perform calculations according to the model. All values are measured by the single scale, later we minimise all values: the less the obtained value is, the higher level of attractiveness of object we get.

The outgoing data are put into the Excel table; then we evaluate the values of the objects by year θ_i^a and criteria β_j^a . Further, we calculate the probability P_{ij} . The sum of squared deviations is calculated by the following formula (5):

$$\sum_{i=1}^m \sum_{j=1}^n (u_{ij} - P_{ij})^2 \quad (5)$$

The sum to be minimised has been presented via formula (3), which is the efficiency function, and it is in a field of the table shown as: =SUM(C26:H32).

To further calculate the criteria, we use the add-in program Solver. We select field D34 to be the efficiency function, set a task to minimise, introduce ranges C12-H12

Tab. 5: Evaluation of marketing attractiveness of Djibouti as an importing country

		K ₁	K ₂	K ₃	K ₄	K ₅	K ₆
2010	A ₁	2,699.23	3.49	4	0.83	31.9	5
2011	A ₂	2,782.97	4.47	5.1	0.84	59.6	5
2012	A ₃	2,879.2	4.84	3.70	0.85	59.6	5
2013	A ₄	2,982.99	5	2.4	0.86	59.6	5
2014	A ₅	3,120.04	6	2.9	0.88	54.8	5
2015	A ₆	3,279.12	6.5	2.1	0.89	54.8	5
2016	A ₇	3,351.62	6.5	3	0.99	54.6	5

Source: Compiled by the authors based on Table 3

and I5-I11, define the condition of inherence, set no limits and activate the add-in. Further, we summarise the criteria by year and the values by the model (4), resulting in the value of country attractiveness. The same calculations are carried out with regard to each of the selected potential importing countries in Africa. Based on the data obtained from the analysis, we build a comparative table where we include values indicating attractiveness relating to development intensity, which allows us to select the most attractive country in terms of trade relationships. According to Table 6, Tunisia, Mauritius, the Seychelles are viewed to be the most attractive countries in Group 1, while Djibouti is the most attractive country in Group 2 (see Table 6). Comparing the countries based on the results of the development intensity analysis, we can say that Djibouti, Lesotho and the Seychelles have the best values that determine the countries' attractiveness. Therefore, it would be appropriate for Ukraine to foster cooperation with the above countries. Currently, Djibouti has a lack of food, petroleum products, chemicals, transport and vehicles [4], as well as advisory services [5]. The same is true in the case of the Seychelles [18].

The proposed approach to determine the value of marketing attractiveness of countries based on the adapted Rasch

model can be tested and used with regard to different countries to identify the level of country attractiveness.

5. Conclusions

Based on the results of the conducted analyses of the trends in the volumes of export and import transactions on African markets, we can conclude that African countries are potentially promising for Ukraine in terms of trade due to the fact that the turnover between Ukraine and African countries has been increasing. Accordingly, we propose to establish «Ukraine-Africa» Trade House as a pilot project to change Ukraine's export structure and reorient the country's industrial priorities in terms of geography, shifting towards African countries in general and small African countries in particular by using modern integrated technologies. Thus, large natural potential creates preconditions for Ukraine to obtain competitive advantages regarding the country's key exports both on large and small African markets which are developing rapidly due to substantial investment in the development of industry, particularly in the renovation of production facilities, introduction of innovative technologies, energy conservation measures, reorientation to new sales markets, also with regard to government orders including the light industry and the food industry, as well as to the provision of qualified staff.

Based on the analysis of the determinants of economic development and the application of the adapted Rasch model we have identified the most promising potential trade partners for Ukraine among small African countries with markets which continue to grow very rapidly. We can say that Djibouti, Lesotho and the Seychelles are potential trade partners for Ukraine if we evaluate the relevant values according to the development intensity analysis by means of the relative dynamic value. Based on the evaluations done by the adapted Rasch model, we identify Tunisia, Mauritius, Djibouti and the Seychelles as promising trade partners for Ukraine. Here, Djibouti and the Seychelles are considered to be the most sustainable trade partners for Ukraine. Ukraine is able to provide the African countries with food, petroleum products, chemicals, transport and vehicles, as well as advisory services and qualified staff.

Tab. 6: Evaluation of marketing attractiveness of importing countries on the basis of the adapted Rasch model

Countries	Djibouti	Egypt	Lesotho	Liberia	Mauritius	Seychelles	Tunisia
Values	346.4	6,309.04	852.0	7,116.4	162.7	438.5	148.4

Source: Compiled by the authors based on the previously obtained results

References

- Chen, K. C. W., Chen, Z., & Wei, J. K. C. (2009). Legal Protection of Investors, Corporate Governance, and the Cost of Equity Capital. *Journal of Corporate Finance*, 15(3), 273-289. doi: <https://doi.org/10.1016/j.jcorpfin.2009.01.001>
- Mokoaleli-Mokoteli, Th., & Iatridis, G. (2017). Big 4 auditing companies, earnings manipulation and earnings conservatism: evidence from an emerging market. *Investment Management and Financial Innovations*, 14(1), 35-45. doi: [https://doi.org/10.21511/imfi.14\(1\).2017.04](https://doi.org/10.21511/imfi.14(1).2017.04)
- Awolusi, O. D., & Adeyeye, O. P. (2016). Impact of foreign direct investment on economic growth in Africa. *Problems and Perspectives in Management*, 14(2-2), 289-297. doi: [https://doi.org/10.21511/ppm.14\(2-2\).2016.04](https://doi.org/10.21511/ppm.14(2-2).2016.04)
- Iformatsiya.ru (2010). *The economics of Djibouti*. Retrieved from <http://iformatsiya.ru/africa/493-yekonomika-dzhibuti.html> (in Russ.)
- Polpred.com (2017). *The News of Djibouti. Database Section for 1998-2017*. Retrieved from <http://polpred.com/?cnt=50> (in Russ.)
- Safarov, R. & Panishchev, O. (2012). Numerical simulation of the invariance of the knowledge assessment with respect to test tasks within the framework of G. Rash's model. *Educational Technology & Society*, 15(1), 424-435. Retrieved from http://ifets.ieee.org/russian/depository/v15_1/pdf/3.pdf (in Russ.)
- Rasch, G. (1960/1980). *Probabilistic models for some intelligence and attainment tests*. Chicago: The University of Chicago Press.
- Ministry of Economic Development and Trade of Ukraine (2017, May 25) *Draft of the National Strategy of Export Development of Ukraine*. Retrieved from: <http://ukrexport.gov.ua/ukr/zed/strategy/ukr/4589.html> (in Ukr.)
- Barkalov, S., Kireev, Y., Kobelev, V., & Moiseev, S. (2014). A model for evaluating the attractiveness of alternatives in the Rush analysis approach. *Control systems and information technologies*, 57(3.2), 209-213 (in Russ.).
- Smotrova, T., & Moiseev, S. (2015). Marketing model for evaluating the attractiveness of shopping centres. *Naukovedenie* 7(6), Retrieved from <https://naukovedenie.ru/PDF/21EVN615.pdf> (in Russ.)
- Segodnya.ua (2016, November 4) *Africa is one of Ukraine's important partners*. Retrieved from <https://www.segodnya.ua/economics/enews/afrika-odin-iz-vaznyh-partnerov-ukrainy-766895.html> (in Ukr.)
- PressORG (2017, February 28) *Ukraine and Côte d'Ivoire have agreed to intensify trade and economic cooperation*. Retrieved from <http://pressorg24.com/news?id=319438> (in Russ.)
- State Statistics Service of Ukraine (2017). *Official web-site*. Retrieved from <http://www.ukrstat.gov.ua> (in Ukr.)
- Navrotska, N. H., & Marharytina, O. B. (2006). *Custom statistics for lawyers and economists*. Manual. Dnipropetrovsk: Ukrainian Academy of Customs (in Ukr.).
- International Bank for Reconstruction and Development. The World Bank (2017). *Global economic prospects. A Fragile Recovery*. A World Bank Group Flagship Report. Retrieved from <http://www.worldbank.org/en/publication/global-economic-prospects>
- International Monetary Fund (2016). *Official web-site*. Retrieved from <http://www.theglobaleconomy.com>
- Boone, W. J., Staver, J. R., & Yale, M. S. (2014). *Rasch Analysis in the Human Sciences*. Dordrecht: Springer. doi: <https://doi.org/10.1007/978-94-007-6857-4>
- Embassy of the Russian Federation in the Republic of Seychelles (2016). *The Republic of Seychelles*. Information reference about the country. Retrieved from <https://seychelles.mid.ru/21> (in Russ.)
- Antonjuk, V., Liashenko, V., Novikova, O., Kotov, Ye., & Chumachenko M. (2014). Program for Creation and Preservation of Jobs in Donetsk and Luhansk Oblasts for the Period till 2017 and Scientific Expertise of its Project. *Economy and Management: Theory and Practice*, 3-25 (in Ukr.).
- Kramar, O. (2016) *Open Africa. New Markets for Ukrainian Exports*, 27, 14-17.

Received 1.06.2017