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## Linking to compete: Logistics and global competitiveness interaction



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### ARTICLE INFO

#### Article history:

Received 28 January 2015

Received in revised form

20 October 2015

Accepted 30 January 2016

Available online 7 March 2016

#### Keywords:

Logistics performance

Competitiveness

Artificial neural network

Cumulative belief degrees

### ABSTRACT

A country's ability to trade globally depends to a great extent on the traders' access to efficient logistics networks. The efficiency of logistics networks, in its turn, depends on government services, investments, and policies. Building infrastructure, developing a regulatory regime for transport services, and designing and implementing efficient customs clearance procedures are the areas where governments play an important role. One of the measures for logistics performance at national level is the Logistics Performance Index (LPI) published by the World Bank Group. LPI is composed of six indicators namely customs, infrastructure, service quality, timeliness, international shipments, and tracking and tracing. This study argues that there is a close relationship between global competitiveness and the logistics efficiency of a country and it analyzes the validity of these relations using an artificial neural network (ANN) and cumulative belief degrees (CBD) approach. For this purpose; initially, a screening process is carried out to find the World Economic Forum's competitiveness indicators that may have an impact on each of the LPI indicators. Subsequently, the relationship between the competitiveness indicators and LPI indicators is analyzed using ANN where the LPI indicators are represented by CBDs. As a case study, this methodology is used to analyze Turkey's logistics performance and to develop the basic strategies to be adopted by the government to achieve a targeted LPI level for the country. Among the many factors relating to logistics performance, it was found that fixed broadband Internet availability is the most important target area for improvement related to sustainable logistics policy.

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### 1. Introduction

As the backbone of international trade, logistics encompasses freight transportation, warehousing, border clearance, payment systems and many other functions which are mostly performed by private service providers for private traders and owners of goods; however, it is also important for public policies of national governments and regional and international organizations (Arvis et al., 2012). It is necessary to understand logistics performance at the country level in order to better evaluate and target trade and transport facilitation policy efforts over time and across countries. If a country can obtain a competitive advantage in terms of logistics performance, this will increase its international trade, help to open new markets and encourage business. Country-based logistics performance evaluation will also help in understanding the relative position of the country and providing guidance on which areas require special attention, such as infrastructure, services,

procedures and regulations, in order to improve the logistics performance level. Companies with access to high quality cost-efficient logistical capabilities can often outsource certain logistics tasks and devote fewer internal resources to these tasks. For instance, in countries with good roads and predictable customs clearance, delivery times will be both shorter and more reliable. As is also stated by Lean et al. (2014) economic development of a country will increase the demand for logistics services and this in turn will increase the need for logistics development.

However, there is scarce research focusing on logistics performance evaluation from the perspective of nations as a whole. Some research has aimed to find the link between the supply chain process performance of companies and their financial performance (Elgazzar et al., 2012). But, the existing literature on supply chain and logistics performance is generally static and provides cross-sectional analysis of performance rather than a dynamic picture of performance evolution (Töyli et al., 2008). In fact the Logistics Performance Index (LPI) (Arvis et al. 2007, 2010, 2012, 2014) shows comparative performance of logistics in more than 150 countries and assesses performance flow of goods through each country. The World Bank and the Turku School of Economics have been making evaluations for the index every two

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years since 2007. The LPI takes into account customs, infrastructure, service quality, timeliness, international shipments, and tracking and tracing as the key elements of logistics and compares these logistics profiles between 166 countries, rating them on a scale of 1 (worst) to 5 (best) (Arvis et al., 2014). As can be seen, these indicators are directly influenced by the level of some of the indicators that shape the relative economic performance of a nation as a whole. Due to the complexity of global supply chains, the efficiency of logistics depends on the efficiency of government services, investment and policies as well as other factors which influence the competitiveness of the nation as a whole.

The success in improving the logistics performance of a country is therefore highly dependent on the national competitiveness of that country. Logistics is a complex sequence of coordinated activities and the performance of the whole is highly dependent on the government interventions such as building infrastructure, developing regulatory regime for transport services, and designing and implementing efficient customs clearance procedures. In fact, these areas are directly related with the improvement of the related indicators in the global competitiveness of the country. As traditional competition becomes global, businesses often fail to take the required measures on their own in order to become more competitive, so improvement at the national level is crucial, especially for businesses directly involved in logistics.

Competitiveness of a nation is generally defined as the set of institutions, policies and relevant factors that determine the level of productivity of a country (Artto, 1987). Each year, selected organizations, such as the World Economic Forum (WEF) and the Institute for Management Development (IMD), apply several hundred objective and subjective indicators to assess the wealth created by the world's nations, and subsequently publish rankings of national competitiveness. These rankings serve as a benchmark for policy-makers and other interested parties for judging the relative competitive performance of their country within a global context. In fact, several of these indicators also have an important impact on the performance of the logistics of the related country. Building infrastructure, developing regulatory regime for transport services, and designing and implementing efficient customs clearance procedures are just a few areas where government play an important role. Global Competitiveness Index (GCI) developed by WEF assess the competitiveness of an economy based on 12 pillars, namely; institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication and innovation (Sala-i Martin et al., 2012, 2015). In fact, the majority of these pillars are very important for the success of logistics activities. For example; the logistics performance of the country depends heavily on measures taken by the individual countries in infrastructure provision, regulation and development services or facilitation of trade through more friendly and technologically improved procedures. It is obvious that infrastructure provision is directly related to well-developed transportation and communication infrastructure that will reduce the effect of distance between regions. Effective modes of transport will enable the entrepreneurs to send their goods and services to the market in a secure and timely manner (the infrastructure pillar of GCI). The regulation and development services, on the other hand, can only be realized in an economy having a sound and fair institutional environment (The institution pillar of GCI) and facilitation and trade can only be realized when the firms operate in a country that have to advanced information and communication technologies, with broadband internet (the technological readiness pillar of GCI), with a good quality of business network and supporting industries measured by the quantity and quality of local supplier as well advanced operations strategies

(the business sophistication pillar of GCI) with well educated workers who are able to perform complex logistics activities (the higher education and training pillar of GCI) etc. Therefore; in order to reduce the logistics gap between best performing countries and the ones that are still lagging behind, priorities should be given to the national policies that will have the highest impact on the improvement of logistics performance of the country. Governments will need to make long-term policy changes in a way to make substantial improvement in the competitiveness of logistics services. The specification of the priorities will be essential in the specification of long term commitments and reforms from policy makers and private shareholders. As a result, if it is possible to highlight which of the WEF indicators have an important priority on improving the LPI of a country, this will provide an invaluable guide for government policy makers. With such a guide, the policy makers will be able to see the global competitiveness indicators that will make the highest impact on the improvement of logistics competitiveness. They will prioritize their investment decisions accordingly. Such analysis will also be imperative to facilitating and improving the activities of the traders and of the logistics providers that have to operate under very different environments globally.

In parallel with these assertions, this study analyzes the relationship between logistics performance and competitiveness at national level. In order to develop a decision making tool to support policy makers in their decisions to improve the logistics performance of a country, the interrelation between the criteria related to competitiveness of a nation as a whole and the logistics performance indicators is analyzed using a methodology which integrates an Artificial Neural Network (ANN) and cumulative belief degree (CBD) approach. With this method the logistics performance of any country can be analyzed based on the primary national competitiveness factors.

Turkey, an important logistics center in Europe exhibiting high trade values with its regional partners, has a large population, diversified economy and strategic geographic location. It is considered a critical actor in the trade between Europe, the Commonwealth of Independent States (CIS) and the Middle East (ITF, 2014) and as such is an ideal subject for case study.

In the following section the proposed methodology is presented in detail. Scenario analysis and policy suggestions are given in the third section. The fourth section deals with conclusions drawn from this study.

## 2. Methodology: Gauging the interaction between national competitiveness and logistic performance

The aim of this study is to develop a decision making tool to support policy makers in improving the logistics performance of their country. To begin with, the relationship between competitiveness indicators and logistics performance is revealed in order to identify the most important factors that impact on logistics performance of a given country.

The interaction between the logistics performance of a country and some of the components of competitiveness such as its economic growth has been investigated by many researchers. In fact, the logistics industry plays an important role in the national development (Chen and Novy, 2011). Nguyen and Tongzong, (2010) underline that international trade will affect the transport and logistics sector through higher demand for transport services and creating opportunities for business expansion. However, the development of logistics sector, in its turn, is also expected to have a positive impact on increasing production, consumption and trade and thus stimulating the economic growth. For example; the better infrastructure will also contribute to attract foreign direct

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