THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT

AND INTERNATIONAL TRADE IN TURKEY

KERİME AYCAN ERTUĞRUL

BOĞAZİÇİ UNIVERSITY

2018

THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND INTERNATIONAL TRADE IN TURKEY

Thesis submitted to the

Institute for Graduate Studies in Social Sciences

in partial fulfillment of the requirements for the degree of

Master of Arts

in

International Trade Management

by

Kerime Aycan Ertuğrul

Boğaziçi University

2018

The Relationship Between Financial Development

and International Trade in Turkey

The thesis of Kerime Aycan Ertuğrul

has been approved by:

Assist. Prof. Mehtap Işık
(Thesis Advisor)

Assoc. Prof. Gökhan Akay

Assist. Prof. İrem Doğan
(External Member)

December 2018

DECLARATION OF ORIGINALITY

I, Kerime Aycan Ertuğrul, certify that

- I am the sole author of this thesis and that I have fully acknowledged and documented in my thesis all sources of ideas and words, including digital resources, which have been produced or published by another person or institution;
- this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
- this is a true copy of the thesis approved by my advisor and thesis committee at Boğaziçi University, including final revisions required by them.

Signature....................................

Date ...12.12.2018...............................

ABSTRACT

The Relationship Between Financial Development and International Trade in Turkey

This thesis examines the short-run and long-run relationships between financial development and international trade in Turkey from the first quarter of 1990 to the second quarter of 2017. Initially, two supply-leading hypotheses which imply that financial development causes economic growth and international trade are investigated. Then, three demand-following hypotheses which imply that the economic growth and international trade cause financial development are analyzed. In the hypotheses, international trade indicator is defined as the sum of imports and exports; while financial development indicators are defined as the money supply M2 as a proxy for the breadth, the banking system's credit to the private sector as a proxy for the depth and the stock market capitalization as a proxy for the liquidity of the financial development. Johansen's Cointegration Test and Vector Error Correction Model are applied for investigating the long run and short run causations, respectively. According to the results of the econometric analyses, there are bi-directional long-run causation between private sector credits and real economic growth as well as stock market capitalization and trade openness. Also, in the long-run, there are positive causations from international trade to M2 money supply and from M2 money supply to real economic growth. On the other hand, it is found that there is short-term causation from stock market capitalization to the real economic growth.

ÖZET

Türkiye'de Finansal Gelişmişlik ve Uluslararası Ticaret Arasındaki İlişki

Bu çalışmada Türkiye'de 1990 1. çeyrek ve 2017 2. çeyrek dönemi arasında finansal gelişmişlik ve uluslararası ticaret arasındaki kısa ve uzun vadeli ilişki incelenmiştir. Finansal gelişmişlik ve uluslararası ticaret arasında kısa ve uzun vadede ilişkinin yönünün saptanabilmesi amacıyla iki arz yönlü ve üç talep yönlü hipotez kurulmuştur. Hipotezlerde uluslararası ticaret belirteci olarak ihracat ve ithalatın toplamı alınmıştır; finansal gelişmişlik içinse üç ayrı belirteç kullanılmıştır. Bunlar sırasıyla M2 para arzı, bankacılık sektörü tarafından özel sektöre sağlanan krediler ve İstanbul Borsası hacmidir. Uluslararası ticaret ve finansal gelişmişlik arasındaki uzun ve kısa vadeli ilişkiler sırasıyla Johansen Eşbütünleşme Testi and Vektör Hata Düzeltme Modeli ile incelenmiştir. Ekonometrik analiz sonuçlarına göre, özel sektöre sağlanan krediler ile reel ekonomik büyüme ve borsa hacmi ile uluslararası ticaret arasında uzun vadede çift yönlü nedensellik saptanmıştır. Ayrıca, uzun vadede uluslararası ticaretten M2 para arzına doğru ve M2 para arzından ekonomik büyümeye doğru pozitif nedensellik saptanmıştır. Öte yandan, kısa vadede finansal belirteçlerden İstanbul Borsası hacminden reel ekonomik büyümeye doğru pozitif nedensellik saptanmıştır.

ACKNOWLEDGEMENTS AND DEDICATION

I would like to express my profound gratitude to my thesis advisor, Asst. Prof. Mehtap Işık, for her professional guidance and valuable comments in the writing process of this thesis and heartfelt assistance in many other aspects of life.

I dedicate this thesis to my beloved husband, my parents, my brother and my three cats for their unending love, support, and motivation. This thesis would not have been possible without them.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDIX TABLES

ABBREVIATIONS

ADF	Augmented Dickey Fuller
ARDL	Autoregressive Lag Model
CBRT	Central Bank of the Republic of Turkey
DF	Dickey Fuller
G	Economic Growth Rate
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
HDI	Composite index developed by United Nations Development Program representing the weighted average of life expectancy index (1/3 weight), adult literacy index (2/9 weight), gross educational index (1/9 weight), and GDP index (1/3 weight)
LNCR	Log-transformed banking system’s credit advances to the private sector as a proxy for the depth of financial development
LNM2	Log-transformed money supply M2 as a proxy for breadth of financial development
LNST	Log-transformed stock market capitalization as a proxy for liquidity of the financial development
LNXM	Log-transformed trade openness measured by sum of exports plus imports
M2	Measure of the money supply that includes cash and checking deposits as well as near money
M3	Measure of the money supply that includes M2 as well as large time deposits, institutional money market funds, short-term repurchase agreements and larger liquid assets
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
STAR	Smooth Transition Autoregressive Model
UNDP	United Nations Development Program
VAR	Vector Autoregression
VEC	Vector Error Correction

CHAPTER 1

INTRODUCTION

In the past few decades, many developing countries focus on implementing major economic and financial reforms to accelerate economic growth, attract foreign direct investments, increase exports and their share in the international trade. Turkey is one of these countries. The policy practices in the countries are from a wide range. The main motivation of this thesis is to understand the major relationship between financial development, economic growth and international trade and to test the findings for Turkey's macroeconomic data. In that respect, different type of policy reforms can be assesed and the preconditions for sucessful implementations can be determined for Turkish economy.

Turkey is amongst the developing countries that have been aggressively implementing economic and financial reforms to implement trade openness since the 1980s. Before 1980, the economy was built upon the roots of domestic and demand-led inward industrialization. Turkey's economic strategy was based on import substitution policies, where the focus was achieving economic growth and development through discouraging imports of foreign goods and producing them domestically by encouraging private investment. Thus, it is not wrong to classify the Turkish economy until 1980s as a closed economy.

1970s were the years of high public investment on capital goods and heavy industries. Under the import substitution growth strategy, Turkey enjoyed a period of rapid economic growth until 1976. However, eventually financial and economic repressions including negative real interest rates, subsidized credits to the private sector, high intermediation costs and requirements on reserves and liquidity and overvaluation of Turkish Lira under fixed exchange rate regime caused that corporates were heavily relied on credits rather than equity financing and shallow capital markets. Meanwhile public sector was depended on the Central Bank of the Republic of Turkey. The daily reflections of these financial indicators were severe shortages even in basic necessities. During the period of 1977 to 1980, the Turkish economy experienced a continual decline in economic growth and accelerated inflation (Ucan & Ozturk, 2011).

The transformation process has started with the introduction of 1980 - Stabilization Package. Import substitution strategy was abandoned and export-led growth strategy has been adopted in order to lead growth and development of Turkish economy through expansion of exports. Export-led growth strategy required trade and financial openness which led into the gradual liberalization in the economy. At first, this transformation was cushioned generously by international authorities via debt relief, structural adjustment loans and technical support.

The new economic strategy was introduced through a package of policies including financial and trade liberalization, flexible exchange rates system, removal of many subsidies, and providing incentives for foreign direct investment. The transition from import substitution to export-led growth considerably increased Turkey's private manufacturing base by domestic as well as multinational corporations and increased export (imports) figures as a percentage of gross domestic products (GDP). As Ozturk and Acaravci (2010) stated, while the average annual share of exports (imports) was 6% (7%) in the period 1970-1979, they increased to 9.8% (15%) in 1980-1989 and then to 14% (19%) in 1990-2005.

In parallel to post-1980 economic growth and trade openness, Turkey went through phases of financial development. Turkey's financial reforms and liberalizations can be classified into three sub-periods as follows (Ozkan, Balsari & Varan, 2014). The first period lasting from 1980 to 1989 was the period of domestic liberalization, during which interest rates were liberated, capital market was created, and the central bank started open market operations. The second period, 1989 to 2001, was the period of international financial liberalization, during which regulations were enacted and institutions were created to liberalize the foreign exchange system and movement of international capital. During this period Turkey witnessed the currency crisis of 1994 and the financial crisis of 2001. The post-2001 period has been the era of institutional reforms and stability, where the banking system was restructured; some banks were taken over by the government, some left the system, new measures were set to supervise banks' capital adequacy and effective managemet. Despite the post-1990 economic and financial crises of 1994, 2001, and 2008-2009, Turkey has been able to continue her financial development and trade openness and has maintained impressive economic growth in real terms for most of the years. Trend in GDP growth rate and some preliminary indicators of financial development and trade openness are exhibited in Figure 1 and zero-order correlations between these variables are reported in Table 1.

The trend lines in Figure 1 indicate that trade openness, measured by the ratio of imports plus exports divided by GDP is almost reaching a stationary state, while financial development measures, money supply M2 and ratio of credit to nonfinancial private sector are still on the rise. Moreover, as shown in Table 1, there are strong zero-order positive correlations between financial development and trade openness indicators and moderate positive correlations between real GDP growth rate and all other indicators. These preliminary observations suggest an analytical examination of these and other relevant time-series in order to determine the existence and direction of causalities between economic growth, financial development, and trade openness.

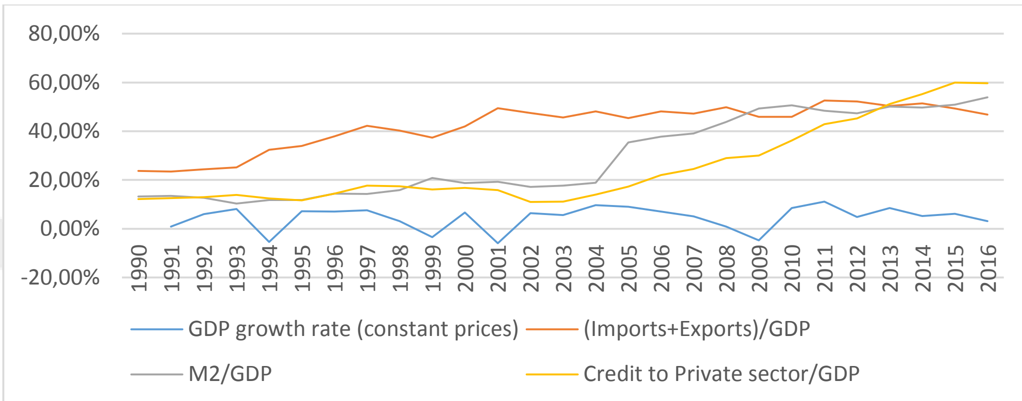

Figure 1. Real GDP growth rate, financial development, and trade openness trends in Turkey,1990-2016 (Data source: Credit to private sector from Bank for International Settlements, other data from IMF International Financial Statistics)

Table 1. Zero-Order Correlation Matrix for Financial Development, Trade Openness, and Real GDP Growth Rate in Turkey

	GDP Growth Rate (constant prices)	(Imports+Exports) / GDP	M2 / GDP	Credits to Private Sector / GDP
GDP Growth Rate (constant prices)	1			
(Imports+Exports)/GDP	0.150	1		
M2/GDP	0.112	0.72	1	
Credits to Private Sector/GDP	0.147	0.59	0.89	1

The rest of this research study is organized as follows. In the next section a comprehensive review of the relevant literature is presented. First, the studies related to financial development, trade openness, and economic growth in developing countries other than Turkey and the related studies on Turkey in particular are reviewed. Then, the methodology and data analysis sections follows, in which appropriate proxies for financial development and trade openness for Turkey are chosen and an econometric model is constructed, then tested for the existence and direction of causalities between economic growth, financial development, and trade openness in Turkey. Finally, results of data analysis and policy recommendations are presented and further research opportunites are revealed.

CHAPTER 2

LITERATURE REVIEW

The effectiveness of financial development in promoting economic growth and stimulating international trade in developing countries has been the subject of much academic research. Previous studies on the role of finance in economic development were basically Schumpeterian and focused on the role of banking and finance on the promotion of entrepreneurial activities as the path to economic growth and development (Goldsmith, 1969; McKinnon, 1973). Recent studies are generally empirical and have examined the relationships between financial development, economic growth, financial openness, trade openness, and the directions of causality through developing econometric models and testing hypotheses by analyzing relevant data. Majority of these studies are inspired, one way or the other, by the seminal methodological work of Granger (1969 and 1988) on the concept of causality in econometrics.

Empirical studies on the relationships between trade openness and financial development in developing countries can be evaluated in two categories. Most of the studies are cross-sectional involving a group of developing countries at the macro-macro level. The findings of these studies are useful for policy implications as the sample countries are rather homogenous in terms of economic development and their fiscal and monetary policies. Some other studies are on individual countries at the macro-macro, macro-micro, or micro-micro levels. The findings from all types of studies can be classified into four categories. A group of studies reveal a causal link from economic growth to financial development and trade openness, confirming the demand following hypothesis (economic growth causes financial development). On the other hand, another group of studies show directional causality from financial development to economic growth and trade openness, which supports the supply leading hypothesis (financial development causes economic growth). Two-way directional causality between economic growth and financial development and or trade openness is also found by some studies. Lastly, some studies reported no causal link between these variables.

In this literature review, initially, the studies related to financial development, trade openness, and economic growth in a number of developed and developing countries are reviewed. Then, the research focused on Turkey is examined, in particular. In each review, the proxies that the authors have adopted for the study, the methodology used, the time period for which data is collected, and the general findings of the study are discussed.

2.1 Studies without a particular focus to Turkey

Hur, Raj and Riyanto (2006) conducted a cross-country study involving 42 countries and 27 industries examining the relationships among financial development, asset tangibility and international trade. They extended the Heckscher – Ohlin model suggesting countries with developed financial sector might have a comparative advantage in industries, which are more dependent on external finance. They contributed to the literature by advancing the idea that asset tangibility plays a significant role in the relationship between financial development and external finance for international trade. Namely, firms in countries with less developed financial system require more tangible assets to offer as collateral for external finance while firms in more developed financial markets require less tangible assets to increase their exports. Following this idea, they proposed and tested the hypothesis that countries with more developed financial market have higher exports share and trade balance in industries with less tangible assets, and vice versa. To test their hypothesis, the authors developed a multiple regression model with the ratio of export to GDP as the dependent variable and financial development level, degree of asset tangibility, degree of external finance dependence, and their interactions as the independent variable averaged over the period 1980-1989. The findings supported that the countries where financial markets are more developed and property rights are more protected, have higher exports and trade balance in industries with more intangible assets.

The study of Braun and Raddatz (2008) examined the impact of politics on financial development and the subsequent impact of financial development on the entry of new firms in industries, which leads to more competition and reduces the economic rent of incumbents. They tested the dependency of the financial development of a country on the political support provided for the financial liberalization in the country. They conducted an event study on a sample of 41 countries that liberalized trade from 1970 to 2000 and found that when industries that promote the political party in favor of liberalization gain relative strength compared to the opponents of liberalization, financial sector’s depth improved in the subsequent period.

Wacziarg and Welch (2008) updated the dichotomous trade liberalization index developed by Sacks and Warner (1995) to make the index fit the developing counties’ trade policies of the 1990s and conducted a cross-country study to examine the effect of trade liberalization on economic growth. They showed that the relationship between growth and trade liberalization was mediated by the rate of gross domestic investment rate, by running a multiple regression model on 24 developing countries. Then, they demonstrated over the 1950-98 period, countries that liberalized their trade policies achieved average annual growth rates, which were about 1.5% higher than before liberalization. After liberalization, investment rates rose 1.5-2.0% points, confirming the path from liberalization to growth was mediated by capital investment. Liberalization raised the average trade to GDP ratio by about 5%, indicating that the level of trade openness increases after trade policies were liberalized.

Berman and Hericourt (2010) studied the impact of financial development on international trade at the micro level. Their study involved firm-level data on 5000 firms across nine developing countries. They developed a model to examine whether the financial development affected firms' decision to enter the export market (extensive margin of trade) and the amount of export by the firms (the intensive margin of trade). In order to test the extensive margin of trade, a binary logistic regression model was used. In the model, firms' decision to join the export market was the dependent variable. Productivity, access to external finance, and firms' size and nationality were the independent variables. In order to test the intensive margin of trade, they used a multiple linear regression equation. In the model, value of trade was the dependent variable with the same independent variable as the ones in the binary logistic equation. They found that access to external finance affected the likelihood that a firm enters into the export market, but after the entry, better financial health did not increase the chance that the firm would stay in or leave the market, nor did it influence the size of the export. Furthermore, they found that productivity was effective on export decision only if the firm had a sufficient access to external finance.

Tennant, Kirton, and Abdulkardi (2011) noted that most studies about the relationship between financial development and economic growth used broad proxies for financial development and did not consider the roadmap through which the financial sector affected economic growth. Thus, they conducted a study in Jamaica. In the study, they used the Levine's five functions of the financial sector as proxies for financial development. The five basic functions of the financial sector were savings mobilization, risk diversification, resource allocation, corporate control, and ease of trading. Tennant, et al. (2011) tested GDP growth as the dependent variable against the proxies developed from these five functions as independent variables in their regression, cointegration, and error models. They estimated the models using quarterly data from March 1986 to December 2005. They initially found that all five financial development factors had statistically significant long-run effects on GDP growth, but the saving mobilization factor had opposite sign of what is predicted by the theory. Thus, they realized the interactions between savings mobilization and other factors in their model. In the next run, all factors showed long-run significant effects on GDP growth as predicted signs, except for the sign of ease of trading factor. Moreover, they showed that none of the five financial development factors had a short-run significant effect on economic growth.

Mercan and Gocer (2013) developed a panel research design for studying financial development and growth in the BRICT countries (Brazil, Russia, India, China, and Turkey) for the period 1989 to 2010. They first conducted some panel root analysis to check for stationarity for both cross-section and time series. They found the series were not stationary and the effects of shocks did not disappear in the short-run, implying that macroeconomic shocks significantly affected the sample economies. In their model, they included the share of foreign direct investment in GDP and trade openness (imports plus exports/GDP) as mediating factors in the relationship between financial development and economic growth. The findings supported the positive effects of both financial development and trade openness on the economic growth. Furthermore, it was shown that foreign direct investment positively affected financial development, which in turn affects economic growth.

Yildirim, Ozdemir, and Dogan (2013) took a different approach than many of other studies. They noted that after the global credit crisis, the relationship between financial development and economic growth is undermined due to the asymmetry of this relationship as a whole. Thus, they examined the relationship between financial development and economic growth from the asymmetry perspective within the emerging European economies for the period 1990 to 2012. The sample countries included Bulgaria, Hungary, Latvia, Lithuania, Poland, Romania, Croatia, Turkey, Russia, and Ukraine. The study used two proxies for the financial development in the sampled countries, the ratio of money supply M2 to GDP and the share of the bank's credit to the private sector in the GDP; and tested them for a causal relationship with economic growth separately. The authors emphasized that although Granger causality test provided useful information about the impact of one time series on the future values of the other time-series, it did not distinguish between the impact of negative and positive values. They, therefore, applied the asymmetric causality test developed by Hatami-J (2012) to examine the causal relationship between financial development and growth. This study concluded that there was a causal relationship between financial development and growth in general; however, the direction of causality was mixed in different countries and for negative and positive financial shocks. Specifically, the findings indicated that for Lithuania, Poland, Romania, and Turkey; financial development caused economic growth, whereas for Bulgaria, Croatia, Hungary, and Latvia the causality was bidirectional. Furthermore, in Latvia and Croatia, both negative and positive shock in financial developments caused economic growth, but in Hungary and Bulgaria negative shocks in financial development caused negative shocks to economic growth.

Herwartz and Walle (2014) adapted and modified the ideas propounded by Rajan and Zingales (2003) on the impact of trade openness and financial openness on financial development and then, on economic growth. Herwartz and Walle (2014) used empirical study to argue that financial development did not necessarily lead to economic growth and that the impact of financial development on growth depended on many institutional and economic conditions of the country, including its financial openness and trade openness. Herwartz and Walle (2014), therefore, hypothesized that the link or the interrelationship between financial development and growth in a country depended on financial openness and trade openness in that country. They operationalized financial openness through two measures: Foreign assets as a percentage of the GDP, and foreign liabilities as a percentage of the GDP. Similarly, they disaggregated trade openness measure into the share of export (import) of goods in the GDP and the share of export (import) of services in the GDP. For the proxy for financial development, they only used credit by deposit money banks and other financial institutions to the non-financial private sector as a percentage of GDP. They ran a regression model with real GDP per capita as the dependent variable and financial development, financial openness measures, and trade openness measures as the independent variables using data from 78 economies including Sub-Saharan, African, Latin American, and OECD countries for the period 1981–2006. Their main findings were that when financial openness was too high, the growth promoting the impact of financial development would be eroded while high trade openness strengthened the relationship.

Rahman, Shahbaz, and Farooq (2015) studied the relationship between financial development, international trade, and economic growth for Australia using time-series data for the period 1965-2010. They tested for the long-run relationships between the time-series variables by first applying the autoregressive distributed lag (ARDL) bounds approach showing the existence of cointegration and then used the VEC (vector error correction) Granger causality approach to test the direction of causality. Their findings were supporting that in the long-run (a) there was feedback effect between international trade (both exports and imports) and economic growth; (b) financial development caused economic growth in the long-run, confirming the supply-leading hypothesis; and (c) financial development and capital caused international trade (both exports and imports). The findings were suggesting that in the short-run there was (a) a bidirectional causality between international trade (exports) and economic growth, (b) a feedback effect between capital and economic growth, (c) Granger causality from financial development and export to capital, and (d) Granger causality from capital to economic growth.

Lebe (2016) studied 16 European countries and examined whether there was a causality relationship between financial development and economic growth in these countries for the period 1988-2012. The author pointed out that the existence of a positive relationship between financial development and growth is generally accepted in the literature, but there was a debate on whether the direction of the causality process was external or internal. The author tested the relationship between financial development and economic growth using six alternative financial indicators through applying bootstrap panel causality test developed by Kónya (2006). They found that there was a bidirectional causality relationship between financial development and economic growth in European countries during the sample period. The finding supported both the supply-leading hypotheses and demand following hypotheses in the selected European countries.

Trabelsi and Cherif (2016) applied the causality test developed by Toda and Yamamoto (1995) to examine the causal relationship between capital account liberalization and economic growth for certain emerging economies during the period 1975-2011. The sampled countries included Malaysia, Argentina, Chile, Singapore, South Korea, and Turkey. In their multivariate VAR (vector autoregression) analysis, they included real GDP per capita, two proxies for capital account reform, the ratio of gross investment to GDP, trade openness measured by exports plus imports divided by GDP, financial development proxy measured by the ratio of credits to the private sector, and a proxy for capital account liberalization. They found general evidence for causality running from capital account liberalization to economic growth. For Malaysia and South Korea, the causality was bidirectional, whereas, for other countries in the sample, the causality was unidirectional from capital account liberalization to economic growth. As per the authors, the results also indicated that the causality run through an increase in domestic capital accumulation rather than improving efficiency.

2.2 Studies that focus on Turkey

Ince (2011) examined the relationships between financial liberalization, financial development, and economic growth in Turkey using annual data for the period 1980-2010. They employed six indicators for measuring financial development, broad money M2 as ratio of GDP, domestic credits as ratio of GDP, private credits as ratio of GDP, commercial bank assets to commercial bank assets plus Central Bank assets, stock market capitalization and total deposits as ratio of GDP. They also included three dummy variables to account for 1994, 2001, and 2008 financial crises. As they found high correlations between these six financial development indicators, they applied PCA (principal component analysis) to normalize the indicators and reduce them to a smaller number of uncorrelated variables. They applied Granger causality and cointegration tests to examine the existence and direction of causality between economic growth and financial development. They found that there was no long-run relationship between financial development and growth, but there was a one-way causality from financial development to economic growth in the short-run. Finding lack of long-term causality from financial development to economic growth, the authors concluded that Turkey should have reformed its economic and banking policies to control inflation, reevaluated the role of commercial banks, and improved its financial system in general.

Acikgoz, Balcilar, and Saracoglu (2012) studied the impact of trade openness and financial openness on financial development in Turkey using quarterly time series data for the period 1989:1-2007:2. They considered four indicators as proxies for financial development: (a) ratio of the financial system's liquid liabilities (currency in the hand of public plus demand and interest-bearing deposits with the financial intermediaries) to GDP representing financial deepening, (b) ratio of deposit banks' domestic assets to deposit banks' domestic assets plus central bank's domestic assets, (c) the ratio of claims on the non-financial private sector to total domestic credit, and (d) the ratio of private credit by deposit money banks to GDP. Interpreting financial openness as removal of administrative and market-based restrictions on international capital movement, they used the ratio of gross capital inflows plus capital outflows to GDP as a proxy for financial openness. Following the related literature, they used the ratio of imports plus exports to GDP as the indicator for trade openness. Their model consisted of four multiple regression equations. In each of the equations, one of the four financial development indicators was treated as the dependent variable and financial openness indicator, trade openness indicator, and logarithm of GDP were the independent variables. In addition, the product of the financial openness and trade openness were included as an additional independent variable to account for simultaneity of the two indicators. Findings could be summarized as follows: First, all four measures of financial development had long-run relationships with financial openness and trade openness. Second, financial openness and trade openness impact on financial development had negative signs. However, the simultaneous effect of financial openness and trade openness on financial development was positive over the long-run, supporting the idea that the combination of financial openness and trade openness had a further effect on financial development. Last, the impacts of openness measure and real GDP on financial development were not stable over time and were subject to structural shift.

Iyidogan (2013) examined the causal relations between financial deepening and economic growth on monthly data of Turkey from the first month of 1998 to the third month of 2012 by applying the smooth transition autoregressive (STAR) Granger causality model. The author argued that a nonlinear STAR model is appropriate for this kind of data analysis because both financial deepening and economic growth are affected by policy changes necessitated after the economic crises and thus the linear models were not adequate to capture such asymmetries. In particular, the author mentioned that due to the financial crises in Turkey in 2001 and 2008 and following fiscal and monetary reforms after the crisis; financial deepening, and economic growth time-series were expected to follow nonlinear processes for quite some time. Financial deepening was measured by ratio of credit to GDP, and ratio of money supply M3 to

GDP. Real GDP per capita was the proxy for economic growth. Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) unit root tests showed the existence of unit roots for all data series, and the series showed the integration of order one at 1% significant level. Linearity test with choosing appropriate delay parameter in the autoregressive model supported that all three time-series are nonlinear. A non-linear Granger causality test based on STAR estimation model indicated that both M3 and credit were causing variables, that is, causation run from financial deepening to GDP per capita. However, linear Granger causality test showed the opposite result which was that causality run from GDP per capita to financial deepening. Based on these findings, the author’s conclusion was that because the time-series are nonlinear, linear and nonlinear; Granger causality test led to contradictory results, the appropriate causality test for this time-series data was the nonlinear causality test. Thus, the findings supported the supply leading hypothesis for the relationship between financial development and economic growth.

Noting that there are few studies about the relationship between trade openness and regional development, Oktay and Gozgor (2013) run a panel data analysis in which data for trade openness and economic development were collected for 81 provinces in Turkey over the period 2002-2008 and analyzed for fixed effect and dynamic panel data Generalized Method of Moment (GMM). In order to operationalize regional development, they estimated Human Development Index (HDI) measure for each region. The HDI is a composite index developed by United Nations Development Program (UNDP) representing the weighted average of life expectancy index (1/3 weight), adult literacy index (2/9 weight), gross educational index (1/9 weight), and GDP index (1/3 weight). For trade openness, they defined two metrics, the ratio of each region's international imports plus exports to total imports plus exports of Turkey, and the ratio of each region's international imports plus exports to the GDP of that region. They estimated a region's GDP by multiplying the share of income tax return of the region in total Turkey's income tax return by the nominal GDP of Turkey. They also included government's investments in the regions and the regions' population as control variables in their model. The result from the fixed effect model was that both openness measures and the government's investment had positive effects and population had a negative effect on development across the regions. In the GMM estimation, they found positive lagged effects of openness measures on development across the regions. The GMM result for the control variables was similar to the fixed effect estimates; lagged positive effect of government investment and lagged negative effect of population on the regions' development.

Bakay (2014) studied the relationships between financial deepening and international trade in Turkey from the regional perspective. The author used panel data of loans and deposits (irrespective of the bank's ownership) for financial deepening and imports and exports for international trade by the 81 provinces of Turkey for the period 2007-2010. The study was conducted in two stages. In the first stage, the author run a fixed effect panel data regression model in which the dependency of trade volume in a province (exports, imports, or sum of exports and imports) was tested against loans advanced by the banks in the province, available deposits by all banks in the province, population per branch in the province, urbanization and human capital. Urbanization was measured by the ratio of urban population to total population in the province, and human capital was measured by net schooling which was the ratio of the students of a specific age group enrolled in a level of education divided by total population of that age group in the province. Log linear form was used in the analysis. The results for fixed effect regression model indicated that loan was statistically significant at 1% level in predicting imports, exports and sum of imports and exports and the deposit were not statistically significant in predicting any of those dependent variables. Furthermore, population per branch had a negative statistically significant impact on exports and urbanization and schooling did not show statistically significant effects in predicting a province's international trade. In the second stage of the analysis, the author developed and tested a panel Granger causality model with a 1-year time lag. The results showed strong bidirectional causality between foreign trade indicators and financial deepening indicators.

Arac and Ozcan (2014) considered 8 indicators for financial development and examined the causations between these indicators and economic growth in Turkey for the first quarter of 1987 to the fourth quarter of 2012. The financial development indicators included various ratios of banks assets, credits, and deposits to GDP, money supply ratio M2/GDP, and stock market value to GDP. They applied cointegration technique and bound testing to examine long-run causal connections between the variables. Long-run tests showed a causal relationship between economic growth and all the selected financial development indicators. They used Granger causality test based on error correction to examine for the long-run and short-run directions of causality and found that the direction of causality depended on the selected financial indicator. Bank's asset ratios and credit ratio had positive impacts on economic growth, supporting the supply leading hypothesis. However, economic growth had a positive causal connection with the money supply, bank's deposits, and credit ratios, supporting the demand following hypothesis. In addition, the stock market ratio was positively driven by the economic growth.

Dinar, Dalgic, and İyidogan (2015) investigated the causality between financial liberalization and economic growth in Turkey for the period 1998-2012. They used real GDP per capita for economic growth and three proxies for financial liberalization which were broad money supply M3 to GDP, deposit banks credit to the private sector as a percentage of GDP, and total traded value in Borsa Istanbul (BIST) to GDP. They developed three separate VAR models for each of the financial liberalization proxies and used quarterly data to test the models. All three models were tested for direction of causality through applying Toda and Yamamoto (1995) causality test. The results were that causality from economic growth to financial development was significant at 10% for BIST and private sector loans, but not for money supply M3. However, the causality from financial liberalization to economic growth was not significant for any of the three financial liberalization proxies. Thus, for Turkey in the studied period, the findings were falsifying the hypothesis by McKinnon (1973) and Shaw (1973) that financial liberalization leads to economic growth. The authors interpreted this lack of causality from financial liberalization to economic growth as due to the rising share of government bonds in the bank's portfolio and the inability of the banks to fund productive investments.

While most studies on the relationship between financial development and trade openness is at the macro-macro or micro-micro levels (a firm's financial health and its export performance), there are some studies that take a macro-micro approach. Coban (2015) examined the impact of financial development on trade openness at the micro-macro level by studying how financial development affects individual firms' export performance in the manufacturing sector of Turkey. The author constructed some indexes for financial development from the banking sector and the stock markets and applied those to the export performances of 101 Turkish firms for the period 1991-2012. The banking sector index included five financial variables, and the stock market index was made up of 4 variables. The model developed by Coban (2015) was based on the idea that within a country, firms of different characteristics were affected differently by the country's financial development. The author; therefore, categorized the sample firms into three subgroups of (a) foreign shareholding firms, no foreign shareholding firms; (b) lower leverage firms, higher leverage firms; and (c) lower liquidity firms, higher liquidity firms. Conducting a panel data analysis on the financial development indexes and the sample firms' export performance, the author reported that the stock market development had a positive impact on the export performances of all the three subgroups in the sample, while the banking sector development and firm's export performances showed different direction of causality for different groups.

A recent study on the relationship between financial development and economic growth in Turkey was conducted by Avci (2017), which included quarterly data from the first quarter of 2003 to the first quarter of 2016. The author examined financial development under three sections: Banking development proxied by total credit to the nonbank private sector, stock market development proxied by market capitalization of BIST, and debt market development proxied by the traded value of debt securities market. Expenditure-based real GDP was used as a proxy for economic growth. A log form of the data was used. The time series data were first tested for the existence of unit root test using ADF and Unit Perron tests and then applied Zivot Andrews Unit root test to check for structural breaks. Finally, Granger causality test was applied to the time-series to investigate the causality directions between the variables. The findings in this study supported that (a) structural breaks occurred in the third quarter of 2006 in the credit series and in the fourth quarter of 2009 in the GDP series; (b) there were unidirectional causalities for economic growth to banking development and debt development, supporting demand following hypothesis; and (c) there was unidirectional causality from the stock market development to economic growth, supporting supply leading hypothesis.

In the next section, an econometric model to examine the causality relationship between financial development and trade openness in Turkey for the period 1990 to 2016 is developed taking the previous studies of the literature into consideration.

CHAPTER 3

METHODOLOGY AND STATISTICAL ANALYSIS

In this chapter, related statistical concepts of time series data analysis are briefly explained. Then, the models are developed with the appropriate proxies for financial development and trade openness. Finally, the analysis of the data, the interpretations and the implications of the results are revealed.

3.1 Stationarity and unit root analysis

In time-series analysis, the first step is to check whether each data series is stationary or not, and if not, to find the order of integration of each series. This is because estimation using non-stationary series may lead to spurious regression, in other words it implies statistically significant relationship when there is no actual relationship. If the variables in the regression model are not stationary, the standard assumptions for asymptotic analysis would not be valid, and the usual t test critical values would not follow t test distribution. Thus, we cannot test hypotheses on the parameters.

A series y_t is stationary (white noise error) if its mean and variance are constant and time independent which can be showed as:

$E(y_t) = \mu$ (Constant mean)

$Var(y_t) = \sigma^2$ (Constant variance)

$Cov(y_t, y_{t-s}) = Cov(y_t, y_{t-s}) = \varphi$ (Time independent covariance)

The common method for checking the stationarity is to set up a Dickey-Fuller (DF) autoregressive of order one *AR(1)* test for the series. Depending on the type of data, the Dickey-Fuller *AR(1)* can take the following forms:

1- Test for random walk:

$y_t = \rho y_{t-1} + \varepsilon_t$, where ε_t is white noise: $\varepsilon_t \sim i.i.d.(0,\sigma^2)$ *(1)*

H_0: $\rho = 1$: Time series is not stationary (random walk with white noise)

H_1: $|\rho| < 1$: Time series is stationary

To see the mathematical logic behind the above hypotheses, we need to successively substitute the lagged values into Equation (1); we get:

$$y_t = \rho y_{t-1}+\varepsilon_t = y_t = \rho(p y_{t-2}+\varepsilon_{t-1})+\varepsilon_t = p^t y_0+(\varepsilon_t+\rho\varepsilon_{t-1} + p^2\varepsilon_{t-2} + \ldots\ldots + p^t\varepsilon_0) \quad (2)$$

Equation *(2)* shows how the effect of a disturbance at time 0 will accumulate through time for different values of ρ.

- If $\rho = 1$, then all the error terms in Equation *(2)* add up and there will be a permanent stochastic time trend in the series; the system never reaches a stationary point. In this case, we have: $y_t = y_0 + \sum_{i=0}^{i=t} \varepsilon_i$; that is, sum of past disturbances plus the initial value. Thus, the time series has one or more unit roots. We can check for non-stationarity by calculating the mean, variance, and covariance of the variable. We have:

$$E(y_t) = E(y_0) + \sum_{i=0}^{t} E(\varepsilon_i) = E(y_0) + 0 = \mu$$

$$Var(y_t) = Var(y_0) + \sum_{i=0}^{t} Var(\varepsilon_i) = t\sigma^2$$

Mean is constant, but variance is time variant which means that the covariances are time variant as well.

- If $|\rho| < 1$, then ρ^t tends to converge zero as t tends to go infinity. Hence, the effect of the initial disturbance dies away as it moves forward in time. Eventually, the system achieves stationarity in the long-run. In this case, we say that the series y_t is integrated of order zero and denote it by $y_t \sim I(0)$.
- When $\rho > 1$, the impact of initial disturbance is not only persistent but grows exponentially in time and we never reach stationarity, which is rare in economic and financial time series.

The DF test for stationarity in the case of random walk is conducted through differencing Equation (1), which yields:

$$\Delta y_t = y_t - y_{t-1} = (\rho - 1) y_{t-1} + \varepsilon_t \qquad (3)$$

If series y_t in Equation *(1)* is not stationary and the first difference Δy_t in Equation *(3)* is stationary; then, we say the series y_t is integrated of order 1 and denote it as $y_t \sim I(1)$. If Δy_t is not stationary; then, we do the differencing on Δy_t and continue with differencing until we reach stationarity. If we reach stationarity after *d* times of differencing, we say y_t is integrated of order *d* and denote it as $y_t \sim I(d)$.

2- Test for random walk with drift

$$y_t = \mu + \rho y_{t-1} + \varepsilon_t \qquad (4)$$

H_0: $\rho = 1$: Time series is not stationary

H_1: $\rho < 1$, $\mu = 0$: Time series is stationary

As in the previous case, the DF test for stationarity in the case of random walk is induced through differencing, y_t in Equation (4).

3- Test for random walk with drift and *deterministic* time trend

$$y_t = \mu + \rho y_{t-1} + \beta t + \varepsilon_t \qquad (5)$$

H_0: $\rho = 1$, : Time series is not stationary

H_1: $\rho < 1$, $\beta = 0$, and $\mu = 0$: Time series is stationary

In this case, the test for stationarity is conducted by detrending y_t in Equation *(5)*.

The DF tests mentioned above are valid only if ε_t is white noise. This assumption will not hold when there is autocorrelation in successive values of ε_t and the DF test will not be warranted. In this case, the Augmented Dickey Fuller (ADF) test with *q* lags of the independent variable is used. The ADF model for the case of random walk with no drift and no deterministic trend would then be:

$$\Delta y_t = (\rho - 1) y_{t-1} + \sum_{i=1}^{q} a_i \Delta y_{t-i} + \varepsilon_t \qquad (6)$$

An alternative test for stationarity condition is the Phillips-Perron test which is similar to ADF tests, but they incorporate an automatic correction to the DF procedure to allow for autocorrelated residuals.

3.2 Causality

Most economic and financial time-series are non-stationary stochastic processes and applying standard hypotheses testing inferences to the OLS estimates of regressions on these data series might indicate statistically significant relationships between the series while there is no theoretical or logical justification for such relationships; the so-called spurious regressions. In their seminal paper, Granger and Newbold (1974) demonstrated that tests of such a regression may often suggest a statistically significant relationship between variables where none in fact exists. They reached their conclusion by generating independent non-stationary series and observing that when they regressed one series on the other, they obtained statistically significant OLS estimates. Subsequently, Engle and Granger (1987) considered testing the null hypothesis of no cointegration between a set of *I(1)* variables by estimating the coefficients of a static relationship between these variables through OLS and applying the unit root tests to the residuals. Rejecting the null hypothesis of a unit root is evidence of cointegration.

To sum up, the cointegration methodology is an approach to identify spurious regressions and distinguish between spurious and non-spurious regressions. Based on the analysis of Engle and Granger (1987), we could say that two or more time-series are cointegrated if (a) each of the series has the same order of integration, and (b) there exists at least one linear combination of the series which is stationary *I(0).* In particular, if there is only one such linear combination, it can be obtained by regressing one of the series upon the others and consider the error term of the regression as the linear combination of the series. Hence, if in the regression equation is given by $y_t = \alpha + \beta x_t + \varepsilon_t$, the series y_t and x_t have the same order of integration *I(1)* and the residual ε_t is stationary then we say y_t and x_t are cointegrated, and we have strong evidence that the variables y_t and x_t are causally related. There is no need to include *I(0)* variables in the regression equation. OLS estimates of the regression of the *I(1)* variables describes non-spurious long-run equilibrium relationship between the variables. The second step in Engle and Granger (1987) cointegration analysis is the vector error correction (VEC) model to explain how the variables behave in the short-run consistent with the long-run cointegrating relationship. The VEC model is a special case of the vector autoregressive (VAR) model in which the variables are not stationary at *I(0)* level, but are stationary at the differences and have a cointegration relationship at *I(0).* The VEC model treats the error term obtained from the cointegrating equilibrium relationship as one-period lagged regressor in the short-run relationship and in this way shows if and how deviations from the long run equilibrium are corrected in the short-run. With one independent variable if the cointegrating relationship is $y_t = \beta_0 + \beta_1 x_t + \varepsilon_t$, then the VEC model with one lag in the differences would be :

$$\begin{aligned}\Delta y_t &= \alpha_1(y_{t-1} - \beta_0 - \beta_1 x_{t-1}) + \varphi_1 \Delta y_{t-1} + \gamma_1 \Delta x_{t-1} + C_1 + u_t \\ \Delta x_t &= \alpha_2(y_{t-1} - \beta_0 - \beta_1 x_{t-1}) + \varphi_2 \Delta y_{t-1} + \gamma_2 \Delta x_{t-1} + C_2 + v_t\end{aligned} \tag{7}$$

The term in parenthesis is the one-period lagged error obtained from the cointegrating equation and the coefficients measure the speed of correction of the cointegrating error towards long-term equilibrium relationship.

As the variables in Equation (7) are *I(0)*, standard OLS application is appropriate to estimate the regression parameters.

3.3 The models and the sources of data

There is no single way for the appropriate measure of financial development; hence, we used the following indicators that are mostly used in the literature as measures of financial development. We did not aggregate them into a single index through principal component analysis (PCA) or other methods, because the aggregation would mask the unique effects of these individual metrics and their interaction effects on other variables of the model. For the financial development and trade openness indicators, we originally considered them as ratios over current price GDP; as stated in the introduction section. However, in the data analysis we found that selecting the indicators as such would not lead to cointegration and would not show long-run equilibrium relationship. Subsequently, we log transformed these indicators and conducted our data analysis on log-transformed data. Therefore, the financial development indicators used in our model are:

- Money supply M2 log-transformed as a proxy for breadth of financial development: LNM2,
- The banking system's credit advances to the private sector CR log-transformed as a proxy for the depth of financial development: LNCR, and
- The stock market capitalization ST log-transformed as a proxy for liquidity of the financial development: LNST

The other variables of the models are trade openness measured by sum of exports plus imports log-transformed (LNXM*)* and economic growth (g) measured by percentage quarterly change in real GDP, previous same quarter basis.

We tested both the supply-leading hypotheses, which suggests financial development causes economic growth and the demand-following hypothesis that economic growth causes financial development.Therefore, the model includes two multiple regression equations to test the supply-leading hypothesis and three multiple regression equations to test the demand-following hypothesis.

The supply-leading regression equations are:

$$g = \beta_0 + \beta_1(LNCR) + \beta_2(LNM2) + \beta_3(LNST) + \varepsilon \quad (8)$$

$$LNXM = \beta_0 + \beta_1(LNCR) + \beta_2(LNM2) + \beta_3(LNST) + \varepsilon \quad (9)$$

The demand-following regression equations are:

$$LNM2 = \beta_0 + \beta_1 g + \beta_2(LNXM) + \varepsilon \quad (10)$$

$$LNCR = \beta_0 + \beta_1 g + \beta_2(LNXM) + \varepsilon \quad (11)$$

$$LNST = \beta_0 + \beta_1 g + \beta_2(LNXM) + \varepsilon \quad (12)$$

The statistical analysis covers quarterly data from the first quarter of 1990 to the second quarter of 2017. The choice for the time period was basically due to the availability of quarterly data for all the five variables of our model. Quarterly data for bank credit to the private sector were collected from International Bank for Resettlement. Quarterly data on nominal GDP and imports-exports were collected from Central Bank of the Republic of Turkey (CBRT). Stock market capitalization data were collected form Istanbul Stock Exchange. Finally, quarterly money supply M2 data were collected from OECD database.

3.4 Statistical analysis

As discussed in the above, the first step in causality analysis with time series data is to check for stationarity and possible unit roots through *AR(1)* estimation. However, to decide which version of *AR(1)* to use, random walk only, random walk with drift, or random walk with drift and time trend, we took a look at the charts of the time series in Figures 2 and 3.

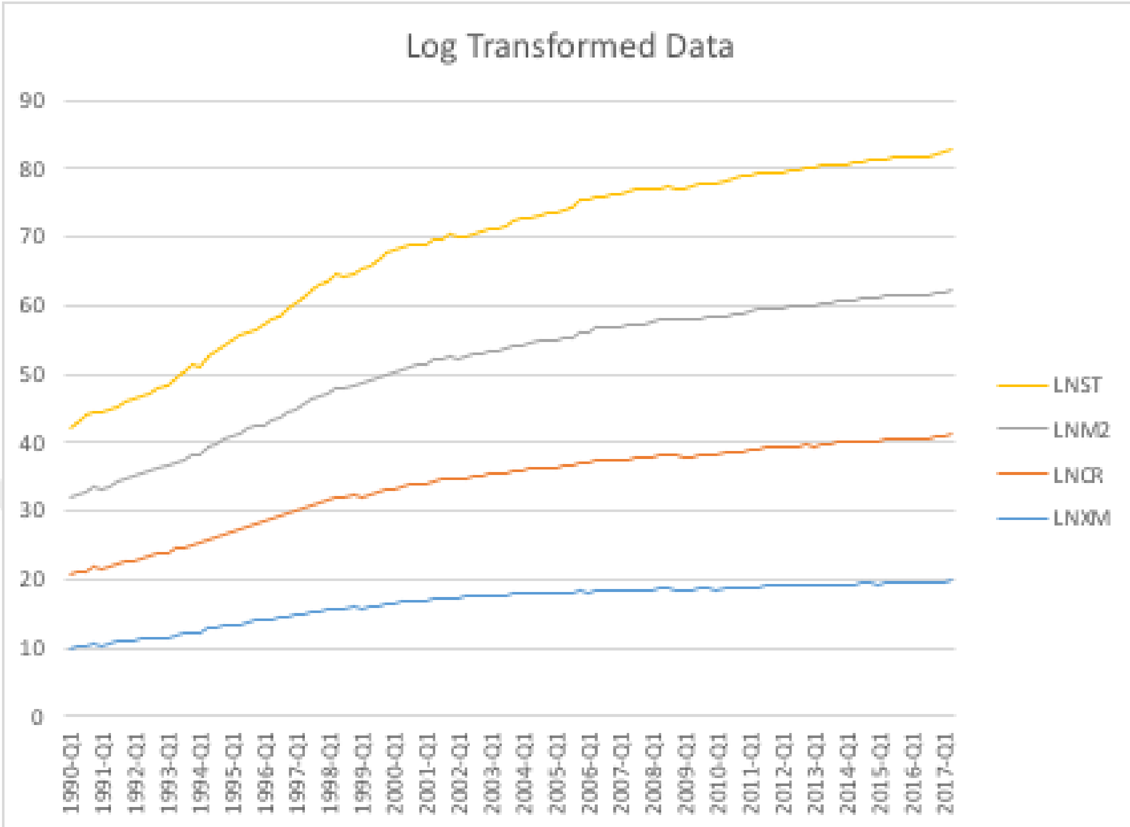

Figure 2.Plot of quarterly data for financial development and trade openness, indicators, log- transformed: 1990-Q1 to 2017-Q2

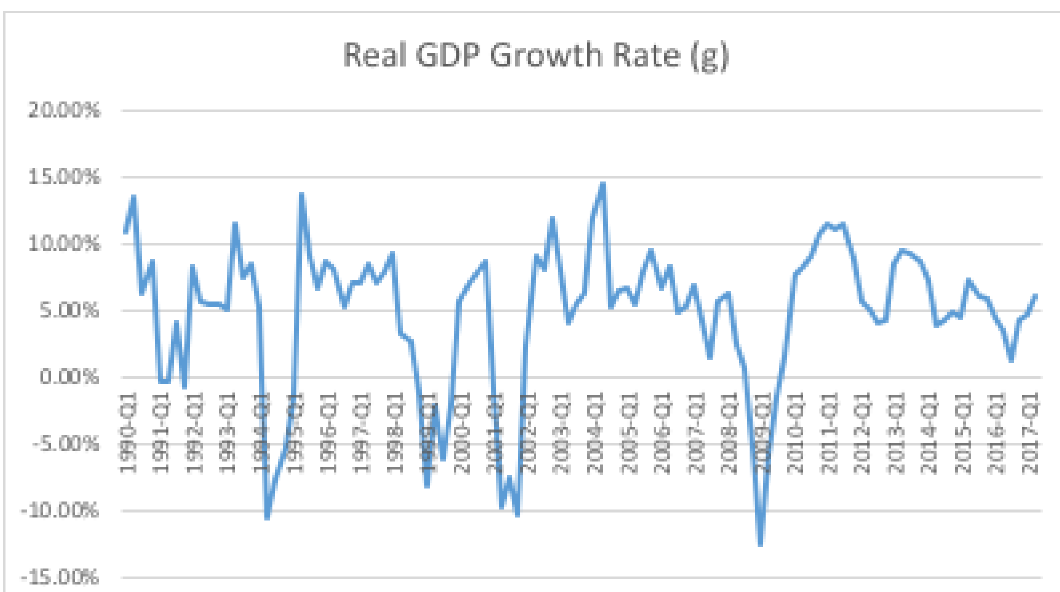

Figure 3. Plot of quarterly data for real GDP growth rate: 1990-Q1 to 2017-Q2.

To test for stationarity and unit root, the trajectories in Figure 2 and 3 suggest random walk AR(1) model with drift and trend for LNXM ,LNCR, LNM2, and LNST. The g variables does not show a time trend; therefore, random walk AR(1) with drift should be applied. We conducted the unit root test at 1% significant level. We used Eviews 10 Software to conduct our unit root tests.

3.5 Unit root test results

The ADF unit root test results show that the series are non-stationary at level; however, they become stationary after obtaining their first difference which means that the variables are *I(1)*. The summary of the unit root tests can be seen in Table 2. The sample ADF test statistic for g is higher than the critical values at all significance intervals; therefore, the null hypothesis of unit root is rejected; suggesting that the data is *I(1)* stationary. On the other hand, the intercepts' (drift) p value is 93.46% implying that there is no intercept in the model.

The ADF test statistics with intercept and trend for LNXM, LNCR and LNM2 in the first difference are higher than the critical values at 1% significance level; therefore, the null hypothesis of unit root is rejected which suggests that the data of these variables are *I(1)* stationary.

The actual tables of the unit root test results of Equation 8, 9, 10, 11 and 12 that are produced in the Eviews program can be seen under the Appendix A as the Table A1, Table A2, Table A3, Table A4 and Table A5, respectively.

Table 2. ADF Unit Root Test Results

Statistics	g	lag	lnXM	lag	lnCR	lag	lnM2	lag	lnST	lag
ADF with intercept	-9.94*	3	-2.11	3	-1.88	0	-9.15*	0	-10.06*	0
ADF with intercept and trend	-9.88*	3	-3.83*	3	-7.48*	0	-10.87*	0	-10.68*	0
ADF without intercept and trend	-10.0*	3	-1.28	3	-1.21	3	-1.18	7	-8.86*	0

Note: * denotes 1% significance level

3.6 Causality test results

Initially, we conduct Johansen's Cointegration Test for every equation in our model and then report the long-run equilibrium relationships and the short-run error correction (VEC) relationships of the variables. By using Schwarz Criterion, lag lengths are defined as 1 lag for all 5 models as depicted in the Table 3.

Table 3. Lag length selection for the VEC models

lag	Equation 8	Equation 9	Equation 10	Equation 11	Equation 12
0	3.32	6.35	3.04	3.11	2.42
1	-8.46*	-6.42*	-7.96*	-6.86*	-5.16*
2	-8.32	-6.09	-7.71	-6.55	-5.13
3	-7.95	-5.77	-7.66	-6.38	-4.87
4	-7.71	-5.52	-7.62	-6.31	-4.78

Note: * denotes lag order selected by the criterion

3.6.1 Cointegration and VEC test for equation 8

Equation 8 in our model hypothesizes the impact of financial development indicators LNCR, LNM2, and LNST on real GDP growth g. The Johansen's Cointegration Test result for this relationship is shown in Table 4. Equation 8 represents a non-spurious regression for the long-run relationship between g, LNCR, LNM2, and LNST.

Table 4. Johansen's Cointegration Test Results for Equation 8

Number of CEs	Eigenvalue	Trace statistic	Critical (5%)	Prob.
None*	0.460723	107.2671	47.85613	0.0000
At most 1*	0.229354	40.57421	29.79707	0.0020
At most 2	0.075023	12.43740	15.49471	0.1371
At most 3*	0.036492	4.014868	3.841466	0.0451

Note: Trace test indicates 2 co-integrating equation(s) at 5% significance, * denotes the null hypothesis at the 5% significant level

The VEC output in the Table 5 shows the cointegrating regression estimate, that is, the coefficients of the long-run model are normalized on *g* with the signs reversed due to normalization. All the *t* values are significant at 5% (two-tailed). The long-run relationship, therefore, is:

$$g_t = -0.486 - 0.075 LNCR_t + 0.181 LNM2_t - 0.077 LNST_t + \varepsilon_t \qquad (13)$$

Regression coefficients in Equation (13) indicate positive causality from money supply M2 to economic growth, which supports the supply leading hypothesis. However, coefficients of LNCR and LNST in the long-run equation are negative; which cannot be justified by theory.

The VEC output also reports the short-run dynamics in reaching long-term equilibrium. The error correction factor is negative only for Δg and for Δ(LNST), significant at 5% only for Δg. Therefore, we take one lagged Δg as the dependent variable in the short-run dynamics. Therefore, the short-run regression output with one lagged difference is:

$$\Delta g_t = -0.183\varepsilon_{t-1} + 0.094\Delta g_{t-1} + 0.066\Delta(LNCR_{t-1}) + 0.010\Delta(LNM2_{t-1}) + 0.011\Delta(LNST_{t-1}) - 0.018 \quad (14)$$

In Equation 14, as well in all other short-term regressions that follows the term ε_{t-1} is estimate of one period lagged error term obtained from the long-run regression estimates. The first coefficient in the right hand side of the Equation 14, the error correction term shows that around 18.3% of deviation from long-term equilibrium in a quarter is corrected in the succeeding quarter. The other coefficients are all positive and indicate short-run causation with one period time lag from financial economic indicators to real economic growth, though only the coefficient of LNST is statistically significant.

Table 5. VEC Results for Equation 8

Description	Variable	Coefficient	Standard error	t statistic
Speed of Adjustment	Dg	−0.183	0.044	-4.18
Short run coefficients	Dg(1)	0.094	0.081	1.16
	DlnM2(1)	0.010	0.038	0.27
	DlnCR(1)	0.066	0.069	0.96
	DlnST(1)	0.107	0.016	6.98
Long run coefficients	lnM2(−1)	0.181	0.039	-4.68
	lnST(−1)	-0.077	0.019	4.03
	lnCR(−1)	-0.075	0.037	2.06

3.6.2 Cointegration and VEC test for equation 9

Equation 9 in our model was hypothesized for the impact of financial development indicators LNCR, LNM2, and LNST on trade openness LNXM. The Johansen's Cointegration Test result for this relationship is shown in Table 6. The Trace Statistics and *p* values in Table 6 indicate cointegration of variables of Equation 9 at *I(0)* level.

Table 6. Johansen's Cointegration Test Results for Equation 9

Number of CEs	Eigenvalue	Trace statistic	Critical (5%)	Prob.
None*	0.434495	86.97680	47.85613	0.0000
At most 1	0.134837	25.41285	29.79707	0.1472
At most 2	0.065956	9.770378	15.49471	0.2988
At most 3	0.021990	2.401368	3.841466	0.1212

The VEC results for Equation 9 as indicated in Table 7 shows the cointegrating regression estimate normalized on LNXM with the signs reversed due to normalization. All the *t* values are significant at 5% two-tail. Therefore, the long-run relationship is:

$$LNXM_t = 7.959 + 1.323LNCR_t - 2.687LNM2_t + 1.899LNST_t + \varepsilon_t \quad (15)$$

Regression coefficients in Equation 15 indicate positive causality from private sector credit and stock market capitalization to trade openness, which supports the supply leading hypothesis. However, coefficients LNM2 in the long-run equation is negative, which cannot be backed by the theory.

The error correction factor is negative for all variables except for Δ(LNST), however, Δ(LNCR) has the highest adjusted R-square and the *t* value is strongly significant at 5%, Therefore, we take Δ(LNCR) as the dependent variable in the short-run dynamics. Hence, the short-run regression output with one lagged difference is:

$$\Delta(LNCR)_t = -0.019\varepsilon_{t-1} + 0.041\Delta(LNXM)_{t-1} + 0.259\Delta(LNCR)_{t-1} + 0.0004\Delta(LNM2)_{t-1} + 0.009\Delta(LNST)_{t-1} - 0.067 \quad (16)$$

The first coefficient in the right hand side of the Equation 16, the error correction term, shows that about 2% of deviation from long-term equilibrium in a quarter is corrected in the succeeding quarter. The other coefficients are all positive and indicate short-run causation with one period lag from trade openness, money supply M2, and stock market capitalization to private sector credit, though only the coefficient of Δ(LNCR) is statistically significant.

Table 7. VEC Results for Equation 9

Description	Variable	Coefficient	Standard error	t statistic
Speed of Adjustment	DlnCR	-0.019	0.005	-3.58
Short run coefficients	DlnXM(1)	0.041	0.054	0.76
	DlnM2(1)	0.0004	0.063	0.01
	DlnCR(1)	0.259	0.102	2.54
	DlnST(1)	0.009	0.026	0.33
Long run coefficients	lnM2(−1)	2.69	0.54	4.91
	lnST(−1)	-1.90	0.27	-7.05
	lnCR(−1)	-1.32	-0.51	-2.58

3.6.3 Cointegration and VEC test for equation 10

Equation 10 in our model hypothesizes the impact of trade openness LNXM and economic growth *g* on financial development indicator LNCR. The Johansen's Cointegration Test results for this relationship is shown in Table 8. The Trace Statistics and p values in Table 8 indicate cointegration of variables of Equation 10 at *I(0)* level. Therefore, Equation 10 represents a non-spurious regression for the long-run relationship between LNXM, g and LNCR.

Table 8. Johansen's Cointegration Test Results for Equation 10

Number of CEs	Eigenvalue	Trace statistic	Critical (5%)	Prob.
None*	0.322109	65.35669	29.79707	0.0000
At most 1*	0.177049	23.36965	15.49471	0.0027
At most 2	0.021296	2.324860	3.841466	0.1273

The VEC results for Equation 10 reported as in Table 9 shows the cointegrating regression estimate normalized on *LNCR* with the signs reversed due to normalization. Hence, the long-run relationship is:

$$LNCR_t = 12.502 + 42.735 g_t + 0.168 LNXM_t + \varepsilon_t \quad (17)$$

Regression coefficients in Equation 17 indicate positive causality from economic growth and trade openness to private sector credit, which supports the demand-following hypothesis. However, coefficients of LNXM in the long-run equation is not statistically significant at 5% level.

The error correction factor is negative for Δ(LNCR) and Δ(LNXM); however, Δ(LNCR) has the highest adjusted R-square and the t value is strongly significant at 5%, Therefore, we take Δ(LNCR) as the dependent variable in the short-run dynamics. Therefore, the short-run regression output with one lagged difference is:

$$\Delta(LNCR)_t = -0.009\varepsilon_{t-1} + 0.217\Delta(LNCR)_{t-1} + 0.016\Delta(g_{t-1}) + 0.061\Delta(LNXM_{t-1})T_{t-1}) + 0.070 \quad (18)$$

The first coefficient in the right hand side of the equation 18, the error correction term, shows that about 1% of deviation from long-term equilibrium in a quarter is corrected in the succeeding quarter. The other coefficients are all positive and indicate short-run causation with one period lag from trade openness and economic growth to private sector credit, though only the coefficient of Δ(LNCR) is statistically significant.

Table 9. VEC Results for Equation 10

Description	Variable	Coefficient	Standard error	t statistic
Speed of Adjustments	DlnCR	-0.009	0.002	-4.12
Short run coefficients	DlnXM(1)	0.061	0.049	1.22
	DG(1)	0.016	0.128	0.13
	DLNCR(1)	0.217	0.104	2.09
Long run coefficients	lnXM(−1)	0.17	0.16	1.05
	g(−1)	42.73	7.74	5.52

3.6.4 Cointegration and VEC test for equation 11

Equation 11 hypothesizes the impact of trade openness LNXM and economic growth g on financial development indicator LNM2. The Johansen's Cointegration Test result for this relationship is shown in Table 10. The Trace Statistics and *p* values in Table 10 indicate cointegration of variables of Equation 11 at *I(0)* level. Therefore, Equation 11 represents a non-spurious regression for the long-run relationship between LNM2, LNXM, and g.

Table 10. Johansen's Cointegration Test Results for Equation 11

Number of CEs	Eigenvalue	Trace statistic	Critical (5%)	Prob.
None*	0.284911	66.57384	29.79707	0.0000
At most 1*	0.203676	30.35630	15.49471	0.0002
At most 2	0.051931	5.759400	3.841466	0.0164

The VEC results for Equation 11 as reported in Table 11 show the cointegrating regression estimate normalized on LNM2 with the signs reversed due to normalization. Therefore, the long-run relationship is:

$$LNM2_t = 5.383 - 2.750g_t + 0.735LNXM_t + \varepsilon_t \quad (19)$$

Regression coefficients in Equation (19) indicate strong positive causality from trade openness to money supply M2, which supports the demand-following hypothesis. However, coefficient of real economic growth in the long-run equation is negative and not statistically significant at 5% level, so we can argue that there is no long-run causality from real economic growth to money supply M2.

The error correction factor is negative for all the variables in Equation 11, but statistically significant at 5% only for Δ(LNM2) and Δ(LNXM). However, the Δ(LNM2) has the highest adjusted R-square and its F value is strongly significant at 5%; therefore, we take Δ(LNM2) as the dependent variable in the short-run dynamics. Therefore, the short-run regression output with one lagged difference is:

$$\Delta(LNM2)_t = -0.051\varepsilon_{t-1} - 0.049\Delta(LNM2)_{t-1} + 0.062\Delta(g_{t-1}) - 0.085\Delta(LNXM_{t-1}) + 0.102 \quad (20)$$

The first coefficient in the right hand side of the Equation 20, the error correction term, is statistically significant and shows that about 5% of deviation from long-term equilibrium in a quarter is corrected in the succeeding quarter. Except for the constant term, the other coefficients are not statistically significant and, therefore, do not point out to statistically significant causation over the money supply in the short-run.

Table 11. VEC Results for Equation 11

Description	Variable	Coefficient	Standard error	t statistic
Speed of Adjustments	DlnM2	-0.051	0.01	-5.14
Short run coefficients	DlnXM(1)	-0.085	0.08	-1.02
	DG(1)	0.062	0.20	0.31
	DlnM2(1)	-0.049	0.10	-0.48
Long run coefficients	lnXM(−1)	-0.735	0.05	-13.85
	g(−1)	2.750	2.66	1.03

3.6.5 Cointegration and VEC test for equation 12

Equation 12 in our model hypothesizes the impact of trade openness LNXM and economic growth g on financial development indicator LNST. The Johansen's Cointegration Test result for this relationship is shown in Table 12. The Trace Statistics and *p* values in Table 12 indicate cointegration of variables of Equation 12 at *I(0)* level. Therefore, Equation 12 represents a non-spurious regression for the long-run relationship between LNST, LNXM, and g.

Table 12. Johansen's Cointegration Test Results for Equation 12

Number of CEs	Eigenvalue	Trace statistic	Critical (5%)	Prob.
None*	0.301960	71.91040	29.79707	0.0000
At most 1*	0.174650	33.08674	15.49471	0.0001
At most 2*	0.108108	12.35635	3.841466	0.0004

The VEC results for Equation 12 as seen in Table 13 shows the cointegrating regression estimates are normalized on LNST with the signs reversed due to normalization. Hence, the long-run relationship is:

$$LNST_t = -2.355 - 7.110 g_t + 1.992 LNXM_t + \varepsilon_t \tag{21}$$

Regression coefficients in Equation (21) indicate strong positive causality from trade openness to stock market capitalization, which supports the demand-following hypothesis. However, coefficient of real economic growth in the long-run equation is negative and statistically significant at 5% level, indicating negative impact of real economic growth on the stock market capitalization.

The error correction factor is negative for Equation 11 is negative for Δ(LNST) and Δ(g), but statistically significant at 5% only for Δ(g). Therefore, we take Δ(g) as the dependent variable in the short-run dynamics. The short-run regression output with one lagged difference, therefore, is:

$$\Delta(g)_t = -0.025\varepsilon_{t-1} + 0.113\Delta(LNST)_{t-1} + 0.115\Delta(g_{t-1}) - 0.026\Delta(LNXM_{t-1}) - 0.009 \qquad (22)$$

The first coefficient in the right hand side of the Equation 22, the error correction term is statistically significant and shows that about 2.5% of deviation from long-term equilibrium in a quarter is corrected in the succeeding quarter. The coefficient of Δ(LNST) is highly significant and indicate strong short-run causation from the stock market capitalization to real economic growth. Other coefficients in Equation 22 are not statistically significant at 5%.

Table 13. VEC results for Equation 12

Description	Variable	Coefficient	Standard error	t statistic
Speed of Adjustments	Dg	-0.025	0.006	-4.22
Short run coefficients	DlnXM(1)	-0.026	0.028	-0.89
	Dg(1)	0.115	0.082	1.39
	DlnST(1)	0.113	0.016	7.23
Long run coefficients	DlnXM(−1)	-1.199	0.03	-34.25
	Dg(−1)	7.110	1.74	4.08

The actual tables of the Johansen cointegration test results of Equation 8, 9, 10, 11 and 12 that are produced in the Eviews program can be seen under the Appendix B as the Table B1, Table B2, Table B3, Table B4 and Table B5, respectively.

The actual tables of the VEC test results of Equation 8, 9, 10, 11 and 12 that are produced in the Eviews program can be seen under the Appendix C as the Table C1, Table C2, Table C3, Table C4 and Table C5, respectively.

3.7 Summary of the statistically significant results

The results of this data analysis are summarized below.

3.7.1 Long-run causalities

- There is bi-directional positive causality between real economic growth and banking sector credits to the private sector
- There is bi-directional positive causality between stock market capitalization and trade openness
- There is bi-directional negative causality between stock market capitalization real economic growth
- Money supply M2 has positive causality on real economic growth
- Private sector credit has positive causality on trade openness
- Money supply M2 has negative causality on trade openness
- Trade openness has positive causality on money supply M2

3.7.2 Short-run causalities

- Stock market capitalization has positive causality on economic growth
- Private sector credit has positive causality on next period's private sector's credit

CHAPTER 4

CONCLUSION

In this study, we investigated whether growth and trade openness caused financial development and financial development caused growth and trade openness both in the short run and long run with the quarterly data for the period between the first quarter of 1990 to the second quarter of 2017. Following the previous literature, financial development indicators were defined as money supply M2 as a proxy for breadth of financial development, the banking system's credit advances to the private sector as a proxy for the depth of financial development and the stock market capitalization as a proxy for liquidity of the financial development and employed separately. By this way, the effect of each indicator on growth and trade openness was analyzed individually. Trade openness was measured as the ratio of total trade to GDP and the growth was taken as the real economic growth percentage in terms of the previous year.

We employed recent time series methods and found evidence for both supply leading and demand following economic theories in the long run. In the long run, our models showed a positive bi-directional long-run causality between private sector credit and real economic growth and one-way positive causality from money supply to real economic growth. On the other hand, we found negative bi-directional causality between stock market capitalization and real economic growth in the long run which is not consistent with the current literature and might be due to structural breaks during the study period since in the short run, we found positive causality from stock market capitalization to the real economic growth. The policy implications of these results led to the conclusion that long-term real economic growth could be achieved by expansionary monetary and credit policies. Furthermore, we found positive bi-directional positive causality between stock market capitalization and trade openness and one-way positive causality from credits to private sector to the trade openness. These results are consistent with the economic theories and current literature. The policy implications are the importance of continuous privatization and encouragement of private companies to go public.

APPENDIX A

AUGMENTED DICKEY FULLER TEST RESULTS

Table A1. ADF Unit Root Test Results for Equation 8

Null Hypothesis: D(g) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.943916	0.0000
Test critical values:	1% level	-3.493747	
	5% level	-2.889200	
	10% level	-2.581596	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D((g2))
Method: Least Squares
Date: 02/03/18 Time: 12:03
Sample (adjusted): 6 110
Included observations: 105 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(g(-1))	-1.537741	0.154641	-9.943916	0.0000
D(g(-1),2)	0.577550	0.135293	4.268881	0.0000
D(g(-2),2)	0.533852	0.109771	4.863306	0.0000
D(g(-3),2)	0.583601	0.076997	7.579540	0.0000
C	0.000278	0.003386	0.082246	0.9346

Table A2. ADF Unit Root Test Results for Equation 9

Null Hypothesis: D(LNXM) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.833079	0.0185
Test critical values:	1% level	-4.047795	
	5% level	-3.453179	
	10% level	-3.152153	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNXM,2)
Method: Least Squares
Date: 02/06/18 Time: 12:36
Sample (adjusted): 6 110
Included observations: 105 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNXM(-1))	-0.794915	0.207383	-3.833079	0.0002
D(LNXM(-1),2)	-0.244232	0.168428	-1.450064	0.1502
D(LNXM(-2),2)	-0.346924	0.127836	-2.713830	0.0078
D(LNXM(-3),2)	-0.469658	0.083700	-5.611222	0.0000
C	0.155576	0.044023	3.533978	0.0006
@TREND("1")	-0.001491	0.000475	-3.136899	0.0022

Table A3. ADF Unit Root Test Results for Equation 10

Null Hypothesis: D(LNCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.485591	0.0000
Test critical values:	1% level	-4.045236	
	5% level	-3.451959	
	10% level	-3.151440	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNCR,2)
Method: Least Squares
Date: 02/06/18 Time: 12:22
Sample (adjusted): 3 110
Included observations: 108 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNCR(-1))	-0.696408	0.093033	-7.485591	0.0000
C	0.116790	0.019233	6.072500	0.0000
@TREND("1")	-0.000892	0.000210	-4.241352	0.0000

Table A4. ADF Unit Root Test Results for Equation 11

Null Hypothesis: D(LNM2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.86888	0.0000
Test critical values:	1% level	-4.045236	
	5% level	-3.451959	
	10% level	-3.151440	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNM2,2)
Method: Least Squares
Date: 02/06/18 Time: 16:53
Sample (adjusted): 3 110

Included observations: 108 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNM2(-1))	-1.058957	0.097430	-10.86888	0.0000
C	0.170540	0.023746	7.181734	0.0000
@TREND("1")	-0.001352	0.000305	-4.430361	0.0000

Table A5. ADF Unit Root Test Results for Equation 12

Null Hypothesis: D(LNST) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.68163	0.0000
Test critical values:	1% level	-4.045236	
	5% level	-3.451959	
	10% level	-3.151440	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNST,2)
Method: Least Squares
Date: 02/06/18 Time: 17:02
Sample (adjusted): 3 110
Included observations: 108 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNST(-1))	-1.029495	0.096380	-10.68163	0.0000
C	0.198185	0.047649	4.159273	0.0001
@TREND("1")	-0.001887	0.000706	-2.671653	0.0088

APPENDIX B

JOHANSEN COINTEGRATION TEST RESULTS

Table B1. Johansen Cointegration Test Result for Equation 8

Sample (adjusted): 3 110
Included observations: 108 after adjustments
Trend assumption: Linear deterministic trend
Series: G LNCR LNM2 LNST
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.460723	107.2671	47.85613	0.0000
At most 1 *	0.229354	40.57421	29.79707	0.0020
At most 2	0.075023	12.43740	15.49471	0.1371
At most 3 *	0.036492	4.014868	3.841466	0.0451

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table B2. Johansen Cointegration Test Result for Equation 9

Sample (adjusted): 3 110
Included observations: 108 after adjustments
Trend assumption: Linear deterministic trend
Series: LNXM LNCR LNM2 LNST
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.434495	86.97680	47.85613	0.0000
At most 1	0.134837	25.41285	29.79707	0.1472
At most 2	0.065956	9.770378	15.49471	0.2988
At most 3	0.021990	2.401368	3.841466	0.1212

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table B3. Johansen Cointegration Test Result for Equation 10

Sample (adjusted): 3 110
Included observations: 108 after adjustments
Trend assumption: Linear deterministic trend
Series: LNCR G LNXM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.322109	65.35669	29.79707	0.0000
At most 1 *	0.177049	23.36965	15.49471	0.0027
At most 2	0.021296	2.324860	3.841466	0.1273

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table B4. Johansen Cointegration Test Result for Equation 11

Sample (adjusted): 3 110
Included observations: 108 after adjustments
Trend assumption: Linear deterministic trend
Series: LNM2 G LNXM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.284911	66.57384	29.79707	0.0000
At most 1 *	0.203676	30.35630	15.49471	0.0002
At most 2 *	0.051931	5.759400	3.841466	0.0164

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table B5. Johansen Cointegration Test Result for Equation 12

Sample (adjusted): 3 110
Included observations: 108 after adjustments
Trend assumption: Linear deterministic trend
Series: LNST G LNXM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.301960	71.91040	29.79707	0.0000
At most 1 *	0.174650	33.08674	15.49471	0.0001
At most 2 *	0.108108	12.35635	3.841466	0.0004

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

APPENDIX C

VECTOR ERROR CORRECTION TEST RESULTS

Table C1.Vector Error Correction Test Result for Equation 8

Vector Error Correction Estimates Sample (adjusted): 3 110 Included observations: 108 after adjustments Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
G(-1)	1.000000			
LNCR(-1)	0.075215 (0.03656) [2.05745]			
LNM2(-1)	-0.181059 (0.03865) [-4.68506]			
LNST(-1)	0.077213 (0.01914) [4.03322]			
C	0.486484			
Error Correction:	D(G)	D(LNCR)	D(LNM2)	D(LNST)
CointEq1	-0.182763 (0.04373) [-4.17930]	0.303049 (0.06768) [4.47767]	0.582848 (0.10853) [5.37034]	-0.392597 (0.26908) [-1.45903]
D(G(-1))	0.093775 (0.08122) [1.15456]	0.076618 (0.12570) [0.60951]	-0.231539 (0.20158) [-1.14864]	-0.131776 (0.49977) [-0.26367]
D(LNCR(-1))	0.065900 (0.06877) [0.95826]	0.152306 (0.10643) [1.43099]	-0.464023 (0.17068) [-2.71873]	1.236625 (0.42316) [2.92237]
D(LNM2(-1))	0.010098 (0.03766)	0.054398 (0.05828)	0.068451 (0.09346)	0.192947 (0.23171)

	[0.26816]	[0.93337]	[0.73242]	[0.83269]
D(LNST(-1))	0.108191	0.029795	-0.028448	-0.013708
	(0.01551)	(0.02400)	(0.03848)	(0.09541)
	[6.97738]	[1.24155]	[-0.73923]	[-0.14368]
C	-0.018264	0.074392	0.131955	-0.046971
	(0.00765)	(0.01183)	(0.01897)	(0.04704)
	[-2.38902]	[6.28728]	[6.95456]	[-0.99850]
R-squared	0.375297	0.428511	0.236709	0.106868
Adj. R-squared	0.344674	0.400497	0.199293	0.063087
Sum sq. resids	0.127652	0.305761	0.786262	4.833125
S.E. equation	0.035376	0.054751	0.087798	0.217678
F-statistic	12.25550	15.29623	6.326381	2.440977
Log likelihood	210.7457	163.5772	112.5749	14.51309
Akaike AIC	-3.791587	-2.918096	-1.973609	-0.157650
Schwarz SC	-3.642580	-2.769088	-1.824601	-0.008643
Mean dependent	-0.000669	0.097064	0.090110	0.090638
S.D. dependent	0.043700	0.070712	0.098118	0.224887

Table C2. Vector Error Correction Test Result for Equation 9

Vector Error Correction Estimates	
Sample (adjusted): 3 110	
Included observations: 108 after adjustments	
Standard errors in ( ) & t-statistics in [ ]	
Cointegrating Eq:	CointEq1
LNXM(-1)	1.000000
LNCR(-1)	-1.323095
	(0.51186)
	[-2.58488]
LNM2(-1)	2.687069
	(0.54716)
	[4.91094]
LNST(-1)	-1.899083
	(0.26945)
	[-7.04798]

C	-7.959156			

Error Correction:	D(LNXM)	D(LNCR)	D(LNM2)	D(LNST)
CointEq1	-0.059154	-0.018622	-0.051174	0.016383
	(0.00968)	(0.00520)	(0.00758)	(0.02015)
	[-6.10787]	[-3.58208]	[-6.74985]	[0.81311]
D(LNXM(-1))	-0.017176	0.040899	-0.023103	0.098414
	(0.10032)	(0.05385)	(0.07853)	(0.20871)
	[-0.17121]	[0.75949]	[-0.29418]	[0.47153]
D(LNCR(-1))	-0.343782	0.259544	-0.385406	0.923385
	(0.19016)	(0.10207)	(0.14886)	(0.39561)
	[-1.80789]	[2.54272]	[-2.58907]	[2.33409]
D(LNM2(-1))	-0.141289	0.000413	0.006017	0.190148
	(0.11852)	(0.06362)	(0.09278)	(0.24657)
	[-1.19211]	[0.00649]	[0.06485]	[0.77117]
D(LNST(-1))	-0.040100	0.008685	-0.090476	4.96E-05
	(0.04868)	(0.02613)	(0.03811)	(0.10127)
	[-0.82378]	[0.33238]	[-2.37429]	[0.00049]
C	0.141133	0.067075	0.138019	-0.026069
	(0.02218)	(0.01191)	(0.01736)	(0.04615)
	[6.36283]	[5.63356]	[7.94871]	[-0.56494]
R-squared	0.297816	0.388890	0.324941	0.092419
Adj. R-squared	0.263395	0.358933	0.291850	0.047929
Sum sq. resids	1.134726	0.326959	0.695375	4.911318
S.E. equation	0.105474	0.056617	0.082568	0.219431
F-statistic	8.652219	12.98185	9.819581	2.077323
Log likelihood	92.76460	159.9574	119.2082	13.64643
Akaike AIC	-1.606752	-2.851063	-2.096447	-0.141601
Schwarz SC	-1.457745	-2.702056	-1.947440	0.007407
Mean dependent	0.089210	0.097064	0.090110	0.090638
S.D. dependent	0.122893	0.070712	0.098118	0.224887

Table C3.Vector Error Correction Test Result for Equation 10

Vector Error Correction Estimates

Sample (adjusted): 3 110
Included observations: 108 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LNCR(-1)	1.000000		
G(-1)	-42.73486		
	(7.73666)		
	[-5.52368]		
LNXM(-1)	-0.168200		
	(0.16094)		
	[-1.04511]		
C	-12.50178		
Error Correction:	**D(LNCR)**	**D(G)**	**D(LNXM)**
CointEq1	-0.008695	0.005952	-0.015119
	(0.00211)	(0.00158)	(0.00444)
	[-4.12057]	[3.77671]	[-3.40810]
D(LNCR(-1))	0.217240	0.136563	-0.182496
	(0.10391)	(0.07761)	(0.21844)
	[2.09073]	[1.75970]	[-0.83544]
D(G(-1))	0.016345	0.083716	-0.235614
	(0.12844)	(0.09593)	(0.27003)
	[0.12725]	[0.87266]	[-0.87255]
D(LNXM(-1))	0.060648	-0.004383	0.017383
	(0.04956)	(0.03702)	(0.10420)
	[1.22363]	[-0.11839]	[0.16682]
C	0.070321	-0.013620	0.105414
	(0.01107)	(0.00827)	(0.02327)
	[6.35351]	[-1.64766]	[4.53034]
R-squared	0.402800	0.127754	0.126136
Adj. R-squared	0.379608	0.093881	0.092199
Sum sq. resids	0.319517	0.178235	1.412161
S.E. equation	0.055697	0.041599	0.117091

F-statistic	17.36787	3.771497	3.716818
Log likelihood	161.2008	192.7208	80.95320
Akaike AIC	-2.892607	-3.476311	-1.406541
Schwarz SC	-2.768434	-3.352139	-1.282368
Mean dependent	0.097064	-0.000669	0.089210
S.D. dependent	0.070712	0.043700	0.122893

Table C4. Vector Error Correction Test Result for Equation 11

Vector Error Correction Estimates			
Sample (adjusted): 3 110			
Included observations: 108 after adjustments			
Standard errors in ( ) & t-statistics in [ ]			
Cointegrating Eq:	CointEq1		
LNM2(-1)	1.000000		
G(-1)	2.750521		
	(2.66130)		
	[1.03352]		
LNXM(-1)	-0.734579		
	(0.05304)		
	[-13.8489]		
C	-5.382668		
Error Correction:	D(LNM2)	D(G)	D(LNXM)
CointEq1	-0.050992	-0.001842	-0.062617
	(0.00991)	(0.00497)	(0.01253)
	[-5.14498]	[-0.37057]	[-4.99894]
D(LNM2(-1))	-0.048814	0.028002	-0.179952
	(0.10104)	(0.05068)	(0.12770)
	[-0.48312]	[0.55248]	[-1.40919]
D(G(-1))	0.062118	-0.008117	0.111101
	(0.19739)	(0.09901)	(0.24947)
	[0.31470]	[-0.08198]	[0.44535]
D(LNXM(-1))	-0.084925	-0.042116	-0.067572
	(0.08304)	(0.04166)	(0.10495)
	[-1.02265]	[-1.01105]	[-0.64383]
C	0.102216	0.000561	0.111722
	(0.01301)	(0.00653)	(0.01645)
	[7.85511]	[0.08597]	[6.79326]
R-squared	0.220221	0.010900	0.206048
Adj. R-squared	0.189938	-0.027511	0.175215
Sum sq. resids	0.803247	0.202113	1.283023

S.E. equation	0.088309	0.044297	0.111609
F-statistic	7.272160	0.283778	6.682691
Log likelihood	111.4208	185.9317	86.13191
Akaike AIC	-1.970755	-3.350587	-1.502443
Schwarz SC	-1.846582	-3.226415	-1.378270
Mean dependent	0.090110	-0.000669	0.089210
S.D. dependent	0.098118	0.043700	0.122893

Table C5. Vector Error Correction Test Result for Equation 12

Vector Error Correction Estimates
Date: 02/11/18 Time: 08:21
Sample (adjusted): 3 110
Included observations: 108 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LNST(-1)	1.000000		
G(-1)	7.109933 (1.74353) [4.07790]		
LNXM(-1)	-1.199190 (0.03501) [-34.2526]		
C	2.355511		
Error Correction:	**D(LNST)**	**D(G)**	**D(LNXM)**
CointEq1	-0.043957 (0.03691) [-1.19085]	-0.024732 (0.00586) [-4.21717]	0.077440 (0.01889) [4.09961]
D(LNST(-1))	0.047356 (0.09876) [0.47952]	0.113456 (0.01569) [7.23088]	0.014057 (0.05054) [0.27814]
D(G(-1))	-0.029924 (0.52005) [-0.05754]	0.115163 (0.08263) [1.39379]	-0.270776 (0.26613) [-1.01745]

D(LNXM(-1))	0.370816	-0.025907	0.018503
	(0.18121)	(0.02879)	(0.09273)
	[2.04629]	[-0.89983]	[0.19952]
C	0.052818	-0.009043	0.086063
	(0.02810)	(0.00447)	(0.01438)
	[1.87932]	[-2.02517]	[5.98384]
R-squared	0.048294	0.363799	0.165400
Adj. R-squared	0.011335	0.339092	0.132989
Sum sq. resids	5.150095	0.130002	1.348709
S.E. equation	0.223609	0.035527	0.114430
F-statistic	1.306683	14.72461	5.103113
Log likelihood	11.08291	209.7608	83.43573
Akaike AIC	-0.112647	-3.791867	-1.452513
Schwarz SC	0.011526	-3.667695	-1.328341
Mean dependent	0.090638	-0.000669	0.089210
S.D. dependent	0.224887	0.043700	0.122893

REFERENCES

Acikgoz, S., Balcilar, M., & Saracoglu, B. (2012). Openness and financial development: Time series evidence for Turkey. *International Journal of Banking, Accounting, and Finance*, 4(2), 172-201.

Araç, A. & Ozcan, S. K. (2014). The causality between financial development and economic growth: The case of Turkey. *Journal of Economic Cooperation and Development*, 35(3), 171–198.

Avci, O., B. (2017). Examination of the relationship between financial development and economic growth: Case of Turkey. *Journal of Accounting and Finance*, 75, 171-181.

Bakay, A. (2014). Granger Causality between Financial Deepening and International Trade: Evidence from Regional Panel Data. *Eurasian Journal of Business and Economics*, 7(14), 91-107. DOI: 10.17015/ejbe.2014.014.06

Berman, N., & Hericourt, J. (2010), Financial factors and the margins of trade: Evidence from cross-country firm-level data. *Journal of Development Economics*, 93(2), 206-217.

Braun, M., & Raddatz, C. (2008). The politics of financial development: Evidence from trade liberalization. *Journal of Finance*, 63(3), 1469-1508.

Coban, S. (2015). Does the financial development spur export performance? Evidence from Turkish firm-level data. *International Journal of Economics and Financial Issues*, 5(2), 434-440.

Dinar, G., B., Dalgic, B., C., & İyidogan. P., V. (2015). Financial liberalization and economic growth in Turkey: A reexamination. *Journal of Economics and Administrative Sciences*, 33(1), 19-43.

Engle, R., F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2), 251-276.

Goldsmith, R.Y. (1969) Financial Structure and Development, Yale University Press, New Haven, CT.

Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica*, 37 (3): 424–438. doi:10.2307/1912791.

Granger, C. W. J., & Newbold, P. (1974). Spurious regression in econometrics. *Journal of Econometrics*, 2, 111-120.

Granger, C.W.J. (1988), Some recent developments in the concept of causality. *Journal of Econometrics*, 39, 199-211.

Hatami-J, A. (2012). Asymmetric causality tests with an application. *Empirical Economics*, 43, 447-456.

Herwartz, H., & Walle, Y., M. (2014). Openness and the finance-growth nexus. *Journal of Banking & Finance*, 48, 235-247.

Hur, I., Raj, M., & Riyanto, Y. (2006). Analysis on the impact of financial development and asset tangibility on international trade. *World Development 34*(10), 1728-1741. doi:10.1016/j.worlddev.2006.02.003

Ince, M. (2011). Financial liberalization, development and economic growth: An empirical analysis for Turkey. *Journal of Yasar University* 23(6) 3782-3793.

Iyidogan, P., V. (2013). Nonlinear causality analysis of finance-growth relation: Evidence from Turkey. *Journal of Economic Cooperation and Development* 34(3), 23-34.

Konya, L. (2006). Export and growth: Granger causality analysis on OECD countries with a panel data approach. *Economic Modelling*, 23(6), 978-992.

Lebe, F. (2016). Financial development and economic growth in European countries: Bootstrap causality analysis. *Journal of Global Analysis*, 6(1), 47-70.

Levine, R. (1997). Financial development and economic growth: Views and agenda, *Journal of Economic Literature*, 35, 688-728.

Mercan, M., & Gocer, I. (2013). The effect of financial development on economic growth in BRIC-T countries: Panel data analysis. *Journal of Economic and Social Studies*, 3(1), 199-2016.

McKinnon, R. (1973). Money and Capital in Economic Development. Washington, DC: Brookings Institution.

Minetti, R. & Zhu, S. (2011), Credit constraints and firm export: Microeconomic evidence from Italy. *Journal of International Economics*, 83, 109-125.

Oktay, E., & Gozgor, G., (2013). Trade and regional development in a developing country: The case of Turkey. *Review of Urban & Regional Development Studies*, 25(3), 201-2012, doi: 10.1111/rurd.12013

Ozkan, S., Balsari, C., K., & Varan, S. (2014). Effect of banking regulation on performance: Evidence from Turkey. *Emerging Markets Finance & Trade*, 50(4), 196-211.

Ozturk, I., & Acaravci, A., (2010). Testing the export-led hypothesis: Empirical Evidence from Turkey. *Journal of Developing Areas*, 44 (1), 245-254.

Rahman, M., M., Shahbaz, M., & Farooq, A. (2015). Financial development, international trade, and economic growth in Australia: New evidence from multivariate framework analysis. *Journal of Asia-Pacific Business,* 16(1), 21-43.

Rajan, R., & Zingales, L. (2003). The great reversals: The politics of financial development in the twentieth century. *Journal of Financial Economics*, 69, 5-50.

Saci, K., Holden, K. (2008). Evidence on growth and financial development using principal components. *Applied Financial Economics,* 18(19), 1549-1560.

Sachs, J., D., & Warner., A. (1995). Economic growth and the process of global integration. *Brookings Papers on Economic Activity,* 1, 1-118.

Said, S. E. & Dickey, D. A. (1984). Testing for unit roots in autoregressive-moving average models of unknown order. *Biometrika*, 71(3), 599-607.

Shaw, E., S. (1973) Financial Deeping in Economic Development. Cambridge, MA: Harvard University Press.

Tennant, D., Kirton, C., & Abdulkardi, A. (2011). Modelling the effect of financial sector functions on economic growth in a developing country: A cointegration and error correction approach. *The Journal of Developing Areas,* 4(2), 183-205.

Toda, H., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics,* 66(1-2), 225-250.

Trabelsi, M., & Cherif, M. (2016). The causality issue in the financial openness and economic growth nexus: Empirical evidence from selected emerging countries: 1975-2011. *Journal of Applied Finance & Banking*, 6(1), 95-109.

Ucan, O., & Ozturk, O. (2011). Financial determinants of investment for Turkey. *Journal of Economic and Social Studies*, 1(1), 83-110.

Wacziarg, R., & Welch, K., H. (2008). Trade liberalization and growth: New evidence. *The World Bank Economic Review*, 22(2), 187-231.

Yildirim, S., Ozdemir, B., K., & Dogan, B. (2013). Financial development and economic growth nexus in emerging European economies: New evidence from asymmetric causality. *International Journal of Economics and Financial Issues,* 3(3), 710-722.