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## Article

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Article

# Modeling the Risks of the Global Customs Space

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**Abstract:** The influence of globalization processes, the customs space of the country, requires the development and implementation of a transparent state customs policy to ensure security and integration into the space of the higher hierarchical order. The purpose of the study is to form scientific-applied recommendations regarding the development vectors of the customs space of a country in the global environment to improve its risk management system. The main method of study is econometric modeling, namely, canonical analysis in determining the interdependence of sustainable development and customs space. The purpose of the study is to suggest directions for development vectors for a country's customs space that will mitigate various risks. Originally, 174 countries were selected for analysis, but the final sample was formed by 98 countries. According to the results of econometric modeling, it was determined that the following variables have the greatest impact on the customs space: human development index; GDP per capita; corruption perception index; global enabling trade index; environmental performance index; social progress index; global competitiveness index. The findings can be used by public authorities in developing a strategy for reforming the customs system of developing countries, taking into account the risks and challenges of the global environment.

**Keywords:** risk; global customs space; international business; customs policy



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## 1. Introduction

The current stage of development of the global economy is characterized by the deepening of world economic relations and the intensification of all forms of international economic relations, including the long-term growth of international trade and investment activity of countries (Basu 2014). Under the influence of global transformations, the global economic environment becomes more unstable, and in the context of reformatting the world economic order, the demands of international organizations for the financial and economic recovery of national economies are increased (Quimby 2015), protectionist sentiments of the countries are strengthened (Cerezo-Román 2015), and the role of the national component in the regulation of foreign economic relations is actualized (Le 2020).

There is a loss of part of the national sovereignty in resolving the issues of international trade and its rules (Truel and Maganaris 2015), institutional regulation (Cantens et al. 2015), asymmetric positioning of countries using tariff protection instruments and non-tariff restrictions (Anshar 2017), by the infrastructure of foreign trade operations and logistics services (Chamberlain 2019).

Increasing the pace of development and volumes of international trade, the growing level of competition in the world market has led to an increased number of risks and an increase in their level. The uncertainty of the external and internal environment of the

organization and the functioning of the business have led to the emergence of a risk as a result of the movement of goods and vehicles across the customs border. The risk is associated with all areas of human activity in the process of social interaction and the achievement of relevant goals, but under the influence of globalization and integration processes, it is especially manifested in customs affairs.

Such transformations require countries to consider current global trends and the dualistic nature of globalization in developing strategic directions of development and integration into the global economic environment, as global instability has given impetus to the concept of sustainable development, which transforms the current national models of foreign trade.

The processes of globalization, as well as the global environment, cause new challenges for the integration of countries into the global space and increase the role of customs regulation and customs policy in protecting the economic space and national interests (Klippenstein 2020). The above processes have significantly affected the autonomy of countries in the implementation of customs policy through the delegation of functions at the supranational and global levels and their initiative in developing a new format of economic and customs cooperation.

Deepening and expanding relationships in the current world space, accelerating integration processes form a single global space (Addo 2020). Globalization encourages countries to have a single common development covering all areas of human activity from financial transactions to cultural exchange (Massa 2014). In the dynamics of globalization processes, the migration of goods and services takes place (Gordon and Pardo 2015), the exchange of information is accelerated, money and capitals cross national borders (Rashki et al. 2014), a system of global supplies is formed, and innovations and new technologies are constantly developed and implemented (Azhimetov 2014).

Globalization can be considered in three dimensions: political, which reflects the political weight of the country on the world stage and its impact on global processes of world development (Kim and Kim 2020); social, which indicates the level of human integration into the international community through their activities, family and professional ties, belonging to world institutions (Morini et al. 2017); economic, which is characterized by opportunities for the development of production, foreign investment attraction, and deepening the processes of transnationalization (Alimbekov et al. 2017).

The most acute contradictions are between the global expansion of monopolies and the national economic sovereignty of the world countries, i.e., between global and national economic interests and between global and local economic interests (Elliott and Bonsignori 2019).

In different historical epochs and social systems, the customs component of the economic space occupies an important place in the development of the state, as the integration of countries is impossible without the development of foreign economic policy (Kelly et al. 2015). The origins of the organization of customs affairs and, accordingly, the formation of the customs space and the settlement of relations between its subjects, are found in the early periods of trade development (Al-A'wasa 2018).

Under the influence of globalization, the customs space of a country functions as an open system that objectively requires the development and implementation of such a transparent customs policy, which would meet global standards of harmonization and simplification of customs procedures and, at the same time, provide quality customs control and inspection, providing security and integration into the spaces of the higher hierarchical order.

The global environment is undergoing constant transformations, changing the traditional and forming new approaches to the definition of emerging risks, their identification, and their management models, which have been constantly changing over the past decades. If in the 20th century a risk was considered a negative phenomenon of activity that needed to be eliminated, then under the influence of globalization it turned into an imperative of global economic development, for which successful management and taking into account in activities ensures the achievement of positive effects (Mikuriya and Cantens 2021).

The negative consequences of global challenges for national economies negatively affect the world economy, generating new threats to it. This process again receives a backlash, provoking liquidity crises and an increase in the shortage of financial resources in banks and capital markets (Fernandes et al. 2021). After the last world economic crisis, globalization acquired a negative identification, which caused mass anti-globalist demonstrations. At the current stage, the restoration of economic growth and its stable dynamics remains a priority.

Institutional settlement of the issues of simplification and harmonization of customs procedures remains an important basis for managing the riskiness of the customs space. Customs procedures are a group of customs operations, including (McCarron and Chambers 2021) customs clearance, which consists of the documentary recording of data obtained in the conditions of customs control of physical objects that cross customs control; customs control, which is carried out in customs control zones by customs authorities in the form of an oral interview, document verification, and inspection of customs facilities; the collection of duties and customs payments specified in the customs and tax legislation of the country from goods and other physical objects moved across the customs border. A problem in the implementation of customs procedures is the differences in the development of customs legislation in different countries, which forces us to take them into account when forming directions for the simplification, harmonization, and unification of customs procedures in the conditions of foreign economic activity.

The foreign economic component of the strategic guidelines for the development of countries remains one of the most significant in the context of deepened integration into the global space. Practice shows that in a globalized society, the search for new scenarios for the development of humanity is impossible without the development of an effective foreign economic policy by each country under the conditions of the maximum possible synergy of national interests (Hendy and Zaki 2021). It is clear that the country seeks to protect its national economic space from the expansion of others. The countries' economic leaders were able to transform national interests into global ones by imposing their vision of the development of inter-country cooperation and coordination of national interests. Global interests at the current stage of development of the world economy are a projection of the advantages and opportunities of a certain group of countries, but not the sum of the interests of countries and individual interests (Al-Shbail 2020). Foreign economic policy leaves countries with mechanisms to protect their national interests. They do not always provide the same effect when applied by countries with different levels of economic development.

It was found that the asymmetric distribution of strategic resources and the uneven economic development of countries lead to the deepening of existing global problems (Ibsen et al. 2017). Global transformational processes cause a dualistic influence on the development of the modern global economy. Activation and deepening of all forms of international economic relations contribute to the development of international trade and investment relations between business entities in the global economic environment. The intensification of the use of protectionist approaches in the regulation of foreign economic relations signals the emergence of new challenges for the integration of countries into the global economic space.

The polarity of the effects of globalization processes gives impetus to the development of the concept of balanced socio-economic development.

For developing countries, which are characterized by unstable positions in international trade, slow structural transformations, and continuous, uneven modernization of the customs component, the problem of maximally taking into account the instability and challenges of the global environment for the purpose of forming priorities for the development of its customs space in a new format, its effective integration into the global space while preserving national economic interests remains urgent.

It was found that the asymmetric distribution of strategic resources and the uneven economic development of countries lead to the deepening of existing global problems.

Global transformational processes cause a dualistic influence on the development of the modern global economy. The activation and deepening of all forms of international economic relations contributes to the development of international trade and investment relations between business entities in the global economic environment. In contrast to this, the intensification of the use of protectionist approaches in the regulation of foreign economic relations signal the emergence of new challenges for the integration of countries into the global economic space.

The formation of a balanced customs space of countries is a priority task to ensure effective integration into the global space. Taking into account the existing challenges of the countries in the implementation of the foreign economic policy, this shows the relevance of the subject of this paper.

The main problems of the economic integration of countries, which prevent the balancing of the customs space and increase the uncertainty of the global environment, thereby complicating the identification of risks, have been clarified, in the context of the deepening of theoretical-methodological approaches to the determination of systemic inconsistencies in globalization processes.

We believe that the main risks arising from an unjustified change in customs policy instruments for the customs space are a decrease in the receipt of customs payments to the state budget due to tariff increases and the oversaturation of the market with imported goods at excessively liberal tariff rates; the loss of the regulatory purpose due to the export duty, although its fiscal value for the country is extremely low; the imperfection of customs control procedures, which causes underestimation of the customs value of goods, incorrect coding of goods, and indication of the country of origin; corruption of customs due to the high burden on subjects of foreign economic activity, etc.

Full and effective integration of countries into the global economic space is impossible without the formation of transparent procedures for passing customs control and inspection, effective activities of customs authorities, and the creation of an appropriate system of control over the movement of goods and objects across the customs border of a country.

The issue of balancing the customs space, taking into account the main risks of the global environment, makes it necessary to research theoretical and methodological foundations and practical recommendations for the formation of the latest paradigm of the functioning of the customs space of countries. This actualizes the subject of the study and its purpose.

The purpose of the study is to form scientific-applied recommendations regarding the development vectors of the customs space of a country in the global environment to improve its risk management system.

The purpose of the study is to suggest directions for development vectors for a country's customs space that will mitigate various risks.

## 2. Literature Review

### 2.1. Analysis of the "Customs Space" Concept

The customs space directly concerns issues such as ensuring the security of the customs territory and border, sovereignty, and protection of national interests, as integration into the regional or global space requires countries to cede part of their national interests (Bouvet et al. 2017).

The characteristic features of the customs space are defined as follows (Vlachová and Hamplová 2022): openness to interaction and interpenetration with other subspaces of the geoeconomic space; anisotropy, which is manifested in the different reaction of structural elements of space to the action of factors external to them; heterogeneity of space in both temporal, territorial, and functional dimensions; zonal and sectoral differences; dynamism.

Given that the customs space is a concept that is interconnected with a political and legal category such as sovereignty, it can be considered as a sphere related either to the state or to the so-called international territory, or to a part of the territory of one state, which is used to exercise customs jurisdiction by another state according to an agreement



between them and within the limits allowed by international law (Veldhuis 2022). Countries consider the protection of national interests within the customs space as a mechanism for ensuring national security.

The formation and development of the customs space with appropriate institutional support for most countries of the world had an evolutionary character and took place gradually, taking into account the different willingness to integrate into the world economy and international trade in particular. The following levels of customs space should be distinguished (Dionysopoulou et al. 2021): global, supranational (regional, trans-regional), national, and local. We note that each of these levels is not separated from the others, because each higher level contains lower levels. The global customs space covers countries with different levels of national market protection and tariff harmonization, which is confirmed by the analysis of the customs profiles of individual countries. The institutional support of this process is carried out with the help of regulation of the World Trade Organization.

From the point of view of national interests, the customs space at a national level is strategically important for the state for ensuring the security priorities of development, as it is not limited only to customs infrastructure or customs control.

The analysis of modern scientific and legal approaches to the interpretation of the customs space confirms the existence of national normative legal acts (mostly the Customs Code) at the level of countries, at the level of integration associations (for example, the Customs Code of the European Union), within the framework of concluded global agreements and the fulfillment of obligations according to international conventions and agreements (within the World Trade Organization (WTO), the World Customs Organization), as part of the implementation of bilateral and multilateral agreements between countries (free trade agreements, customs union, etc.). The legislator avoids a clear interpretation of the customs space and its structuring.

The understanding of the customs space through its identification with the customs territory does not reveal the structure and functional purpose of the space. The customs space goes beyond the customs territory of the country if it is considered not from a geographical and territorial point of view, but from an economic point of view, therefore, it is limited by economic borders, which scientists propose to understand as "...conditional economic and functional limits of the influence of countries, transnational structures" (Dionysopoulou et al. 2021), i.e., "... the economic boundary of space is virtual and has a temporary nature".

It is a mistake to consider the customs space as a customs territory, since in the study the space is defined as a place where customs development processes take place and connections between subjects are formed and implemented. The territory of a country without an appropriate institutional basis has no sense for the implementation of the customs policy of the country. In the process of formation of the customs space, relations between its elements change, which is why we suggest emphasizing balance, not stability, as a fundamental characteristic of development (Chamberlain 2019).

Based on a philosophical approach to the interpretation of the essence of the customs space, we will define its characteristic features (Özer 2020):

- Openness to interaction and interpenetration with other subspaces of the geo-economic space. Diffusion of subspaces can be accompanied by migration of basic elements between them, changing the concentration;
- Anisotropy, which manifests in the different reactions of structural elements of space to the action of factors external to them. The anisotropy of the customs space is explained by its structural asymmetries, the internal contradictions of the architecture of the space, the heterogeneity of the global environment, and the differentiation of the characteristics of the space;
- Heterogeneity of space in both temporal, territorial, and functional dimensions;
- Zonal and sectoral differences;

- Dynamism (the customs space can be considered as the Minkowski space, which is three-dimensional, but supplemented by a non-spatial variable, time).

The formation of the customs space of the country took place in parallel with the development of the customs affairs, therefore its main characteristics depend on the integration course of the state and domestic economic policy. The customs space is characterized by cyclical development and has the same stages as the economic space in general (Nas 2018): formation (synchronization of processes), development (acceleration), recession (slowdown, stabilization), and depression (disintegration and desynchronization). Accordingly, the space is also fractal, heterogeneous, and synchronous (Grobbeelaar and Meyer 2017).

The relevance of spatial aspects in customs affairs is characterized by both global transformations and the specifics of the formation of the internal customs environment of each country. The customs sphere is not separate from other spheres of public life. It is tangential to the socio-economic, political, ideological, and ecological life of the country, since the customs policy has a direct influence on the balancing of national interests and other international economic entities, determining the foreign economic vector of development.

Based on the content analysis carried out, we offer the following author's definition of the concept of "customs space of the country" as an open system in the conditions of globalization with essential differences from the concept of "customs territory", the functional purpose of which goes beyond only territorial positioning, reflecting the processes of formation and implementation of inter-subject connections for the purpose of realizing the interests of each of them and ensuring the security of the customs space; the security of the customs space, in contrast to the existing interpretations, is proposed to consider such a state of it, the priority of which is the observance of national economic interests, ensuring the protection of interests vital to society in the economic, social, informational, and ecological spheres in the conditions of the expansion of foreign economic activity of subjects, the preservation of the environment, countering threats to the life and health of people and external challenges that arise in the process of moving goods, objects, people, and capital across the country's customs border.

This author's definition determines the specifics of the application of the concept of the global customs space as a synergistic effect of functions and principles—a factor of sustainable development, technical functions of border control, customs policy, etc.

## 2.2. Global Sustainable Development and Balancing the National Customs Space

The global inequality in the economic development of countries and the uneven ownership of strategic resources are patterns of global economic development in the 21st century, which significantly deformed the global space, giving it new characteristics (Karlsson 2017). It was established that these regularities deepened existing global problems, the solution of which is complicated by unstable relations between countries, asymmetries in the development of structural elements of the global space, and a permanent conflict of interests between the subjects of international economic relations, the main ones of which are countries, transnational corporations, regional integration associations, and international organizations (Malefane 2021). The customs space plays a special role in the global system of economic coordinates.

In the conditions of global integration, a customs subspace was formed in the global space, which historically has one of the oldest preconditions, since the history of trade began in the 3rd century B.C. (Iovan 2020). Only when trade began to go beyond a certain territory were regulatory measures introduced to move goods through another territory. As the century-old practice has proven, "...stable states are states that trade" (Langhout and Vaccarino-Ruiz 2021), so the customs space has become one of the fundamental links of the global space.

The countries of the world form their policies differently for the protection of foreign trade interests and national development priorities. Therefore, according to the level of involvement in the processes of integration and globalization, the customs space of countries can be either closed (North Korea can be considered an example of such a closed

customs space) or open (fully or moderately open as in the case of Belarus) (Fischer et al. 2020). Scientists propose to consider the activity of countries in the customs space in various aspects (trade, regulatory (institutional and logistical), fiscal), taking into account the level of implementation of the customs doctrine (global, regional, national), the level of integration (low, medium, high), and phases of activity (rise, fall, recovery) (Rogić and Kaščelan 2021).

Modern global transformations have led to changes in theoretical approaches to understanding the essence of development, its indicators, and the practical implementation of the model of sustainable (balanced) development. The processes of global integration of countries, along with economic issues, also brought social and economic issues to the fore. However, the coexistence of countries with different levels of economic development inevitably leads to the loss of part of their national interests, deformation of the economic and customs space, deepening of instability, and the spread of imbalances (Averfalk and Werner 2017). The problem of ensuring sustainable (balanced) development at both the global and national level remains unsolved, as it is a development that is aimed at uniting joint efforts to ensure the future (Kilkki et al. 2014).

Global sustainable development is harmonious and balanced in its essence, but in practice it is extremely difficult to achieve, despite the efforts of international organizations and economically developed countries of the world. The problems of environmental and social development have long since become global, so they require special approaches to solving and the initiative of each country.

The balance of the customs space can be institutional, functional, and parametric (Herzog 2021). The institutional balance involves the coordination of actions of all subjects of the space at different levels. The parametric balance of the space is the coordination of indicators that reflect the state of the customs space. The parametric balance reflects the dynamic balance of indicators (planned and actual).

Let us consider the issue of customs aspects of the protection of national interests as an implementation of the principle of balancing the global customs space.

Global economic transformations affected countries not only in terms of the development of international trade and investment, but also in terms of the protection of national economic interests, taking into account the active development of international economic relations at the beginning of the XXI century. The sphere of international economic relations, due to the deepening interdependence of national economies, experiences a number of contradictions, because, for example, international trade has become a model of successful harmonization of the economic interests of countries, in particular due to their participation in the WTO. The global regulatory system itself includes such tools, which deprive countries of the opportunity to independently decide which level of protection is needed for the most vulnerable areas of national economies (Ramezani et al. 2014).

The development of the global rules of the game through the WTO and WCO agreements was aimed at the simultaneous liberalization of trade conditions; simplification of customs and other procedures necessary for the movement of goods, capital, and people across the customs border of countries; deepening the theoretical foundations of the formation of a single global and customs space; ensuring equal conditions for access of countries to markets (Lipshutz 2019).

When defining the customs aspect as one of the main ones in the liberalization of international trade, the right of countries to implement foreign economic policy exclusively based on national development priorities was violated (Coe 2014), because areas are formed in the world based on the principles of regional economic integration, where a single customs space is formed for the participating countries, and accordingly, discriminatory trade conditions for third countries.

An example can be the common foreign trade and customs policy of the European Union (Grech 2015). In today's conditions, the problems of implementing state policy measures (including customs policy) to ensure national economic interests are becoming more urgent.



Despite the rules of international trade unified by international institutions, each country maintains its own geo-economic priorities and defends the right to maintain sovereignty in solving issues of economic development and security. That is why, for the integration of countries into the global economic environment, it is important to ensure their foreign economic and trade interests in accordance with their own potential and justified needs (Bouvet et al. 2017). This approach explains their use of various models of economic behavior based on national interests.

At the same time, the issue of the significance of the “interest” for countries in the context of global interaction is controversial, which has caused a heated debate in the scientific literature, and the arguments against the concept of “national interests” boil down to the following (Hillberry and Zhang 2018): the priority of the national interests of a country develops the worst features of the nation, deepens international misunderstandings, provokes wars and aggression in international politics, because each country tries to get the maximum realization of its needs.

The authors share the position of scientists who believe that an effective policy is a rational policy of the state, which is based on a correctly defined national interest, as it is unstable and filled with real content depending on the state of development of the global economy or the variability of a specific situation in the development of a country. “The idea of interest derives from the essence of the policy, which is naturally determined by the conditions of time and place...” (Le 2020).

In modern economic theory, the problem of examining the content of the interests of participants in economic relations remains one of the most difficult, because its study is based largely on the intuitive reasoning of scientists. The national interest is an abstract category, which is determined by the value foundations laid down in the state. Accordingly, its interpretation is different.

The development of the concept of national interests and its practical implementation is a long-term historical process, which is carried out in a complex dimension of economic, social, national-psychological, and other factors determined by the nature of the national-historical experience of a certain country. Therefore, national interests cannot exist independently of the consciousness of their bearers because they are closely interconnected with the identity of a specific nation.

### 2.3. Definition of the “Customs Risk”

Our analysis of the scientific literature showed that there is no unambiguous interpretation of the definition of “customs risk” in the scientific literature, which is explained by the multifacetedness of the concept of “risk” itself.

We can state that science has developed several approaches to the interpretation of the concept of “customs risk”, which is quite logical given the fact that there is also no single approach to the concepts of “risk” and “customs affairs”. Customs risk is mostly considered as:

- The probability/likelihood of violations of customs rules, implementation of customs threats, non-compliance with customs legislation, etc. (Hammadi et al. 2017);
- Loss/threat of loss (González García and Mateos Caballero 2021);
- A combination of the probability of violations and negative consequences (Chalendard et al. 2019).

The last approach (cause-and-effect one) to the interpretation of the concept of “customs risk” is most interesting for us because risky situations can also lead to a positive result. For example, in the case of choosing the right decision, the emphasis is shifted towards the combination of the probability of violation of the norms of customs legislation and other related branches of legislation with resulting losses (customs damage).

Customs risks can be considered in a three-dimensional model: risk as a possibility, risk as a danger, and risk as an uncertainty. For example, due to the identification of customs risks and the automation of this process, it becomes possible to prevent losses

(in the form of non-payment or minimization of customs payments, probable violation of customs rules), and therefore customs risk becomes a possibility (Nelson 2020).

If a violation of customs rules or non-observance of customs legislation is detected, the customs risk acquires signs of danger since it leads to negative consequences for the state (Erkoreka 2021). Insufficiently complete identification of all types of customs risks leads to certain uncertainty regarding the possibility of preventing customs risks or minimizing their consequences as much as possible.

Therefore, in this regard, some features of the customs risk should be mentioned (Suyunov and Fakhriddinova 2022): the presence of negative consequences; the stable or progressive nature of the consequences; the minimum threshold for the probability of violation of customs legislation; variability; subjective-objective nature of assessment.

As noted in the source (Song et al. 2019), the customs risk can be considered as follows: the economic (financial) category (taking into account financial results); the category of deviation from the goal (given the possible violation of the planned course of events); the probability category (taking into account the possibility of adverse events).

The above makes it necessary to classify customs risks. For example, there are many types of customs risks in scientific literature.

It should be noted that by duration, they distinguish termless or permanent risks, the effect of which is not limited in time (for example, the risk of smuggling weapons and ammunition at checkpoints across the state border of the country), and term risks, that is, those characterized by a time limit (for example, risks caused by seasonal changes in the import duty rate for a certain product) (Alqaryouti et al. 2022). According to the authors, term risks can be divided into short-term (with a duration of no more than 1 month), medium-term (with a duration of 1–3 months), and long-term (with a duration of more than 3 months but no more than 1 year).

It is appropriate to classify customs risks according to the customs regime for which the goods are declared, namely risks associated with customs regimes involving the transfer of ownership of goods (import, export, reimport, reexport); risks associated with customs regimes involving the provision of services for goods (transit, customs warehouse, processing in the customs territory, processing outside the customs territory); risks associated with special customs regimes (temporary import (export), duty-free shop, special customs zone); risks associated with exceptional customs regimes (destruction or damage, refusal in favor of the state).

Note that all customs risks can be divided as follows.

(1) Depending on the subject (Jablonskis et al. 2018):

- Risks associated with the activities of customs authorities (caused by risks in the management of the customs service). It is advisable to consider them regarding the main components and areas of management support, such as legal, financial, personnel, informational, and logistical ones.
- Risks associated with the activities of foreign economic activity entities, customs brokers, carriers, owners of customs warehouses, temporary storage warehouses, and the behavior of citizens when crossing the border.

(2) Depending on the object (Świerczyńska 2019):

- Risks of documentary sources associated with incompleteness, inconsistency, or unreliability of information specified in documents submitted to the customs authority.
- Risks of physical sources associated with goods and means of transport by which they are moved.

The main risks of the customs space, which are fiscal, are determined by the specifics of the application of customs and tariff instruments and certain non-tariff instruments, which in the end involve the use of tariffs. We are talking about the absence of a limit when customs policy instruments disrupt the balance of fiscal and regulatory functions, creating pressure on subjects of foreign economic activity, or excessively liberal regulation which can lead to a significant decrease in the competitiveness.

The riskiness of the customs space also affects the functioning of foreign economic activity entities, in particular from changes in tax policy and customs regulation, stability of customs legislation, access to open information on tax and customs regulation issues, to consulting and explanatory services of the relevant state bodies.

During a risk analysis, the characteristics of general groups are not investigated (goods, foreign economic activity entities, etc.). Risk areas are determined, covering groups of risk analysis objects by certain criteria, for example, goods that have a common country of origin or are declared in the same product heading (subheading), for which there is a need to carry out separate forms of customs control (Francescangeli 2020). It should be noted that the presence of customs risks does not directly depend on the characteristics of entities. It is not necessary for an entity that is just starting foreign economic activity to intentionally or negligently make mistakes in customs declarations. An enterprise with significant experience in foreign economic activity can be used for illegal operations, and its positive reputation can be used as a cover.

It was established that for the customs space, uncertainty takes different forms. For example, the uncertainty of goals, the uncertainty of information, the uncertainty of the business climate in the country, and the uncertainty of the national and international legal field, etc. Depending on the degree of uncertainty in the space, it is proposed to define zones of the customs space, which are identified as a zone of acceptable risk, a zone of critical risk (for example, customs posts where there are frequent violations of customs rules (higher than the average value), movement of counterfeit goods and, as a rule, there are simplified pedestrian crossings), and the zone of catastrophic risk (customs posts through which drug traffic passes, channels of illegal migration and weapons).

### 3. Materials and Methods

To achieve the defined goal, a set of general scientific and special research methods was used, the application of which ensured the thoroughness, objectivity, and reliability of the presented provisions and formulated conclusions. The methodological basis of the work is the fundamental provisions of the theories of globalization, integration, riskology, and customs affairs. In particular, the following methods are used in the paper: systematization and generalization (when conceptualizing, outlining the genesis and architecture of the customs space); scientific abstraction and explication (when studying the conceptual and categorical research apparatus); analysis, synthesis, induction, deduction (when studying the patterns of formation and functioning of the customs space, in the process of analyzing the global customs space in the context of regional economic integration); typology (when identifying the determinants of customs space formation, classification of its risks); institutional analysis (when studying the institutional basis of the functioning of the customs space, taking into account risks); structural and functional analysis (when segmenting the global economic space); riskology (when developing directions for reducing the riskiness of the customs space of countries in the global environment); econometric modeling (canonical analysis when determining the interdependence of sustainable development and customs space; correlation-regression analysis when establishing dependencies between customs space and the level of involvement of countries in international trade and economic growth of countries; methods of descriptive statistics and visual analysis when identifying asymmetries of global customs space and customs space of countries).

The informational and factual basis of the research is the data and informational and analytical materials of the International Monetary Fund, the World Bank, the World Trade Organization, the United Nations Conference on Trade and Development (UNCTAD), and the World Customs Organization. Information and related references were added to the paper. In particular, the following ratings of sustainable development were used (The World Bank 2018; EPI 2020; DHL 2021; Fund for Peace 2021; The World Bank 2022).

Indicators of the functioning of the customs space of countries are taken from the data of the World Customs Organization: time of border crossing, bound tariff, export time, etc. (Economic Competitiveness Package 2022).

We formulated a hypothesis about the existence of the influence of the main characteristics of the customs space on indicators that reflect the social, environmental, and economic planes of balanced development. The first set of variables—the set X—includes indicators that characterize the global customs space: 1—net barter terms of trade (2000 = 100); 2—imports of goods and services (% of GDP); 3—customs duty and other import taxes (% of tax revenues); 4—logistics performance index; 5—time of import, border crossing (hours); 6—time of export, border crossing (hours); 7—efficiency of the customs clearance process (1 = low, 5 = high); 8—duty-free, most-favored-nation treatment,%; 9—non-ad valorem duty, bound tariff,%; 10—non-ad valorem duty, most-favored-nation treatment,%; 11—customs duty > 15%, bound tariff,%; 12—customs duty > 15%, most-favored-nation treatment,%; 13—customs duty > 3\* arithmetic mean of the bound tariff,%; 14—customs duty > 3\* the arithmetic mean of the most-favored-nation treatment,%; 15—preferential terms that have not yet been enacted in 2019,%; 16—number of individual customs rates, bound tariff; 17—the number of individual customs rates, the most favored-nation treatment; 18—coefficient of variation, bound tariff; 19—coefficient of variation, the most-favored-nation treatment; 20—the number of tariff rates of the most-favored-nation treatment.

Among the indicators of balanced development, we singled out those that were selected for analysis and formed the set of variables Y: 1—Human Development Index (HDI); 2—GDP per capita at purchasing power parity, US dollars; 3—the level of terrorist activity (Global Terrorism Index), 4—Corruption Perceptions Index, 5—the index of involvement of countries in international trade (Global Enabling Trade Index), 6—Environmental Performance Index; 7—Social Progress Index; 8—Global Competitiveness Index; 9—Business Freedom Index; 10—Global Peace Index.

We determined the structure of relationships and dependencies between the variables of both sets using the tools of canonical correlation analysis using STATISTICA software given that the customs space is unstable, so it complicates the process of establishing relationships between the characteristics. In world practice, the method of canonical correlations has been used in various fields and has long been used in studies (Hoad 2016; Hillberry and Zhang 2018; Li and Li 2019).

The input data in the canonical analysis, where  $x_1, x_2, \dots, x_n$  are independent variables (factorial variables);  $y_1, y_2, \dots, y_m$  are dependent variables (resulting variables). The purpose of the canonical analysis is to identify correlations between factorial and resulting variables, that is to find such linear combinations between two new canonical variables A and B so that the correlation between them is maximum. The level of the new canonical variables has the following form:

$$A = a_1x_1 + a_2x_2 + \dots + a_nx_n \tag{1}$$

$$B = b_1y_1 + b_2y_2 + \dots + b_ny_n \tag{2}$$

Originally, 174 countries were selected for analysis (Appendix A, Table A1), but the final sample was formed by  $N = 98$  countries (Appendix B, Table A2). With the help of the tools of canonical correlation analysis, using STATISTICA software, the structure of relationships and dependencies between variables of both sets were determined.

All calculations (results—Appendix B (Table A2) and Appendix C (Table A3) were carried out using the Multivariate Adaptive Regression Splines (Mar Splines) module in STATISTICA. The basic functions, the influence of factors, and the factors that ensure the balance of the customs space were identified. The applied method is a non-parametric procedure based on the used data without assumptions, allowing you to identify functional dependencies between predictor and dependent variables and including two stages—“forward” and “backward”.

The obtained results of the canonical analysis (Appendix C, Table A3) were adequate because the canonical value R (the first canonical root, which reflects the correlation between the weighted sums of variable sets X), is large (0.89735), and is highly significant ( $p < 0.0001$ ). For each set, there is the same number of canonical variables as the input variables. In our

case, there is an objective need for the canonical analysis because the constructed correlation matrices for the variables of both sets did not allow for establishing clear relationships between variables within both sets.

The percentage of indicators of the state of the global customs space, which determine the variations of indicators of sustainable (balanced) development, was established; canonical roots, canonical weights of indicators of the global customs space, and sustainable (balanced) development were calculated.

#### 4. Results

The global customs space is a field of activity of participants in international economic relations with different goals and interests, in particular, states, regional associations, transnational companies, as well as international criminal groups fighting for their interests, and the attempts to balance them in global terms have so far failed.

Customs space and its characteristics at all levels are one of the determinants of such balanced and sustainable development. One should take into account that the global customs space has an ambivalent effect on national economies.

The dependence between the two sets is confirmed by the calculated total share of variance and total loss (Table 1).

Table 1. Characteristic roots.

Root	Eigenvalues									
	Root 1	Root 2	Root 3	Root 4	Root 5	Root 6	Root 7	Root 8	Root 9	Root 10
Value	0.805240	0.684724	0.486463	0.427290	0.379699	0.297511	0.247794	0.119538	0.113054	0.074826

For variables of set X, the total loss is 32.6775% (such percentage of variation of variables of the customs space is explained by changes of indicators of sustainable and balanced development), and for variables of set Y, the total loss is 60.9344% (20 variables of set X explain changes in set Y by 60.93%). The total share of variance of the variables of set X is 61.5842%, and that of set Y is 100%.

A graphic representation of eigenvalues is presented in Figure 1.

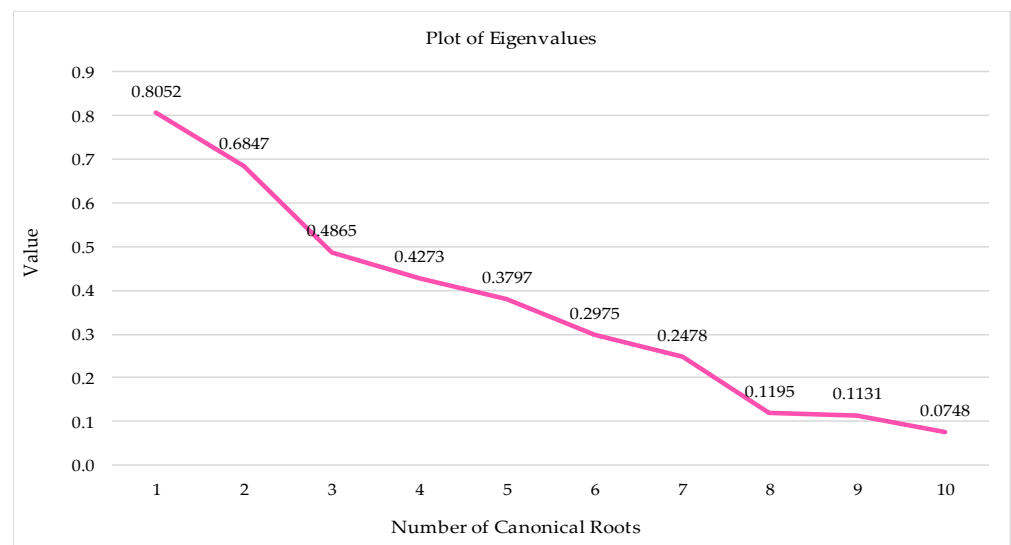


Figure 1. Graph of eigenvalues.

In the model, the smallest possible number of roots is equal to the smallest number of variables in both sets. In our case, it is 10. An important step is to check the significance of canonical correlations, in the process of which the program in turn assesses the significance

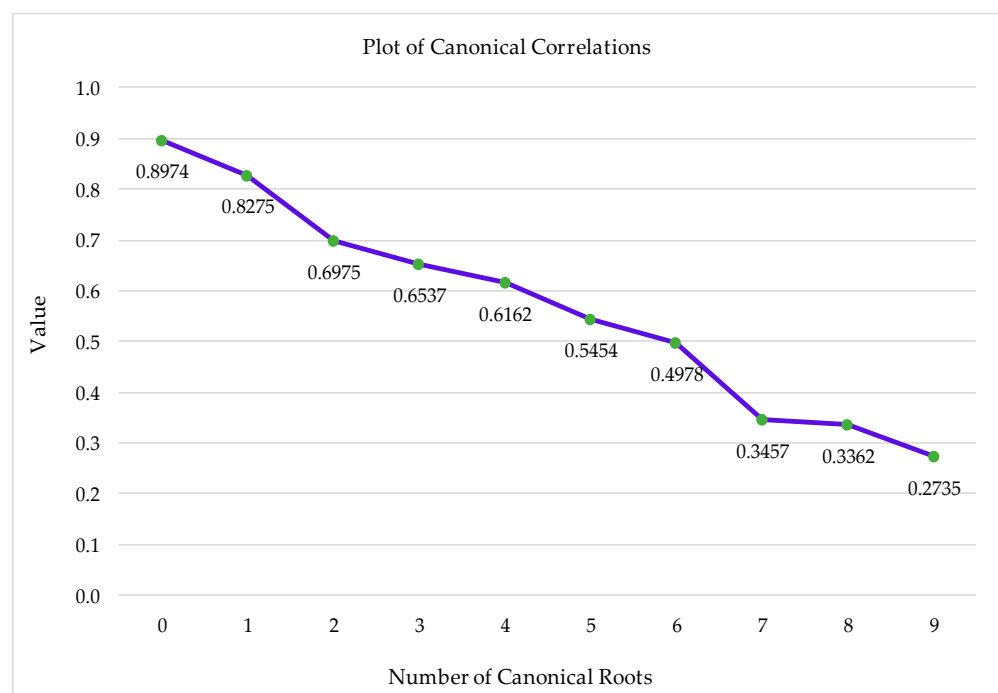


of the roots removing the previous one. Chi square test statistic even at small sample sizes allows you to reveal canonical correlations. Ten characteristics (Table 1) and ten canonical roots were obtained (Table 2). The most important is the first root ( $\chi$ -square = 444.5482;  $p < 0.0001$ ), and the canonical value  $R = 0.897352$ .

**Table 2.** Estimation of statistical significance of canonical correlations.

Root Removed	Chi-Square Tests with Successive Root Removed					
	Canonical R	Canonical R-sqr.	Cgi-sqr.	df	p	Lambda Prime
0	0.897352	0.805240	444.5482	200	0.000000	0.004277
1	0.827480	0.684724	311.2151	171	0.000000	0.021959
2	0.697469	0.486463	217.1392	144	0.000082	0.069649
3	0.653674	0.427290	162.8248	119	0.004829	0.135627
4	0.616197	0.379699	117.3987	96	0.068492	0.236815
5	0.545446	0.297511	78.4784	75	0.369393	0.381775
6	0.497789	0.247794	49.6986	56	0.710673	0.543460
7	0.345743	0.119538	26.4919	39	0.936488	0.722489
8	0.336235	0.113054	16.1162	24	0.883782	0.820579
9	0.273544	0.074826	6.3386	11	0.849828	0.925174

A graphical representation of canonical correlations is presented in Figure 2. The next step concerns the verification of the correlation of the first canonical root with the variables of sets X and Y by determining their factor structure.



**Figure 2.** Graph of canonical correlations.

We analyzed the structural coefficients in the left set (Appendix B, Table A2). It is noticeable that 20 variables of set X 10 correlate with the first canonical root, that is, they have a significant load on it.

There is a close relationship with such variables: non-ad valorem duty, bound tariff, %; the number of individual customs rates, bound tariff; the number of individual customs rates, and most-favored-nation treatment. There is an average relationship with such variables: imports, border crossing (hours); export time, border crossing (hours), %;

duty > 15%, most-favored-nation treatment, %; duty > 3\* arithmetic mean of bound tariff, %; duty > 3\* the arithmetic mean of the most-favored-nation treatment, %; coefficient of variation, most-favored-nation treatment; the number of tariff rates of the most-favored-nation treatment.

Regarding the right set, seven variables have the highest load on the first canonical root (Table 3): human development index; GDP per capita at purchasing power parity, US dollars; corruption perception index; global enabling trade index; environmental performance index; social progress index; global competitiveness index.

**Table 3.** Factor structure of the right set (set Y).

Root Variable	Factor Structure, the Right Set	
	Root 1	Root 2
Human Development Index	0.920447	0.007432
GDP per capita at purchasing power parity, US dollars	0.743164	0.208457
Terrorist activity level	-0.117864	-0.442463
Corruption Perception Index	0.676567	0.458954
Global Enabling Trade Index	0.847085	0.418918
Environmental Performance Index	0.896309	0.006174
Social Progress Index	0.864605	0.229713
Global Competitiveness Index	0.836657	0.030461
Business Freedom Index	0.570014	0.366788
Global Peace Index	-0.407824	-0.626864

Regarding the left set, the first canonical root extracts an average of 24.2% of the variance from the variables of the global customs space. Setting the values of variables of set Y, we can explain about 19.52% of the variance of the variables of set X (Table 4).

**Table 4.** Proportions of extracted variance for the left set.

Root Factor	Variance Extracted (Proportions), Left Set	
	Variance Extracted	Reddncy.
Root 1	0.242365	0.195162
Root 2	0.063755	0.043655
Root 3	0.040041	0.019478
Root 4	0.058681	0.025074
Root 5	0.027646	0.010497
Root 6	0.034425	0.010242
Root 7	0.047888	0.011866
Root 8	0.040625	0.004856
Root 9	0.037245	0.004211
Root 10	0.023172	0.001734

The first canonical root explains 53.3% of the variance in the variables of the set Y. With the help of the first canonical root, setting the values of variables in the left set, we can explain 42.9% of the variance in the variables of the right set (Table 5).

We used the canonical weights of the left and right sets to calculate the canonical variables. An increase in the canonical weight of the indicator led to an increase in its contribution to the value of the canonical variable. The canonical weights allow for finding out how the variables in each set affect the weighted sum (canonical variable).

**Table 5.** Proportions of extracted variance for the right set.

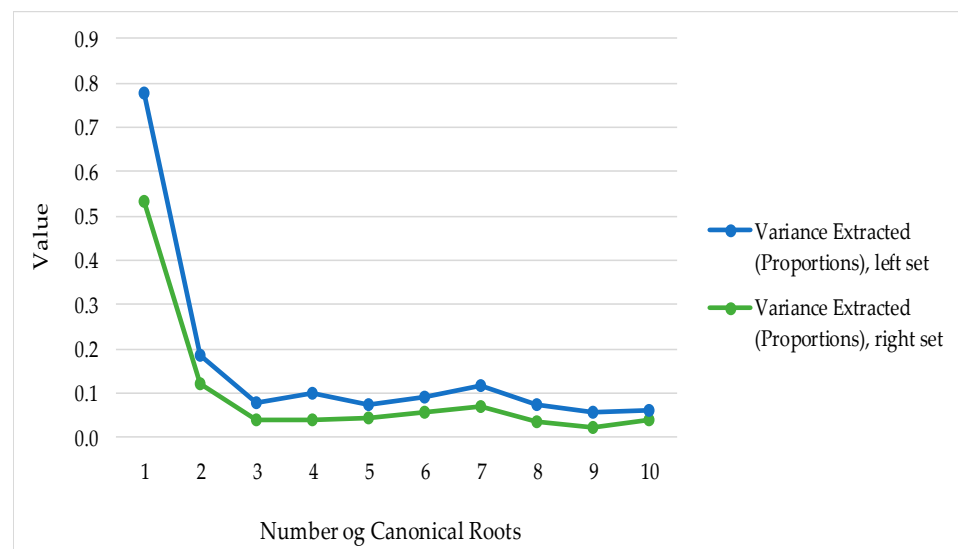
Root Variable	Variance Extracted (Proportions), The Right Set	
	Variance Extracted	Reddncy.
Root 1	0.533085	0.429261
Root 2	0.120664	0.082621
Root 3	0.039860	0.019391
Root 4	0.040195	0.017175
Root 5	0.045964	0.017452
Root 6	0.057180	0.017112
Root 7	0.068696	0.017022
Root 8	0.034120	0.004079
Root 9	0.021529	0.002434
Root 10	0.038708	0.002896

The equation of new canonical variables of both sets is obtained:

$$\begin{aligned}
 A = & 0.2627x_1 - 0.0589x_2 - 0.063x_3 + 10.308x_4 - 0.1375x_5 - 0.2362x_6 \\
 & - 10.2364x_7 + 0.1082x_8 - 0.0563x_9 + 0.0761x_{10} \\
 & + 0.0441x_{11} + 0.0066x_{12} - 0.0175x_{13} - 0.3363x_{14} \\
 & - 0.0697x_{15} + 0.2788x_{16} + 0.0384x_{17} + 0.3982x_{18} \\
 & - 0.2094x_{19} + 0.1952x_{20}
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 B = & 0.602381y_1 - 0.063731y_2 - 0.08494y_3 - 0.215029y_4 + 0.770486y_5 \\
 & + 0.505166y_6 - 0.591592y_7 + 0.086498y_8 - 0.106508y_9 \\
 & + 0.176923y_{10}
 \end{aligned} \tag{4}$$

To confirm the analysis made, we built a canonical variable scattering plot (Figure 3), which confirms the absence of significant outliers and values similar to A or B around the regression line. This state is satisfactory because the presence of pronounced outliers affects the calculation of canonical correlations. The estimation of the plot allows for identifying clusters, which are formed within the sample.



**Figure 3.** Canonical variable scattering plot.

We can conclude that there are no clear-cut clusters, but there is a noticeable accumulation of a group of countries closer to the upper end of the graph. The estimation of the positioning of countries on the plot allows for determining that this group of countries was formed by developed countries, mostly members of the European Union, including France,

Poland, Estonia, the Netherlands, the Czech Republic, Belgium, Greece, and others, including the United Arab Emirates, South Korea, and Japan. This suggests that these countries have characteristics, which are different from those of other countries, which is quite true because they are close both in socioeconomic development and customs characteristics.

The conducted analysis confirmed the existence of a relationship between the main indicators of global sustainable development and indicators of the state of the global customs space and allowed for identifying those characteristics of the customs space, the change of which is most noticeable to ensure sustainable development.

## 5. Discussion

An innovation platform should become one of the fundamental ones in the risk-oriented paradigm of balancing the customs space of a country because an innovation factor is an important determinant of the socio-economic development of its economy in the global environment and effective integration into the global space while maintaining competitiveness.

The development of an innovation platform provides for the following initiatives: monitoring of major technological innovations in the world, including the use of 4D and 5D printers; creation of a single IT system, including the connection of information systems of other countries, which will ensure rapid exchange of information, the ability to obtain preliminary information, identify the recipient of the goods, determine the degree of risk of the transaction, before the goods arrive at the checkpoint; use of modern methods of data processing in work with large arrays of information; creation and introduction of technical means of customs control, development of information system of international trade; use of the latest intelligent programs in the work of customs, for example, in the customs practice of other countries artificial intelligence algorithm is successfully used to determine risks (Okazaki 2018); introduction of innovative technologies for customs control, customs clearance (for example, the useful experience of customs procedures at Dubai Airport (UAE) using biometric technologies (Martincus et al. 2015).

The main priority vectors for the development of the customs space of developing countries and its effective integration into the global space should be the following:

- Considering the foreign economic nature of the origin of customs risks, taking into account in their profiles the specifics and structure of foreign economic activity in terms of its participants, the geography of its implementation, type of transport, volume and direction of cargo flows, as well as their structure (Chan et al. 2015).
- Development of an institutional platform for the customs space, which will combine all state bodies, institutions, and organizations involved in ensuring the security of space and its balanced development (Pourakbar and Zuidwijk 2018).
- Development of international cooperation and use of transit potential of the customs space of a country (Afontsev 2014).
- Intensification of professional development of specialists who will ensure the operation of the customs space institutional platform, including through distance learning (Tsirekidze 2019).
- Introduction of innovative technologies in the activities of customs institutions, taking into account the challenges of the 4.0 industrial revolution for national customs spaces and the possibility of future physical movement of goods produced using 4D and 5D printers across the border, which significantly distorts the organizational and institutional structure of customs (Darling 2015).

## 6. Conclusions

The differently-vectored interests of participants in international economic relations determine the specifics of the operation of the global customs space. The polarity of the vectors of foreign economic policy is due to the need to protect national interests on the international economic stage.

Analysis of the impact of the main characteristics of the customs space on indicators that reflect the social, environmental, and economic plane of risks confirmed the existence of a relationship between the main indicators of global sustainable development and indicators of the state of the global customs space. Based on this, the characteristics of the customs space were identified, the change of which is most noticeable for ensuring sustainable development.

Given the growing global threats and challenges to national economies, the hypothesis of the impact of the customs space on sustainable development was suggested. In the process of study based on the use of econometric modeling methods, variables were identified that are closely related to the characteristics of sustainable development.

The following variables have the greatest impact on the customs space: human development index, GDP per capita, corruption perception index, global enabling trade index, environmental performance index, social progress index, and global competitiveness index. In this paper, the factors influencing economic growth in countries and the degree of their involvement in international trade were identified.

Practical recommendations have been developed to the improvement of the customs space risk management system in a country based on the improvement of the existing theoretical-methodological approaches to assessing the riskiness of the customs space by taking into account the economic, social, and ecological components of the customs space.

Practical significance of the obtained results. The main results of the paper, in particular theoretical provisions, conclusions, and practical recommendations, can be used by state authorities when developing a strategy for reforming the customs system of a country, taking into account the risks and challenges of the global environment.

The authors improved the theoretical approaches to the assessment of the riskiness of the customs space, covering not only the customs component of the customs space, but also its environmental, social, and economic elements, which motivated the development of practical recommendations on the improvement of the risk management system of the country's customs space following the standards and international norms and the latest technical methods of customs control, software, and information systems and IT technologies.

Reforming customs and establishing clear powers for them, expanding customs cooperation, and developing a system of institutional and organizational risk management during customs control and customs clearance in the face of growing challenges in the global environment will contribute to balancing the customs space of a country based on the approaches laid down in the risk-oriented paradigm of the customs space formation.

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## Appendix A

Table A1. Numbering of countries according to UNDP indices.

1	Afghanistan	59	Gambia	124	Peru
2	Albania	60	Georgia	125	Philippines
3	Algeria	61	Germany	126	Poland
+4	Angola	62	Ghana	127	Portugal
5	Antigua and Barbuda	63	Greece	128	Qatar
6	Argentina	64	Grenada	129	Romania
7	Armenia	65	Guatemala	130	Russian Federation
8	Australia	66	Guinea	131	Rwanda
9	Austria	67	Guinea-Bissau	132	Samoa
10	Azerbaijan	68	Guyana	133	Saint Vincent and the Grenadines
11	Bahamas	69	Haiti	134	Sao Tome and Principe
12	Bahrain	70	Honduras	135	Saudi Arabia
13	Bangladesh	71	Hong Kong	136	Senegal
14	Barbados	72	Hungary	137	Serbia
15	Belarus	73	Iceland	138	Seychelles
16	Belize	74	India	139	Sierra Leone
17	Belgium	75	Indonesia	140	Singapore
18	Benin	83	Kenya	141	Slovak Republic
19	Bhutan	84	Republic of Korea (South Korea)	142	Slovenia
20	Bolivia	85	Kuwait	143	Solomon Islands
21	Bosnia and Herzegovina	86	Kyrgyz Republic	144	South Africa
22	Botswana	87	Lao PDR	145	Spain
23	Brazil	88	Latvia	146	Sri Lanka
24	Brunei Darussalam	89	Lebanon	147	Saint Lucia
25	Bulgaria	90	Lesotho	148	Saint Kitts and Nevis
26	Burkina Faso	91	Liberia	149	Suriname
27	Burundi	92	Lithuania	150	Swaziland
28	Cape Verde	93	Luxembourg	151	Sweden
29	Cambodia	94	Macau SAR, China	152	Switzerland
30	Cameroon	95	Madagascar	153	Tajikistan
31	Canada	96	Malawi	154	Tanzania
32	Central African Republic (CAR)	97	Malaysia	155	Thailand
33	Chad	98	Maldives	156	Timor-Leste
34	Chile	99	Mali	157	Togo
35	China	100	Malta	158	Tonga
36	Colombia	101	Mauritania	159	Trinidad and Tobago
37	Comoros	102	Mauritius	160	Tunisia
38	Democratic Republic of the Congo	103	Myanmar	161	Turkey
39	Republic of the Congo	104	Mexico	162	Uganda
40	Costa Rica	105	Moldova	163	Ukraine
41	Côte d'Ivoire	106	Mongolia	164	United Arab Emirates
42	Croatia	107	Montenegro	165	United Kingdom
43	Cuba	108	Morocco	166	USA
44	Cyprus	109	Mozambique	167	Uruguay
45	Czech Republic	110	Namibia	168	Uzbekistan
46	Denmark	111	Nauru	169	Vanuatu
47	Djibouti	112	Nepal	170	Venezuela
48	Dominica	113	Netherlands	171	Vietnam
49	Dominican Republic	114	New Zealand	172	Yemen
50	Ecuador	115	Nicaragua	173	Zambia
51	Egypt	116	Niger		
52	El Salvador	117	Norway		
53	Ethiopia	118	Oman		
54	Estonia	119	Pakistan		
55	Finland	120	Palau	174	Zimbabwe
56	Fiji	121	Panama		
57	France	122	Papua New Guinea		
58	Gabon	123	Paraguay		

### Appendix B

**Table A2.** The results of the canonical correlation analysis of the dependence of the customs space and sustainable development.

N = 98	Canonical Analysis Summary	
	Canonical R: 0.89735 Chi <sup>2</sup> (200) = 444.55 <i>p</i> = 0.0000	
	Left Set	Right Set
No. of variables	20	10
Variance extracted	61.5842%	100.000%
Total redundancy	32.6775%	60.9344%
Variables: 1	Net barter terms of trade	Human Development Index
2	Imports of goods and services (% of GDP)	GDP per capita at purchasing power parity, US dollars
3	Customs duty and other import taxes (% of tax revenues)	Terrorist activity level
+4	Logistics performance index	Corruption Perception Index
5	Time of import, border crossing (hours)	Global Enabling Trade Index
6	Time of export, border crossing (hours)	Environmental Performance Index
7	The efficiency of the customs clearance process	Social Progress Index
8	Duty-free, most-favored-nation treatment, %	Global Competitiveness Index
9	Non-ad valorem duty, bound tariff, %	Business Freedom Index
10	Non-ad valorem duty, most-favored-nation treatment, %	Global Peace Index
11	Customs duty > 15%, bound tariff, %	X
12	Customs duty > 15%, most-favored-nation treatment, %	X
13	Customs duty > 3 arithmetic mean of bound tariff, %	X
14	Customs duty > 3 arithmetic mean of the most-favored-nation treatment, %	X
15	Preferential terms that have not yet been enacted in 2019, %	X
16	Number of individual customs rates, bound tariff	X
17	Number of individual customs rates, most-favored-nation treatment	X
18	Coefficient of variation, bound tariff	X
19	Coefficient of variation, most-favored-nation treatment	X
20	Number of tariff rates, most-favored-nation treatment	X

### Appendix C

**Table A3.** Factor structure of the left set (set X).

Root Variable	Factor Structure, the Left Set		
	Root 1	Root 2	Root 3
Net barter terms of trade	-0.076167	-0.019435	-0.304932
Imports of goods and services (% of GDP)	0.087883	0.383995	-0.287508
Customs duty and other import taxes (% of tax revenues)	-0.016848	0.219997	0.181722
Logistics performance index	-0.106327	0.118739	-0.119042
Time of import, border crossing (hours)	-0.607252	-0.406659	0.144996

Table A3. Cont.

Root Variable	Factor Structure, the Left Set		
	Root 1	Root 2	Root 3
Time of export, border crossing (hours)	−0.635549	−0.393813	0.095065
The efficiency of the customs clearance process	−0.107956	0.123080	−0.121570
Duty-free, most-favored-nation treatment, %	0.225458	0.092618	−0.019574
Non-ad valorem duty, bound tariff, %	−0.708766	0.055926	−0.229487
Non-ad valorem duty, most-favored-nation treatment, %	−0.400056	−0.010045	0.136845
Customs duty > 15%, bound tariff, %	−0.387540	−0.239892	0.139522
Customs duty > 15%, most-favored-nation treatment, %	−0.602225	0.114348	0.182434
Customs duty > 3* arithmetic mean of bound tariff, %	−0.600790	0.225441	0.196453
Customs duty > 3* arithmetic mean of the most-favored-nation treatment, %	−0.657668	0.287198	0.015687
Preferential terms that have not yet been enacted, %	−0.067391	0.421803	0.422655
Number of individual customs rates, bound tariff	0.749929	0.240568	0.287653
Number of individual customs rates, most-favored-nation treatment	0.721224	0.347976	0.303215
Coefficient of variation, bound tariff	0.673200	0.134107	0.044361
Coefficient of variation, most-favored-nation treatment	0.398936	0.031500	0.109919
Number of tariff rates, most-favored-nation treatment	0.564657	−0.370910	0.048979

## References

- Addo, Atta. 2020. Controlling petty corruption in public administrations of developing countries through digitalization: An opportunity theory informed study of Ghana customs. *The Information Society* 37: 99–114. [CrossRef]
- Afontsev, Sergey A. 2014. From the Customs Union to the Common Economic Space: Risks and Opportunities. *Problems of Economic Transition* 56: 3–18. Available online: <https://www.tandfonline.com/author/Afontsev%2C+S+A> (accessed on 16 October 2022). [CrossRef]
- Al-A'wasa, Saleh Ibrahim Sulaiman. 2018. The impact of organizational justice on the counterproductive work behavior (CWB): A field study conducted in the Jordan Customs Department (JCD). *International Journal of Business and Social Science* 9: 27–38. Available online: [http://www.ijbssnet.com/journals/Vol\\_9\\_No\\_1\\_January\\_2018/4.pdf](http://www.ijbssnet.com/journals/Vol_9_No_1_January_2018/4.pdf) (accessed on 16 October 2022).
- Alimbekov, Aidos, Eldar Madumarov, and Gerald Pech. 2017. Sequencing in customs union formation: Theory and application to the Eurasian economic union. *Journal of Economic Integration* 65–89. Available online: <https://www.jstor.org/stable/44133858?seq=1> (accessed on 16 October 2022). [CrossRef]
- Alqaryouti, Omar, Nur Siyam, and Khaled Shaalan. 2022. Outlier Detection for Customs Post Clearance Audit Using Convex Space Representation. In *Recent Innovations in Artificial Intelligence and Smart Applications*. Cham: Springer, pp. 345–60. [CrossRef]
- Al-Shbail, Tariq. 2020. The impact of risk management on revenue protection: An empirical evidence from Jordan customs. *Transforming Government: People, Process and Policy* 14: 453–74. [CrossRef]
- Anshar, Muhammad. 2017. The impact of visionary leadership, learning organization and innovative behavior to performance of customs and excise functional. *International Journal of Human Capital Management* 1: 52–60. [CrossRef]
- Averfalk, Helge, and Sven Werner. 2017. Essential improvements in future district heating systems. *Energy Procedia* 116: 217–25. [CrossRef]
- Azhimetov, Yerulan. 2014. Customs duty as the basic customs payment: Features of legal regulation. *Life Science Journal* 11: 259–63. Available online: [http://www.lifesciencesite.com/lj/life1107s/053\\_24638life1107s14\\_259\\_263.pdf](http://www.lifesciencesite.com/lj/life1107s/053_24638life1107s14_259_263.pdf) (accessed on 16 October 2022).
- Basu, Gautam. 2014. Combating illicit trade and transnational smuggling: Key challenges for customs and border control agencies. *World Customs Journal* 8: 15–20. Available online: [https://worldcustomsjournal.org/Archives/Volume%208,%20Number%20%20\(Sep%202014\)/00%20Complete%20Issue%20WCJ\\_Volume\\_8\\_Number\\_2.pdf#page=22](https://worldcustomsjournal.org/Archives/Volume%208,%20Number%20%20(Sep%202014)/00%20Complete%20Issue%20WCJ_Volume_8_Number_2.pdf#page=22) (accessed on 16 October 2022).
- Bouvet, Florence, Alyson Ma, and Ari Van Assche. 2017. Tariff and exchange rate pass-through for Chinese exports: A firm-level analysis across customs regimes. *China Economic Review* 46: 87–96. [CrossRef]
- Cantens, Thomas, Robert Ireland, and Gaël Raballand. 2015. Introduction: Borders, informality, international trade and customs. *Journal of Borderlands Studies* 30: 365–80. [CrossRef]
- Cerezo-Román, Jessica. 2015. Unpacking personhood and funerary customs in the Hohokam area of southern Arizona. *American Antiquity* 80: 353–75. [CrossRef]
- Chalendard, Cyril, Gaël Raballand, and Antsa Rakotoarisoa. 2019. The use of detailed statistical data in customs reforms: The case of Madagascar. *Development Policy Review* 37: 546–63. [CrossRef]
- Chamberlain, Liz. 2019. Places, spaces and local customs: Honouring the private worlds of out-of-school text creation. *Literacy* 53: 39–45. [CrossRef]
- Chan, Hon-Ki, Huarong Zhang, Feng Yang, and Gunter Fischer. 2015. Improve customs systems to monitor global wildlife trade. *Science* 348: 291–92. Available online: <https://science.sciencemag.org/content/348/6232/291.summary> (accessed on 16 October 2022). [CrossRef] [PubMed]

- Coe, Neil. 2014. Missing links: Logistics, governance and upgrading in a shifting global economy. *Review of International Political Economy* 21: 224–56. [CrossRef]
- Darling, Linda T. 2015. Ottoman Customs Registers (Gümrük Defterleri) as Sources for Global Exchange and Interaction. *Review of Middle East Studies* 49: 3–22. [CrossRef]
- DHL. 2021. Global Connectedness Index–2021 Update. Available online: <https://www.dhl.com/global-en/delivered/globalization/global-connectedness-index.html> (accessed on 16 October 2022).
- Dionysopoulou, Panagiota, Georgios Svarnias, and Theodore Papailias. 2021. Total Quality Management in Public Sector, Case Study: Customs Service. *Regional Science Inquiry* 13: 153–68. Available online: [http://www.rsijournal.eu/ARTICLES/June\\_2021/11.pdf](http://www.rsijournal.eu/ARTICLES/June_2021/11.pdf) (accessed on 14 November 2022).
- Economic Competitiveness Package. 2022. World Customs Organization. Available online: <http://www.wcoomd.org/en/topics/key-issues/ecp-latest-proposal.aspx> (accessed on 14 November 2022).
- Elliott, Dan, and Carlotta Bonsignori. 2019. The influence of customs capabilities and express delivery on trade flows. *Journal of Air Transport Management* 74: 54–71. [CrossRef]
- EPI. 2020. Environmental Performance Index. Available online: <https://epi.yale.edu/downloads> (accessed on 16 October 2022).
- Erkoreka, Mikel. 2021. The European Union Customs Administration and the Fight Against Fraud. *European Papers-A Journal on Law and Integration* 2020: 1425–34. Available online: <https://www.europeanpapers.eu/es/europeanforum/european-union-customs-fight-against-fraud> (accessed on 16 October 2022).
- Fernandes, Ana Margarida, Russell Hillberry, and Alejandra Mendoza Alcántara. 2021. Trade effects of customs reform: Evidence from Albania. *The World Bank Economic Review* 35: 34–57. [CrossRef]
- Fischer, Denise, Malte Brettel, and René Mauer. 2020. The three dimensions of sustainability: A delicate balancing act for entrepreneurs made more complex by stakeholder expectations. *Journal of Business Ethics* 163: 87–106. [CrossRef]
- Francescangeli, Adriano. 2020. Demonstrating Real-World Applications of Chemistry in Customs Laboratories Facilitating Global Trade and Regulation by Guiding Students through Organoleptic Assessment of Olive Oil Using Their Senses of Taste and Smell. *Journal of Chemical Education* 97: 4400–5. [CrossRef]
- Fund for Peace. 2021. Fragile States Index. Available online: <https://fundforpeace.org/what-we-do/data-for-peace/> (accessed on 16 October 2022).
- González García, Ignacio, and Alfonso Mateos Caballero. 2021. A Multi-Objective Bayesian Approach with Dynamic Optimization (MOBADO). A Hybrid of Decision Theory and Machine Learning Applied to Customs Fraud Control in Spain. *Mathematics* 9: 1529. [CrossRef]
- Gordon, Neve, and Sharon Pardo. 2015. The European Union and Israel's Occupation: Using Technical Customs Rules as Instruments of Foreign Policy. *The Middle East Journal* 69: 74–90. [CrossRef]
- Grech, Shaun. 2015. Decolonising eurocentric disability studies: Why colonialism matters in the disability and global South debate. *Social Identities* 21: 6–21. [CrossRef]
- Grobbelaar, Sara, and Isabel Meyer. 2017. The dynamics of regional economic integration: A system dynamics analysis of pathways to the development of value chains in the Southern African Customs Union. *South African Journal of Industrial Engineering* 28: 73–89. [CrossRef]
- Hammadi, Lamia, Eduardo Souza de Cursi, and Vlad Stefan Barbu. 2017. Uncertainty Quantification in Risk Modeling: The Case of Customs Supply Chain. In *International Symposium on Uncertainty Quantification and Stochastic Modeling*. Cham: Springer, pp. 254–70. [CrossRef]
- Hendy, Rana, and Chahir Zaki. 2021. Trade facilitation and firms exports: Evidence from customs data. *International Review of Economics & Finance* 75: 197–209. [CrossRef]
- Herzog, Tamar. 2021. Immemorial (and native) customs in early modernity: Europe and the Americas. *Comparative Legal History* 9: 3–55. [CrossRef]
- Hillberry, Russell, and Xiaohui Zhang. 2018. Policy and performance in customs: Evaluating the trade facilitation agreement. *Review of International Economics* 26: 438–80. [CrossRef]
- Hoad, Neville. 2016. Queer customs against the law. *Research in African Literatures* 47: 1–19. [CrossRef]
- Ibsen, Christian Lyhne, Jonas Toubøl, and Daniel Sparwath Jensen. 2017. Social customs and trade union membership: A multi-level analysis of workplace union density using micro-data. *European Sociological Review* 33: 504–17. [CrossRef]
- Iovan, Marțian. 2020. Analysis of the Connections Between Law and Morals, Between Customs and Contemporaneity. *Journal of Legal Studies* 25: 57–68. Available online: <https://publicatii.uvvg.ro/index.php/jls/article/view/618> (accessed on 14 November 2022). [CrossRef]
- Jablonskis, Alvydas, Mara Petersone, and Karlis Ketners. 2018. Insights into the definition of customs logistics. *Intellectual Economics* 12: 16–33. [CrossRef]
- Karlsson, Lars. 2017. Back to the future of Customs: A new AEO paradigm will transform the global supply chain for the better. *World Customs Journal* 11: 23–34. Available online: [https://worldcustomsjournal.org/Archives/Volume%2011,%20Number%201%20\(Mar%202017\)/1827%2000%20WCJ%20v11n1%20COMPLETE.pdf#page=33](https://worldcustomsjournal.org/Archives/Volume%2011,%20Number%201%20(Mar%202017)/1827%2000%20WCJ%20v11n1%20COMPLETE.pdf#page=33) (accessed on 14 November 2022).
- Kelly, Martyn, Susanne Schneider, and Lydia King. 2015. Customs, habits, and traditions: The role of nonscientific factors in the development of ecological assessment methods. *Wiley Interdisciplinary Reviews: Water* 2: 159–65. [CrossRef]

- Kilkki, Olli, Antti Alahäivälä, and Ilkka Seilonen. 2014. Optimized control of price-based demand response with electric storage space heating. *IEEE Transactions on Industrial Informatics* 11: 281–88. [CrossRef]
- Kim, Sung-Bou, and Dongwook Kim. 2020. ICT Implementation and Its Effect on Public Organizations: The Case of Digital Customs and Risk Management in Korea. *Sustainability* 12: 3421. [CrossRef]
- Klippenstein, Ken. 2020. Exclusive: Customs and Border Protection gains an extra layer of secrecy. *The Nation* 4: 1–6. Available online: [https://immpolicytracking.org/media/documents/The\\_Nation\\_Exclusive\\_Customs\\_and\\_Border\\_Protection\\_Gains\\_an\\_Extra\\_Layer\\_of\\_Secrecy.pdf](https://immpolicytracking.org/media/documents/The_Nation_Exclusive_Customs_and_Border_Protection_Gains_an_Extra_Layer_of_Secrecy.pdf) (accessed on 16 October 2022).
- Langhout, Regina D., and S. Sylvane Vaccarino-Ruiz. 2021. “Did I see what I really saw?” Violence, percepticide, and dangerous seeing after an Immigration and Customs Enforcement raid. *Journal of Community Psychology* 49: 927–46. [CrossRef] [PubMed]
- Le, Thi. 2020. Trade liberalization and customs revenue in Vietnam. *The Journal of Asian Finance, Economics, and Business* 7: 213–24. [CrossRef]
- Li, Guo, and Na Li. 2019. Customs classification for cross-border e-commerce based on text-image adaptive convolutional neural network. *Electronic Commerce Research* 19: 779–800. [CrossRef]
- Lipshutz, David. 2019. Open problem—load balancing using delayed information. *Stochastic Systems* 9: 305–6. [CrossRef]
- Malefane, Malefa. 2021. Export-led growth hypothesis: Empirical evidence from the Southern African Customs Union countries. *Entrepreneurial Business and Economics Review* 9: 55–69. [CrossRef]
- Martincus, Christian, Jerónimo Carballo, and Alejandro Graziano. 2015. Customs. *Journal of International Economics* 96: 119–37. [CrossRef]
- Massa, Michele. 2014. Early Bronze Age burial customs on the central Anatolian plateau: A view from Demircihöyük-Sarıket. *Anatolian Studies* 64: 73–93. [CrossRef]
- McCarron, Eileen, and Gordon Chambers. 2021. A review of suitable analytical technology for physio-chemical characterisation of nanomaterials in the customs laboratory. *Talanta Open* 4: 100069. [CrossRef]
- Mikuriya, Kunio, and Thomas Cantens. 2021. If algorithms dream of Customs, do customs officials dream of algorithms? A manifesto for data mobilisation in Customs. *World Customs Journal* 14: 3–22. Available online: <https://worldcustomsjournal.org/Archives/Volume%2014%2C%20Number%202%20%28Oct%202020%29/1902%2001%20WCJ%20v14n2%20Mikuriya%20%26%20Cantens.pdf> (accessed on 14 November 2022).
- Morini, Cristiano, Paulo Costacurta de Sá Porto, and Edmundo Inácio Jr. 2017. Trade facilitation and customs revenue collection: Is that a paradox. *World Customs Journal* 11: 23–36. Available online: [https://worldcustomsjournal.org/Archives/Volume%2011,%20Number%202%20\(Sep%202017\)/1838%2000%20WCJ%20v11n2%20COMPLETE.pdf#page=31](https://worldcustomsjournal.org/Archives/Volume%2011,%20Number%202%20(Sep%202017)/1838%2000%20WCJ%20v11n2%20COMPLETE.pdf#page=31) (accessed on 16 October 2022).
- Nas, Çiğdem. 2018. Turkey-EU Customs Union: Its Modernization and Potential for Turkey-EU Relations. *Insight Turkey* 20: 43–60. Available online: <https://www.jstor.org/stable/26469843> (accessed on 14 November 2022). [CrossRef]
- Nelson, Christopher. 2020. Machine learning for detection of trade in strategic goods: An approach to support future customs enforcement and outreach. *World Customs Journal* 14: 124–34. Available online: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3817085](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3817085) (accessed on 16 October 2022).
- Okazaki, Yotaro. 2018. Unveiling the potential of blockchain for customs. *WCO Research Paper* 45: 1–24. Available online: [http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/research-paper-series/45\\_yotaro\\_okazaki\\_unveiling\\_the\\_potential\\_of\\_blockchain\\_for\\_customs.pdf](http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/research/research-paper-series/45_yotaro_okazaki_unveiling_the_potential_of_blockchain_for_customs.pdf) (accessed on 16 October 2022).
- Özer, Yonca. 2020. External differentiated integration between Turkey and the European Union: The customs union and its revision. *Turkish Studies* 21: 436–61. [CrossRef]
- Pourakbar, Morteza, and Rob Zuidwijk. 2018. The role of customs in securing containerized global supply chains. *European Journal of Operational Research* 271: 331–40. [CrossRef]
- Quimby, Barbara. 2015. Emerging customs: Small-scale fishing practices in Aceh, Indonesia. *Applied Geography* 59: 125–30. [CrossRef]
- Ramezani, Fahimeh, Jie Lu, and Farookh Khadeer Hussain. 2014. Task-based system load balancing in cloud computing using particle swarm optimization. *International Journal of Parallel Programming* 42: 739–54. [CrossRef]
- Rashki, Zahra, Abdolmajid Hasanqasemi, and Alireza Mazidi. 2014. The study of job rotation and staff performance in customs organization of Golestan and Mazandaran Provinces. *Kuwait Chapter of the Arabian Journal of Business and Management Review* 3: 186. Available online: [http://arabianjbm.com/pdfs/KD\\_VOL\\_3\\_7/16.pdf](http://arabianjbm.com/pdfs/KD_VOL_3_7/16.pdf) (accessed on 16 October 2022). [CrossRef]
- Rogić, Sunčica, and Ljiljana Kaščelan. 2021. Class balancing in customer segments classification using support vector machine rule extraction and ensemble learning. *Computer Science and Information Systems* 18: 893–925. [CrossRef]
- Song, Bo, Wei Yan, and Tianjiao Zhang. 2019. Cross-border e-commerce commodity risk assessment using text mining and fuzzy rule-based reasoning. *Advanced Engineering Informatics* 40: 69–80. [CrossRef]
- Suyunov, Abdunor, and Rushana Fakhriddinova. 2022. Improvement of customs control forms is the key to simplification of customs procedures. *Galaxy International Interdisciplinary Research Journal* 10: 698–706. Available online: <https://giirj.com/index.php/giirj/article/view/2038> (accessed on 16 October 2022).
- Świerczyńska, Jowita. 2019. The Role of Customs Clearance in Ensuring the Security and Protection of Cross-Border Trade in the European Union. *Bezpieczeństwo. Teoria i Praktyka* 4: 83–101. [CrossRef]
- The World Bank. 2018. The Logistics Performance Index. Available online: <https://openknowledge.worldbank.org/bitstream/handle/10986/29971/LPI2018.pdf> (accessed on 16 October 2022).



- The World Bank. 2022. Unemployment, Total (% of Total Labor Force) (Modeled ILO Estimate). Available online: <https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS> (accessed on 16 October 2022).
- Truel, Catherine, and Emmanuel Maganaris. 2015. Breaking the code: The impact of the Union Customs Code on international transactions. *World Customs Journal* 9: 12–23. Available online: [https://worldcustomsjournal.org/Archives/Volume%209,%20Number%202%20\(Sep%202015\)/1784%2000%20WCJ%20v9n2%20Complete.pdf#page=20](https://worldcustomsjournal.org/Archives/Volume%209,%20Number%202%20(Sep%202015)/1784%2000%20WCJ%20v9n2%20Complete.pdf#page=20) (accessed on 16 October 2022).
- Tsirekidze, David. 2019. Trade in intermediate inputs, customs unions, and global free trade. *Review of International Economics* 27: 666–93. [CrossRef]
- Veldhuis, Niek. 2022. Eduba R: The Customs of the Eduba. *Journal of Cuneiform Studies* 74: 3–16. Available online: <https://www.journals.uchicago.edu/doi/abs/10.1086/719860> (accessed on 14 November 2022). [CrossRef]
- Vlachová, Klára, and Dana Hamplová. 2022. The importance of christianity, customs, and traditions in the national identities of European countries. *Social Science Research*, 102801. [CrossRef]