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ANALYSIS OF EXPORT-LED GROWTH MODEL FOR TÜRKİYE ECONOMY WITH MARKOV REGIME SWITCHING MODEL[1]

İHRACATA DAYALI BÜYÜME MODELİNİN TÜRKİYE EKONOMİSİ İÇİN MARKOV REJİM DEĞİŞİM MODELİYLE İNCELENMESİ

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Abstract

Research on the export-led growth model is significant due to the contribution of exports to the development of domestic sectors and its positive impact on national values, especially employment and growth. Therefore, countries prefer the export-led growth model by increasing their export volumes with an outward-oriented policy. When Türkiye's growth figures are analyzed, it is feasible to say that there is a strong connection between exports and economic growth. In this study, within the framework of export-led growth hypotheses, the additive of exports to Türkiye's growth dynamics between 1980 and 2022 is investigated. The aim of the study is to econometrically test the intercourse between exports and GDP in the Türkiye economy. In the analysis, first linear unit root analyses were implemented. Then, the dynamic correlation relationship between exports and GDP was analyzed with DCC-GARCH, and the dynamic regression relationship was performed with the Markov regime switching model. As a consequence of the examines, it was seen that the dynamic correlation indicators and Markov model results were consistent with each other. While it was found that the correlation decreased during the high volatility period, a decrease in the number of regressions was observed according to the Markov model results.

Keywords: Exports, DCC-GARCH, Markov Regime Switching Model.

Öz

İhracata dayalı büyüme modeline yönelik araştırmalar, ihracatın yerli sektörlerin gelişimine katkısı, istihdam ve büyüme başta olmak üzere ülkenin ulusal değerleri üzerindeki pozitif etkisinden dolayı önem taşımaktadır. Bu yüzden ülkeler dışa yönelik bir politikayla ihracat hacimlerini arttırarak, ihracata dayalı büyüme modelini tercih etmektedir. Türkiye'nin büyüme rakamları incelendiğinde ekonomik büyüme ile ihracat arasında güçlü bir ilişkinin olduğu söylenebilir. Bu çalışmada, ihracat yönlü büyüme hipotezleri çerçevesinde, 1980-2022 yılları arasında, Türkiye'nin büyüme dinamiğinde ihracatın katkısı araştırılmıştır. Çalışmanın amacı, Türkiye ekonomisinde ihracat ve GSYH ilişkisini ekonometrik olarak incelemektir. Uygulamalı analizde önce doğrusal birim kök testleri yapılmıştır. Ardından ihracat ile GSYH arasındaki dinamik korelasyon ilişkisi DCC-GARCH ile, dinamik regresyon ilişkisi ise Markov rejim değişim modeli ile analiz edilmiştir. Analiz sonucunda dinamik korelasyon göstergeleri ile Markov model sonuçlarının birbirleri ile tutarlı olduğu görülmüştür. Yüksek oynaklık döneminde korelasyonun azaldığı görülürken, Markov model sonuçlarına göre regresyon sayılarında azalma gözlemlenmiştir.

Anahtar kelimeler: İhracat, DCC-GARCH, Markov Rejim Değişim Modeli.

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1. INTRODUCTION

The question "is trade a source of economic growth" has been a subject of interest since the classical economists to the present day. The first theoretical studies were conducted by classical economists Adam Smith (1776) and David Ricardo (1812). Smith and Ricardo argued that countries can rise the rate of economic growth and thus the welfare levels of countries through specialization in international trade. According to them, static and dynamic gains will be achieved with trade liberalization (Viner, 1950, Corden, 1972, Özgür, 2015: 187). According to the predictions of this theory, international trade is emphasized as a stimulus to the economic growth of nations. The history theory claims that export trade plays a critical role in generating foreign exchange needed to import goods and services that cannot be supplied by domestic production. This export-growth relationship is explained within the framework of the export-led growth hypothesis (Bokosi, 2015: 98).

The relationship between exports and Gross Domestic Product (GDP) depends on certain positive externalities caused by opening up foreign markets. Exports can emerge as a driver of growth in three cases. First, the expansion of exports directly plays an accelerating role in the growth of output, since exports, as an ingredient of all output, directly support growth. With an increase in foreign demand for local products, exports can trigger overall growth by increasing employment and income in the planned sectors. Second, increased exports can directly impact growth through factors such as influential allocation of resources, increased capacity use, economies of scale and competitive advantage in the international market (Helpman and Krugman, 1985; Awokuse, 2008: 162). Thirdly, export expansion can increase the rate of capital accumulation and contribute to the increase in factor productivity, thereby supporting economic growth (Kavoussi, 1984: 241).

It is argued that in the industrialization process, countries initially based their development policies on import-substitution industrialization and later adopted an export-oriented industrialization strategy (Seyidoğlu, 2007: 514). A common view among most development economists is that import substitution policies can negatively affect economic growth. By their very nature, they are thought to promote production inefficiency and encourage rent-seeking behavior (Awokuse, 2008: 162). Türkiye has been among the countries that have maintained this policy for a long time. However since the onset of liberalization in the early 1980s, the Turkish economy has witnessed a period of unprecedented economic growth and competition. Liberalization, which is expressed as the removal or reduction of restrictions and obstacles in the free exchange of goods between countries (Kalaycı, 2020: 226), has also created an environment conducive to the promotion of exports and the transformation of sectors in the economy (Ertuğrul and Mangır, 2015).

The most striking changes in the Turkish economy in the post-liberalization period have taken place in terms of foreign economic relations. Liberalization in foreign trade and the opening of the economy to foreign markets are the most important of these changes (Ateş and Bostan, 2007: 1). In line with the liberalized foreign trade policy adopted worldwide, Türkiye, like many other countries, has turned towards an export-oriented development strategy since the 1980s. In this period, an open approach was adopted instead of protectionist and import substitution policies. With the liberalization of foreign trade and foreign exchange regimes, Turkey took the first steps towards liberalization in foreign trade (Artekin and Duran, 2022: 42). Therefore, the linkage among increased foreign trade and export-led growth became an

agenda item after the 1980s and gained momentum in the 1990s. Thus, most of the studies on the export-led growth theory in Türkiye, which include applications, were conducted after 1990 (Bilgin and Şahbaz, 2009: 182).

This manuscript aims to explore the impact of exports on economic growth, specifically during periods of economic contraction and expansion, setting it apart from numerous other studies in the literature. In contrast to prevailing literature, this research comprehensively investigates the effects of exports across various stages of economic growth. In terms of, identifying the differences in the impact of exports on economic growth during contraction and expansion periods can provide important strategic insights for policymakers and businesses. By evaluating the effects of exports on economic growth from a more comprehensive perspective, this manuscript tries make a novel addition to the existing studies of history. The study has been prepared in four sections including introduction. In the second part of the study, it is investigated which studies are included in the literature on the subject, in the third part, knowledge on data and descriptive statistics is given, and after the fourth part, which includes analysis and findings, the findings and policy recommendations for the study are evaluated in the final section.

2. LITERATURE REVIEW

The Export-led Growth Hypothesis is a concept used in the literature to explain the positive effects of export growth on economic growth. This hypothesis suggests that exports play a significant role in economic growth, which is also known as the unidirectional causality hypothesis from exports to economic growth (Şimşek, 2003: 43). The Export-led Growth Hypothesis is based on the idea that exports contribute to employment generation within the local economy (Abosedra and Tang, 2019: 832), enhansed global collaboration and knowledge exchange and technology transfer (Cai et al. 2020: 503), enhanced efficiency and inventive advancements, poverty reduction (World Bank, 2022), and positive externalities such as export-led industrialization. Many studies in the literature support the export-led growth hypothesis in many economies around the world (Taha et al. 2023: 10). The export-led growth hypothesis is a significant investigate topic for applied studies and has been examined in many studies with different results. It is possible to analyze these studies in various categories, including those that confirm the validity of the export-led growth hypothesis, those that do not confirm the validity of the export-led growth hypothesis, and those that find both supportive and non-supportive findings on the effect of exports on economic growth. In Table 1 shows some international studies that examine the export-led growth hypothesis.

Table 1: Some International Studies Examining the Export-led Growth Hypothesis

Author / Authors	Country / Countries	Period	Method	Conclusion
Tayler (1980)	55 Medium Income and Developing Countries	1960-1977 (Y)	Horizontal Section Analysis	Export-led growth hypothesis is valid
Feder (1982)	55 Developed Country and Developing Country	1964-1973 (Y)	Horizontal Section Analysis	Export-led growth hypothesis is valid
Kavoussi (1984)	73 Developing Country	1960-1978 (Y)	OLS Method	Export-led growth hypothesis is valid
Hsiao (1987)	Hong Kong,South Korea, Singapore, Taiwan	1960-1982 (Y)	Time Series Analysis	Export-led growth hypothesis is not valid
Sung- Sen,Bisvas and Tribedy (1990)	South Korea, Japan, Taiwan	South Korea1960-1984(Y) Japan1957-1987(Y) Taiwan1961-1984(Y)	Time Series Analysis	Export-led growth hypothesis is valid
Abu-Qarn and Suleiman (2001)	Iran, Algeria, Israel, Egypt, Morocco, Jordan, Morocco, Sudan, Türkiye and Tunisia	Türkiye1966-1996(Y) Algeria , Sudan1968-1996(Y) Iran1974-1995(Y) Egypt, Morocco, Tunisia) Israel 1976-1996(Y)	Time Series Analysis	Algeria and Sudan Export-led growth hypothesis is valid; other countries is not valid
Vohra (2001)	Philippines, India, Malaysia, Pakistan, Thailand	1973-1993(Y)	Time Series Analysis	Export-led growth hypothesis is valid
Demirhan and Akçay (2005)	Türkiye, Algeria, Morocco, Iran, Israe , Egypt, Syria, Tunisia , Jordan	Morocco , Israel , Egypt, Türkiye1950-2000(Y) Algeria 1960-1996(Y) Iran1955-2000(Y) Syria1960-2000(Y) Tunisia1961-2000(Y) Jordan1954-2000(Y)	Time Series Analysis	Morocco and Jordan Export-led growth hypothesis is valid;Egypt , Türkiye and Syria is not valid
Siliverstovs and Herzer (2006)	Chile	1960-2001(Y)	Granger Causality and Toda - Yamamoto Causality Tests	Export-led growth hypothesis is valid
Jordaan and Eita (2007)	Namibia	1970-2005(Y)	Granger Causality and Cointegration Tests	Export-led growth hypothesis is valid

Table 1. (devam)

Mahadevan and Suardi (2008)	Taiwan , Japan , Hong Kong, Korea	Taiwan 1961-2005(C) Japan 1957-2005(Q) Hong Kong1973-2005(C) Korea 1970-2005(C)	Time Series Analysis	Export-led growth hypothesis for Taiwan, Korea and Hong Kong is valid; Japan is not valid
Bahmani-Oskooee and Economidou (2009)	Little Advanced 61 Country	1960-1999(Y)	Time Series Analysis	Export-led growth hypothesis is valid
Çetintaş and Barışık (2009)	Transition Economy 13 Countries	1995-2006(Q)	Panel Data Analysis	Export-led growth hypothesis is not valid
Dumitriu et al. (2010)	Romania	1999:1-2009:4(Q)	Johansen Cointegration test and Granger-Causality Test	Export-led growth hypothesis is valid
Dritsaki (2013)	Greece	1960-2011 (Y)	VECM and Granger Causality	Export-led growth hypothesis is valid
Bilas et al. (2015)	Croatia	1996-2012 (Y)	Engle-Granger	Export-led growth hypothesis is valid
Ee (2016)	Selected Sahara Six Africa Countries	1985-2014 (Y)	FMOLS DOLS	Export-led growth hypothesis is valid
Ahmad et al. (2018)	ASEAN5 Economies	1981-2013 (Y)	Panel Data Analysis	Export-led growth hypothesis is valid
Abosedra and Tang (2019)	Morocco, Egypt, Tunisia and Türkiye, Jordan	1980:1-2012:4(Q)	Granger Causation test	Jordan , Morocco And Türkiye for to export based on growth hypothesis is valid
Kalaitzi and Chamberlain (2020)	Unified Arab Emirates	1975-2012(Y)	Time Series Analysis	Long period-Export-led growth hypothesis is not valid
Felipe and Lanzafamea (2020)	Chinese	1981-2016(Y)	Bayes Model	Export-led growth hypothesis is valid
Odhiambo (2022)	Sahara Six Africa Countries	1980-2017(Y)	Panel Cointegration test and Granger-Causation test	In middle income countries export-led growth hypothesis is valid
Desiraju (2022)	India	1980-2020 (Y)	Johansen Cointegration And Breitung test	Export-led growth hypothesis is not valid
Islam et al . (2022)	Banglades, China, India and Myanmar	1990-2018(Y)	ARDL and MWALD Granger Causality test	For Mynamar export-led growth hypothesis is not valid, for Bangladesh, China and India is valid
Çiftçi and Oglakkaya (2023)	Mexico	1993-2022(Y)	Granger Causation and Johansen Cointegration Tests	Export-led growth hypothesis is valid

Table 1. (devam)

Istaiteyeh (2023)	Jordan	1976-2021(Y)	Granger Causation Test and VAR Analysis	Export-led growth hypothesis is valid
Jin (2023)	South Korea	1972-1996(Y) 1999-2017(Y)	OLS Regression Analysis	For 1972-1996 export-led growth hypothesis is valid, for 1999-2017 export-led growth hypothesis is not valid
Lee et al. (2023)	Eight ASEAN Countries	2009-2018(Y)	EGLS Panel Data Analysis	Export-led growth hypothesis is not valid
Taha et al . (2023)	Selected Arabic Economies	2001-2020(Y)	Panel Data Analysis	Export-led growth hypothesis is not valid
Bashir and Ibrahim (2024)	Sudan	1970-2020(Y)	ARDL	Export-led growth hypothesis is valid
Ghosh and Adebayo (2024)	Japan	1994-2022(Q)	Wavelet Local Multiple Correlation Method	Export-led growth hypothesis is valid

The linkage among exports and economic growth can be observed in different dimensions. Among the studies on the Export-led Growth Hypothesis, Tyler (1980), Feder (1982), Kavoussi (1984), Sung-Sen et al. (1990), Vohra (2001), Siliverstovs and Herzer (2006), Jordaan and Eita (2007), Bahmani-Oskooee and Economidou (2009), Dumitriu et al. (2010), Dritsaki (2013), Bilas et al. (2015), Ee (2016), Ahmad et al. (2018), Felipe and Lanzafamea (2020), Çiftçi and Oglakkaya (2023), Istaiteyeh (2023), Bashir and Ibrahim (2024) and Ghosh and Adebayo (2024) find this hypothesis to be valid. The hypothesis is not valid in the studies conducted by Hsiao (1987), Çetintaş and Barışık (2009), Kalaitzi and Chamberlain (2020), Desiraju (2022), Taha et al. (2023), and Lee et al. (2023). In the country group studies conducted by Abu-Qarn and Suleiman (2001), Demirhan and Akçay (2005), Mahadevan and Suardi (2008), Abosedra and Tang (2019), Odhiambo (2022) and Islam et al. (2022), it was found that the Export-Led Growth Hypothesis is valid in some countries while it is not valid in others.

Table 2: Some Studies Examining the Export-led Growth Hypothesis in Türkiye Sample

Author / Authors	**Period**	**Method**	**Conclusion**
Mucuk et al . (2003)	1969-2002 (Y)	Granger causality test	Export-led growth hypothesis is valid
Şimşek (2003)	1960–2002(Y)	Granger causality and VAR test	Export-led growth hypothesis is not valid
Karagöz and Şen (2005)	1989–2004(Q)	Granger causality and cointegration test	While the Export-Led Growth hypothesis is not valid for the short run, the hypothesis is valid for the long run.

Table 2. (devam)

Özer and Erdoğan (2006)	1987–2006(Q)	Granger causality and VAR test	Export-led growth hypothesis is valid
Yapraklı (2007)	1970–2005(Y)	Cointegration and Granger causality test	Export-led growth hypothesis is valid
Aktaş (2009)	1996 –2006(M)	Cointegration and Granger causality	Export-led growth hypothesis is not valid
Bilgin and Şahbaz (2009)	1987–2007(Y)	Granger causality and Toda-Yamamoto causality tests	Export-led growth hypothesis is valid
Ispir et al . (2009)	1989-2007 (Y)	Markov Regime Switching Model	Export-led growth hypothesis is valid
Takım (2010)	1975–2008(Y)	Granger causality test	Export-led growth hypothesis is not valid
Özturk and Acaravcı (2010)	1989–2006(Q)	Toda-Yamamoto causality and cointegration tests	Export-led growth hypothesis is valid
Temiz and Gokmen (2010)	1950–2009(Y)	Cointegration And G rangercausality test	Export-led growth hypothesis is not valid
Tiraşoğlu (2012)	1998-2011(Q)	Causality and Structural Break Cointegration Test	Export-led growth hypothesis is valid.
Akbulut and Terzi (2013)	1980–2010(Y)	Cointegration and Granger causality test	Export-led growth hypothesis is not valid
Saraç (2013)	1989-2011(Q)	Markov Regime Switching Model	Export-led growth hypothesis is valid
Korkmaz (2014)	1998–2013(Q)	Toda-Yamamoto causality tests	Export-led growth hypothesis is valid
Sağlam and Egeli (2015)	1999–2013(Q)	Granger Causation and cointegration test	While the Export-Led Growth hypothesis is not valid in the short run, the hypothesis is valid in the long run.
Yıldırım (2015)	1997-2013 (M)	Asymmetric Causality test	Export-led growth hypothesis is not valid
Akkaş and Öztürk (2016)	2001–2014(Q)	Causality Methods	Export-led growth hypothesis is not valid
Huseyni and Çakmak (2016)	1980–2010(Y)	Granger Causation test	Export-led growth hypothesis is valid
Bal and Akca (2017)	1990-2016 (M)	Bootstrap Simulation Technique	Export-led growth hypothesis is valid
Dura et al. (2017)	1992–2014(Y)	Nonlinear Causality test	Export-led growth hypothesis is valid
Pata (2017)	1971–2014(Y)	VAR and Toda-Yamamoto Causality tests	Export-led growth hypothesis is valid.
Yurdakul and Aydin (2018)	2003–2016 2008–2016(Q)	Cointegration and DOLS	While the Export-Led Growth hypothesis is not valid in the first period, it is valid in the second period.
Aslan and Topçu (2018)	2000–2015(Q)	FMOLS and DOLS	Export-led growth hypothesis is valid.

Table 2. (devam)

Şahin and Durmuş (2018)	2002-2017(M)	Fourier Granger Causality test	Export-led growth hypothesis is not valid.
Yenisu (2019)	1980–2016(Y)	ARDL	Export-led growth hypothesis is valid.
Kara (2020)	2004–2017(Y)	System GMM	Export-led growth hypothesis (regional) is valid .
Yılgör et al. (2021)	2002- 2018 (Q)	Toda-Yamamoto Causality Tests and Hatemi -J Cointegration	Export-led growth hypothesis is valid.
Ayvaz Güven (2021)	1980-2020 (Q)	Johansen Cointegration Test and Granger Causality Test	Export-led growth hypothesis is valid.
Baktemur (2021)	2003-2020(Q)	Granger Causality Test and Diks Panchenko Nonlinear Causality Test	Export-led growth hypothesis is valid.
Kardaşlar (2022)	1990-2019(Y)	Maki Cointegration Test and Toda and Yamamoto Causality Tests	Export-led growth hypothesis is valid.
Orhan et al. (2022)	1999–2013(Q) 2014–2021 (Q)	Granger Causality Test	While the Export-Led Growth hypothesis is not valid in the first period, it is valid in the second period.
Alancıoğlu and Bayraktutan (2023)	1980-2021(Y)	VAR Test	Export-led growth hypothesis is valid
Arslan and Etiz (2023)	1960-2020(Y)	ARDL and VAR Test	Export-led growth hypothesis is valid.
Çelik and Aydın (2023)	1980-2021(Y)	VAR Test	Export-led growth hypothesis is not valid.
Gök and Güvercin (2023)	2005-2017(Q)	ARDL	Export-led growth hypothesis is valid.
Yılmaz and Albayrak (2023)	1980-2020(Y)	ARDL	Export-led growth hypothesis is not valid.
Emek (2024)	2016-2023(M)	Fourier Toda-Yamamoto Granger Causality Test	Export-led growth hypothesis is valid.
Note: This table in the preparation partially from the study *"Kardaşlar (2022)"* was used .			

In order to test the Export-led Growth Hypothesis in Türkiye sample; Mucuk et al. (2003) Özer and Erdoğan (2006), Yapraklı (2007), Bilgin and Şahbaz (2009), Ispir et al. (2009), Öztürk and Acaravci (2010), Tıraşoğlu (2012), Saraç (2013), Korkmaz (2014), Hüseyni and Çakmak (2016), Bal and Akca (2017), Pata (2017), Dura et al. (2017), Aslan and Topcu (2018), Yenisu (2019), Kara (2020), Yılgör et al. (2021), Ayvaz Güven (2021), Baktemur (2021), Kardaşlar (2022), Gök and Güvercin (2023), Alancıoğlu and Bayraktutan (2023), Arslan and Etiz (2023) and Emek (2024) the Export-Led Growth Hypothesis was found to be valid. This hypothesis is not valid in the studies conducted by Şimşek (2003), Aktaş (2009), Temiz and Gökmen (2010), Takım (2010), Akbulut and Terzi (2013), Korkmaz and Aydın (2015), Yıldırım (2015), Akkaş and Öztürk (2016), Şahin and Durmuş (2018), Çelik and Aydın (2023) and Yılmaz and Albayrak (2023). In the period-based studies conducted by Karagöz and Şen (2005), Sağlam and Egeli (2015), Yurdakul and Aydın (2018) and Orhan et al. (2022), the

Export-Led Growth Hypothesis was acceptted to be valid in certain periods, but not in certain periods.

Despite the various analyses in the literature on the Export-Led Growth Hypothesis in Tables 1 and 2, the studies analyzing contraction and expansion periods with the Markov Regime Switching Model are quite limited. İspir et al. (2009) examined the influence of outbound and inbound trade on Turkey's economic expansion from 1989 to 2007. Based on the findings of the research, it is found that exports are more effective in the transition from the contraction period to the expansion period, while exports and imports contribute together in the expansion period. On the other hand,

Saraç (2013) examined the impacts of outbound and inbound trade on economic growth through the utilization of nonlinear analytical techniques during the quarterly intervals spanning from 1989:2 to 2011:4. The study revealed that exports and imports exhibit a favorable influence on economic growth during both periods of contraction and expansion.

3. DATA AND DESCRIPTIVE STATISTICS

The study tests the export-led growth hypothesis for Türkiye in the period 1980-2022. Equation (1) is used to test the effect of export figures on GDP.

$$LGDP_t = a_0 + a_1\, LEXPORT_t + u_t \qquad (1)$$

In equation 1, LGDP is the independent variable and LIHRACAT is the dependent variable. LGDP is the natural logarithm of GDP in dollars and LEXPORT is the natural logarithm of exports in dollars. u_t is the error term. GDP data for the sample period are taken from the World Bank database and export data are taken from TUIK statistics.

In the analysis of the study, firstly, it is checked whether the variables are stationary or not. In the stationarity analysis, the traditional NG-Peron (2001), which is in line with the literature, and Zivot Andrews (2002), which deals with structural breaks, were applied.

After the determination of stationarity, the linearity of the dependent and independent variables was measured by applying the BDS (1996) test. After the results of this test revealed that the series were nonlinear, the export-led GDP relationship in the Turkish sample was analyzed by dynamic correlation and dynamic regression methods.

Firstly, the static correlation between the variables is analyzed and then DCC-GARCH analysis is performed for the dynamic correlation relationship. The distinction of this investigation compared to prior studies in the literature is that it analyzes the effect of exports on the transition between contraction and expansion periods in growth dynamics and the continuity of the aforementioned regimes. Therefore, the Markov analysis of the economic growth variable will be performed first and then the probabilities will be determined within the scope of these analyses (İspir et al., 2009: 63).

Table 3: Descriptive Statistics

	LDP	LEXPORT
Mean	12.55650	10.55146
Median	12.52196	10.35246
Maximum	13.77239	12.44575
Minimum	11.00193	7.975908
Std. Dev.	0.974222	1.289805
Skewness	-0.190662	-0.170893
Kurtosis	1.563073	1.711034
Jarque-Bera	3.959880	3.186033
Probability	0.138078	0.203311
Observations	43	43

When the standard deviation values, which are volatility indicators according to the statistical values shown in Table 3, are tested, it is seen that the standard deviation value of the export variable is relatively higher. Considering the probability values in the Jarque-Bera t-statistic findings that there is a normal distribution in the H_0 hypothesis, it is observed that both GDP and Export variables have a normal distribution.

4. EMPIRICAL ANALYSIS AND FINDINGS

In the empirical analysis, firstly, the traditional Ng-Perron (2001) and Zivot Andrews (2002) tests, which take into account the structural break, were applied and it was observed that LGDP and LEXPORT variables were stationary after taking their first differences I(1). After stationarity, the linearity of the variables was examined with the BDS test.

Table 4: NG Peron Test Results

	MZ_a	MZ_t	MSB	MPT
LGDP	0.73824* **(**-5.70000)	0.76531* (-1.62000)	1.03668* (0.27500)	70.3469* (4.45000)
∆LGDP	-20.4809*** (-13.8000)	-3.19590*** (-2.58000)	0.15604** (0.17400)	1.21092*** (1.78000)
LEXPORT	1.29818* (-5.70000)	1.46212* (-1.62000)	1.12628* (0.27500)	91.5125* (4.45000)
∆LEXPORT	-11.3514** (-8.10000)	-2.35850** (-1.98000)	0.20777** (0.23300)	2.25156** (3.17000)
Note: Both variables are constant but without time trend. ***, **, * are 1, 5 and 10 percent represent the level of significance. Numbers in parentheses are critical values.				

Table 4 above is analyzed in depth, it is found that the series are non-stationary at I(0) level with constant trend. When the absolute value of the t statistic of the series at I(0) level is taken, it is found to be below the required number. For example, the t statistic of LGDP at I(0) level is calculated as 0.73824. This finding is smaller than the lower figure of -5.70000 when absolute values are taken into account. However, the upper t statistic should be greater than the numbers corresponding to the lower percentages. As a matter of fact, the t statistic value of the LGDP differenced at the 1st order is -20.4809. Since this result is greater in absolute value than -13.8000, it can be said that our series is stationary. Similar results were obtained for the other series. Therefore, it is empirically proven in Table 4 above that all series are stationary after first order differences are taken.

Table 5: Zivot Andrews Unit Root Test with Structural Breaks

	Δ LGDP			**ΔLEXPORT**		
	Models			**Models**		
	A	**B**	**C**	**A**	**B**	**C**
Test Statistic	-6.993	-4.862	-6.997	-7.198	-6.425	-7.199
%1	-5.34	-4.80	-5.57	-5.34	-4.80	-5.57
%5	-4.93	-4.42	-5.08	-4.93	-4.42	-5.08
%10	-4.58	-4.11	-4.82	-4.58	-4.11	-4.82
Break Date	2009	2008	2003	2009	2005	2009
Conclusion	Stable	Stable	Stable	Stable	Stable	Stable

Note: Model A indicates a single break in the constant; Model B indicates a single break in the trend; Model C indicates a single break in both the constant and the trend. The lag length k is selected based on the "AIC" criterion.

The study employed the Lee-Strazicich (LS-2003) unit root test due to its consideration of structural breaks. Initially, the first differences of the series, which were non-stationary in their original levels, were computed. The outcomes derived from the LS unit root test are presented in Table 6 below. According to the findings of the LS unit root test analysis in the table, it is concluded that the variables achieve stationarity in their first differences. In this test, if the critical values are lower than the test statistic values (1%, 5%, 10%), the null hypothesis (H_0) of a unit root with structural break is rejected.

Table 6: Lee Strazicich LM Unit Root Test

	Δ LGP	**ΔLEXPORT**
Test Statistic	-6.624	-7.592
%1	-6.750	-6.821
%5	-6.108	-6.166
%10	-5.779	-5.832
Break Date	1984-1991	2001-2012
Conclusion	Stable	Stable

When the break dates of the series are examined, it can be mentioned that foreign trade was liberalized to a great extent after 1984 and its effect on economic growth can be mentioned. The 1991 Gulf Crisis had a negative impact on the Turkish economy in many ways such as the increase in terrorism, migration and tourism. Among the other break dates, 2001 can be matched with the economic crisis of that year. Looking at 2012, it can be said that there has been an increase in the diversity of countries in terms of foreign trade and an expansion of the trade axis.

In the analyses conducted by applying the Ng-Perron (2001), Zivot Andrews (2002) and Lee-Strazicich (2003) tests that take account of the structural break, it is seen that the LGSDP and LIHRACAT variables are stationary after their differences are taken, that is, after they become I(1).

Table 7: BDS Test Results

Dimension	LGDP	LEXPORT
	BDS Statistics	**BDS Statistics**
2	0.181050 (0.0000)	0.189303 (0.0000)
3	0.308934 (0.0000)	0.317076 (0.0000)
4	0.401735 (0.0000)	0.415048 (0.0000)
5	0.461771 (0.0000)	0.481004 (0.0000)
6	0.501670 (0.0000)	0.527056 (0.0000)

In this table, H_0 hypotesis that the series are linear was refused, and according to the BDS test outcomes, it was define that the LGDP and LEXPORT series did not show linear properties.

Table 8: Static Correlation

	LGDP	**LEXPORT**
LGDP	1.000000	0.983167
LEXPORT	0.983167	1.000000

Table 8 is examined, the average correlation coefficient between LEXPORT and LGDP during the sample period was found to be 98 percent.

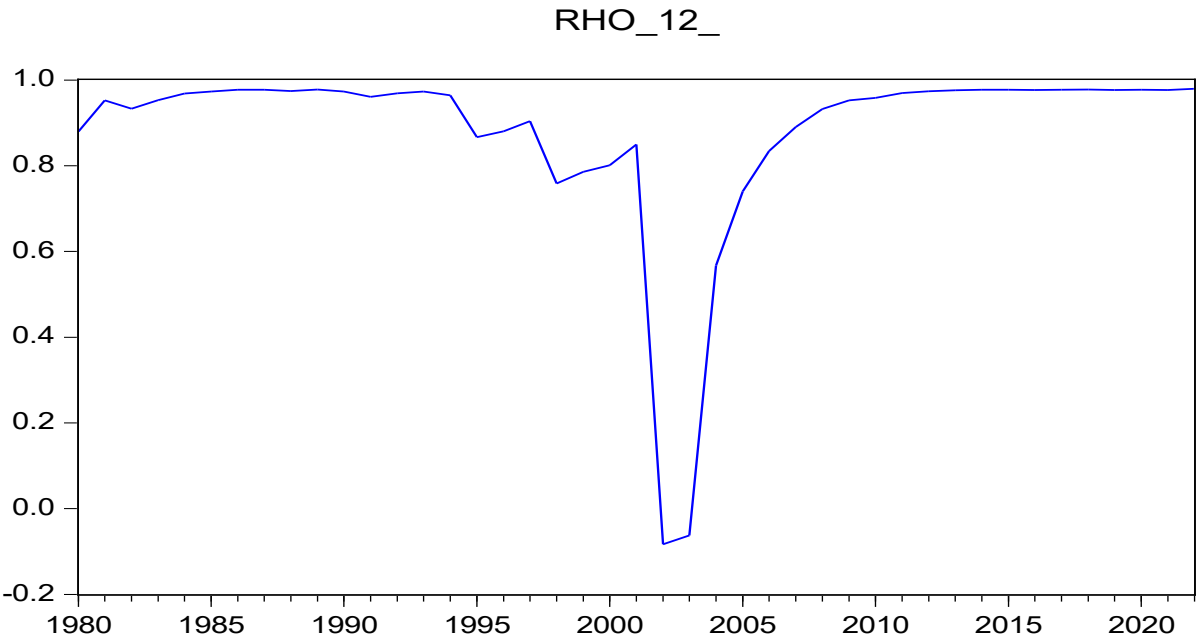

Figure 1: Dynamic Correlation Coefficients (DCC-GARCH Model)

Engle (2002) enhanced the Dynamic Conditional Correlation-GARCH (DCC-GARCH) model to address the limitations of the multivariate constant conditional correlation-GARCH

(CCC-GARCH) model. In contrast to alternative multivariate GARCH frameworks, Engle's (2002) DCC-GARCH model enables the incorporation of time-varying correlations. Furthermore, by virtue of the exponential rather than linear increase in the number of parameters to be estimated, the DCC-GARCH model circumvents the dimensional challenges encountered in other multivariate GARCH models, thus facilitating the derivation of dynamic conditional correlations.

With the DCC-GARCH model applied in the study, it is observed that the dynamic correlation coefficients among LGSDP and LIHRACAT factors are negative in 2002. Due to the 2001 crisis, the correlation decreased in the 2002-2004 period and returned to its previous level after 2004. It is observed that exports have a positive impact on economic growth in both contraction and expansion periods in the time period specified in the study.

Table 9: Regime Transition Probabilities Matrix

	1	**2**
1	0.840914	0.159086
2	0.175339	0.824661

According to the regime transition probability matrix, the probability of contraction in the regime again in the post-constriction period is 0.84. The probability of the regime being in expansion again in the post-expansion period is 0.82. The length of time the economy spends in the expansion regime indicates the permanence of the expansion regime.

Table 10: Markov Regime Switching Model

Dependent Variable: LGDP
Method: Markov Switching Regression (BFGS / Marquardt steps)
Sample: 1980-2022
Included observations: 43
Number of states: 2

Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
Rejim 1				
LEXPORT	0.689947*	0.013818	49.93110	0.0000
C	5.436286	0.150258	36.17973	0.0000
Rejim 2				
LEXPORT	0.738191*	0.014189	52.02636	0.0000
C	4.604429	0.145392	31.66917	0.0000

Note: The table presents the regression outcomes for the MRD model.* and *** indicate 1% and 10% significance levels, respectively. GDP is the dependent variable in all specifications. The independent variable is export volume.

The results of the Markov Regime Switching (MRD) model are presented in Table 10 above. The export volume variable has a positive and statistically important linkage with the price gap among Türkiye and the world in all models. The forecasted coefficients diverse between 0.6899 and 5.4362 across regimes and specifications. The calculated coefficient for

the export volume variable is positive and exhibits statistical significance in both conditions. The calculated coefficient of the Gross Domestic Product (GDP) variable is statistically significant in both Regime 1 and Regime 2. Therefore, considering the MRD model, all the empirical findings obtained for both regimes reveal that the volume of exports affects GDP for Türkiye in the period 1980-2022.

In the model, while the effect of exports on GDP is 0.73 at low volatility (when the economy is stable), the effect of exports on GDP decreases at high volatility. This value decreased from 0.73 to 0.68. As a result, dynamic correlation indicators and Markov model results are consistent with each other. While the correlation decreases during high volatility, the number of regressions decreases according to the Markov model results.

To assess for potential autocorrelation issues in the empirical robustness of our analysis, we examine the residual plot depicted in Figure 2 below.

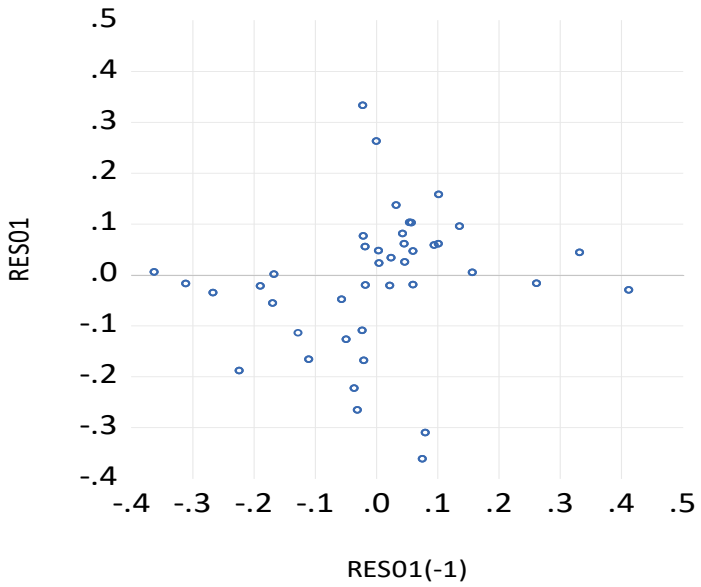

Figure 2: Autocorrelation chart for Türkiye

In this graph, all residues are randomly distributed and have undergone entropy. Therefore, the structure in the figure proves that there is no autocorrelation problem in the sample.

5. CONCLUSION

This research examines the export-led growth hypothesis for Türkiye. As a result of the test, the dynamic correlation coefficients among the DCC-GARCH model and LGDP and LEXPORT series were negative in 2002. Due to the 2001 crisis, the correlation decreased in the 2002-2004 period and returned to its previous level after 2004. In the study, it is found that exports positively impact economic growth in both contraction and expansion periods in the time interval in which the economy is in. In addition, the test results show the persistence in the expansionary regime by taking into account the length of time the economy spent in the expansionary regime.

The Markov Switching Model results demonstrates that while the impact of exports on GDP is 0.73 at low volatility, the effect of exports on GDP decreases at high volatility. This

value decreased from 0.73 to 0.68. As a result, dynamic correlation indicators and Markov model results are consistent with each other. While the correlation decreased during the period of high volatility, the number of regressions decreased according to the Markov Switching Model results.

When the outward-oriented policies implemented with the liberalization period in Türkiye and the final results of this study are evaluated together, it can be stated that exports contribute to Türkiye's growth dynamics. In the Export-led Growth Hypothesis, exports should be supported and policies should be implemented to develop industries that produce capital and intermediate goods. Within the scope of these policies, the main ones are; industrial policies focused on high value-added production and innovation should be created, R&D and innovation should be supported, investments in renewable energy and energy efficiency should be made, dependence on energy imports should be reduced, export diversity and export incentives should be increased. With the policies implemented, the structural process will change, the production of goods and services will increase, foreign exchange revenues will increase with this increase, and this will positively affect growth. With the policies implemented, the structural process will change, the production of goods and services will increase, foreign exchange revenues will increase with this increase, and this will positively affect growth.

With the realization of structural reforms, Türkiye will attract more hot money and foreign investors, and the Know How transfer process will accelerate with the arrival of physical investment. Especially during the period when technology transfer takes place, as China has done, higher quality production will be realized by minimizing the import of intermediate goods in the following stages, as well as imitation at the production stage. In the process of transforming raw materials into high value-added output, the importance given to the baby industry, especially from the beginning, will ultimately make the country more competitive in the international arena by creating its own multinational companies. Minimal state intervention in markets, which is one of the most important phenomena of liberalization, and the transition of sectors from a monopolistic to a more oligopolistic structure will lead to more effective competition between companies. The share of Türkiye's high value-added exports in total exports is 2.5 percent. R&D investments made and to be made will increase this ratio. All these strategies to be implemented by policymakers will not only contribute to Türkiye's economic growth but also accelerate the expansion process in the economy by compensating for the current account deficit.

Türkiye's exports rely heavily on imported inputs, making it import dependent in foreign trade. Trade expansion is important for Türkiye's economic growth, and increased competitiveness will enable Türkiye to enhance the productivity and standard of its goods and services, as well as increase its productivity in the global market. Türkiye's economic strengthening requires the implementation of a competitive, diversified, an export strategy focused on production, aiming for complete trade integration with the global market. Türkiye should increase its competitiveness through an outside trade policy oriented directed towards sectors where it possesses a comparative edge.

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