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Trust and Distress Prediction in Modal Shift Potential of Long-Distance Road Freight in Containers: Modeling Approach in Transport Services for Sustainability

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Received: 31 May 2018; Accepted: 5 July 2018; Published: 8 July 2018

Abstract: Confidence in intermodal transport has not yet been defined. There are many different approaches to the concept of trust. However, the authors have integrated them with the paradigm shift in light of the challenges of sustainability. The objective of this article is to indicate the directions and criteria for that indicate the implementation of the paradigm shift, relative to the idea of sustainable transport. The auxiliary objective is to predict which countries in a given year will have the TRUST status, i.e., implement the paradigm shift, and which ones will not implement it (DISTRESS). The study used taxonometric techniques and built a model using General Discriminant Analysis. On these bases, the utility function was approximated, including the directions of implementation of the paradigm shift, depending on the scale of the environmental load of transport. Over the course of this research, an original and innovative econometric model was constructed, pointing to three variables which have the greatest impact on trust. Thanks to the cognitive value of the model, it is possible to identify individuals who deserve trust (i.e., it will implement the paradigm shift) with 93% probability. In the future, it is worth expanding the research by programing models for each country.

Keywords: sustainability; trust; distress; transport services; road freight transport; modal shift potential; paradigm shift; modeling; prediction; General Discriminant Analysis

1. Introduction

This article focuses on the extremely important subject of trust and distress prediction in the modal shift potential of long-distance road freight in containers. An attempt was made to define the concept of trust in the context of a modeling approach to transport services, including the concept of sustainability and the paradigm shift. The main hypothesis for this research is: Trust and distress in the implementation of the paradigm shift (based on cooperation) depends on the scale of the environmental burden of transport (production and consumption patterns). Expanding on this, it can be considered that quantitative predictors express the environmental burden of transport. The aim of the article is to indicate the directions and criteria for the implementation of the paradigm shift, relative to the idea of

sustainable transport. The auxiliary goal is to predict which countries in a given year will have the TRUST status, i.e., implement the paradigm shift, and which ones will not implement it (DISTRESS status). The structure of this work is aligned with these purposes and consists of six main parts: first—introduction; second—literature background, where previous work is described: the concept of trust is discussed, and interpretation of sustainable development and the paradigm shift are given. The third part describes the test methods used and presents the research stages. The fourth part presents an innovative, original, research-econometric model (General Discriminant Analysis, GDA), along with utility profiles. The article ends with a discussion and conclusions.

2. Literature Background

Every economic relationship is linked to trust, which is an essential link in services, especially transport. The complexity and dynamics of the real economic sphere, on the one hand, require cooperation and trust, and on the other, create economic distress. Therefore, the semantic delimitation of the term "trust" for classic and innovative approaches is necessary. The first approach is associated with a subjective measure, a repeating pattern. The second one takes into account new criteria. Selected literature items were used in terms of the economic environment. Traditionally, trust refers to a way of dealing with social uncertainty and complexity [1]. Confidence is of higher value and increases efficiency. This is a phenomenon that, in economics, is called external effects [2]. Thus, trust and confidence can be formulated as expectations that are formed in a community about the regular, honest, and cooperative behavior of other members of the community based on commonly recognized norms [3]. In addition, it is the expectation that the partner can be relied on, that he will keep his commitments in a predictable way, and that he will act honestly in the face of various possibilities [4]. It is difficult not to agree with Seligman's approach. Trust imposes, on the person of trust, the obligation to keep promises. What counts is the attitude of keeping the promise, the oath of honoring your own declaration of will [5], thus convincing one party of the relationship that the other party will not act their interests. This is accepted without doubts and suspicions in the absence of detailed information about the other party's actions [6], respecting the principles of many people in response to the need for a complex society. Trust is also the conviction that a business partner will take care not only of his or her interest to maintain the exchange relationship [7]. It is also a belief based on moral obligations [8]. Kramer dissociates himself from the recognition of trust as a belief, treating it as a compatible decision with ethical expectations [9]. It is an expression of free will.

The literature recognizes the contexts of the approach to trust, e.g., from the side of the consumer, manager, or the whole organization. On the one hand, it means there is a regulator of decisions made by consumers on the market [10], and the consumer has the expectation is that his weaknesses will not be used in a situation considered risky [11]. On the other hand, the manager has faith in the strength and capabilities of his subordinates [12]. Trust is also a factor enabling organizations to face the complexity and changeability of economic reality [13]. Trust, from a narrow perspective, is a component of customer relations in the logic of service dominance and in the concept of managing a promise [14]. This issue is also equated with a directed relation between two units: trusting and a trustee with risks [15], or the social aspect of the relations connecting participants of economic life [16]. So, trust could be considered the capital of credibility; it is the sum of the resources of economic and social benefits. It is worth noting that an organization is based on the uncertain future actions of people and is a key factor in the relationship [17]. Consumer confidence in the reliability and integrity of online resellers leads to a successful transaction (via the Internet) [18], with the belief that a trustworthy person is motivated by good intentions and that he is capable of fulfilling what is expected of him [19]. Trust is an organizational value which requires strong ethical foundations [20,21]. On the one hand (rational), this means the assessment of competence and credibility and the possibility of relying on the other person; on the other (affective), it is the result of emotional ties created between cooperating people [22]. These approaches to trust confirm its difficulty; however, it is possible to capture the concept of trust in a certain contextual framework. Common goals, despite the divergent transactional

interests of the service provider and the service buyer, stiffen the soft approach to trust. This applies mainly to the benefits of trust, for example, in transport: establishing long-term cooperation—sales of services and constant income for the service provider—and the utility of the service's consumer.

An innovative approach to trust captures it as a balance of strategic interaction (moral hazard and uncertainty in political activities) between agents and policy makers with incentives for deviations [23]. Trust is a key element of society, playing a crucial role in creating interaction and relationships in the context of a platform and peer-to-peer service [24]. It is further defined as a derivative of the personality of the individual and perceived object reliability [25], and faith in others to provide accurate assessments based on the preferences of the active user. Global trust is the average opinion of the whole community about the credibility of the user [26,27], relying on others not to be used. On the other hand, being trustworthy means that you do not use others for lack of satisfaction [28]. Confidence is influenced by intensively and dynamically diverse factors that appear in diverse environments, including the environment of the economic entity and the individual. For example, citizens' place trust in local government authorities. The level of attachment to tourist events affects perception and emotional reactions, creating support based on the theory of social exchange and cognitive theory of assessment [29,30]. The main difference in the perception of trust from traditional and modern perspectives is the distinction of relationships. It should also be noted that these relations are primarily differentiated by the nature of contact—i.e., direct and online, which are associated with different degrees of risk and uncertainty. There is a need to provide the consumer with services; not only full information about the service offer is provided, but also a data set and company credentials. Such is the case when providing, for example, transport services.

Modern global trust models include user reputation calculations, and almost all traditional local trust models define trust between two users based on their previous interactions. Confidence in the classical interpretation usually means expectation and conviction. In turn, in the novel approach—a promise. A common element in the various definitions of trust is the intention to accept support based on positive expectations. A look at trust in transport services requires taking into consideration at least two points of view: the client's perspective and the perspective of a carrier. Further, the type of transport and the content of transport, i.e., passengers or freight, must also to be considered. Taking into account the definitions of trust for the purposes of this article, the authors created a definition referring to the specificity of transport as close to Di Maggio [31] and Bachmann, Zaheer [13] treating trust as a factor enabling enterprises to better use the opportunities created by a variable security-based environment. So, the flow of goods and people is therefore a condition enabling organizations to face the complexity and volatility of economic reality. Furthermore, trust is based on the honoring of commitments and is a factor in facilitating the use of new opportunities provided by the changing environment [31].

Trust-related values are characteristics of service providers in relation to rational action, in accordance with the order of relations assigned to human-focused services. Among these traits, there should be a distinction between compulsiveness, accountability, credibility and a sense of mission. The desired direction, based on the idea of Ordo, is to shape the order corresponding to human nature, without which it is difficult or impossible to provide services [21].

In the framework of the presented positions, it is particularly important to place the issue of trust in transport. The problem of transport trust was raised in the studies by Ivuts and Matwiejczuk, who paid special attention to the contemporary complexity and multidimensionality of the transport process, as well as delivery time, which is considered one of the key factors determining the quality of transport services. The attractiveness of freight traffic is a fairly complex process, including services of various types of transport, forwarding services, handling of cargoes and their storage at terminals, etc. [32]. However, future-oriented, modern processes, including transport, require a continuous flow of information in order to constantly develop knowledge [33]. However, with regard to the movement of goods, services, and manpower, there are still many untapped possibilities for changing and extending economic activity. One of the solutions that can help to improve the business environment and economic growth is to ensure a unitary market [34].

As Załoga notes, in the context of the socioeconomic and political integration of the EU, liberalization is an appropriate method for the creation of a unitary market for transport services [35]. Regulation of the EU's transport services market has mainly relied on economic regulation of a structural nature (conditions for market access and the occupation of the carrier), which influenced the shaping of the supply side of services [35]. However, the interest in social regulation has increased in recent years. It has been caused by concern for the global environment, the need to ensure the safety of transport, and the users of transport services. As Załoga adds, economic and social regulations often seek to exclude, and even have conflicting objectives [35]. Sustainability is based on the principle of harmonization of objectives (economic, environmental, and social) and long-term actions with short-term decisions. Sustainability is linked to the need for development programming [36]. Alleviating these conflicting objectives is conducive to sustainable transport policies, derived from the idea of sustainable development [35]. One of the paradigms of sustainable transport is the paradigm shift—so-called modal shift. This paradigm is the expression of new patterns of production and consumption of services, relevant to environmental constraints [35]. Załoga notes the three conditions for the adoption of this paradigm in EU transport policy [35]:

1. The need to halt the dominance of road transport in the transport needs of society and the economy; road transport is characterized by a relatively high environmental impact and affects the barriers to supply of services of modes (congestion, occupancy of area).
2. The occurrence of high-substitutability services of inland (road and rail) and water transport.
3. High complementarity between modes and means of transport.

In principle, the paradigm shift refers to two types of shifts [35]:

- freight—from road transport to water or rail transport;
- people/passengers—from the use of passenger cars to public transport.

From the paradigm shift perspective, the functionality of complementary transport is important. Land transport (road and rail) is a condition for the operation of air and water transport, as it links these transport modes with their target markets [37]. Therefore, the question of cooperation and trust plays an important role.

According to Kożuch and Sienkiewicz-Małyjurek, the phenomenon of cooperation between organizations derives from the necessity of cooperation, goodwill, commitment, and trust [38]. This approach should, in principle, serve as a basis for the implementation of the paradigm shift. Moreover, from an analytical perspective, reference should be made to the approach by Jabłoński [39]. He points out that, when performing a multidimensional analysis, attention should be paid to the importance of public trust in value building. Trust becomes a determinant of the relationship between individual stakeholders and the audience of public value development [39]. These groups may be referred to as all transport users, including paradigm shift implementers and recipient services formed by the realization of this paradigm.

The literature describes many strategies for sustainable transport and decarbonization of transport. However, they are based on strategic areas, in which aspects such as the improvement of transport efficiency, fuel charges, reduction of carbon intensity, or energy intensity, are important [40–43]. Issues that are particularly discussed include, above all, transport demand, energy intensity of transport, intensity of carbon dioxide emissions from transport, modal shift, and transport activity [40–43]. However, all issues fall within the subject of the paradigm shift, because it takes into account the sensitive aspects of sustainable transport. During the analysis of these critical strategic areas for sustainable transport, it is important to take into account the spatial diversity [44,45].

An important contribution to the study of the paradigm shift in (marine) transport was provided by SHINOHARA [46]. It is true that the author did not use an econometric model, but rather presented a conceptual study based on methods of supporting the decision-making process. However, he referred to the mechanism of rationality for the maritime management processes, raising such aspects as

morality and ethics in favor of economic aspects. He drew attention to trust-oriented relations in light of the implementation of the paradigm shift [46].

Equally interesting are the studies conducted by Tuominen, Kanner, and Linkama [47]. The study was based on a theoretical approach to transport planning, using strategic political documents, empirical materials, and a survey addressed to European transport experts (including ERA-NET TRANSPORT, EPTR, and ECTRI networks). About 70 invitations to participate in the survey received 21 responses from experts from the following countries: Austria, France, Germany, Greece, Hungary, Lithuania, the Netherlands, Norway, Spain, Sweden, Switzerland, and the UK. The areas that were included in the study and which were part of the questions in the questionnaire concerned: new governance and organizational structures of the public sector, improved efficiency of the transport sector, transport design for the end-user of transport technologies and services, and new operational procedures to increase innovation in transport [47].

A slightly more recent study was conducted by Tattini, Gargiulo, and Karlsson on modal shifts in the transport sector in Denmark [48]. In their article, they did not use the name paradigm shift, but they referred to the paradigm of modeling, and their interpretation of the problem refers, in its essence, to the paradigm shift. Furthermore, they used the TIMES energy modeling method, focusing on the problems of operational research, and the scenario method. The authors focused on passenger transport, which is different from freight transport. The survey was carried out using data on transport infrastructure, time, fuel, and demand [48]. However, it should be emphasized that while the postulate regarding the need to decarbonize transport can also be transferred to research on freight transport, cargo transport has a completely different specificity and fulfills slightly different functions for the economy. Therefore, it also requires a different approach.

Also interesting are studies on the need for new methods in the paradigm shift of mobility towards sustainable accessibility [49]. Although the study refers to passenger transport, the method of forecasting using the BAU (business as usual) scenario method deserves attention. The study was presented based on Sweden, Norway, Hungary, and Poland. The analysis addressed the problem of decarbonization, energy efficiency, recoverable sources, and the social efficiency of transport. Transport efficiency, transport intensity, and technology level were also considered.

It is also worth mentioning the research carried out by Ercan, Onat, Tatari, and Mathias. They are also concerned with passenger transport (public transport), however, the approach to analysis was not timebound and the analysis deepened [50]. The authors studied the causality directionality between variables and constructed a dynamic development model. It included both macroeconomic factors and transport efficiency, as well as the negative impact on the environment. However, the discussion on multidimensional sensitivity analysis and policy analysis is interesting in these studies. On the one hand, behavioral limitations were tested for policy implications; on the other hand, they assessed leverage for policy implications [50].

There have not yet been any studies in which the paradigm shift in freight transport (especially intermodal transport) was examined in relation to the trust modeling. It should be pointed out that the presented approach is quite generalized, hence, it can only be treated as preliminary research, introducing deeper analyses. The presented approach is consistent with the concept presented in the *White Paper*. It is not easy to discuss the variables and research techniques used, because, in principle, the methodology was not proposed using the example of intermodal transport for long distances. On the one hand, it addressed implementing the needs of the economy and supporting other modes of transport, and, on the other hand, it was oriented on trust in the sense of implementing the paradigm shift. The authors have made every effort to fill this research gap and present a kind of novelty in terms of the methods used. The work mainly uses General Discrimination Analysis, which can be used to decide on the selection of trust-oriented or distress-oriented units. There are various studies where this method is used, for example: Zioło, Porada-Rochoń, and Szaruga [51]; Safo and Ahn [52]; Chen and Jiang [53], or Dai and Li [54]. However, these studies were applied to completely different issues. The presented approach is aimed at introducing such a significant discussion as though

proposing a toolkit for assessing rather soft aspects, such as trust and distress, in the sense of the paradigm shift for transport. Therefore, the study of the modal shift potential of long-distance road freight in containers seems to be quite interesting in this context. The proposed approaches of the above researchers have led the authors to combine these aspects into one study.

3. Data, Methods, and Steps

In order to carry out the study on trust and distress prediction in the modal shift potential of long-distance road freight in containers, the secondary data from Eurostat [55] and OECD.Stat [56] databases were used. It was assumed that the research period is 2011–2015. The beginning of the research period coincides with the year of publication of the final "*White Paper: Roadmap to a Single European Transport Area—Towards a Competitive and Resource Efficient Transport System*" [57], and the end of this period is when data was last updated. Sixteen countries were included: Bulgaria, Czech Republic, Finland, France, Hungary, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, and the United Kingdom. The choice of countries was deliberately limited to the European territory, and was dictated by the quality, completeness, and availability of the data during the analysis period. The following designations and abbreviations for the representative variables in the paper were used (quantitative predictors express the environmental burden of transport; the abbreviations come from the first letters of keywords for variables that were considered for inclusion in the study):

Trust: one of the dichotomous values for the DT variable for trust status, corresponds with value equal to 1;

Distress: one of the dichotomous values for the DT variable for distress status, corresponds with value equal to 0;

DT: qualitative dependent variable that is vector-encoded (dummy variable); takes the value equal to "Trust" (trust status, not distress) or "Distress" (distress status, not trust); to specify the value, the data from Eurostat database for the modal shift potential of long-distance road freight in containers [tran_im_mosp] were used (percentage of total tkm). In the event that this structure ratio has not increased in relation to the reference period (2011), the variable DT was equal to "Trust" (1); if has increased, then it took the value equal to "Distress" (0);

TS: continuous predictor; modal shift potential of long-distance road freight in containers (in percentage of total tkm); data from Eurostat database [tran_im_mosp];

RFTG: continuous predictor; road freight transport intensity (in tkm per 1000 units of current USD GDP); data from OECD.Stat [..IND-Meas-Roadgood-GDP];

SRFT: continuous predictor; share of road freight transport in total inland freight transport (in percentage); data from OECD.Stat [..IND-Meas-Roadgood-Share];

CO2EG: continuous predictor; CO_2 emissions from transport (in tonnes per 1,000,000 units of current USD GDP); data from OECD.Stat [..IND-Ene-GDP];

SCO2: continuous predictor; share of CO_2 emissions from road in total CO_2 emissions from transport (in percentage), data from OECD.Stat [..IND-Ene-Road];

ENRTG: continuous predictor; energy intensity of road transport expressed by ratio of motor fuel deliveries (in tonnes per 1,000,000 units of current USD GDP); data from OECD.Stat [..IND-Ene-Fuel-GDP].

The division into a dependent variable and continuous predictors was made using the top-down method based on the expert knowledge of the authors; it also resulted from the hypothesis and purpose of the study. However, it should be emphasized that there are econometric methods of division into endogenous and exogenous or quasi-exogenous variables, in which numbers of lags and the degree of cointegration also play an important role. This group includes Vector Autoregressive Models, Vector Error Correction Models (and their structural forms), and Granger causality tests (in the sense

of immediate and delayed causality). The authors have done several other studies in the search for the direction of dependence, the chain of causes, and feedback using these methods [58–62]. However, in this study, the authors focused on a completely different perspective, focusing on the problem of trust orientation.

The authors propose the following research framework (Figure 1) that can be used to conduct similar studies on examples from other countries or groups of countries. Each stage in the below procedure is described in further parts of the work. However, the results from the implementation of this procedure are described in the next part of the work.

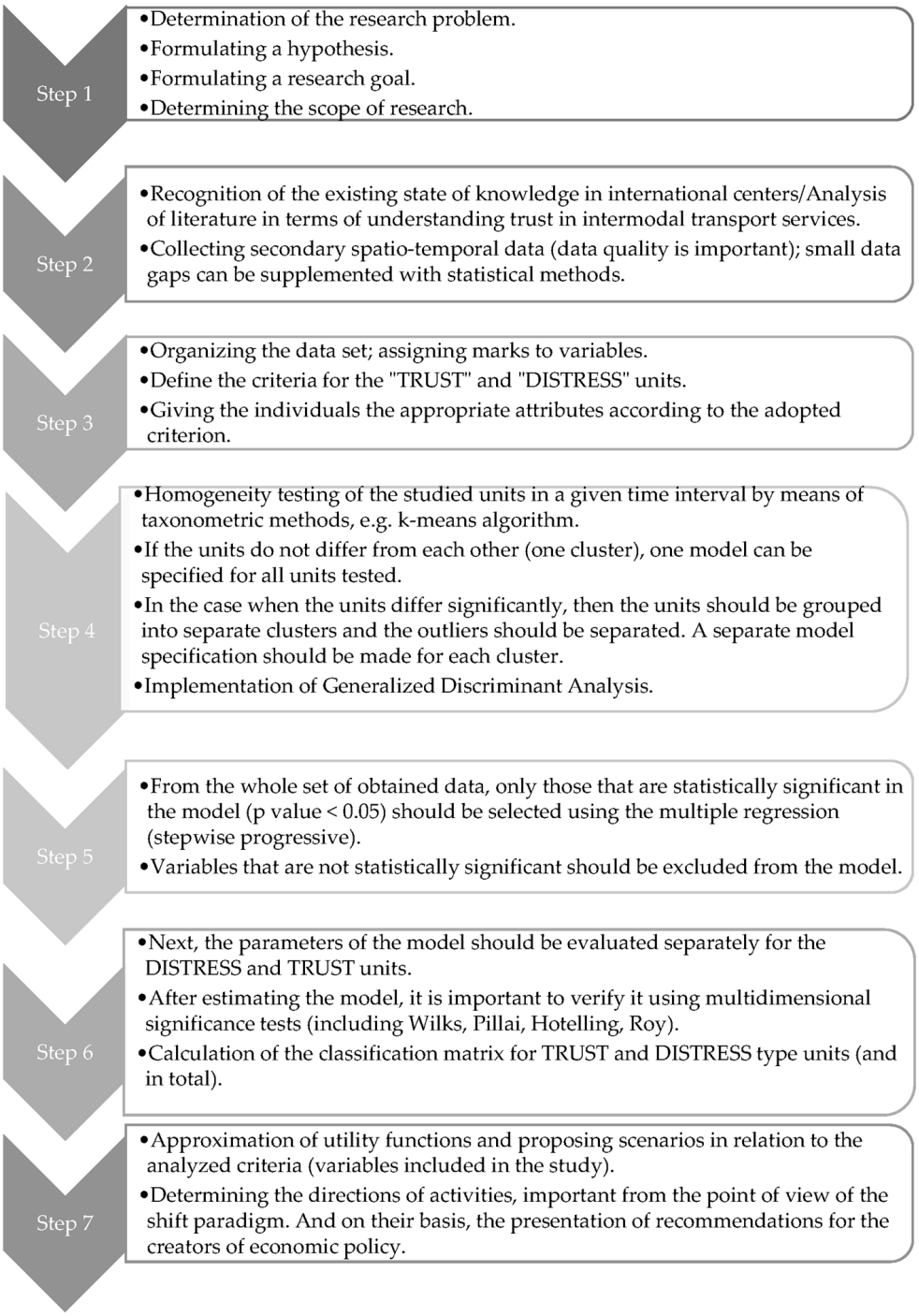

Figure 1. An original proposal for a framework. Source: own calculation elaboration.

The first step in the study was to identify the status (trust/distress) of each country and year on the basis of the criteria described below (Table 1). It was assumed that EU countries that have implemented the paradigm shift (during 2011–2015), which are inscribed in the sustainable transport policy, can be called TRUST. Those that have not realized it (during 2011–2015) were named DISTRESS.

Table 1. Countries and years with trust status and distress status in the modal shift potential of long-distance road freight in containers for selected European countries.

Country	2011	2012	2013	2014	2015
Bulgaria	Trust	Trust	Trust	Trust	Trust
Czech Republic	Trust	Distress	Distress	Trust	Trust
Finland	Trust	Distress	Trust	Distress	Trust
France	Trust	Trust	Distress	Distress	Trust
Hungary	Trust	Distress	Distress	Distress	Distress
Latvia	Trust	Distress	Trust	Trust	Trust
Lithuania	Trust	Distress	Distress	Distress	Trust
Luxembourg	Trust	Distress	Trust	Trust	Trust
Netherlands	Trust	Trust	Trust	Trust	Trust
Poland	Trust	Trust	Distress	Distress	Trust
Portugal	Trust	Trust	Trust	Trust	Trust
Slovak Republic	Trust	Trust	Trust	Trust	Trust
Slovenia	Trust	Distress	Trust	Trust	Distress
Spain	Trust	Trust	Distress	Trust	Trust
Sweden	Trust	Trust	Distress	Trust	Trust
United Kingdom	Trust	Distress	Trust	Trust	Trust

Source: own elaboration based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database (access: 2 May 2018).

As indicated in Table 1, Bulgaria, Netherlands, Portugal, and Slovak Republic had the trust status throughout the entire period considered, which means that they had implemented the principles of the paradigm shift in 2011–2015. Hungary, which, in the years 2012–2015, had a distress status relative to the paradigm shift, remains in that context. Among the countries that were marked with the distress status for only one calendar year were: Latvia, Luxembourg, Spain, Sweden, and the United Kingdom. Apart from being the reference year, the year 2011 was characterized by having the highest number of states with the status of trust (87.5%). The situation was bad in 2012—as many as 50% of the analyzed countries had the status of distress.

The next stage of the study consisted of classifying the examined countries into clusters due to similar features. This stage is necessary due to the possibility of outliers or the occurrence of several smaller clusters (composed of several countries that are similar in terms of the studied statistical features). If outlier observations are not identified, or smaller clusters are not isolated (the distance from the center is similar), it is possible to specify and estimate one model for all tested units (states). Then, these units are treated as one focus. In short, this stage can be defined as a preliminary assessment of the spatial differentiation of the studied features. For this purpose, the k-means algorithm was used (taking into account standardization, the measure of Euclidean distance, and maximization of cluster distances from initial centers). Previously, the test was conducted using a test sample, where it was assumed that the minimum number of clusters is 1, and the maximum is 16; the minimum decrease is 5%. As a result of the clustering properties assessment, only one cluster was verified, and the distances from the center of the cluster were estimated (Table 2).

Table 2. Distances from the center of the cluster.

Country	2011	2012	2013	2014	2015
Bulgaria	1.0509	0.8743	0.9040	0.9104	1.2677
Czech Republic	1.1539	1.4682	1.4597	1.0809	1.1800
Finland	1.2261	1.4941	1.1449	1.4995	1.2797
France	1.1918	1.1200	1.4784	1.5034	1.1979
Hungary	1.1646	1.4722	1.4447	1.4739	1.5637
Latvia	1.4598	1.6924	1.2742	1.2750	1.3906
Lithuania	1.3194	1.5994	1.6095	1.6149	1.3956
Luxembourg	1.3144	1.5965	1.1838	1.1881	1.2510
Netherlands	1.3930	1.3373	1.3369	1.3530	1.4444
Poland	1.2312	1.1528	1.5352	1.5337	1.2991
Portugal	1.1811	1.1163	1.0778	1.1056	1.1961
Slovak Republic	1.3350	1.3252	1.1364	1.1790	1.2453
Slovenia	1.4236	1.7351	1.3847	1.3661	1.7967
Spain	1.2731	1.1786	1.5885	1.1301	1.1964
Sweden	1.2385	1.1674	1.5128	1.1998	1.2667
United Kingdom	1.2335	1.5241	1.1573	1.2246	1.2884

Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

By means of the estimated Euclidean distances from the center of the cluster using the k-means method, it can be concluded that there were no years when any of the countries significantly differed from each other for the studied statistical features. There were no outliers were detected. Therefore, all years and all countries can be included in one model without the need to divide the sample into smaller ones.

The next stage of the research was the evaluation of the variability of the variables under investigation, and then the estimation of the model parameters using GDA. After positive verification of the model for the desired properties, an approximation of the utility function was made. To this end, the utility function for TRUST was defined:

- low-for 0.00, utility is 0.00,
- indirect: for 0.50, utility equal to 0.50,
- high: for 1.00, utility 1.00

whereby optimum values were assigned to the factors. The curvature of s (low) is equal to 1.00 and t (high) is equal to 1.00. The inverse range would have the usability function for DISTRESS for low value of high usability and for high value of low usability. In practice, it only required replacing colors on the service contour profiles of scenarios (see Section 3). The test culminated in obtaining profiles for a posteriori and utility probabilities. The empirical results are shown in the following section.

4. Empirical Results

Table 3 shows the basic descriptive statistics for the variables examined. The data show that the greatest variability (in the spatial–temporal dimension) characterized the variable RFTG, and the smallest was for SCO2. The variability in the spatial–temporal dimension of the remaining variables was at a predictable level of 30–40%.

Table 4 provides a summary of the multiple regression (stepwise progressive). In four stages, it was possible to determine the variables included in the model and those excluded from it. Only three variables were significant from the point of view of the conducted study, i.e., TS, CO2EG, and ENRTG. Therefore, the parameters of the General Discriminant Analysis (GDA) were evaluated further, with all effects at the next stage.

Table 3. Basic descriptive statistics for cluster.

Variable	Mean	Standard Deviation	Variation Coefficient
TS	53.9900	17.4480	32.3171
RFTG	227.7875	181.8065	79.8141
SRFT	70.2575	19.4214	27.6431
CO2EG	76.9625	31.6230	41.0888
SCO2	95.0375	3.3246	3.4982
ENRTG	23.5375	10.4093	44.2242

Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

Table 4. Multiple regression summary (stepwise progressive).

Effect	Steps	F to Put	P to Put	Decision
TS	**Step 1**	**7.89943**	**0.006250**	**Entered**
RFTG		0.44796	0.505283	Outside
SRFT		0.32878	0.568026	Outside
CO2EG		0.00414	0.948879	Outside
SCO2		1.09327	0.298977	Outside
ENRTG		1.13102	0.290839	Outside
TS	**Step 2**			**In model**
RFTG		1.85578	0.177084	Outside
SRFT		0.08135	0.776241	Outside
CO2EG		**11.43696**	**0.001134**	**Entered**
SCO2		0.80317	0.372940	Outside
ENRTG		0.65892	0.419444	Outside
TS	**Step 3**			**In model**
CO2EG				**In model**
SRFT		0.00513	0.943069	Outside
RFTG		0.40656	0.525637	Outside
SCO2		1.67220	0.199882	Outside
ENRTG		**4.20252**	**0.043813**	**Entered**
TS	**Step 4**			**In model**
CO2EG				**In model**
ENRTG				**In model**
RFTG		0.28034	0.598040	Outside
CO2EG		0.16052	0.689815	Outside
SRFT		0.26922	0.605384	Outside

The variables that have been included in the model are highlighted in bold. Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

The model includes only those variables that are statistically significantly different from zero. The main test the re-estimation procedure, followed by *p*-value evaluation. If the value was less than 0.05, the variable was included in the model. Each step of this procedure involved re-estimation of all variables and selection of one for which the *p*-value was less than 0.05. At each next stage, re-estimation was performed on only those variables whose *p*-value was greater than 0.05 (i.e., after elimination of the variable included in the model from the previous step). This procedure may have many stages, however, it ends when, in the set of variables not included in the model, a *p*-value lower than 0.05 cannot be obtained (see step 4). In this way, the set of variables was depleted, so the study only accounted for statistically significant variables that do not cause the model's quality to deteriorate.

Subsequently, the parameters of the General Discriminant Analysis (GDA) were evaluated (Table 5). The analysis of standardized coefficient β (beta) shows that the strongest influence on

the recognition of countries with the status of trust or distress is expressed by CO2EG, then TS and ENRTG. The standardized coefficient shows which variables are the most efficient in discriminating between trust and distress countries. The contribution to discriminating between the trust and distress class is distributed as follows: approx. 66.71% from TS, 79.37% from CO2EG, and 35.76% from ENRTG. The correct recognition of countries as trust units is indicated by the positive contribution of CO2EG and with negative TS and ENRTG. The opposite influence with the same level of discriminating efficiency was noted for distress units.

Table 5. The parameters evaluation of GDA for 16 analyzed countries (cluster).

Effect	Trust Parameter	Trust Standard Deviation	Trust t	Trust *p*-Value	Trust β	Trust Standard Deviation β
Const	1.1479	0.1463	7.8437	0.0000		
TS	−0.0172	0.0038	−4.5288	0.0000	−0.6671	0.1473
CO2EG	0.0113	0.0029	3.9158	0.0002	0.7937	0.2027
ENRTG	−0.0154	0.0075	−2.0500	0.0438	−0.3576	0.1744
Effect	**Distress Parameter**	**Distress Standard Deviation**	**Distress t**	**Distress *p*-Value**	**Distress β**	**Distress Standard Deviation β**
Const	−0.1479	0.1463	−1.0105	0.3155 [1]		
TS	0.0172	0.0038	4.5288	0.0000	0.6671	0.1473
CO2EG	−0.0113	0.0029	−3.9158	0.0002	−0.7937	0.2027
ENRTG	0.0154	0.0075	2.0500	0.0438	0.3576	0.1744

[1] no statistical significance. Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

Table 6 presents descriptive statistics for individual classes. Countries with the status of trust had, on average, lower energy intensity than countries with the distress status, and, to greater extent, they used transport modes other than the road (difference of 12 percentage points) in long-distance freight transport in containers. They also had a higher intensity of carbon dioxide than the states with distress status. However, it should be noted that the trust class has as many as 72.5% of the observations, and the distress class is the remaining 27.5%, so the difference in the intensity of carbon dioxide emission is insignificant.

Table 6. Basic descriptive statistics of predicates in classes.

Variable	Mean	Standard Deviation	Variation Coefficient	Mean	Standard Deviation	Variation Coefficient
	Trust (p = 0.7250)			**Distress (p = 0.2750)**		
TS	50.7517	17.6560	34.7890	62.5273	13.9207	22.2634
CO2EG	77.1035	34.0808	44.2014	76.5909	24.6802	32.2234
ENRTG	22.7759	10.8871	47.8010	25.5455	8.9481	35.0281

Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

Table 7 presents the tests of decomposition of effective hypotheses, verifying the significance of the variables used to identify trustworthy and unreliable units. Verification tests of Wilks, Pillai, Hotteling, and Roy show that all variables were significant. This analysis confirms that the selection of variables carried out in the previous stage was correct and did not disturb the information values of the model that can be read from it.

Table 7. Multivariate tests of significance.

Effect	Test	Value	F	Effect-df	Error-df	*p*
Const	Wilks	0.5526	61.5232	1	76	0.0000
	Pillai	0.4474	61.5232	1	76	0.0000
	Hotelling	0.8095	61.5232	1	76	0.0000
	Roy	0.8095	61.5232	1	76	0.0000
TS	Wilks	0.7875	20.5101	1	76	0.0000
	Pillai	0.2125	20.5101	1	76	0.0000
	Hotelling	0.2699	20.5101	1	76	0.0000
	Roy	0.2699	20.5101	1	76	0.0000
CO2EG	Wilks	0.8321	15.3336	1	76	0.0002
	Pillai	0.1679	15.3336	1	76	0.0002
	Hotelling	0.2018	15.3336	1	76	0.0002
	Roy	0.2018	15.3336	1	76	0.0002
ENRTG	Wilks	0.9476	4.2025	1	76	0.0438
	Pillai	0.0524	4.2025	1	76	0.0438
	Hotelling	0.0553	4.2025	1	76	0.0438
	Roy	0.0553	4.2025	1	76	0.0438

Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

Table 8 contains the percentages of countries correctly classified as a trust or distress class. The model allowed classification of up to 80% of cases into two groups. The model was more accurate for trusted units than untrusted ones. On this basis, the units with the trust status will be selected with greater probability than those with the status of distress. As many as 93% of the variables can correctly identify those units that will meet the criteria for achieving trust, but only in 45% can be selected those units that will change direction to the status of distress.

Table 8. Classification matrix to trust (1) or distress (0) for cluster.

Class	Percent-Correct	Trust	Distress
Trust	93.10345	54.00000	4.00000
Distress	45.45455	12.00000	10.00000
Totality	80.00000	66.00000	14.00000

Source: own calculation based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

Figure 2 shows the utility ranges of the examined criteria for the assessment of trust or distress in the modal shift potential of long-distance road freight in containers for selected European countries (scenarios). Red fields mean high utility, which is desirable (TRUST), and green low utility, which undesirable (DISTRESS). This means that there is not one optimal scenario for the implementation of the paradigm shift, and there are infinitely many of them. It is similar when it comes to DISTRESS.

As can be seen from Figure 2a, the usefulness in assessing TRUST type units from the point of view of realizing the paradigm shift is higher when the intensity of carbon dioxide emissions from transport is high at each level of modal shift. If the intensity of carbon dioxide emissions reaches, for example, a value of around 100 tonnes per 1 mln units of current USD GDP, road transport is best used only for handling 30% of cargo transport for long distances. However, these ranges are very wide (they are not linear). This means that for some countries, even with very high intensities of carbon dioxide emissions, cargo handling by road transport is ca. 80% advantageous. It may be conditioned by the quality, availability, and density of transport infrastructure (e.g., terminals, roads, etc.).

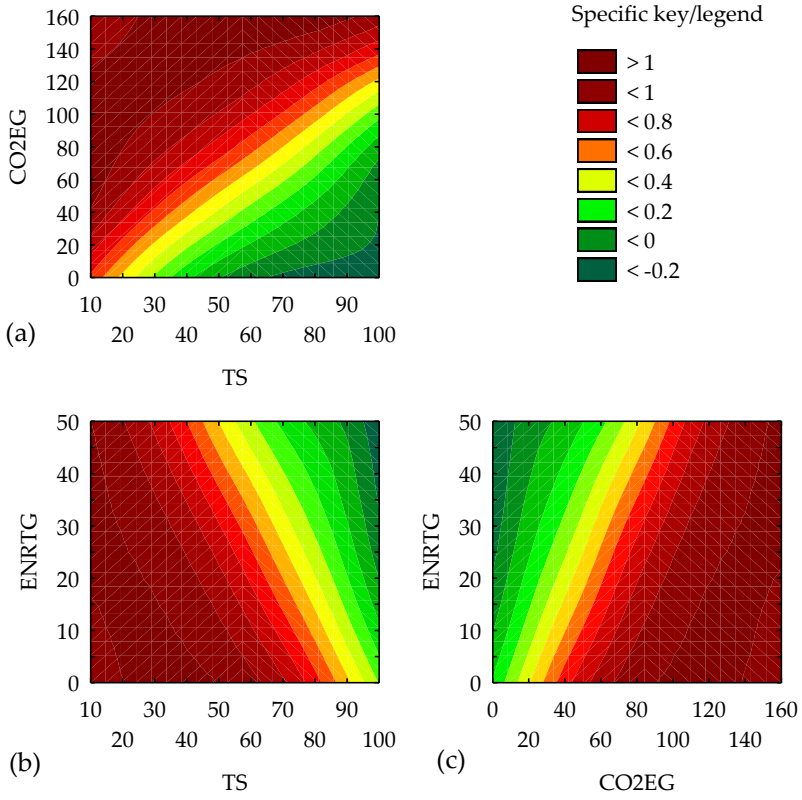

Figure 2. (**a**) Utility of the assessment of trust or distress, depending on the intensity of carbon dioxide emissions in transport and modal shift potential of long-distance road freight in containers for selected European countries; (**b**) utility of the assessment of trust or distress, depending on the energy intensity of road transport and modal shift potential of long-distance road freight in containers for selected European countries; (**c**) utility of the assessment of trust or distress depending on the energy intensity of road transport and the intensity of carbon dioxide emissions in transport. Source: own calculations based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

The results from Figure 2b are rather interesting for energy consumption of this type of transport in relation to its potential. As can be seen from the figure, at almost every level of energy consumption, road transport could handle 10–70% of cargo transport, above 70% usability falls, which means that the implementation of the paradigm shift is not threatened.

However, in Figure 2c, it can be noticed that the need to apply the paradigm shift occurs only at high levels of carbon dioxide emission intensity at each level of energy consumption in road transport. If the intensity of carbon dioxide emissions is not too high, then the implementation of the paradigm shift is not desirable.

In the summary of the investigation, the profiles for a posteriori and utility probabilities appear (Figure 3). The first row (four diagrams) refers to units with the "TRUST" status, and the second row is of units with the "DISTRESS" status. Diagrams in the third row—the last three drawings—relate to the general usefulness for all units under study. It is shown that the selected variables for the identification of the EU countries with the status of TRUST were well-founded. Total utility oscillated within the limits of 0.99. Furthermore, it is noteworthy to underline that the aggregate probabilities are 1.00, which indicates a properly conducted study.

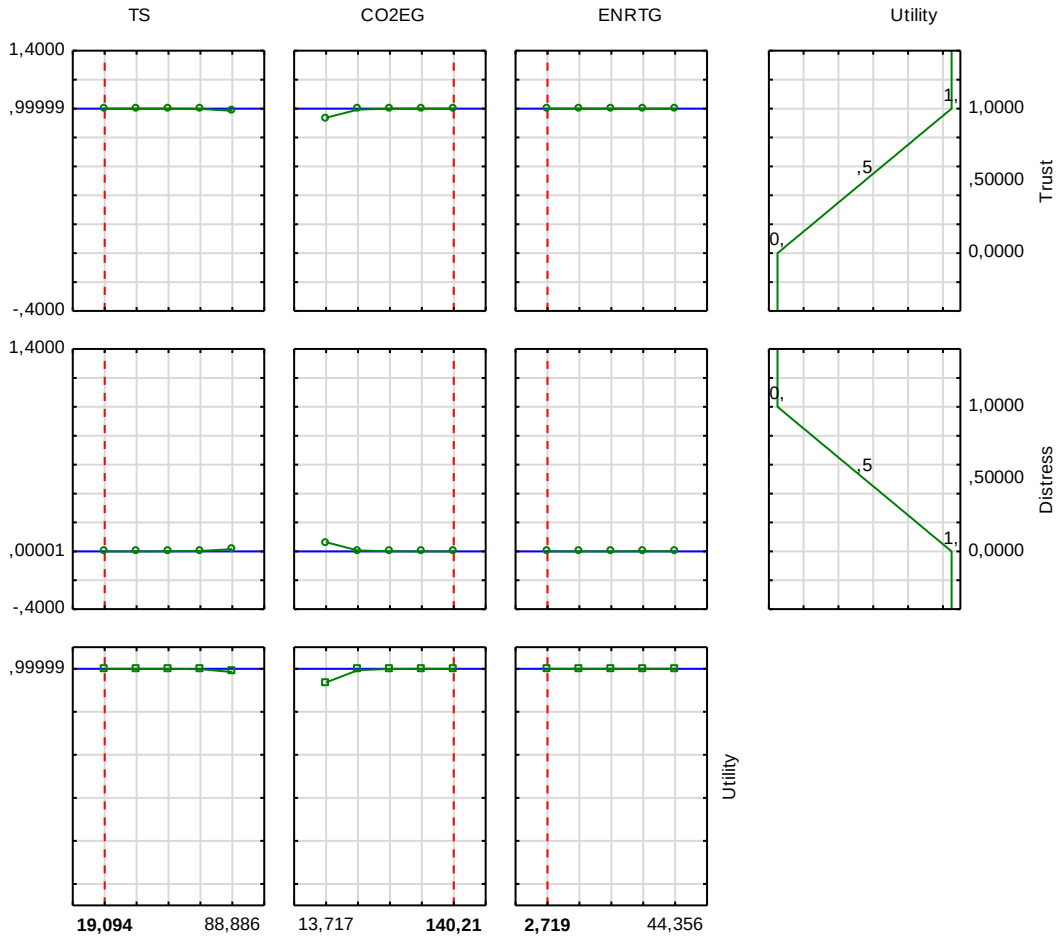

Figure 3. Profiles for a posteriori and utility probabilities. Source: own calculations based on data from Eurostat [tran_im_mosp] http://ec.europa.eu/eurostat/data/database and OECD.Stat [..IND-Meas-Roadgood-GDP; ..IND-Meas-Roadgood-Share; ..IND-Ene-GDP; ..IND-Ene-Road; ..IND-Ene-Fuel-GDP] http://stats.oecd.org/ (access: 2 May 2018).

5. Discussion

The conducted research confirms that the quantitative approach to the issue of trust (non-quantitative) is worth deepening and developing. There are not many quantitative studies on trust in economics, and a negligible number in transport. However, no research was done on modal shift potential of long-distance road freight in containers (expresses the scope of intermodal transport activities). The authors managed to combine three very broad terms: trust, sustainability, and shift, and propose a methodology and the results of their research. The hypothesis has been verified and the goals were achieved.

Only three predictors were significantly different from zero: TS, CO2EG, and ENRTG (Table 4). This means that the standardized coefficient β indicates which variables are the most efficient in discriminating between trust and distress countries (Table 5). The most efficient in discriminating between these two groups was CO2EG (contribution above 20%), followed by ENRTG—contribution is above 17%—and TS, with a of contribution approx. 15%. In this discriminatory analysis, all variables in the analysis were important to the results indicated by the Wilks, Pillai, Hotelling, and Roy tests (Table 7). On the basis of the model, it is more likely to predict units that will implement the paradigm shift (probability of about 93%) than those that will be characterized by the erosion of confidence in the paradigm shift (45% probability). This may mean that it is more likely to correctly identify trustworthy units than those that will lose our trust (Table 8).

The model enables a correct classification of 80.00% cases to trust and distress group (both).

Regarding the usability ranges of the examined criteria for the assessment of trust or distress with respect to the possibility of the modal shift of long-distance road transport in containers for selected European countries (Figure 1), it should be noted that the choice of the optimal scenario depends only on the utility value that satisfies the decision maker. Optimal scenarios are infinitely many, depending on the extent of the burden on the environment; you can assess how strong changes can be made to be able to implement the idea of sustainable development. The impedance range of the paradigm shift is very flexible, allowing adaptation to dynamically changing macroeconomic conditions, sometimes even turbulent ones. Therefore, the authors are deeply convinced that the proposed approach is a contribution to the creation of a comprehensive methodology of trust and distress prediction in intermodal transport in the light of the challenges of sustainable development.

Based on the results and conclusions of the research, the authors' own definition of trust in intermodal transport was formulated. Trust in the modal shift potential of long-distance road freight in containers is based on the implementation of the paradigm shift that is engrained in the idea of sustainable transport. It is expressed by the scale of the environmental burden of transport activity, use of a vector, modal shift potential of long-distance road freight in containers, and CO_2 emissions from the road, in total CO_2 emissions from transport and motor fuel deliveries (own definition, Elżbieta Szaruga and Elżbieta Załoga). Ensuring safety in the implementation of the paradigm shift is therefore an integral element of trust and a form of protection against threats. This applies in transport to ensure continuity in meeting transport needs with various transport modes (own definition, Elżbieta Skąpska and Wiesław Matwiejczuk).

In the future, it is worth expanding the research by proposing models for each country, taking into account a wider range of macroeconomic conditions and the drifting of the economy. An inseparable element of the changing drift is structural shocks, which may indicate the participation of the main factors of disruption/erosion of trust.

6. Conclusions

In summary, several important conclusions can be formulated for policy makers, namely:

1. It is necessary to carry out expert opinions related to the implementation of the paradigm shift and set goals and scope of implementation of the paradigm's assumptions.
2. Each country has a different specificity, but there are also points of contact with other countries. Therefore, all kinds of analyses could be carried out both internationally and in-depth on a national basis.
3. It is also important to develop own methodology: unique for a given country and universal for different countries for comparison purposes.
4. It is necessary to deepen the discussion on the selection of analysis tools in light of the assessment of the implementation of the paradigm shift.
5. Based on the research, it is worth knowing the implications for the chosen scenario and create a decision support system.
6. Using utility profiles, it is possible to analyze tolerance ranges and suggest tools that limit or extend tolerance margins.

There are many different practical solutions that make it possible to successfully implement the paradigm shift, e.g., replacing certain activities with IT technologies, improving the efficiency of transport means, increasing the density of infrastructure, increasing the availability of terminals, financial investments in intelligent technology solutions for economy and transport, consolidation and deconsolidation of loads on large and small distances, and introducing appropriate charges. However, when implementing any solution, it is important to monitor its impact on achieving the goal. The proposed methodology is to serve this purpose, because many different dimensions can be analyzed, not only those proposed by the authors.

Author Contributions: All the authors contribute equally to this paper: E.S. (Elżbieta Szaruga), E.S. (Elżbieta Skąpska), E.Z. and W.M. created the conceptualization; E.S. (Elżbieta Szaruga) conducted formal analysis; E.S. (Elżbieta Szaruga), E.S. (Elżbieta Skąpska), E.Z. and W.M. carried out investigation; E.S. (Elżbieta Szaruga) and E.S. (Elżbieta Skąpska) described methodology; E.Z. and W.M. watched over the work administration; E.S. (Elżbieta Skąpska) prepared resources; E.Z. and W.M. supervised the work; E.S. (Elżbieta Szaruga), E.S. (Elżbieta Skąpska), E.Z. and W.M. wrote the paper.

Funding: Half of the research for this paper has been conducted in the framework of projects no. S/WZ/1/2015 financed from the funds of the Ministry of Science and Higher Education of Poland.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Luhmann, N. *Trust and Power*; King, M., Morgner, C., Eds.; John Wiley & Sons, Inc.: New York, NY, USA, 1979; pp. 66–70. ISBN 9780471997580.
2. Arrow, K.J. *Granice Organizacji (into English: The Limits of Organization)*; Wydawnictwo Naukowe PWN (Into English: Polish Scientific Publishers): Warszawa, Poland, 1958; pp. 16–17. ISBN 9788374176668.
3. Fukuyama, F. *Trust. The Social Virtues and the Creation of Prosperity*; Free Press, a Division of Simon Schuster: New York, NY, USA, 1995; p. 26. ISBN 9780029109762.
4. Zaheer, A.; McEvily, B.; Perrone, V. Does Trust Matter? Exploring the Effects of Interorganizational and Interpersonal Trust on Performance. *Organ. Sci.* **1998**, *9*, 141–159. [CrossRef]
5. Seligman, A.B. *The Problem of Trust*; Princeton University Press: Princeton, NJ, USA, 2000; p. 15. ISBN 9780691050201.
6. Tomkins, C. Interdependencies, trust and information in relationships, alliances and networks. *Account. Organ. Soc.* **2001**, *26*, 161–191. [CrossRef]
7. Lin, N. *Social Capital: A Theory of Social Structure and Action*; Cambridge University Press: Cambridge, UK, 2001; pp. 148–149. ISBN 9780521521673.
8. Hardin, R. Conceptions and explanations of trust. In *Trust in Society*; Cook, K.S., Ed.; Russel Sage Foundation: New York, NY, USA, 2001; Volume 2, p. 3. ISBN 9780871541819.
9. Messick, D.M.; Kramer, R.M. Trust as a form of shallow. In *Trust in Society*; Cook, K.S., Ed.; Russel Sage Foundation: New York, NY, USA, 2001; Volume 2, p. 89. ISBN 9780871541819.
10. Lewicka-Strzałecka, A. Zaufanie w relacji konsument-biznes (into English: Trust in the consumer-business relationship). *Prakseologia (into English: Praxeology)* **2003**, *143*, 195–208.
11. Corritore, C.L.; Kracher, B.; Wiedenbeck, S. On-line trust: Concept, evolving themes, a model. *Int. J. Hum. Comput. Stud.* **2003**, *58*, 737–758. [CrossRef]
12. Andersen, J.A. Trust in managers: A study of why Swedish subordinates trust their managers. *Bus. Ethics Eur. Rev.* **2005**, *14*, 392–404. [CrossRef]
13. Bachmann, R.; Zaheer, A. *Handbook of Trust Research*; Edward Elgar Publishing Limited: Cheltenham, UK, 2006; pp. 357–358. ISBN 9781843767541.
14. Grönroos, C. *In Search of New Logic for Markeing: Foudations of Contemporary Theory*; John Wiley & Sons Ltd.: London, UK, 2007; pp. 203–204. ISBN 9780470061299.
15. Grudzewski, W.M.; Hejduk, I.K.; Sankowska, A.; Wańtuchowicz, M. *Zarzadzanie Zaufaniem w Organizacjach Wirtualnych (into English: Management of Trust in Virtual Organizations)*; Difin: Warszawa, Poland, 2007; pp. 13–17. ISBN 9788372516862.
16. Schoorman, F.D.; Mayer, R.C.; Davis, J.H. An Integrative Model of Organizational Trust: Past, Present, and Future. *Acad. Manag. Rev.* **2007**, *32*, 344–354. [CrossRef]
17. Sztompka, P. *Zaufanie. Fundament Społeczeństwa (into English: Trust. Foundation of Society)*; Znak (into English: Sign): Kraków, Poland, 2007; pp. 67–68. ISBN 9788324008506.
18. Angriawan, A.; Thakur, R. A Parsimonious model of the Antecedents and Consequence of Online Trust: An Uncertainty Perspective. *J. Internet Commer.* **2008**, *7*, 74–94. [CrossRef]
19. Hardin, R. *Zaufanie (into English: Trust)*; Sic!: Warszawa, Poland, 2009; pp. 25–26. ISBN 9788360457771.
20. Bugdol, M. *Wymiary i Problemy Zarządzania Organizacją Opartą na Zaufaniu (into English: Dimensions and Problems of Managing an Organization Based on Trust)*; Wydawnictwo Uniwersytetu Jagiellońskiego (into English: Publisher of the Jagiellonian University): Kraków, Poland, 2011; p. 158. ISBN 9788323330257.

21. Skąpska, E. Services in theory of economic order. Ordo perspective. In *Smart and Efficient Economy: Preparation for the Future Innovative Economy*; Simberova, I., Zizlavsky, O., Milichovsky, F., Eds.; Brno University of Technology: Brno, Czech Republic, 2016; pp. 403–408. ISBN 9788021454132.
22. Dowell, D.; Morrison, M.; Heffernan, T.W. The changing importance of affective trust and cognitive trust across the relationship lifecycle: A study of business–to–business relationships. *Ind. Market. Manag.* **2015**, *44*, 119–130. [CrossRef]
23. Bursian, D.; Faia, E. Trust in the monetary authority. *J. Monetary Econ.* **2018**, in press. [CrossRef]
24. Hawlitschek, F.; Notheisen, B.; Teubner, T. The limits of trust-free systems: A literature review on blockchain technology and trust in the sharing economy. *Electron. Commer. Res. Appl.* **2018**, *29*, 50–63. [CrossRef]
25. Hallikainen, H.; Laukkanen, T. National culture and consumer trust in e-commerce. *Int. J. Inf. Manag.* **2018**, *38*, 97–106. [CrossRef]
26. Faezeh, S.; Fereidoon, S.A.; Hassan, H. A new confidence-based recommendation approach: Combining trust and certainty. *Inf. Sci.* **2018**, *422*, 21–50. [CrossRef]
27. Skąpska, E. Percepcja usługobiorcy w rozwoju społeczeństwa wiedzy (into English: Perception of the recipient in the development of the knowledge society). In *Zarządzanie kapitałem ludzkim w gospodarce opartej na wiedzy (into English: Human Capital Management in a Knowledge-Based Economy)*; Skrzypek, E., Sokół, A., Eds.; Instytut Wiedzy i Innowacji (into English: Institute of Knowledge and Innovation): Warszawa, Poland, 2009; pp. 296–309. ISBN 9788360653104.
28. Goeschl, T.; Jarke, J. Trust, but verify? Monitoring, inspection costs, and opportunism under limited observability. *J. Econ. Behav. Organ.* **2017**, *142*, 320–330. [CrossRef]
29. Ouyang, Z.; Gursoy, D.; Sharma, B. Role of trust, emotions and event attachment on residents' attitudes toward tourism. *Tour. Manag.* **2017**, *63*, 426–438. [CrossRef]
30. Gnusowski, M.; Gonczaruk, G.; Skąpska, E.; Domakur, O. Theoretical components of intra-industry services development strategy. *Eur. J. Serv. Manag.* **2017**, *22*, 21–29. [CrossRef]
31. Di Maggio, P. The futures of business organization and paradoxes of change. In *The Twenty—First—Century Firm: Changing Economic Organization in International Perspective*; Di Maggio, P., Ed.; Princeton University Press: Oxford, UK; Princeton, NJ, USA, 2001; pp. 210–212. ISBN 9780691116310.
32. Ivuts, R.; Matwiejczuk, W. Development of transboundary transport-logistic systems of Poland and Belarus. In *Energia w Nauce i Technice (into English: Energy in Science and Technology)*; Jaroszewicz, J., Ed.; Oficyna Wydawnicza Politechniki Białostockiej (into English: Publishing House of the Białystok University of Technology): Białystok, Poland, 2013; pp. 192–205. ISBN 9788362582457.
33. Matwiejczuk, T.; Matwiejczuk, W. Virtual forms of cooperation as the sources of regional development. In *Šiuolaikines Tarporganizacines Sąveikos Formos Viešajame Sektoriuje*; Puškorius, S., Ed.; Mykolo Romerio Universitetas: Vilnius, Lithuania, 2006; pp. 95–98. ISBN 9955190442.
34. Skąpska, E. *Development of the Service Sector in Poland at the Turn of the Century*; Tendencies, Determinants, Perspectives; LAP Lambert Academic Publishing: Saarbrücken, Germany, 2014; p. 165. ISBN 9783659626494.
35. Załoga, E. *Trendy w transporcie lądowym Enii Europejskiej (into English: Trends in the European Union's land transport*; Wydawnictwo Naukowe Uniwersytetu Szczecińskiego (into English: Scientific Publisher of University of Szczecin): Szczecin, Poland, 2013; pp. 60, 62, 85, 112–113. ISBN 9788372419330.
36. Litman, T.; (Victoria Transport Policy Institute, Victoria, Canada). Well Measured: Developing Indicators for Sustainable and Livable Transport Planning. 2016. Available online: http://www.vtpi.org/wellmeas.pdf (accessed on 30 May 2018).
37. Załoga, E. Nowa polityka transportowa Unii Europejskiej (into English: New transport policy of the European Union). In *Transport: Nowe wyzwania (into English: Transport: New Challenges)*; Wojewódzka-Król, K., Załoga, E., Eds.; Wydawnictwo Naukowe PWN (into English: Polish Scientific Publishers): Warszawa, Poland, 2016; p. 510. ISBN 9788301184629.
38. Kożuch, B.; Sienkiewicz-Małyjurek, K. Factors of effective inter-organizational collaboration: A framework for public management. *Transylv. Rev. Adm. Sci.* **2016**, *12*, 97–115.
39. Jabłoński, A. Public Service Design and Public Trust: Conceptualizing the Sustainability. In *Managing Public Trust*; Kożuch, B., Magala, S.J., Paliszkiewicz, J., Eds.; Palgrave MacMillan: Cham, Switzerland, 2018; p. 166. ISBN 9783319704845.
40. Greene, D.L.; Plotkin, S.E. *Reducing Greenhouse Gas Emissions from US Transportation*; Pew Center on Global Climate Change: Arlington, VA, USA, 2011.

41. Organization for Economic Co-Operation and Development (OECD). *Reducing Transport GHG Emissions. Opportunities and Costs*; International Transport Forum: Paris, France, 2009.
42. Gozdek, A.; Szaruga, E. Analysis of factors of GHG from road transport with LMDI approach. In *Modern Economic Issues and Problems*; Sokół, A., Drab-Kurowska, A., Kasian, S.Y., Eds.; Kartprint: Bratislava, Slovakia, 2016; pp. 37–47. ISBN 9788089553372.
43. Załoga, E.; Szaruga, E. Dekarbonizacja transportu jako wyzwanie dla współczesnych gospodarek (into English: Decarbonization of transport as the challenge for contemporary economies). *Ekonomika Transportu i Logistyka (into English: Transp. Econ. Logist.)* **2016**, *59*, 261–269.
44. Szaruga, E. Analiza energochłonności transport samochodowego na przykładzie wybranych państw Unii Europejskiej (into English: Analysis of energy consumption of road transport Relative to GDP based on selected European Union countries). *Współczesne Problem Ekonomiczne (into English: Mod. Econ. Probl.)* **2014**, *9*, 197–205.
45. Szaruga, E. Energochłonność transport jako czynnik wyróżnienia obszarów typu *hot spot* w koncepcji zrównoważonego transportu na przykładzie wybranych krajów UE (into English: Energy intensity of road transport as a factor in highlighting of hot spot clusters in the concept of sustainable development on the example of selected EU countries. In *Zrównoważony Rozwój—Debiut Naukowy 2013 (into English: Sustainable Development—Scientific Debut 2013)*; Jemczura, T., Kretek, H.A., Eds.; Wydawnictwo Państwowej Szkoły Zawodowej w Raciborzu (into English: Publisher of the State Vocational School in Racibórz): Racibórz, Poland, 2014; pp. 69–76. ISBN 9788360730775.
46. SHINOHARA, M. Paradigm Shift in Maritime Transport. *Asian J. Shipp. Logist.* **2009**, *25*, 57–67. [CrossRef]
47. Tuominen, A.; Kanner, H.; Linkama, E. A paradigm shift in European transport and urban planning—Fact or fable? *Procedia Soc. Behav. Sci* **2012**, *48*, 1415–1423. [CrossRef]
48. Tattini, J.; Gargiulo, M.; Karlsson, K. Reaching carbon neutral transport sector in Denmark—Evidence from the incorporation of modal shift into the TIMES energy system modeling framework. *Energ. Pol.* **2018**, *113*, 571–583. [CrossRef]
49. Johansson, H.; Sandvik, K.O.; Zsidákovits, J.; Łutczyk, G. A Need for New Methods in the Paradigm Shift from Mobility to Sustainable Accessibility. *Transp. Res. Procedia* **2016**, *14*, 412–421. [CrossRef]
50. Ercan, T.; Onat, N.C.; Tatari, O.; Mathias, J.-D. Public transportation adoption requires a paradigm shift in urban development structure. *J. Clean. Prod.* **2017**, *142*, 1789–1799. [CrossRef]
51. Zioło, M.; Porada-Rochoń, M.; Szaruga, E. The Financial Distress of Public Sector Entities, Causes and Risk Factors. Empirical Evidence from Europe in the Post-crisis Period. In *Risk Management in Public Administration*; Raczkowski, K., Ed.; Palgrave MacMillan: Cham, Switzerland, 2017; pp. 315–360. ISBN 9783319308760.
52. Safo, S.E.; Ahn, J. General sparse multi-class linear discriminant analysis. *Comput. Stat. Data Anal.* **2016**, *99*, 81–90. [CrossRef]
53. Chen, L.-H.; Jiang, C.-R. Sensible functional linear discriminant analysis. *Comput. Stat. Data Anal.* **2018**, *126*, 39–52. [CrossRef]
54. Dai, X.-M.; Li, S.-G. Cross-Modal Deep Discriminant Analysis. *Neurocomputing* **2017**, in press. [CrossRef]
55. Database—Eurostat—European Commission. Available online: http://ec.europa.eu/eurostat/data/database (accessed on 2 May 2018).
56. OECD Statistics. Available online: http://stats.oecd.org (accessed on 2 May 2018).
57. European Union. *White Paper on Transport: Roadmap to a Single European Transport Area—Towards a Competitive and Resource-Efficient Transport System*; European Union: Brussels, Belgium, 2011; ISBN 9789279182709.
58. Załoga, E.; Szaruga, E. Analiza zależności pomiędzy intensywnością emisji dwutlenku węgla a energochłonnością, jednostkowym zużyciem energii i produktywnością ciężarowego transportu samochodowego (into English: Analysis of the relationship between the CO_2 intensity, energy intensity, unit consumption of energy and productivity of road freight transport on the example of Poland). *Logistyka (into English: Logistics)* **2015**, *4*, 6973–6982.
59. Szaruga, E. Weryfikacja zależności przyczynowo-skutkowych pomiędzy energochłonnością transport samochodowego a transportochłonnością i poziomem podatków paliwowych w Polsce (into English: The verification of causal linkages among road transport energy intensity, transport intensity and level of fuel taxes in Poland). *Problemy Transportu i Logistyki (into English: Probl. Transp. Logist.)* **2015**, 429–441. [CrossRef]

60. Szaruga, E. Effects of Energy Price Shock on Business Cycles in Industrial Production of Consumer and Capital Goods: Evidence from Poland in the Post-Crisis Period. In *Gospodarka i społeczeństwo wobec wyzwań przyszłości. Aspekt makroekonomiczny (into English: Economy and Society in the Face of Future Challenges. The Macroeconomic Aspect)*; Gotowska, M., Antoszak, P., Eds.; Wydawnictwa Uczelniane Uniwersytetu Technologiczno-Przyrodniczego w Bydgoszczy (into English: University Publishers of the University of Technology and Life Sciences in Bydgoszcz): Bydgoszcz, Poland, 2017; pp. 101–111. ISBN 9788365603265.
61. Szaruga, E. Badanie przyczynowości w sensie Grangera pomiędzy przewozami ładunków przez transport samochodowy a wzrostem gospodarczym na przykładzie Polski (into English: Examination of Granger-causality between the road freight transport and economic growth on the example of Poland). *Studia i Prace WNEiZ US (into English: Stud. Pap. WNEiZ US)* **2016**, 463–473. [CrossRef]
62. Załoga, E.; Szaruga, E. Efekty polityki dekarbonizacji w transporcie samochodowym Unii Europejskiej (into English: Effects of decarbonization policy in the European Union's road transport). In *Niskoemisyjność we współczesnej polityce gospodarczej (into English: Low-Carbon in Modern Economic Policy)*; Pająk, K., Urbaniak, M., Zwierzchlewski, S., Eds.; Adam Marszałek Publishin House: Toruń, Poland, 2015; pp. 365–390. ISBN 9788380192065.