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Determinants of export entrepreneurship development: A comprehensive analysis of their heterogeneous impact

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Abstract

The article aims to analyse current trends in the export entrepreneurship sphere. The main objective of the study is to identify a possible relationship between the attained level of export performance achieved in different countries and various institutional and other determinants. The article provides a concise theoretical overview and bibliometric analysis of publications, highlighting promising directions for the promotion of export entrepreneurship and identifying key factors influencing its effectiveness. To achieve the study's objective, data are used on the time to export a single cargo, the number of procedures to register a new business, the creditworthiness of countries, GDP per capita, the share of natural resource rents in GDP, the efficiency of government institutions, the share of urban population in the total population, and the average years of education. The specified parameters have been collected for the period from 2006 to 2020. To analyse the nature of the influence of the selected determinants, a sample of 135 countries with different levels of population income was compiled. Statistical data processing was carried out using the software tools EViews 13 and Stata/MP 14.2. Initially, a series of econometric tests were used to check the panel data for multicollinearity, variable stationarity, and their cointegration. Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) methods were then used to estimate the statistically significant long-term relationship between the variables. As a result, a pool of significant factors of institutional and other factors has been identified that determine the effectiveness of export entrepreneurship in the country. The results obtained allow for a more comprehensive justification of measures to support the development of export business activities.

Keywords: export, entrepreneurship, risk, uncertainty, institutional factors, state regulation, bibliometric analysis, modelling.

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出口企业发展的决定因素：对其异质影响的综合分析

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简介

该文章致力于分析出口企业发展领域的现有趋势。研究的主要目标是确定不同国家出口活动的成果水平与一系列制度性和其他因素的潜在关联。文章提供了简要的理论综述和文献计量分析，重点强调了出口企业发展的前景方向，并确定了影响其效益的关键因素。为了实现研究目标，研究了一些数据，包括货物出口时间、注册新企业的程序数量、国家信用评级、人均国内生产总值（GDP）、自然资源租金在GDP中的比重、政府机构效率、城市人口占总人口的比例以及平均受教育年限。这些参数的数据收集时间为2006年至2020年。为了分析选定决定因素的影响性质，对 135 个不同收入水平的国家进行了抽样调查。统计数据的处理使用了 EViews 13 和 Stata/MP 14.2 软件产品。在第一阶段，通过一系列计量经济学测试，对面板数据进行了多重共线性、变量的平稳性以及它们的协整性检验。然后，为了评估变量之间的长期显著关系，应用了完全修改的最小二乘法（FMOLS）和动态最小二乘法（DOLS）。因此，形成了一组影响出口企业发展的重要因素，这些因素包括制度性和其他因素。所得到的结果有助于更加深入地为促进出口企业发展而采取的措施提供论据。

关键词: 出口、企业家精神、风险、不确定性、制度因素、政府监管、文献计量分析、建模。

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Introduction

Creating favourable conditions for export entrepreneurship plays a crucial role in the economic development of a country by leveraging opportunities in international markets. Effective entrepreneurship can enhance balance sheet size, facilitate the transfer of new knowledge, and foster increased competitiveness and diversification. Export activities positively impact national foreign exchange reserves and wealth, drive domestic industry growth, and boost productivity and employment [Navarro-Garcia et al., 2015b].

It is important to recognise that both entrepreneurship and export activities are the focus of numerous scientific studies, each exploring their characteristics and implementation aspects in depth. For instance, research on boosting entrepreneurial activity is covered extensively in works such as [Klapper et al., 2010; Aparicio et al., 2016; Barinova et al., 2018; Zemtsov & Tsareva, 2018; Kravchenko & Bogachev, 2023], among others. Specifically, [Aparicio et al., 2016] examines institutional factors that stimulate entrepreneurial activity and their impact on economic growth using the three-stage least squares method.

The efficiency of export activities and international trade, and their impact on sustainable development, are subjects of considerable interest to the scientific community. This is evidenced by the number of papers published on the topic, including those by Fernandes et al. (2016), Forslid et al. (2018), Qu et al. (2018), Li (2019), Linder (2020) and An et al. (2020). To illustrate, a group of authors in Forslid et al. (2018) investigated the influence of exporting firms on environmental pollution. They conclude that export activities, which facilitate an increase in production volumes, result in a reduction in the intensity of pollutant emissions.

However, the emergence of new challenges arising in connection with ongoing geopolitical changes, as well as the specificity and versatility of such an activity as export entrepreneurship, highlight the necessity for further research. Concurrently, one of the most significant areas of investigation is the identification of the characteristics of the interdependent development of export activities and entrepreneurship. In light of the aforementioned considerations, the objective of this study is to ascertain whether a correlation exists between the level of export performance achieved in different countries and a range of institutional and other factors that facilitate an increase in entrepreneurial activity. This will help refine strategies to advance export entrepreneurship during unforeseen circumstances.

1. Theoretical framework

The subject of the study, export entrepreneurship, is not adequately delineated in the scientific literature. In the majority of publications, it is equated with export activities. One of the earliest references to export entrepreneurship can be found in the work of K. Raipuria (1978), which

examines the emerging challenges of developing export entrepreneurship in India. However, this publication did not gain significant traction in the scientific community in the subsequent years, and the topic of export entrepreneurship only regained interest among researchers only in the early 2000s.

For example, in their work, researchers K. Ibeh and S. Young defined export entrepreneurship as 'a process by which individuals benefit from market opportunities in foreign markets, either independently or within an organisation, taking into account available resources and environmental factors that influence them'. [Ibeh, Young, 2001]. In this definition, the authors highlight the interdependence of export entrepreneurship on the availability of resources, which are regarded as internal factors, and the state of the environment, which is viewed as an external factor. In a subsequent publication (Ibeh, 2003), particular emphasis was placed on the examination of the impact of these variables on the process of establishing export enterprises by small firms. The author's findings indicate that a company's entrepreneurial orientation is associated with a greater likelihood of success in export-oriented business activities. This orientation is also deemed an appropriate strategic position for small firms operating in challenging environments. The researcher points out that this orientation is associated with specific characteristics of decision-makers, including international orientation, contacts, and previous business experience, as well as competencies at the firm level.

A group of authors led by A. Navarro-García [Navarro-García et al., 2015a; Navarro-García, 2016] define export entrepreneurship as 'the ability to recognise or create an opportunity and take action in international markets.'The publication [Navarro-García et al., 2015b] employs a resource-based approach and the Schwartz value approach to analyse the internal driving forces of export entrepreneurship. The findings of the study indicate that export entrepreneurship is positively influenced by a number of internal factors, including commitment to export, the value of managers, and resources related to experience and structure. In scientific publications devoted to the analysis of factors determining export entrepreneurship, the author concludes that young managers who exhibit a high level of entrepreneurial orientation, possess experience in a specific industry, and have established social connections, as well as a comprehensive understanding of the export market, exert the greatest influence on export entrepreneurship.

In [Munemo 2022a], the concept of entrepreneurship is linked to the opening of new firms, and it is proposed that export entrepreneurship be evaluated based on the rate of entry of firms into the market. The author defines the rate of entry of firms into the market as the number of export participants divided by the number of exporters. Furthermore, the paper investigated the correlation between regulatory time delays in countries and institutional quality, on the one hand, and export entrepreneurship, on the other. The scientist thus corroborates the hypothesis that the reduction of temporary barriers resulting from regulation has a favourable impact on the net market entry rate and the survival rate of export business participants. Furthermore, high-quality institutions (such as political stability, the rule of law, the fight against corruption, the protection of private property rights, etc.) markedly enhance the magnitude of this positive outcome.

It is notable that three dimensions of export entrepreneurship (speed, scale, and intensity) have been identified in the works of [Navarro-García et al., 2015a; 2015b; Navarro-García, 2016]. The dimension of speed refers to the time during which companies begin exporting. The term 'scale' is used to describe the number of foreign markets in which export companies generate income. The degree or intensity of exports is determined by the level of orientation of the company to foreign markets in relation to the domestic market [Kuivalainen et al., 2007]. This is usually measured as the ratio of export sales to total sales. For each of these attributes, [Navarro et al.] examine the permissible range of variation. In summary, the researchers conclude that export entrepreneurship is a process through which a company exploits export opportunities in foreign markets during the initial six years of its life cycle. Regardless of size, companies typically commercialise their products and/or services through a market diversification strategy (typically establishing a presence in more than ten countries simultaneously) and exhibit a high export intensity (typically exceeding 20%).

2. Literature review

A bibliometric analysis was employed to review the extant literature on entrepreneurship, export, and contingency. This entailed several sequential steps, including the collection and preliminary processing of publications deemed relevant to the study, the analysis of the resulting sample of scientific papers and the visualisation of its individual components using the VOSviewer program. The obtained results were then integrated and potential directions for future research were discussed.

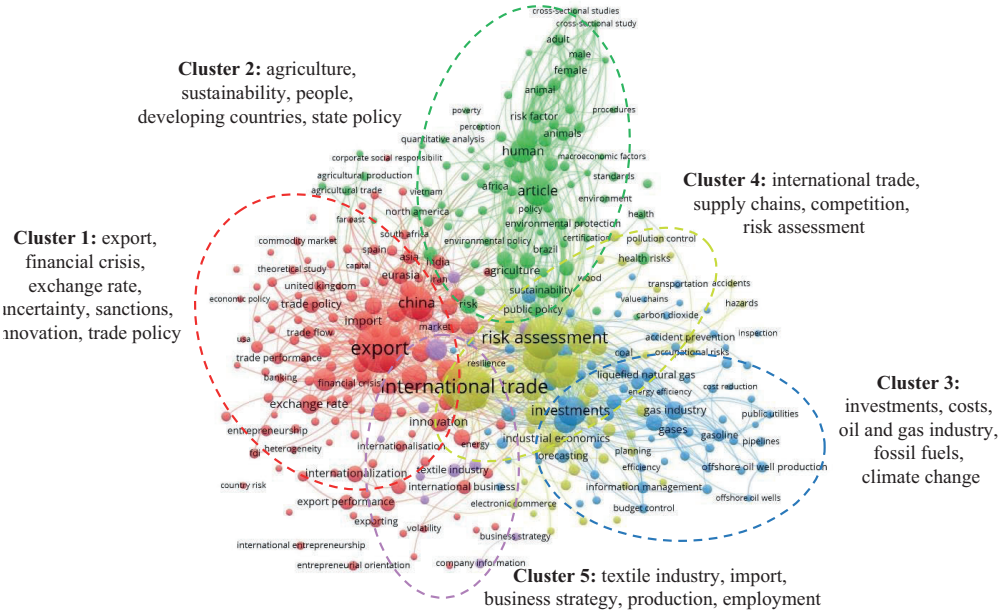
The selection of relevant publications was conducted using the Scopus database, employing a combination of three keywords in accordance with the following criteria:

1) export component - export*;
2) entrepreneurial component - entrepreneurship, company*, enterprise*, firm*, business*;
3) environmental conditions - risk*, uncertainty, sanction*.

The "*" operator was employed to account for the various endings of keywords, and the "AND" operator permitted the combination of the specified directions of keywords in the search query. Accordingly, 3,473 publications indexed by the Scopus database for the period 1990-2023 were selected for analysis.

The results of the analysis of bibliometric data from the selected sample of articles, together with their visual representation, are presented in Figures 1 and 2. The map (Fig. 1) was constructed taking into account the frequency of occurrence of keywords and the overall strength of connections. This enabled the identification of the principal scientific clusters corresponding to specific areas of

Fig. 1. A neural network map showing the relationships between keywords in publications on export entrepreneurship under conditions of uncertainty



Source: compiled by the author based on materials from the Scopus database.

publication activity of the authors. In order to guarantee the dependability of the clusters, a minimum of 10 keyword matches was employed, thus enabling the selection of 354 keywords from 15,039 and the formation of five clusters based on them.

The largest cluster (red in Fig. 1) encompasses 127 pivotal categories and is primarily concerned with the examination of uncertainty, financial crises, innovations, and other elements pertaining to export performance. Additionally, it considers these aspects in the context of the trade policies across different countries. The scientific work by Fernández-Mesa and Alegre (2015) corroborates the hypothesis that entrepreneurial orientation, conceptualised as a managerial position encompassing three key aspects (inclusion of frequent or radical innovations, orientation towards competition, and aggressive or proactive decisions associated with high risk), exerts a positive influence on the intensity of exports of small and medium-sized enterprises (SMEs). [Muhammad and Chelliah, 2024] also demonstrate that organisational innovations are a crucial instrument for attaining enhanced export performance in the global market, due to competitive advantages.

The second largest cluster (green in Fig. 1) includes 84 keywords and focuses on the analysis of agricultural exports to developing countries to prevent risks associated with food security and ensure sustainable development, especially the social component. For example, [Grace, 2015] argues that low-income countries are witnessing a surge in foodborne illnesses due to the exponential rise in the consumption of risky foods (livestock, fish, and other foods) and the expansion of value chains. In the study by Qet al. (2018), an investigation was conducted into the influence of water scarcity risk on the global trading system. The researchers identified five leading national sectors (China, India, Turkey, Spain and France) that exhibited a high level of vulnerability to virtual water scarcity risk. This risk is defined as the potential for local water scarcity in a given country to be transmitted to other countries through the export of goods.

The third cluster (blue in Fig. 1) encompasses 76 key categories and is dedicated to the examination of the interrelationship between investment volumes in the oil and gas industry and export indicators. Additionally, it is concerned with the analysis of the extraction of fuel and energy resources and their impact on climate change. To illustrate, [An et al. 2020] analyses the impact of the US-China trade war on the energy and resource sectors in Africa, employing data from this region. The researchers confirm that as a consequence of the trade war, the real changes in the stock prices of Chinese companies (-0.07%) in the energy and resource sectors are less pronounced than similar changes in US companies in Africa (-0.32%) in 2019. This supports the notion that US companies with greater reliance on exports and imports from China exhibit diminished stock and bond returns, concomitant with elevated short-term default risks. The publication [Demirer et al., 2015] explores the impact of accounting for oil price risk on stock returns in net oil exporting countries. Utilising data on the returns of companies in the stock markets of the Arab Gulf states, the authors identify a correlation between stocks that are more sensitive to changes in oil prices and significantly higher returns. This suggests that exposure to oil price risk may serve as a predictor of returns in these stock markets.

The fourth cluster (yellow in Fig. 1), comprises 55 keywords and is concerned with the analysis of global supply chains, risk assessment and management in international trade, competition research in international markets, and so forth. As an example, [Keilhacker and Minner, 2017] investigate strategies for mitigating the risks posed by external interventions in the supply chain for critical goods. [Cao et al., 2019] attempts to quantify the impact of dynamic risk spillover within and between integrated firms in global fresh produce supply chains.

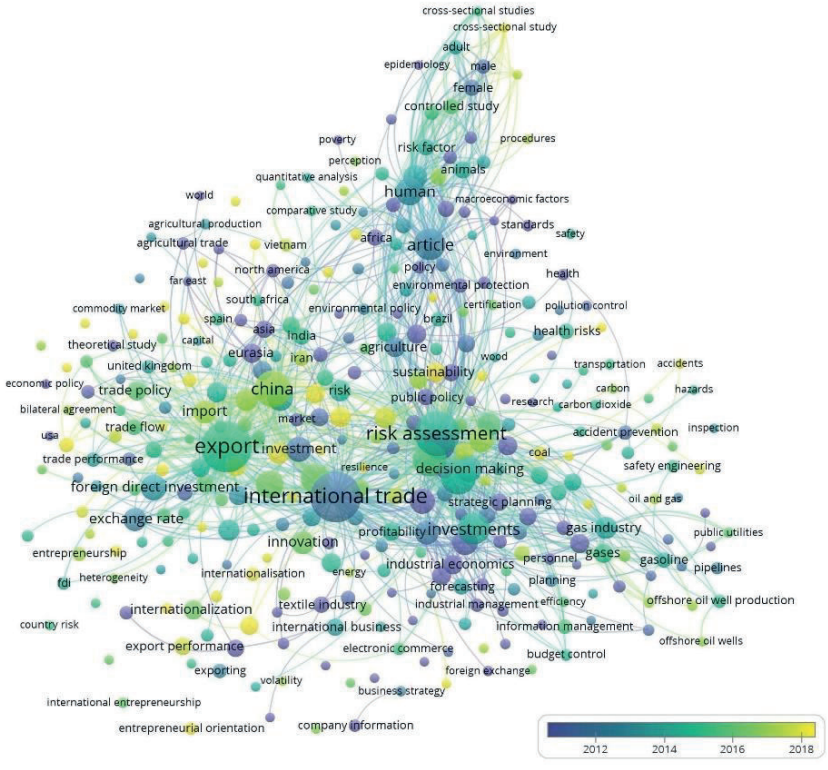
The smallest cluster (purple in Figure 1), comprises 12 keywords and is concerned with the study of export issues in the textile industry. These include the relocation of production to other countries with a view to reducing labour costs. The publication [Lin et al., 2018] is thus devoted to the study of the impact of technological progress on the textile industry of China, which is the largest textile exporter in the global market, as well as to forecasting the future energy saving potential. To achieve this, the authors establish the relationship between energy intensity and five main factors (enterprise scale, technological progress, labour productivity, dependence on foreign trade, and the price of electricity in industry) using the cointegration method. This leads them to conclude that there is a long-term equilibrium between these factors.

Figure 2 presents the findings of a study on the evolution of the relationship between exports, entrepreneurship, and risk. The results enable us to identify shifts in the use and relevance of keywords.

The data obtained allows us to identify five significant stages in the development of scientific research on this topic. Therefore, before 2012, the primary focus of scientific research was on topics such as industrial economics, the oil industry, multinational enterprises, costs, marketing, strategic planning, legislation, and the law. From 2012 to 2014, research shifted its focus to international trade, exchange rates, and productivity. Between 2014 and 2016, the most prevalent subjects of research within this field were export, price dynamics, risk assessment and management, economic growth, and sustainable development, among others. In the period between 2016 and 2018, research output on topics including supply chains, innovations, uncertainty and its analysis, climate change, and related areas increased significantly. Since 2018, the focus of scientific research has shifted towards global supply chains, the impact of the Coronavirus Disease (COVID-19) 2019 Pandemic, the effects of sanctions, the role of political uncertainty, the contribution of small and medium-sized businesses, and the importance of entrepreneurial orientation.

The findings of the bibliometric analysis highlighted the interconnectivity between the themes of export, entrepreneurship, and risk/uncertainty. In particular, the analysis demonstrated that international trade is associated with a multitude of factors that contribute to environmental instability, including financial crises, sanctions, and government policy. It is evident that in the near future, the most notable studies will concern digitalisation and export entrepreneurship. The latter is becoming a catalyst for the introduction of new technologies, achieving competitive advantages in the global market, and ensuring the economic growth of states.

Fig. 2. A neural network map illustrating the evolution of relationships between keywords in publications on exports, entrepreneurship and risk



Source: compiled by the author based on materials from the Scopus database.

3. Variables, data, and methodology

3.1. Explanatory and explained variables

A summary of the literature review materials on entrepreneurship, export, and contingencies was prepared based on the works of Nielsen (2014), Barinova et al. (2018), Linder (2020), Munemo (2022a), and Kravchenko and Bogachev (2023). The theoretical foundations of export entrepreneurship were also considered, in addition to the stated objective of the study. This process allowed for the selection of the main variables for subsequent analysis and construction of a functional dependence model. The volume of exports per employee was selected as the explanatory variable, representing the achievements of all business entities in the country engaged in the

export of goods and services over a specified period. It is assumed that this indicator accurately reflects the efficacy of export entrepreneurship.

In selecting explanatory variables, consideration was given to the influence of institutional factors on the level of entrepreneurial activity in the country, as well as the potential for increasing export volumes. One of the most crucial parameters is the time required for export, which encompasses the number of days necessary for cargo documentation, customs procedures, domestic transportation, and processing at the port and terminal [Djankov et al., 2010; Li, 2019; Munemo, 2022a].

Furthermore, the simplicity of establishing a business is a crucial factor in fostering export entrepreneurship. As observed by Munemo (2022b), the deregulation of market entry is typically linked to enhanced economic outcomes, including elevated per capita income, improved formalisation of firms, and augmented labour productivity. As demonstrated in [Nielsen, 2014 and Aparicio et al, 2016], reducing the number of procedures associated with business registration has a positive effect on the level of entrepreneurial activity. In light of the aforementioned evidence, the indicator reflecting the number of procedures required to register a business is employed as a measure of the regulation of entry into the export market.

The availability of financing also plays a significant role in stimulating entrepreneurial activity [Barinova et al., 2018; Zemtsov and Tsareva, 2018]. Therefore, the relaxation of credit restrictions can facilitate the growth of newly established enterprises and encourage the expansion of small and medium-sized businesses, including those engaged in export activities [Klapper et al., 2010; Munemo, 2022b]. In order to evaluate the accessibility of financial resources, a credit rating was employed, which ranges from 0 to 100, with 0 representing the most unfavourable indicators of banking sector regulation and 100 indicating the most favourable[1].

A number of studies have demonstrated that the level of economic development exerts a significant influence on entrepreneurial activity within a given country. This is evidenced by the findings of studies conducted by [Fernandes et al., 2016; Barinova et al, 2018; Munemo, 2022a]. The scientific community has reached a consensus that the more efficient allocation of resources in economically developed countries results in lower rates of new enterprises entering the export market. This is because existing exporting companies are highly productive and therefore do not seek to leave occupied export markets. In this regard, the most universal indicator characterising the level of economic development of a country is the volume of gross domestic product (GDP) per capita, which is included in the sample of explanatory variables.

In the context of export entrepreneurship, it is essential to consider the structure of the economy and the potential for increasing the volume of exported products. As observed in the study by [Barinova et al., 2018], economies based on raw materials tend to exhibit a higher level of income among the population. Consequently, the elevated purchasing power of citizens serves as a catalyst for entrepreneurial growth. In order to achieve this, the indicator of total rent from natural resources (in % of GDP) was selected as one of the explanatory variables. This included rent on oil, natural gas, coal (hard and brown), minerals (gold, silver, copper, iron, zinc, etc.), and wood.

A significant body of literature emphasises the influence of state institutions on the development of entrepreneurship in a given country. This perspective is espoused by [Djankov et al., 2010; Nielsen, 2014; Munemo 2022a]. However, the direction of such influence may vary. On the one hand, a stable state policy can be seen to promote the growth of entrepreneurial activity. However, on the other hand, it can also create conditions that are manifestly unfair for firms of different sizes, forms of ownership, and locations. In their 2023 study, Kaufmann and Kraay put forth a framework for evaluating the quality of public administration. This framework employs six aggregate indicators: voice and accountability, political stability and absence of violence, government effectiveness, quality of regulation, rule of law, and control over corruption. As indicated in [Munemo, 2022a], the first two of these indicators characterise the process of selection, control, and change of state power, the third and fourth describe the government's ability to effectively formulate and implement public policy, and the remaining two represent the respect of citizens and the state for the institutions regulating economic and social interactions between them. Each indicator is measured on a scale from -2.5 to +2.5, with higher values indicating superior results. J. Munemo used the principal component method to validate the effectiveness of utilising a comprehensive indicator of the quality of public institutions, calculated as the average of the six metrics [Munemo, 2022a]. Accordingly, an indicator of the quality of public institutions was constructed based on the data provided by [Kaufmann and Kraay, 2023], in accordance with the recommendations set forth by [Munemo, 2022a]. This indicator was also incorporated into the set of explanatory variables.

The works [Nielsen, 2014; Barinova et al., 2018] indicate that the level of entrepreneurial activity can be significantly influenced by agglomeration effects, which have the potential to stimulate or slow it down. Consequently, urban agglomerations can facilitate business activities due to the presence of entrepreneurial networks and the corresponding infrastructure. However, they can also impede the growth of the number of new enterprises due to high competition in the market, which results from the significant concentration of economic agents. In light of the above, it would be prudent to incorporate an indicator delineating the proportion of the urban population in the country into the econometric model.

The level of education of a country's population represents a significant factor influencing the development of export entrepreneurship. As stated by [Nielsen, 2014; Trachuk and Linder, 2018], entrepreneurs with a higher level of education are more likely to possess the requisite business skills for success. Furthermore, a higher level of education fosters the development of innovative thinking and a creative approach

[1] World Bank open data (2023). https://data.worldbank.org/.

Table 1
Research sample of countries with income distribution

Group	Country
High income level	Australia, Austria, Bahamas, Bahrain, Belgium, Brunei Darussalam, Great Britain, Hungary, Germany, Greece, Denmark, Israel, Ireland, Iceland, Spain, Italy, Canada, Qatar, Cyprus, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, UAE, Oman, Poland, Portugal, South Korea, Saudi Arabia, Singapore, Slovakia, Slovenia, USA, Uruguay, Finland, France, Croatia, Czech Republic, Chile, Switzerland, Sweden, Estonia, Japan
Above average income level	Albania, Algeria, Argentina, Armenia, Belarus, Belize, Bulgaria, Bosnia and Herzegovina, Botswana, Brazil, Gabon, Guatemala, Georgia, Dominican Republic, Jordan, Iraq, Iran, Kazakhstan, China, Colombia, Costa Rica, Lebanon, Mauritius, Malaysia, Mexico, Namibia, Paraguay, Peru, Russia, Romania, Samoa, North Macedonia, Serbia, Thailand, Tonga, Turkey, Fiji, Montenegro, Ecuador, Equatorial Guinea, South Africa, Jamaica
Below average income level	Angola, Bangladesh, Bolivia, Bhutan, Vanuatu, Vietnam, Ghana, Honduras, Egypt, Zimbabwe, India, Indonesia, Cape Verde, Cambodia, Kenya, Kyrgyzstan, Ivory Coast, Lesotho, Mauritania, Moldova, Mongolia, Nicaragua, Pakistan, Republic of Congo, El Salvador, Senegal, Solomon Islands, Sudan, Tunisia, Ukraine, Philippines
Low income level	Benin, Burundi, Chad, Democratic Republic of Congo, Gambia, Haiti, Madagascar, Mali, Nepal, Niger, Rwanda, Sierra Leone, Tajikistan, Tanzania, Uganda.

Source: compiled by the author based on data from [Hamadeh et al., 2023].

Table 2
Descriptive statistics of the variables

Variable	Symbol	Units of measure	Average value	Min	Max	SD
Export per 1 EAP	*Export*	In constant 2015 prices, USD/ person.	17237.4	39.3	423163.0	40640.7
Time for export	*TE*	Days	21.3	6.0	102.0	15.0
Property registration	*RP*	Number of procedures	5.8	1.0	14.0	2.1
Credit rating	*CS*	Index score	47.0	0.0	100.0	23.0
GDP per capita (PPP)	*GDP*	2017 constant international dollars	22271.4	711.4	120647.8	21505.5
Rent from natural resources	*NRR*	% of GDP	6.7	0.0	63.7	10.6
Efficiency of government institutions	*WGI*	Index score	0.1	–1.7	1.9	0.9
Urban population	*UP*	% of country population	61.3	9.6	100.0	22.0
Average years of education	*EdY*	Years	8.9	1.2	14.1	3.1

Note. EAP - economically active population, PPP - purchasing power parity, Min/Max - the minimum and maximum values respectively, SD - standard deviation.

Source: calculated by the author.

to problem-solving, which enables aspiring entrepreneurs to develop their own ideas for new businesses and thereby increase the profitability of entrepreneurial activity [Kolodnyaya et al., 2022; Kravchenko, 2024]. In light of the aforementioned evidence, the set of factors analysed in this study is supplemented by an indicator of the quality of human resources, measured by the average number of years adults spend in education.

Accordingly, the most pertinent variables were identified for subsequent empirical investigation and econometric modelling of the extent of export entrepreneurship development.

3.2. Selection of countries and description of initial data

The sample was selected to encompass a range of income levels, as classified by the World Bank (Table 1).

For each country, data from 2006 to 2020 have been collected on the factors impacting the development of export entrepreneurship and for which statistical information is publicly available. Thus, the initial data have a temporal structure characterising the general period of the study (T = 15) and a spatial structure indicating the number of countries in the sample (n = 135). The descriptive statistics of the variables selected for modelling are presented in Table 2.

Data on export time, property registration, and credit rating are taken from the Doing Business database[2]; GDP per capita, urban population as a percentage of the country's population, total rent from natural resources - from World Bank open data[3]; average years of schooling - from the Human Development Index database[4]. The quality of public institutions is calculated using the Worldwide Governance Indicators [Kaufmann, Kraay, 2023] as the arithmetic mean. All initial data selected to build the models were transformed into logarithms in order to stabilise the variance of the errors in the regression model and to increase its homoscedasticity, which is an important assumption of regression analysis.

3.3. Methodology for building an econometric model

The following regression model was used to identify the functional relationship between the parameters characterising entrepreneurial activity and the efficiency of the country's export activities:

$$Export_{it} = \beta_0 + \beta_1 TE_{it} + \beta_2 RP_{it} + \beta_3 CS_{it} + \beta_4 GDP_{it} + \\ + \beta_5 NRR_{it} + \beta_6 WGI_{it} + \beta_7 UP_{it} + \beta_8 EdY_{it} + \varepsilon_{it}, \quad (1)$$

where t - temporary data $t = \overline{1,T}$; i - spatial data $i = \overline{1,n}$; $(\beta_0,\ldots, \beta_8)$ - coefficients estimated from the regression equation; ε_{it} - error.

The first step in empirically testing the model is to check the panel data for multicollinearity, stationarity of the variables, and their cointegration, as these factors may lead to inappropriate estimates and hence misleading results. The variance inflation factor (VIF) was used to assess multicollinearity, as well as the calculation of pairwise correlation coefficients. If significant multicollinearity is found, it is important to eliminate it in order to obtain accurate estimates of the coefficients in the model. Based on the findings in [O'Brien, 2007; Lin et al., 2011], a threshold of 10 was applied for VIF (if VIF ≥ 10 for any variable, it is advisable to exclude it from the regression model).

Data stationarity was tested using Levine-Lin-Chu (LLC) panel unit root tests, Dickey-Fuller-Fisher (ADF)

Table 3
Correlation matrix and variance inflation factor results for the research variables

Variables	*TE*	*RP*	*GDP*	*CS*	*NRR*	*WGI*	*UP*	*EdY*	*Export*	*VIF*
TE	1.00									2.65
RP	0.01	1.00								1.13
GDP	–0.47	–0.22	1.00							5.85
CS	–0.42	–0.20	0.24	1.00						1.17
NRR	0.40	0.04	–0.01	–0.39	1.00					1.45
WGI	–0.62	–0.30	0.64	0.46	–0.37	1.00				2.92
UP	–0.50	–0.06	0.68	0.25	0.05	0.55	1.00			3.21
EdY	–0.45	–0.24	0.61	0.51	–0.31	0.58	0.59	1.00		2.47
Export	–0.27	–0.08	0.74	0.01	–0.07	0.48	0.37	0.33	1.00	–

Source: calculated by the author.

[2] Doing business legacy. Historical data - Doing business (2023). https://www.worldbank.org/en/businessready/doing-business-legacy.
[3] World Bank open data (2023). https://data.worldbank.org/.
[4] Subnational Human Development Index (v7.0) (2023). Global Data Lab. https://globaldatalab.org/shdi/download/msch/.

Table 4
Stationarity analysis of variables empirical results

Test	Test statistics	Variables								
		Export	*TE*	*RP*	*GDP*	*CS*	*NRR*	*WGI*	*UP*	*EdY*
		Level								
LLC	Statistics	–3.91	–59.9	–2.91	–5.68	–2.10	–5.54	–5.32	–7.76	–9.48
	Probability	0.00	0.00	0.002	0.00	0.02	0.00	0.00	0.00	0.00
IPS	Statistics	0.59	–18.1	1.71	1.93	2.24	–0.24	0.82	1.89	1.87
	Probability	0.72	0.00	0.96	0.97	0.99	0.40	0.79	0.97	0.97
ADF-Fisher	Statistics	246.5	422.7	69.5	212.9	188.3	291.5	258.1	388.8	260.5
	Probability	0.84	0.00	0.99	0.99	0.81	0.18	0.69	0.00	0.65
PP-Fisher	Statistics	307.4	447.0	73.8	331.1	374.3	286.1	283.4	1252.0	478.9
	Probability	0.058	0.00	0.99	0.01	0.00	0.24	0.27	0.00	0.00
		First differences								
LLC	Statistics	–13.5	–44.3	–3.53	–4.04	–7.92	–28.9	–15.7	–8.1	–10.3
	Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IPS	Statistics	–13.5	–16.9	–2.84	–8.33	–10.7	–20.9	–13.8	–0.32	–6.27
	Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00
ADF-Fisher	Statistics	685.0	466.7	49.0	527.3	365.8	941.9	672.7	302.0	474.8
	Probability	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.05	0.00
PP-Fisher	Statistics	1045.2	660.7	129.9	594.8	680.8	1404.4	1282.9	322.5	717.9
	Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00

Note. Probabilities for Fisher's tests are calculated using the asymptotic chi-square distribution. Other tests assume asymptotic normality.
Source: calculated by the author.

Table 5
Results of the Pedroni and Kao panel cointegration tests

Test name	Test statistics name	Statistics	Probability	Statistics	Probability
				Weighted	
Pedroni test	Panel v-statistic	–3.23	0.99	–4.59	1.00
	Panel rho-statistic	8.07	1.00	7.57	1.00
	Panel PP-statistic	–1.75	0.04	–5.24	0.00
	Panel ADF-statistic	–3.44	0.00	–6.74	0.00
	Group rho-statistic	9.95	1.00	–	–
	Group PP-statistic	–9.71	0.00		
	Group ADF-statistic	–5.74	0.00		
Kao test	ADF t-statistic	–10.21	0.00	–	–
	Residual variance	0.017	–		
	HAC-variance	0.019			

Source: calculated by the author.

augmented unit root tests, Phillips-Perron-Fisher (PP) and Im-Pesaran-Shin (IPS). For these tests, the null hypothesis was formulated as follows: the presence of a unit root implies that the selected variable is non-stationary.

Pedroni and Kao residual cointegration tests were used to identify cointegration between variables, with the null hypothesis being the absence of cointegration [Pedroni, 2018]. In the case of cointegration, a statistically significant long-run relationship between variables was tested using panel cointegration methods (fully modified least squares - FMOLS; dynamic least squares - DOLS).

4. Research findings

In order to check the quality of the constructed panel data sample, tests are carried out to identify problems leading to spurious regressions at an early stage. For this purpose, we calculate pairwise correlation coefficients and the dispersion inflation coefficient to detect multicollinearity (Table 3), perform tests to identify non-stationarity (Table 4), and apply Pedroni and Kao tests for cointegration (Table 5).

The obtained results of the multicollinearity check of the data (Table 3) show that the variables selected for building the model are independent of each other, with the highest pairwise correlation coefficient recorded at 0.74. As indicated in [Kwilinski et al., 2023], a stable correlation is evident when the coefficient exceeds the threshold of 0.80. Using this criterion, it can be concluded that the present study is not burdened with problems related to multicollinearity. In addition, the VIF value is below the threshold for all variables (the highest VIF value of 5.85 is recorded for the GDP per capita variable). This suggests that it is appropriate to include all the selected variables in the subsequent modelling.

A series of tests (Table 4) was used to test the null hypothesis of non-stationarity for the initial data on the variables and their first differences. If the test statistics are insignificant at the level and significant at the first difference, the null hypothesis is not rejected [Alekhine, 2021; Kravchenko, Dementyev, 2023].

The results of the stationarity analysis presented in Table 4 confirmed that only the TE variable was stationary at the levels in all tests. In addition, all variables became stationary after their increment (taking the first difference). The results obtained allowed us to reject the null hypothesis of non-stationarity at a 1% significance level, therefore it is advisable to further test the cointegration of the variables using Kao's t-statistic, as well as Pedroni's panel and group statistics (Table 5).

It should be noted that the Pedroni and Kao tests are characterised by different assumptions and computational approaches. At the same time, they are characterised by a common objective, which simultaneously assumes the heterogeneity of fixed effects and short-term changes for different panel groups, as well as the pooling of information on the long-term convergence of the variables analysed.

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Thus, the results of the tests carried out on the initial sample of panel data have confirmed the presence of joint integration and the absence of multicollinearity, which makes the sample of variables suitable for assessing the long-term dependence of the variables. Based on the revealed facts, it is advisable to use the FMOLS and DOLS models for heterogeneous panel data. The results of the application of these techniques are presented in Table 6.

Table 6
Estimates of long-run cointegration regression coefficients

Variables		FMOLS		DOLS	
Explained	**Explanatory**	**Coefficient**	**Probability**	**Coefficient**	**Probability**
Export	*TE*	0.193329	0.0042	0.100676	0.0531
	RP	–0.052076	0.3450	–0.014120	0.7854
	GDP	0.828675	0.0000	1.044299	0.2287
	CS	0.016038	0.1000	0.011091	0.0000
	NRR	0.035472	0.0048	0.028515	0.0086
	WGI	0.340186	0.0000	0.189354	0.0016
	UP	4.419289	0.0020	2.707204	0.0174
	EdY	–0.120840	0.5589	–0.109310	0.5467
Adjusted R^2		0.991324		0.991907	

Source: calculated by the author.

It should be noted that, according to the data obtained using the FMOLS model, statistically significant influence (at the level of 1-10%) on the efficiency of export activities is exerted by such variables as time for export, GDP per capita, credit rating, rent from natural resources, efficiency of state institutions, and the share of urban population in the total population of the country. According to the DOLS model, all the same variables as in the FMOLS have a significant influence, except for the factor characterising the level of economic development of the country - GDP per capita. Thus, in both models, the educational level of the population and the ease of starting a business (i.e. the *RP* and *EdY* variables) have a statistically insignificant influence at the same time.

For the FMOLS and DOLS models, the adjusted coefficients of determination are over 99%, which indicates the cointegration of exports with the variables included in the study and a high degree of reliability of the models constructed. This makes it possible to establish the existence of a long-run equilibrium relationship between the explanatory and explained variables. According to the obtained empirical results, the theoretical assumption that the effectiveness of export entrepreneurship is significantly influenced by the quality of state institutions, the country's credit rating, the time of export of cargo, the level of urban population, the actual contribution of mineral extraction to the formation of GDP and, consequently, the potential for the extraction of natural resources in the long term, is confirmed.

5. Conclusions and limitations

A brief theoretical review and bibliometric analysis of scientific publications in the field of export, entrepreneurship, and contingency confirm their close relationship, as well as their relevance in terms of increasing the effectiveness of export entrepreneurship, which becomes a catalyst for the introduction of new technologies, achieving competitive advantages in the global market and ensuring economic growth of states.

This study attempts to create a formalised theoretical model that describes a set of factors that influence the country's export entrepreneurship. Based on a series of econometric tests on panel data collected for 135 world economies for the period 2006-2020, the influence of a number of institutional and other factors on the effectiveness of a state's export activities has been identified and assessed.

The results of applying the dynamic and fully modified least squares method, as well as a series of accompanying verification tests on the initial data, made it possible to confirm that the volume of exports per unit of economically active population is cointegrated with the variables included in the analysis. In one way or another, this characterises the quality of state institutions, as the constructed models explain more than 99% of the variation in the resulting indicator. In both models, the following variables had a statistically significant influence on the efficiency of export activities: the number of days to export cargo, the country's credit rating, the level of natural resource rents as a percentage of GDP, the efficiency of government regulation, and the share of the urban population in the total population. It should be emphasised that all statistically significant factors in the constructed models directly impact the resulting indicator, i.e. an increase in the value of the specified variables leads to an increase in export volumes calculated per economically active person.

Despite the factual findings on the existence of a relationship between the efficiency of export entrepreneurship in different countries with certain institutional and other factors, this study is characterised by some limitations.

As geopolitical tensions rise, countries are divided into two blocs (China-Russia, USA-Europe) and certain restrictive measures are taken that directly affect the ability to enter export markets, which in turn can significantly reduce the efficiency of export activities of various countries. This geopolitical division has not been taken into account in the modelling process at this stage. In addition, the panel data examined is limited to 2020, as the World Bank will stop collecting and publishing global statistics for the Doing Business report after this period. As a result, the existing statistics do not take into account the current export experience of certain countries, including those due to the current geopolitical situation.

In general, the complexity and multifaceted nature of the problem of developing export entrepreneurship, which depends on a significant number of traditional and emerging factors, determines both new opportunities and challenges. In this respect, future studies on this aspect of the country's economic development should use an extended list of variables to identify a larger number of significant cause-and-effect relationships that could serve as a basis for improving the regulation of export activities of countries and enterprises. In addition, it is advisable to analyse the impact of the situational geopolitical division of countries on the effectiveness of export entrepreneurship.

The results of the work contribute to a more thorough justification of policies aimed at developing export entrepreneurial activity under conditions of uncertainty.

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