



Competitiveness analysis of automotive industry in Turkey using Bayesian networks

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ABSTRACT

The purpose of this study is to analyze the relations between the factors that enable national competitive advantage and the establishment of competitive superiority in automotive industry through a comprehensive analytical model. Bayesian networks (BN) are used to investigate the associations of different factors in the automotive industry which lead to competitive advantage. The results of the study focus on building a road map for the automotive sector policy makers in their way to improve the competitiveness through scenario analysis. Using the probabilistic dependency structure of the Bayesian network all of the variables in the model can be estimated. Thus, with the proposed model the automotive industry can be analyzed as a whole system and not only in terms of single variables. Findings of the model indicate that technological developments in automotive industry can alter the nature of competition in this industry.

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1. Introduction

The rising trends in the globalized world are the key factors that make the business environment highly dynamic and competitive (Artto, 1987). This necessitates to focus on the comparative advantage and to build up technological competences for both developed and developing countries. As also emphasized in the UNIDO project of regional Europe (2011), policy makers face increasingly complex issues related to economic, technological, environmental and thus social challenges due to globalization and recent global financial crises. Therefore, they need to have a foresight process in order to see the interrelations among the factors that shape the economy and, thus, identify various development scenarios in face of different policy options.

In order to reveal the competitiveness of a country, different approaches have been used in literature. 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 benchmarks for policy-makers and other interested parties into judging the competitive success of their country within a global context. The IMD jointly with the WEF has produced listings of national competitiveness in their annual World Competitiveness Yearbook since 1989 (Sala-i-Martin & Artadi, 2004).

The WEF uses three indices to analyze nations' competitiveness levels from both macroeconomic and microeconomic perspectives.

The Growth Competitiveness Index (GCI), developed by McArthur and Sachs (2001) and Blanke and Lopez-Claros (2004) is based on critical and, for the most part, macroeconomic environmental factors that influence sustained economic growth over the medium to long-term. More recently, the Global Competitiveness Index (Blanke & Lopez-Claros, 2004) was designed to help unify the GCI and BCI, and may eventually replace them in the Global Competitiveness Reports.

Global Competitiveness Index (GCI) of the World Economic Forum (WEF) is generally recognized by many countries in correctly defining competitiveness and measuring countries competitive strengths. Based on this index, released every year, in its Global Competitiveness Report, WEF measures the competitiveness of countries, providing a source of data for all sides concerned, including public and private sectors, with which they can work and create policies.

When Turkey's trend in terms of relative competitiveness is analyzed through consecutive WEF reports (2005, 2006, 2007, 2008, 2009, 2010), it can be seen that, with a significant improvement in competitive performance, Turkey moved up 18 places in the 2007–2008 Global Competitiveness Index ranking of the World Economic Forum. Turkey not only surpassed Bulgaria and Romania who became members to the EU during its 2007 expansion, but also ranked higher than Greece, Cyprus, and Malta which had joined earlier. Similarly, during the same period, Turkey also outranked two of the BRIC members, namely, Russia and Brazil. Therefore, it was believed that political reforms following the 2001 economic crisis were bearing fruit. However, the improvement in question was replaced by a dramatic fall in the 2008–2009 report where Turkey slipped down 10 places, only managing to be ranked the 63rd (Sala-i-Martin et al., 2008) (Table 1).

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Table 1
Turkey's rank in GCI.

Year	Total number of countries	Turkey's rank
2007	131	53
2008	134	63
2009	133	61
2010	139	61
2011	143	59

Turkey moved up two places in the 2009–2010 GCI thanks to a balanced performance (Sala-i Martin, Blanke, Hanouz, Geiger, & Mia, 2009). The 2010–2011 report indicates that Turkey has retained its ranking at 61. It has been pointed out that Turkey needs to intensify local competition, improve infrastructure for ports and electricity supply despite having built reasonably advanced infrastructure for roads and air travel, improve human resources through improved primary education and health systems, cut down inefficiencies in labor markets and to increase efficiency and transparency of public institutions (Sala-i Martin, Blanke, Hanouz, Geiger, & Mia, 2010).

In 2011–2012 report, however, Turkey again improved her rank and became 59th through 143 economies analyzed (Sala-i-Martin, Bilbao-Osorio, Blanke, Hanouz, & Geiger, 2011).

In global competition, technological infrastructure, education system, public-private sector relations and economic policies are all integrated. Therefore, in dynamic markets where time becomes ever more significant, the success of businesses looking to gain competitive advantage depends on their ability both to perceive the changes around them and also to adapt to those changes in the short term. Success in an intensively competitive environment requires businesses to reduce production costs, improve quality and take the necessary steps to exceed customer expectations. However, as traditional competition becomes global, businesses fail to take the required measures on their own to become more competitive. Hence, in a globally competitive environment, national improvement has also become vital. In a country where an environment that will enable international competition has not been established, sector-based competitiveness is bound to be limited and obstacles emerge which undermine the protection and maintenance of this competitiveness. In international competition, dynamic and competitive management strategies of companies alone cannot sufficiently improve their chances. Therefore, businesses need to utilize and be supported by countries international competitiveness.

In Turkey, a part of the Turkish market in labor intensive sectors has been lost to Asian economies rising due to cheap labor. Also in capital intensive sectors Turkey has lost a part of its market to countries like Poland, Czech Republic, Slovakia, Romania and Hungary, the new members of the EU (EU-12 countries). These losses happened particularly in capital intensive markets such as the automotive industry where direct foreign investment has shifted from Turkey to EU-12 countries recently. In order to get a complete look of the current state of the Turkish automotive industry and to prevent further losses, reasons for these losses need to be explored and exclusively designed long-term industrial and export strategies need to be implemented.

In this paper, automotive industry is selected as the target sector to foresight its future developments that might occur in Turkey in face of competitiveness. Hence, this research should act as a guide to decision makers on analyzing the essential factors in automotive industry to achieve sustainable competitive advantage. The main reason behind the choice of the automotive industry is that it is one of the leading industries in all industrialized countries. The reason for the driving-locomotive effect of this industry is that it is closely related to other industries in the economy. Automotive

industry is the main buyer of iron-steel, petrochemical, and tires industries and the driving force behind the technological development in these industries. All kinds of motor vehicles needed by the tourism, infrastructure, transport and agriculture industries are produced by this sector. Therefore, any changes in the industry deeply affect the economy as a whole. The world's automotive industry, with around 70 million units yearly production is essential to the working of the global economy and is an important contributor to the well being of the societies. The automotive production chain has a strategic role in Czech Republic, Poland, Slovakia and Turkey on economic basis regarding its contribution to the national production and industrial development, employment (direct and indirect), and the level of technology enhancement.

The model developed in this study takes into account the variables used in comparison of the countries by WEF. A preliminary version of this model is prepared for a report sponsored by Automotive Manufacturer Association-OSD, TÜSİAD-Sabancı University Competitiveness Forum-REF and Federation of Industrial Associations-Sedefed (Ulengin, Onsel, Aktaş, & Kabak, 2010)

The second section analyses the current situation of the automotive sector in Turkey. The third section explains the steps of the proposed model as well as the guide map derived from it for the Turkish Automotive Industry. Finally conclusions and further suggestions are given.

2. Automotive industry in Turkey

Automotive Industry Strategic Report (2010) prepared by the Ministry of Industry of Turkey urges that in its present state the automotive industry, which is sensitive to global developments, does not promise a more competitive future. For that reason, under the conditions of global competition and considering the positive support provided to this industry in competing countries, there is an urgent need of support to the automotive industry in order to facilitate the necessary demand transfer in Turkey.

With the global financial crisis losing effect, determination and implementation of an automotive industry strategy is even more significant if the Turkish Automotive Industry is to benefit from post-crisis opportunities. This strategic report analyses the present situation, researches the problems and determines the action plan for those problems, predicts when and how this action plan is to be carried out and investigates how the present situation is expected to evolve.

A study of monthly reports of Turkish Exporters Assembly (TİM) (2011) reveals that Turkey's production levels in food, textiles, clothing, leather goods, chemicals, plastics, machines, and electrical machines have already exceeded June 2008 production figures and are back to pre-crisis levels. Two main industries that have failed to reach pre-crisis levels are automotive and base metal industries. In the period September 2009–March 2010, there are four countries (India, Romania, South Africa, and Taiwan) in the automotive sector who managed to push exports to pre-crisis levels. At this time period, Turkey's export was 23% behind compared to the pre-crisis figures (Turkish Exporters Assembly (TİM), 2010). However, according to Turkish Exporters Association (TİM), the sector – including motor vehicles, parts and accessories – generated \$5.1 billion export revenue, which indicated 12% expansion, and captured 16.1% share in Turkey's overall exports in 3M11. The sector is also at the top in March-only performance, with a share of 16.7%. In first three months of 2011 automotive sector export boosted by 5%, to 213,503 units. The growth in the export mainly stemmed from a hike in the commercial vehicles. Commercial vehicles depicted 9% growth, while passenger car export recorded meager increase as 2%. Despite these improvements, the automotive sector does not seem to reach its pre-crisis level in 2011.

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