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THE FACTORS AFFECTING TEXTILE PRODUCTION AMOUNTS OF LEADING COUNTRIES IN TEXTILE EXPORT: DYNAMIC PANEL DATA ANALYSIS

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ABSTRACT

It is known that the textile industry, which is one of the most influential areas in the development of many countries in the world, played a very important role in the Industrial Revolution. The textile industry in Turkey, which continues its development depending on cotton farming, has gained momentum in terms of development in recent years. In this study, in which the annual data for the 2003-2013 period were used, the factors affecting the textile production amounts of the leading countries in textile export were examined. As a result of the analysis, it was found that the econometric model constituted a dynamic structure, and the estimation results were obtained by using the GMM-System estimation technique. According to the results obtained, there is a significant correlation of textile production amount with lagged value and population variables at a 1% level, with Gross Domestic Product and cotton production at a 5% level, and with the inflation rate at a 10% level. population variable, which is the control variable in the model, is positive and per theoretical expectations, population increase boosts the amount of textile production. An increase of 1% in the Gross Domestic Product causes a decrease of 0.06% in textile production. The amount of cotton production positively affects textile production and a 10% increase in cotton production leads to a 0.2% increase in textile production. The coefficient of the inflation rate was determined as -0.009 and it was negative. As expected in theory, increases in inflation rate adversely affect growth.

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Keywords: Textile Export, Textile Production, Dynamic Panel Data Analysis

TEKSTİL İHRACATINDA LİDER ÜLKELERİN TEKSTİL ÜRETİM MİKTARLARINI ETKİLEYEN FAKTÖRLER: DİNAMİK PANEL VERİ ANALİZİ

ÖZET

Dünyada birçok ülkenin kalkınmasında en etkili alanlardan biri olan tekstil sektörünün sanayi devriminde de oldukça önemli roller üstlendiği bilinmektedir. Türkiye' de ise pamuk tarımına bağlı olarak gelişimini sürdüren tekstil sektörü teknolojinin de etkisiyle son yıllarda gelişimine ivme kazandırmıştır. 2003-2013 dönemine ait yıllık verilerin kullanıldığı bu çalışmada tekstil ihracatında önder ülkelerin tekstil üretim miktarlarını etkileyen faktörler incelenmiştir. Yapılan analiz sonucunda ekonometrik modelin dinamik bir yapı teşkil ettiği görülmüş ve tahmin sonuçları GMM-Sistem tahmin tekniği kullanılarak elde edilmiştir. Elde edilen sonuçlara göre tekstil üretim miktarı ile gecikmeli değeri ve nüfus değişkeni arasında %1 seviyesinde, Gayri Safi Yurtiçi Hasıla değişkeni ve pamuk üretimi miktarı değişkeni arasında %5 seviyesinde ve enflasyon oranı ile %10 seviyesinde anlamlı bir ilişki vardır. Modelde kontrol değişkeni olan nüfus değişkeni pozitiftir ve teorik beklentilere uygun olarak, nüfusu artışı tekstil üretim miktarını artırmaktadır. Gayri Safi Yurtiçi Hasıladaki %1'lik bir artış tekstil üretiminde %0.06'lık bir azalışa neden olmaktadır. Pamuk üretim miktarı tekstil üretimini pozitif olarak etkilemektedir ve pamuk üretimindeki %10'luk bir artış tekstil üretimine %0.2'lik bir artış sağlamaktadır. Enflasyon oranının katsayısı ise -0.009 olarak tespit edilmiştir ve negatiftir. Teoride beklenildiği gibi enflasyon oranındaki artışlar büyümeyi olumsuz etkilemektedir.

Anahtar kelimeler: Tekstil İhracatı, Tekstil Üretimi, Dinamik Panel Veri Analizi

1. INTRODUCTION

The textile and garment industry are one of the largest and oldest industries available worldwide (Gereffi, 2002: 1). The textile industry, which was the first industrial sector of the country established in the early 1930s, made great progress in the following years thanks to the high rate of cultivation of cotton, which is the main raw material in the sector, in our country (Uyanık and Çelikel, 2019: 33). The textile and garment industry, which made a significant

contribution to the industrialization process of developed countries in the 18th century, plays a similar role in the economic development of developing countries today (Ekti, 2013: 5).

While the production content of the textile industry has included products such as clothes, curtains, and carpets for centuries, the areas of use of textile products have become more diverse with the rapid developments in science and technology in the 20th and 21st centuries. Since the beginning of the 20th century, textile products have started to be used in the fields of military, medicine, automotive industry, construction and in the production facilities of many sectors and even in road construction (UIB, 2018: 2). With the diversity in the usage area of the sector, as the production and trade volume expands day by day, the need for personnel to work in the sector is also increasing.

Economic growth, with its potential to increase income levels, reduce poverty and improve living standards in societies, is the main focus of policymakers in both developed and developing countries (Erkişi and Boğa, 2019: 670). The employment provided by the textile and garment industry branches, the added value created during the production process and the high share in export revenues are important factors that affect the economic development process in both developed and developing countries (Hatırlı et al., 2012: 185).

The globalization trend, which has accelerated since the 1980s, has increased the trade flow in the textile and garment industry, and in the last 30 years, approximately half of the total capacity of the industry has shifted from developed countries to developing countries. Therefore, the textile industry is known as one of the most globalized industries today (Aydoğdu, 2012: 4). Globalization has also changed the competitive dynamics of nations, firms and industries. This change has caused many manufacturers to move the centre of gravity for their production and export towards newly industrialized economies, and the reflection of this situation on international trade patterns has been observed (Gereffi, 1999: 37).

From the 1990s to the present, a rapid transformation has been experienced in the world economy, and the concept of competition has become increasingly important in this transformation process. During this period, a tougher competition has emerged in the textile and garment industry. China has the highest share in the world export market of the sector, which is defined as the engine of development for developing countries (Şahin, 2015: 155). Based on panel data on the textile industry in China, Zhao and Lin (2019) concluded that there was a significant positive correlation between the level of economic development, energy

prices, research and development investment (R&D), business size, and total factor energy efficiency of the textile industry.

Textile and garment production and trade of developing countries are growing faster than those of developed countries. The most important reason for this is that labor-intensive textile and garment production has been shifted to countries with low labor costs (Kanoğlu and Öngüt, 2003: 24). Accordingly, this situation is very important in terms of employment in poor countries such as Bangladesh, Vietnam, Sri Lanka and Mauritius and plays a vital role in the increase of the Gross Domestic Product (GDP) of these countries (Keane and te Velde, 2008: 7).

Table 1. Major exporters of textiles

Country	**Value ($ Billion)**	**%**
China	94.4	32.1
EU27	76.6	26.1
India	15.0	5.1
United States of America	13.8	4.7
Korea Republic	12.4	4.2
Turkey	10.8	3.7
Pakistan	9.1	3.1
Indonesia	4.8	1.6
Vietnam	3.8	1.3
Bangladesh	1.6	0.5
Rest of the World	51.7	17.5
Total	294	99.9

Source: WTO 2012 World Trade Report

China is the biggest exporter of almost all the textiles followed by European Union, India, USA and Korea as shown in Table 1. Countries with very low labour costs such as China, Bangladesh, India, Hong Kong and Indonesia rank first in the manufacturing part of the industry. Textile and garment being the main products of consumption in all countries and easy entry of new entrepreneurs into this market with small capital paved the way for the textile and garment sectors to occupy an important place in world trade in every period of the industrialization process (Şahin, 2015: 158).

Using data from 1985 to 2005, Chan et al. (2008) used panel data analysis approach to describe the impact of the main factors that constituted the basis of India's textile exports and affected textile exports between India and its top 10 importers. Their results showed that the determinants, including Gross Domestic Product (GDP), real exchange rate, GDP per capita, importers and population growth rate all had a significant impact. It was stated that India's

wealth in cotton resources and its labour-based textile industry contributed significantly to the country's economy and employment. Amponsah and Ofori-Boadu (2007) analysed the flow of the textile and garment trade to the US market in the traditional gravitational framework using panel data. They concluded that the GDP of both exporters and importers had a positive and significant effect on trade between countries. In their study in which they examined the factors affecting cotton exports, Gündüz et al. (2020) found a positive correlation between Turkey's cotton export amounts and the population of the importing countries. They emphasized that the high textile needs of countries with a high population also increased the demand for cotton. The present study, which aimed to examine the factors affecting textile production amounts of the leading textile exporting countries including Turkey, which occupies an important position in cotton production, will introduce the materials and method used, followed by the analysis and evaluation of the findings, and will be finalized with the interpretation of the results and recommendations.

2. MATERIALS AND METHOD

In this study, the factors affecting textile production quantities for the group of countries including the USA, Spain, Turkey, China, India, Vietnam, Indonesia and Korea were analyzed by using annual data for the 2003-2013 period. The availability of the data was considered in the selection of the country and the year of the study. Textile production is thought to be affected by the variables of gross domestic product, country's population, country's inflation rate and cotton production amount. The data of these countries, which constitute the econometric model of the study, were obtained from the World Bank's statistical databases (WDI) and the web address of the United Nations Industrial Development Organization (UNIDO). As a result of the analysis conducted to investigate the effect in question, it was seen that the econometric model constituted a dynamic structure. Models in which the lagged values of the dependent variable are included as independent variables are called dynamic models.

An important advantage of the GMM method, which is widely used in estimating dynamic models, is that it takes into account the unobservable country-specific effects and problems arising due to the inherent nature of independent variables in lagged dependent variable models. In GMM estimators, the lagged values of the dependent variable are added to the model as independent variables, providing the opportunity to solve such econometric problems. GMM estimators have been widely used in recent years, especially in economic

growth regressions. The inclusion of both time constant and country fixed effects into the model provides additional information about the growth and its determinants over time, thus helping to obtain more precise results (Mhadhbi, 2014: 48). Two basic GMM estimators, namely "Difference GMM" and "System GMM", can be used in dynamic panel analysis. The first estimation method developed by Arellono and Bond (1991) takes into account the estimation of the first difference of each equation to eliminate the specific effects of cross-sections (countries or individuals) and uses one unit lagged levels of explanatory variables as tool variables. The first difference GMM estimator has significant weaknesses, although under some conditions the prediction results show a congruent and asymptotically normal result. When the explanatory variables show continuity over time, the lagged values of these variables can be weak tools for the regression equation expressed by their first differences. Arellano and Bover (1995) and Blundell and Bond (1998) indicated that these tools used in the first difference GMM estimator are less informative in models where the variance of the fixed effects is higher than the variance of transient shocks. This situation probably causes more deviating coefficients, and this problem becomes more pronounced in small samples.

As a solution to this problem, Arellano and Bover (1995) and Blundell and Bond (1998) proposed a system GMM estimator. This second GMM estimator is based on the first method. This estimator is obtained by making significant improvements to the first difference GMM estimator. Due to its lower deviation and higher efficiency characteristics, the system GMM estimator is a superior estimator over many estimators, especially the first difference GMM estimator. Moreover, if the number of countries is small, the system GMM estimator performs better than the first difference GMM estimator. Therefore, it is stated that the system GMM estimator performs better than the difference GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998; Bond et al., 2001). To this end, the GMM-System estimation technique, which gives the best estimation results in dynamic panel data analysis, was used in the study. The module developed by Roodman (2006) in STATA was used for econometric estimation. Analyses were carried out by taking the logarithm of the relevant variables.

In GMM-System estimation, it is recommended to do some tests related to modeling, as in the GMM estimation. For this, as in GMM, first the Wald test and secondly the Sargan test are performed. Unlike the GMM estimation, in the GMM-System estimation, the Difference-Sargan test statistics is run for the validity of the vehicle variables added to the model. This statistical test is calculated by the difference between two separate Sargan tests calculated by GMM-System and GMM-Dif estimates. Finally, AR (1) and AR (2) tests are used to test

whether there are specification errors and autocorrelation problems in the model (Bozkurt, 2007).

3. FINDINGS

Since the assumption that the variables are stationary in the system GMM estimator is valid (Jung and Kwon, 2007: 2), the stationarity analysis of the variables in the panel data set should be performed before the model is estimated. To decide on the test to be used to determine whether the variables contain unit roots or not, the presence of inter-unit correlation should be tested. According to whether there is a correlation between units, the panel unit root tests are divided into two groups as first-generation tests and second-generation tests.

Table 2. Cross- Section Dependence Test Values

	Test value	**P value**
Pesaran	2.848	0.004
Friedman	18.109	0.011
Frees	1.588	Critical values of the Q distribution 0.342 for 0,05

As seen in Table 2, according to Pesaran, Friedman and Frees test results, the absence hypothesis that there is no correlation between the units cannot be rejected. In this case, it can be said that there is cross-section dependence in this sample group. Therefore, Augmented Dickey-Fuller (ADF) unit root tests developed by Pesaran (2007), which is the second generation unit root test used in case of cross-section dependence, were used in the study to test the stationarity in variables. Panel unit root test results are shown in Table 3. Unit root statistics reported here express the level values of the variables.

Table 3. Panel Unit Root Test Results

Variables	**ADF**
TP	2.123 (0.983)***
GDP	0.760 (0.776)***
POP	1.055 (0.854)***
INF_R	-2.572 (0.005)*
CP	1.733 (0.958)***

Notes: Each unit root test contains a fixed-trend model. Values in parentheses *, **, *** indicate probability values and represent significance at 1%, 5% and 10% levels, respectively.

As seen in Table 3, the null hypothesis, which expresses the existence of unit root for each variable, can be rejected at different levels of significance. Thus, each series level was determined as stationary, i.e. I (0). GMM-System estimation results obtained as a result of empirical application are also summarized in Table 4.

Table 4. GMM-System estimation results

Explanatory Variables	**Coefficients**
TP_{it-1}	0.977*** (0.000)
GDP	-0.063** (0.002)
POP	0.049*** (0.000)
INF_R	-0.009* (0.684)
CP	0.020** (0.030)
Diagnostic Tests	
Wald Test	2.11e+06 (0.000)
Sargan Test	53.41 (0.241)
Hansen Test	4.11 (1.000)
AR(1)	-2.05 (0.041)
AR(2)	-1.07 (1.000)

Notes: *, **, *** show statistical significance at the level of 10%, 5% and 1%, respectively. Values in parentheses are Z values.

According to the analysis results in Table 4, a significant relationship at the level of 1% significance was detected between the dependent variable of textile production (TP) and lagged value (TP_{it-1}). It is seen that the lag in textile production has a positive effect on textile production. This situation shows that the textile production levels of the previous period will be reflected in the following periods.

The variable of Gross Domestic Product (GDP), which is used as a measure of economic growth, is negative and statistically significant at 5% level. An increase of 1% in the Gross Domestic Product causes a decrease of 0.06% in textile production.

The population variable (POP) added as a control variable in the model refers to the total population. The effect of the population on growth can be positive or negative. The POP variable is positive and statistically significant at 1% level. Accordingly, in line with theoretical expectations, population growth increases the amount of textile production.

The coefficient of the annual inflation rate, which is the consumer price index, is expected to be negative. Growth will be adversely affected as the increase in inflation, which is an indicator of macroeconomic stability and management, indicates instability in the economy. Savings and investments will suffer as a result of the shaking of the confidence atmosphere and expectations being negatively affected, and efficient distribution of resources will be out of question. Besides, as inflation increases, real money balances will decrease and transaction costs will increase (Jongwanich, 2007). All these events will damage growth. In this context, as expected in theory, according to analysis results, increases in the inflation rate negatively affect growth. The inflation rate (INF_R) was found to be significant at the 10% level and its coefficient as -0.009. Although the value of the coefficient is low, it is negative.

Cotton is the most important input of the textile industry. Therefore, the cotton production amount is expected to affect textile production positively. As can be seen from the analysis results, the cotton production amount variable (CP) is positive and statistically significant at 5% level. A 10% increase in cotton production leads to a 0.2% increase in textile production.

Besides, when Table 4 is examined, it is seen that according to the results of the Wald test, the explanatory variables together are significant in explaining the dependent variable. Sargan test results show that the instrument variables do not have an internality problem (they are external), so the instrument variables are valid. Over-identification restrictions apply according to the Hansen test, and instruments are valid. Besides, the presence of the first-order and the second-order autocorrelation in the model was tested, and AR (1) test statistics were negative and significant as desired, while AR (2) test statistics were found to be insignificant. Thus, according to the findings obtained, it was concluded that while the existence of first-order autocorrelation was confirmed, there was no second-order autocorrelation.

4. CONCLUSION

In this study, the factors affecting textile production quantities for the group of countries including the USA, Spain, Turkey, China, India, Vietnam, Indonesia and Korea were analyzed by using annual data for the 2003-2013 period in line with the availability of the data. These factors were considered as the gross domestic product, the population of the country, the inflation rate of the country and the amount of cotton production. As a result of the analysis, it was found that the econometric model constituted a dynamic structure, and the estimation

results were obtained by using the GMM-System estimation technique. According to the results obtained, it was determined that there was a significant correlation of textile production amount (TP) (TP_{it-1}) with lagged value and population variable (POP) at 1% level, with Gross Domestic Product (GDP) variable and cotton production amount (CP) at 5% level, and with the inflation rate (INF_R) at the 10% level. Textile production lag affects textile production positively. This situation shows that the textile production levels of the previous period will be reflected in the following periods. The population variable (POP) added as the control variable in the model is positive, and per theoretical expectations, population growth increases the amount of textile production. A 1% increase in the Gross Domestic Product (GDP) leads to a 0.06% decrease in textile production. The amount of cotton production (CP) positively affects textile production, and a 10% increase in cotton production leads to a 0.2% increase in textile production. The coefficient of the inflation rate (INF_R) was determined as -0.009 and it was negative. As expected in theory, increases in inflation rate adversely affect growth.

Considering the history of the textile industry, it is seen that it has been a driving force in the development of many countries and played an important role in the Industrial Revolution. The textile industry in Turkey, which continues its development depending on cotton farming, has gained momentum in terms of development in recent years.

In recent years, Turkey in the textile industry has risen from the status of a country that follows trends to the status of a country that creates trends and fashion. Turkey, which is located at a point that can be considered as the center of the world, is only a few hours of flight away to countries in Europe, North Africa, West Asia and the Middle East. The industry stands out in the global market with its qualified human resources, production according to European Union technical and health standards, fast and error-free production capability in line with the fashion, and environmentally friendly production processes. With the developments in smart and high-tech fabrics and interior decoration, it has become a world brand, especially in the contract sector, and has undertaken airports, large hotel chains, restaurants, sports complexes and similar large projects in many countries of the world (UIB, 2018).

While the textile industry has played an important role in the economic development of developed countries, it has also been very effective in strengthening the economies of developing countries. Although the textile industry, which adapts rapidly to the changes in global trade, has experienced a contraction in exports in recent years, the measures to be taken to decrease this contraction are very important. At this point, factors such as technological innovations, R&D and product design come into play. The point that the textile industry, which

is quite important for Turkey in terms of international trade and due employment opportunities it provides, has reached looks promising for the future. Increasing the investments to be made in the sector, maintaining the competitive edge, and increased interest in fashion and design products day by day are important factors for the sector to progress without slowing down. As in every industry, competition comes to the fore in the textile industry, and countries need to keep up with the different dynamics of the sector to keep up with this competitive environment and to maintain their existence. While state-backed policies should be pursued for Turkey to adapt to globalization and the immediate changes experienced in the sector, it is also important to ensure domestic raw material to increase the competitiveness of the sector.

ETHICAL DECLARATION

In the writing process of the study titled "The Factors Affecting Textile Production Amounts of Leading Countries in Textile Export: Dynamic Panel Data Analysis", there were followed the scientific, ethical and the citation rules; was not made any falsification on the collected data and this study was not sent to any other academic media for evaluation.

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