Economic Growth Response to Exports in Turkey: A Cointegration Analysis

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Abstract

This paper scrutinizes the response of Turkey's economic growth to exports from 1980-2021, The data were obtained from the World Bank data system. This study employs cointegration and error correction model approaches. The empirical results show that the short-run dynamic behavior of Turkish economic growth has been tested by estimating an error correction model, the error correction coefficient is negative signed and statistically significant, and Granger causality shows no relationship between growth and exports.

Keywords: Exports, economic growth, labor, capital, ECM, Turkey.

JEL: F43. F49 . C32 . O55

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1. Introduction

The emergence of globalization enables countries to engage in a new phase of economic relations. Countries that followed the trade liberalization approach had a great opportunity to attract foreign investment, as these investments are one of the dynamic factors of production and international trade. Manufacturing expansion is portrayed as an "engine of growth". In emerging countries such as China and India, industrialization plays an essential role in sustainable growth. Free trade leads to more labor division and efficiency in resource allocation in these countries. Globally, the growth in manufacturing exports is driven by the accumulation of innovation, cheap intermediate and intra-trade, the reduced cost of transportation, and qualified industrial zones (QIZ). There is a controversial debate among scholars about the obscure relationship between exports and economic growth, some believe that exports are the key factor in sustaining growth based on export-led growth theory.

Counties with high export growth can witness accelerated specialization, as well as benefit from comparative advantage. Moreover, by exporting sectors taking advantage of the international division of labor, global competition demands exporting countries to keep costs low and employ more efficient operations. Export growth stimulates foreign direct investment leading to new technology and innovation which later shift aggregated demand and hold economic growth. The scale of economies and diversification as the motor of exporting base leads to new operation methods, human skills, and physical capital accumulation to support economies toward sustaining growth.

Export-led growth theory should be embodied by investment expansion; investment has a crucial role in reinforcing the growth of aggregate demand and enlarging the economy’s capacity by accumulating its capital stock and injecting a production base with advanced technology. Export growth indicators enhance the positive expectation of future economic growth, as well as, expanding exports allow countries to access the global capital market (Krueger, 1985).

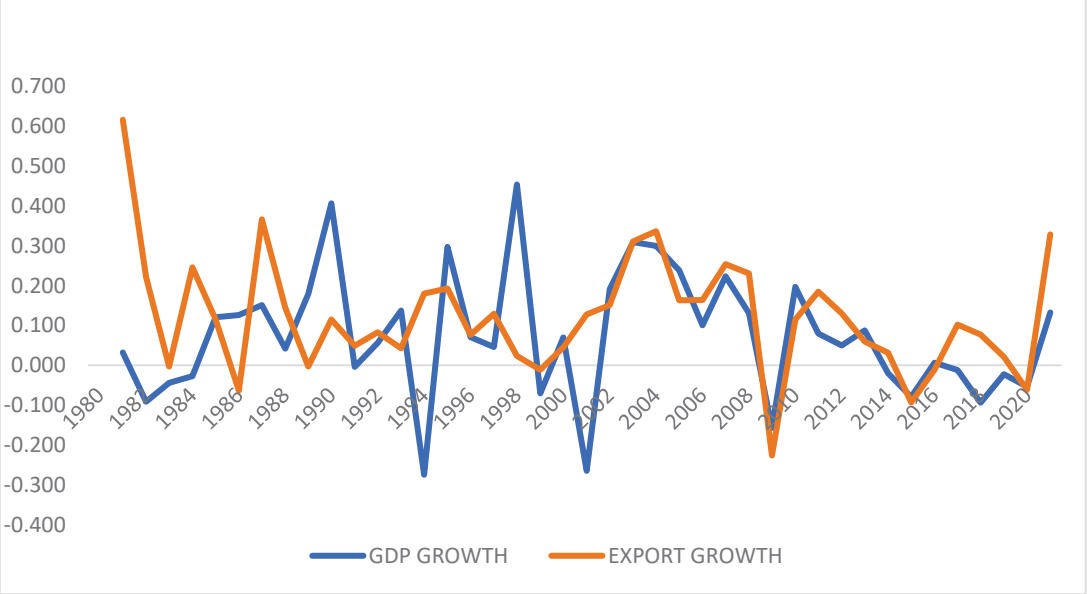
Based on the economic reform agenda of 1980, the Turkish government gave priority to supporting exporters and constructing companies to serve industries instead of traditional agricultural export sectors. This will lead to employing an import-substitution strategy, The relationship between economic growth and exports occupies high debate among scholars around the globe as well as Turkish economists, this puzzle is supported and rejected by each other.

The long -run relationship between Turkey’s exports and economic growth, were affected by both national and worldwide crises (Simdi & Seker ,2018). During past years Turkey achieved high growth in exports, economic growth affected positively (Aslan & Topu, 2018; Ozcan & Ozcelebi, 2013). The short-run and long-run relationship between exports and growth during 1965-2009 in Turkey tested, results

show that the relationship is not valid in the short run, nevertheless, the long-run relationship between exports and economic growth is supported (Temiz, 2010).
Turkey adopted economic reforms with a view to its access to international markets through the adoption of trade liberalization, reducing tariffs and attention to exports, which contributed to the growth of foreign trade significantly and doubled its size, where industrial products accounted for the highest percentage of total Turkish exports.

Figure 1. presents the trend of GDP rate and export rate from 1980 to 2021, it can be seen that the two variables present different trends in some years, in 1982 growth rate was recorded at -0.09 and exports recorded growth of nearly 0.22, in 1990 growth rate reached 0.40, in other hand, exports growth rate were 0.11, in 2009 turkey exported affected by global financial crises, in this year GDP rate and exports rate trend move at the same movement, overall, figure 1 shows that economic growth and exports rate move in a different direction.

Figure 1. GDP and Exports growth rate (1980-2021)



2. Literature review

In the opinion of numerous experts, the relationship between exports and economic growth is crucial. Exports increase economic growth by leveraging economies of scale and fostering greater competition for productivity (Bhagwati & Srinvasan, 1979). A nation must devote a sizeable portion of its resources to research and development in order to provide the market with cutting-edge products, even though it can achieve the economies of scale through the expansion of exports and reap these benefits over an extended period of time.

To diversify exports, countries increase resources which allocated to research and development (R&D), new innovations has a major role in economic growth (Barro, (1991; Mankiw, 1995) . It is vitally important to provide the global market with cutting edge goods and services using the most recent production process techniques, expertise, and information. It is crucial to provide the global economy with unique items because it is changing daily. The two additional elements that are crucial for the growth of exports are innovations and technology. According to Edward the creative and diverse product lines are responsible for the exports' that induce economic growth (Edward, 1992).

Indonesia in last years followed Export-led growth strategy, some study examined the nation's economic development using data on imports, exports, and exchange rates over 1980-2019. multiple regression analysis is employed as a research method in conjunction with the ordinary least square regression strategy. The results demonstrate that while imports are crucial in favorably impacting economic growth, exports and exchange rates only have an indirect effect on it. Surprisingly, the link between imports and exports exhibits notable positive results after being mediated by the currency rate. The government may also find the study's findings useful in formulating policies, particularly those pertaining to boosting economic growth through import and export operations (Haryani & Azam, 2021).
Recently, the effects of trade openness, imports, and exports on Namibia's economic growth examined. ARDL cointegration method employed. The findings indicate that imports and economic growth have a strong negative association, whereas exports and trade openness have positive and significant relationships with economic growth. Moreover, trade openness, imports, and exports are the main drivers of short-term economic growth. The results imply that trade liberalization and growth driven by exports are essential to Namibia's economic progress. All things considered, this research backs with the mercantilist thesis, which highlights how crucial it is to engage in international markets by growing trade and exports (Tafirenyika et al., 2023).

In a different study the connection between Namibia's GDP and exports from 1970 to 2005. The study supports an export-led growth strategy by demonstrating the large contribution of exports to economic growth through the application of Granger causality and cointegration methods (Jordaan & Eita, 2007)) . Exports and technology have a favourable and considerable impact on the economic growth of growing Asian economies, according to the Solow economic growth model (Md Reza, 2019) .The long-term estimate establishes the noteworthy and advantageous effects of commerce and technology on the nations' economies. Using various dynamic panel models, the results show a strong correlation between technology and exports and the countries' economic growth. In order to preserve steady economic growth, we advise policymakers to create enticing policies that can promote trade and technological advancement.

Exports are essential to the expansion and development of an economy. The important correlation between exports, technology, and economic growth in developing and emerging nations has also been highlighted by a number of recent studies (Dollar, 1992; Frankel & Romer, 1999; Radelet, Sachs, & Lee, 1997; Sachs, Warner, Aslund, & Fischer, 1995; Schiff & Wang, 2006; Baliamoune-Lutz (2011), World Bank, 1993). According to a study by Hagemejer and Mu_ck (2019), the GDP growth of the CEEC (Central and Eastern European) nations occurred between 1995 and 2014. It implies that, for the most part during the transition and EU integration, exports have been a significant factor in determining economic growth. It also demonstrates that the main force behind these nations' convergence with their more developed counterparts has been exports.

Some researchers investigate the relationship between Western Balkan Countries (WBCs) economic growth and technology-intensive exports between 2005 and 2015. The results indicate that the production of commodities, which is driven by medium-low and low-technology businesses, has the biggest impact on raising GDP per capita. These economies ought to grow their technology-driven sectors in order to mitigate their heavy reliance on high-end product imports. Thus, for any WBC nation, natural resources may play a key role in driving up overall exports and reindustrialization (Trlakovi et al., 2018).

Using panel data for 69 nations from 1975 to 1993, demonstrated the substantial and positive causal relationship between these countries' growth, exports, and export composition (Greenaway et al., 1999). Diversifying exports is a key component in helping developing nations boost economic growth. Similarly, industrialized nations are also benefiting from specialization in exports (Hesse, 2008).

In 1989, Canada and united state of America signed free trade agreement, bilateral trade increased, the causal relationship between trade and economic in Canada and united states of America examined, vector error correction employed on time series annual data 1948-1996, results support that the presence relation in Canada that trade induce growth and vice versa, while in us the relation is weak, moreover, results reveal that Canada is more open than USA and trade play significant role in Canadian growth (Zestos & Tao, 2002) .

India economy witnessed high economic growth, the relationship between exports and growth and other factors in India scrutinized, vector autoregression (VAR) employed on annual data during 1961-2015, results show a unidirectional relationship between RGFC economic growth and exports, imports had bidirectional relationship in long run, moreover, results show that exports sector has significant role in economic growth in India (Subhan et al., 2021).

The relationship between exports and GDP for BIMSTEC (Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand) nations tested, time series over period 1997-2015, results support the exports led growth and vice versa (Kaur et al., 2017).

Employed a nonparametric causality-in-quantile approach to test the relationship between export and Turkish economic growth, annual data used from 1960-2018, results show a positive causality from economic growth to export growth at low, while high -quantile ranges of export growth (Bahramian & salimiezhad, 2019).

In Singapore exports play important role in economic growth, Singapore has highly efficient infrastructure in logistic services, free trade policies applied as well as innovation in new products supported (Mahadevan, 2009).

Export-led growth hypothesis tested in Canada by constructing a vector autoregression (VAR) , granger causality test , two period were chosen , the first (1877-1945), the second (1946-1991), results show one way granger causal relationship , which indicates the growth rate of GDP in Canada influences export growth (Henriques & Sadorsky, 1996) . The relationship between exports, imports, and growth for Japan and south Korea has investigated, vector autoregression (VAR) employed, time period for Japan 1957-2003, and for south Korea 1963-2003, results show that a bidirectional causality between imports and growth in two countries, in Japan export-led growth hypothesis was supported, (Zang & Baimbridge ,2011; Awokuse, 2006; Koh & Mah (2013).

In south east Asian countries (Malaysia, Indonesia, Singapore, Thailand and Philippines), exports and economic growth have long run relationship, causality test reveal that domestic economic growth represents the vital one to cause exports to grow (Ahmad & Harnhirun,1996).

However, in South Korea exports and foreign direct investment not lead the economic growth (Berasaluce & Romero , 2017; Zang and Baimbridge, 2011). Moreover, Italian exports plays important role in growth, the relationship between exports, imports and economic growth in Italy scrutinized, study data from 1863-2004, cointegration analysis and causality tests employed, results confirms that a weak support for export -led growth and exports were not only the main factor of Italian economic growth (Pistores and Rinaldi, 2012).

3. Methodology of the study

The causality relationship between exports and Turkish economic growth is studied by employed a Cobb- Douglas production function which augmented to involve exports and imports (Balassa, 1978) (Fosu, 1990), (Riezman et al.,1996), imported inputs one of the main export's combinations especially technological devices.

This study assumes that the aggregated production of Turkish economy can be showed as a function of human capital, physical capital exports and imports:

$$Y \quad L\ \#\ -\ *\% \qquad (1)$$

Where ; denotes the aggregate production of Turkish economy at time t, # is total factor productivity, while - represent physical capital, in this study Gross fixed capital formation taken as a proxy for physical capital, and *% represent human capital (labor force).

While, total factor productivity can be expressed as a function of exports, imports, and other exogenous factors Æ% :

$$\#\ L :: Æ\ /\ 2Æ\%\ ;L\ :\ +\ /\ 2\% \qquad (2)$$

After combining (1), (2) the following equation is obtained:

$$;\ L\ \%\ -\ *\%\ :\ +\ /\ 2 \qquad (3)$$

Where Æ Æ =J @ indicate production elasticities with respect to production inputs. Natural log has taken of both sides of equation (3) obtained the following:

$$.;\ L\ \%E\ .\ -E\ *\ \%E\ .\ :E\ +/\ E2 \qquad (4)$$

In more specification, in this research GDP used instead of Y, Eq (4) become as:

$$.)\&\ 2L\ \%E\ .\ -E\ *\ \%E\ .\ :E\ +/\ E2 \qquad (5)$$

$$¿\ )\&\ 2L = E\ ^{l}_{@5\ 5}\ ¿)\&\ 2E\ ^{l}_{g@4}\ >_{6}\ ¿\ -\ E\ ^{l}_{g@4\ 7}\ ¿\ *\ \%E\ ^{l}_{g@4}\ >_{8}\ ¿\ .\ :E\ ^{l}_{g@4\ 9}\ ¿+\ /\ 2E\ J\ :F\ s;E \qquad (6)$$

Where O r

The theory of cointegration reports this issue by using an error correction term to capture the short-dynamic effects, this led us to transformation of a general error correction model (ECM):

Annual time series obtained from world bank over the period 1980-2021, macroeconomic variables are expressed in current price. Descriptive statistics are show in Table 1. Prior investigating the presence of a causal relationship between exports and growth in Turkey during 1980-2021, it is necessary to show that variables are stationary. Augmented Dickey-Fuller (ADF) test, Phillip- Perron (PP) test achieved.

4. Empirical results and discussion

4.1 Descriptive statistics

This study tried to explore the relationship between economic growth and some macroeconomic variables (exports, imports, human capital, physical capital) from 1980 to 2021, with annual data employed. Study variables, GDP as a proxy of economic growth, labor force as a proxy of human capital, and physical capital). Table 1 and below encompass descriptions of the GDP, exports (X), imports (IM), labor force (LA), Gross fixed capital formation (GFCF) variables in the model, and some descriptive statistics:

Table 1. Descriptive statistics of the series for the period 1980-2021

Statistics	GDP	LA	GFCF	X	IM
Mean	411.0084	23.26819	108.1934	69.69852	109.8031
Median	265.3442	22.24100	55.94830	29.55450	56.32550
Maximum	957.7830	33.42000	271.4978	225.2910	292.0070
Minimum	59.98991	16.23000	8.635900	2.910000	8.209000
Std. Dev.	323.8607	4.907131	94.61656	67.38980	99.22389
Skewness	0.411446	0.690219	0.506108	0.672775	0.527934
Kurtosis	1.480556	2.443021	1.592407	1.945375	1.618176
Jarque-Bera	5.225257	3.877712	5.260327	5.114792	5.292519
Probability	0.073342	0.143868	0.072067	0.077506	0.070916
Sum	17262.35	977.2640	4544.121	2927.338	4611.732
Sum Sq. Dev.	4300316.	987.2775	367044.1	186196.8	403660.6
Observations	42	42	42	42	42

Source: author calculation

4.2 Unit root test for stationarity

Table 3 reports the result of unit root for the following variables (GDP, exports, imports, labor capital, physical capital) in our study. Results of Dickey- Fuller (ADF) unit root test suggest that all variable are non-stationary at level but become stationary at first difference, to summarize all the variables are integrated at order I(1).This result enable us to apply ARDL method.

The first steps of the estimation autoregressive distributed lag (ARDL), Augmented Dickey-Fuller (ADF) and Phillips-person (PP) unit root tests employed to check the stationarity. The results of these tests are portrayed in Table below.

Table 2. Results of unit root test

Variables	**ADF Test Statistics (with Trend and Intercept)**			**PP Test Statistics (with Trend and Intercept)**		
	Level	First Difference		Level	First Difference	
GDP	-1.7006	-5.5253*	I(1)	-1.9591	-5.6096*	I(1)
EX	-1.3394	-5.2590*	I(1)	-0.9110	-5.2590*	I(1)
IM	-2.1810	-5.9137*	I(1)	-2.2008	-5.8580*	I(1)
LA	-1.1698	-6.2892*	I(1)	-1.2888	-6.2999*	I(1)
GFCF	-1.9338	-5.4404*	I(1)	-2.0619	-5.4436*	I(1)

Source: author calculation

The results indicated that the null hypothesis of the series contains a unit root that cannot be rejected at a level for all variables in the ADF and PP unit root approach. However, this null hypothesis can be rejected when those variables are transformed into first difference forms.

Meanwhile, the number of lag periods has an impact on the result of cointegration. Then, we have selected these through AIC & SC. Since annual data has been used in the study, a maximum of one lag period has been selected Based on minimum AIC and SC values as seen in Table 3.

Table 3. Lag selection

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	70.39499	NA	2.20e-08	-3.441842	-3.226370	-3.365178
1	237.2492	281.0176	1.28e-11	-10.90785	-9.615021*	-10.44787*
2	266.2479	41.20873*	1.11e-11*	-11.11831	-8.748122	-10.27502
3	286.3065	23.22568	1.75e-11	-10.85824	-7.410686	-9.631624
4	317.9711	28.33153	1.87e-11	-11.20901*	-6.684098	-9.599079

* Indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error

AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

4.3 Johansen-Juselius maximum likelihood Cointegration test

Johansen's cointegration procedures were employed to determine the number of cointegration vectors. The lag was set at one depend on selection made by several criterion. On the basis of the unit root results, Johansen-Juselius applied to determining whether any combinations of the study variables model are cointegrated**.** Table 4 shows the Johansen-Juselius cointegration results.

Table 4. Johansen-Juselius maximum likelihood cointegration test

Trace test				Maximal Eigen value Test			
Null	Alternative	Statistic	0.05 Critical Value	Null	Alternative	Statistic	0.05 Critical Value
r =0	r =1	84.82375*	69.81889	r =0	r =1	35.46701*	33.87687
r ≤1	r =2	49.35674*	47.85613	r ≤1	r =2	22.50905	27.58434
r≤2	r =3	26.84769	29.79707	r≤2	r =3	15.41829	21.13162
r ≤3	r =4	11.42939	15.49471	r ≤3	r =4	11.28241	14.26460
r ≤4	r =5	0.146981	3.841466	r ≤4	r =5	0.146981	3.841466

Source: author calculation

Notes: (i) r stands for the number of cointegrating vectors.

(ii) * denotes rejection of null hypothesis of no cointegration at 5% significance level.

The results from trace statistics indicate that the null hypothesis of zero is rejected at 95% critical value which means two cointegration vectors exist (r =2). this verifies the conclusion that there are only two cointegrating relationships among the five I(1) variables. However, the Maximal Eigenvalue Test revealed that the statistic value is 84.82 above the 95% critical value of 69.81. Hence it rejects the null hypothesis r=0, in favour of the general alternative r=1. Results conclude that there is only one cointegration among the five study variables (GDP, Exports, imports, Labor capital, Gross fixed capital formation).

4.4 Estimation Error -Correction Model

The error correction model obtained from the ECM test provides knowledge about the short-run effects of variables on exports, Table 4 contains the estimation results from the error correction model, results explain the short-run effects of exports, imports, labor, and Gross fixed capital formation, on growth.

Table 5. Short-run coefficients estimation and error correction representation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(LA)	-0.177657	0.153185	-1.159754	0.2542
LOG(X)	-0.019060	0.088396	-0.215620	0.8306
LOG(IM)	0.202634	0.108186	1.873016	0.0697
DLOG(GFCF)	0.487785	0.056579	8.621381	0.0000
CointEq(-1)*	-0.377575	0.091332	-4.134092	0.0002
R-squared	0.851113	Mean dependent var		0.060292
Adjusted R-squared	0.847295	S.D. dependent var		0.149388
S.E. of regression	0.058377	Akaike info criterion		-2.796244
Sum squared resid	0.132906	Schwarz criterion		-2.712656
Log likelihood	59.32301	Hannan-Quinn criter.		-2.765806
Durbin-Watson stat	1.971461			

Source: author calculation

According Table 5, ETC (1) value appear with a negative sign-0.37, this value is significant at level 1% implying that the whole system may get back to the long-run equilibrium at the speed of adjustment 37.75% one period after the exogenous shock.

4.5 Granger causality test

The result of the Granger causality test, Table 6 shows that Turkey has no relationship between exports and growth, imports and growth, On the other hand, results show a directional relationship from growth to labor, while there is a bidirectional relationship between Gross fixed capital formation and Growth.

Table 6. Granger causality test

Null Hypothesis	F- statistics	Probability
X does not Granger Cause GDP	1.04275	0.3632
GDP does not Granger Cause X	1.79249	0.1815
IM does not Granger Cause GDP	0.28774	0.7517
GDP does not Granger Cause IM	0.92768	0.4050
LA does not Granger Cause GDP	0.55908	0.5768
GDP does not Granger Cause LA	8.31250	0.0011
CA does not Granger Cause GDP	4.17705	0.0236
GDP does not Granger Cause CA	7.09953	0.0026
X does not Granger Cause LA	4.97744	0.0125
LA does not Granger Cause X	3.43212	0.0435
X does not Granger Cause CA	3.86176	0.0305
CA does not Granger Cause X	8.16733	0.0012
IM does not Granger Cause X	7.52605	0.0019
X does not Granger Cause IM	3.53620	0.0399

Source: author calculation

5. Conclusion

In our empirical examination of the relationship between economic growth and exports in Turkey, cointegration and error correction modelling methodology have been employed, results show an equilibrium relationship among variables, GDP, exports, imports, human capital, and Gross fixed capital formation. To determine the short-run dynamic around the equilibrium relationship, an error correction model (ECM) is estimated, the value of ECM is found to be statistically significant, confirming the long-run relationship is valid, moreover, the error correction term is -0.37 which indicates that a high speed of adjustment to equilibrium.

Granger causality test show that exports and imports do not cause economic growth in Turkey, however, there is a bidirectional relationship between Gross fixed capital

formation and economic growth, and finally, there is a directional relationship from economic growth to human capital.

The policy implications that, the export-led growth strategy can't be applied to the Turkish case, expanding Gross fixed capital formation as advanced countries did, represent the fit mechanism toward paving the way for sustaining economic growth.

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