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Political economy map – A useful tool for public policy decision makers

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Abstract. *This paper shows the usefulness of political economy mapping for public policies decision makers and for those designing public policies. A political economy map is not a perfect instrument, but easy to use and not expensive. It could be considered a major ingredient in designing and implementing any public policy. Its power comes from the knowledge provided. Its usefulness can be increased when more resources (time and money) are devoted to realize it. In the same time, ignoring it could lead to failure or unintended and undesired reactions of those affected, even if decision makers would have been well intended and some changes would have been necessary to implement.*

Public policy makers would always welcome more information on the potential effects of their decisions. Public policy decisions alter costs and benefits for individuals, households, companies, various institutions and structures of the administration or other organized groups - trade unions, consumer or business associations, etc. (Croitoru et al., 2000).

The experience of the last 30 years provides many examples of success and failure in public policies. In many cases, what made the difference between success and failure were the support or opposition societies where various public policies decisions were implemented provided (Ruehl and Daianu, 1999; Doltu and Duhaneanu, 2010).

This paper is based on a previous study on the position and role of different stakeholders, who would win and who would lose from reforming the public administration in Romania.

Keywords: political economy map, public policies, public administration, incentives, winners, losers, interest, influence.

JEL Classification: B4, D7, P16.

Background

From Vietnam (TPP membership in 2016⁽¹⁾) to Romania (second generation of reforms), from Paraguay (taxing the soy beans producers and improving supervision in the banking system) to the Netherlands (blocking the EU Free Trade Agreement with Ukraine) or from Georgia (increasing transparency and anti-corruption programs) to France (“taxing more the rich”), the experience of the last 30 years provides many examples of success and failure in public policies. In many cases, what made the difference between success and failure were the support or opposition from societies where various public policies decisions were implemented.

While on the one hand it is obvious that public policy decisions change the structure of incentives for the economy as a whole, on the other hand it is not so easy to know ex-ante how different groups of economic actors or individuals would react to certain changes of the existing incentives. Ignoring this basic principle (“People respond to incentives”) may end up in failure when implementing well designed, good intentioned, desired or necessary various public policies.

A political economy map is an essential tool for the decision makers and for those designing public policies. Even if such tool is not perfect, is easy to use and not costly to realize. It could be considered at least a first step in designing and implementing any public policy. Its power in terms of knowledge provided and hence usefulness can be increased when more resources (time and money) are devoted to realize it.

Objectives

This paper has two objectives. The first objective is to enhance the usefulness of stakeholder mapping in specific sectors. Such mapping shows at a glance the potential losers or winners from implementing various public policies. The second objective is to show how based on a political economy mapping bottlenecks in implementing public policies could be identified and possible allies could be identified for supporting successful implementing of various public policies.

The study use major findings of a preliminary political economy study aimed at helping the Government of Romania to prioritize its effort to reform the public administration. The study was based on a World Bank’s methodology and provided an image on the position and role of different stakeholders – who would win and who would lose from reforming the public administration (World Bank, 2011).

Method: Realizing a political economy map

Even in the last phase of the last major economic and financial crises (2007-2009) the Government of Romania engaged in modernizing the public administration to effectively and efficiently deliver services to the citizens, and in line with four principles of coherence, responsibility, performance and partnership.

1. Defining the areas of interest⁽²⁾

First, major areas of interest, considered critical and comprehensive for the public administration of Romania were identified. These areas were: (1) Public finance, Public Administration reform and Governance; (2) Education and Research and Development; (3) Agriculture and Rural development; (4) Transport; (5) Energy and Environment; (6) Business Environment and Competition; (7) Social inclusion, Social Assistance and Health.

2. Identifying the major stakeholders

Stakeholders map is an instrument of political economy meant to give the perceived picture of the stakeholders positioning at a certain moment. Major stakeholders were identified for each mapping in specific sectors. The research was aimed at showing at a glance, which stands to lose or benefit from the reforms so as to be able to predict bottlenecks and identify possible allies.

3. Realizing the stakeholders map

The designed and used map for this study had three coordinates: (i) stakeholder is a winner/loser of the reform in the sector, (ii) stakeholder's interest in the sector, and (iii) stakeholder's influence. Each dimension was marked from 1 to 10 where 10 were the strongest in the opinion of the respondents.

The resulting maps show average marks based on respondents grading of the different stakeholder. Stakeholders were identified for each of the seven areas considering specific characteristics of the activities. Some of the stakeholders were common for all areas, while others were specific for the particular areas.

As data are not based on a sample, the conclusions should be carefully analyzed and any temptation to generalize should consider the specific features of each area. Data were collected using a questionnaire and direct interviews. 70 respondents with different social background and professional experience covered eight categories: (1) Public Administration (Central and Local), (2) Business community, (3) Civil society (NGOs), (4) Trade unions, (5) Media, (6) Academia, (7) Political parties and (8) International Financial Institutions (IFI) with experience in the Romanian transformation process after 1990.

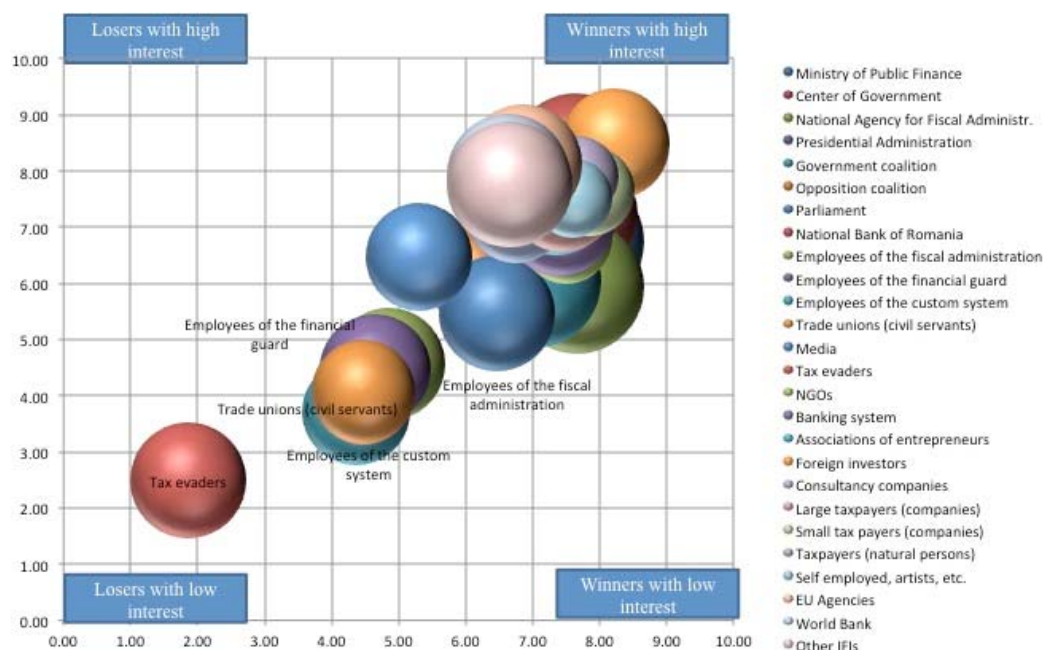
Findings and their interpreting: Winners and losers

Public Finance and Public Administration

Foreign investors, small businesses, natural persons, the National Bank of Romania self employed, the Ministry of Public Finance, the Center of Government, NGOs, large companies, the banking system and the associations of entrepreneurs would be the main winners from the reform in these areas⁽³⁾ They could be considered "potential champions".

Figure 1. *Public Finance, Public Administration and Governance Reform*

(23 winners, 5 losers)



All Figures in this paper use the data base realized by the author for the World Bank in 2011.

A second group of winners with lower gains compared with the stakeholders in the previous group (“potential champions”) includes: the government, the Presidential Administration, EU Agencies, consultancy companies, the National Agency for Fiscal Administration.

The stakeholders that would be worst off/losers from the reforms are: the tax evaders, the employees of the custom system, the employees of the financial guard and, the employees of the fiscal administration system.

The initial distribution of the potential winners and losers can be easily disaggregated in smaller groups based on different ranges of accumulated marks. This generates a more clear understanding of the potential effect on various stakeholders. Later on this data can be correlated with the findings on each stakeholder’s interest in the reform process and with its influence during the design phase and implementing of certain reforms.

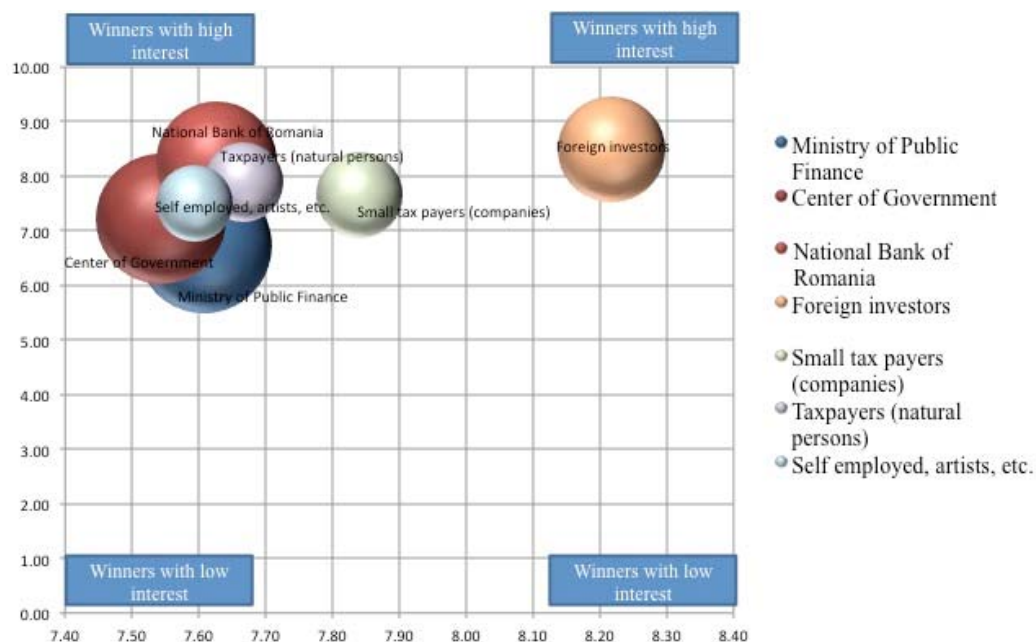
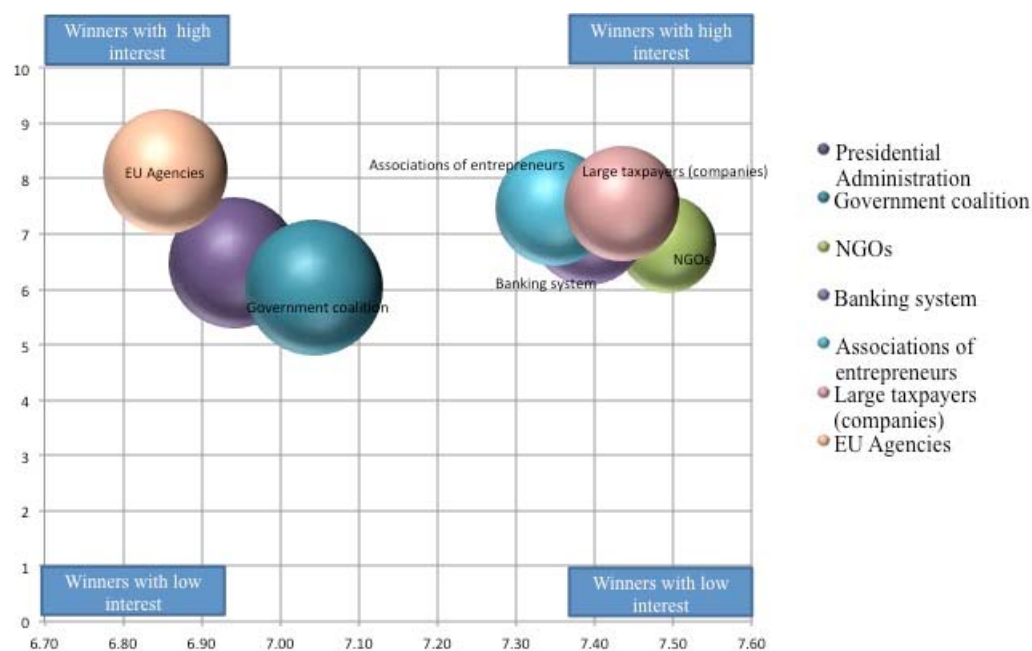
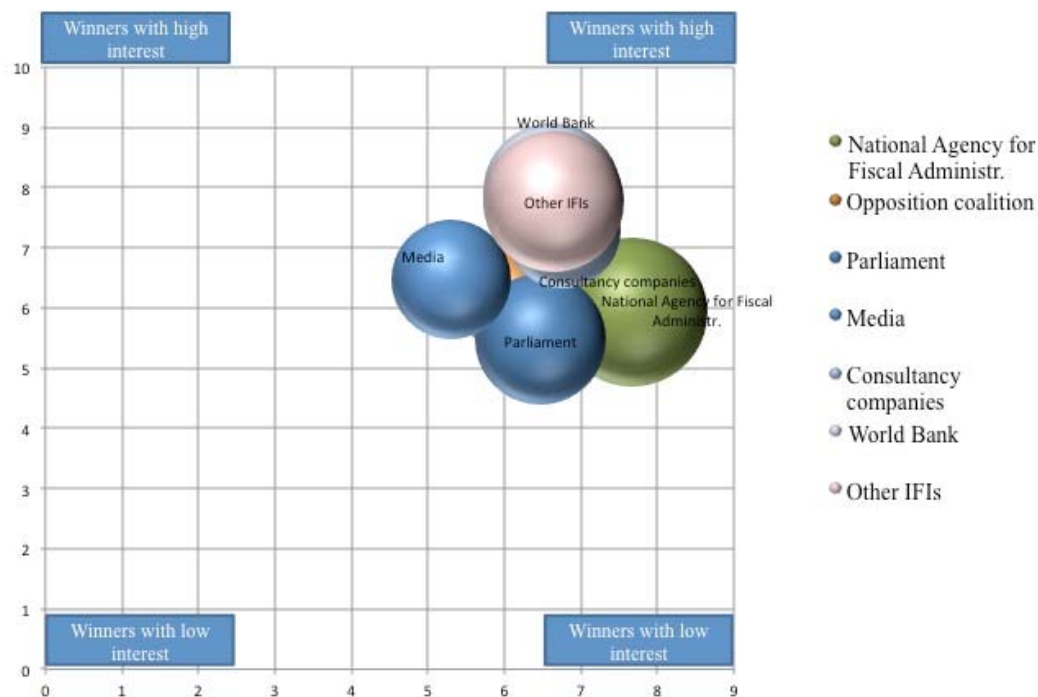
Figure 2. (Public Finance) *The First Group of Winners***Figure 3.** (Public Finance) *The Second Group of Winners*

Figure 4. (Public Finance) *The Third Group of Winners**Agriculture and rural development*

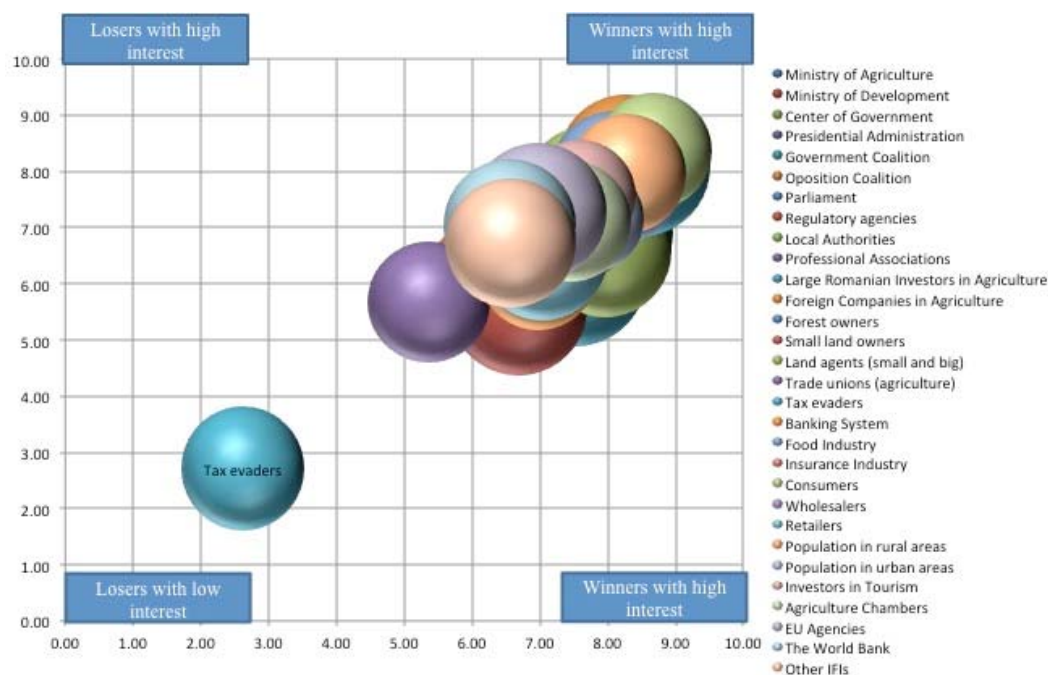
There is a general positive perspective on the reforms in these areas. The only expected losers are the tax evaders operating in economic activities related to agriculture. All the other stakeholders are expected to benefit in different degrees from the reform. The “potential champions” are: the consumers, large Romanian investors in agriculture, population in rural areas, foreign companies in agriculture, food industry and the local authorities. Also, significant gains are expected for other stakeholders including various institutions of the central government, professional associations, wholesalers, retailers, investors in tourism and small landowners.

Reforming the transport sector

The reforms in the transport area are not expected generate winners and losers, but just winners. Although an uneven distribution of gains among stakeholders is expected, there is a strong positive perspective on the reforms in this area. The “potential champions” are: population (in terms of safety), the investors in other industries, investors in rural areas, transport companies, local communities, construction companies, project companies and various institutions of the central government.

Figure 5. Reforming Agriculture and Rural Development

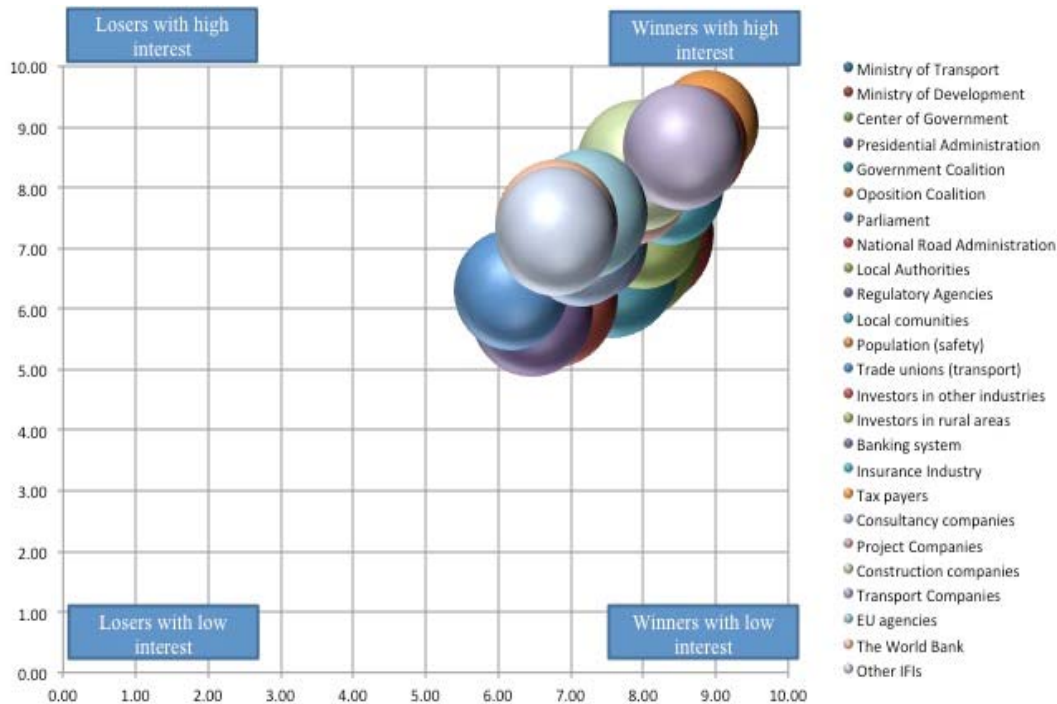
(29 winners, just 1 loser)



Analyzing the marks attributed by various stakeholders, significantly increase the chances for success in implementing various policy decisions due to deeper and high quality of knowledge on the reality and individuals' and various groups' expectations. For instance, in Romania's particular situation a strongly supportive attitude towards the reform of education and R&D systems was identified. No losers were expected. The high position of the Ministry of Education among the winners reflected the broad view/acceptance on/of the Government's role in education, while the high mark for foreign schools and universities reflects the awareness that the reform also means to open the system. In the same time, the high marks for students, parents and employers reflected the expectations that reforming these systems would generate better study conditions, and would enhance the link between the education system and the labor market.

Figure 6. Reforming Transport Sector

(25 winners, no losers)



Interest and influence

Difference may exist between the interest and influence of the stakeholders. Some stakeholders with high interest (ex. consumers, small land owners) may have a minor influence. However, ignoring them in the process of designing and implementing the reforms – especially the small land owners – could increase the resistance to change and could reduce the chances to reach the objectives.

A top-down approach in designing and implementing the reforms (i.e. ignoring stakeholders with lower influence, but with high interest) could increase the resistance to change and could reduce the chances to succeed. To prevent this, a special attention may be addressed to the consultation process in designing and implementing reforms. The reforms in the Transport area are not expected generate winners and losers, but just winners. Although an uneven distribution of gains among stakeholders is expected, there is a strong positive perspective on the reforms in this area.

Several findings and their interpretation

Transport

The stakeholders with the highest interest in reforming the Transport area are more or less the same stakeholders expected to win the most from the reforms. On the one hand, this is a significant advantage in the programming process for major investments – setting priorities in critical investment areas and linking them with the limited available resources. On the other hand, the stakeholders with the highest influence are various institutions of the central government related with the ruling political party/ruling coalition and also construction companies. Thus, a transparent allocation of resources is a critical condition in order to reduce/avoid corruption and to increase responsibility and accountability.

Education and R&D

A significant difference exists between the interest and the influence of the stakeholders. While the most interested stakeholders are parents, students (university level), vocational schools, private research institutes, foreign schools and universities in Romania, research institutes, employers, NGOs and professors, the stakeholders with the highest influence are the bureaucrats associated with the ruling party/coalition. Broadening the consultation process on designing and implementing reforms in these areas is strongly recommended in order to avoid the rejection from the system and to increase the likelihood to reach the objectives.

Business environment and competition

Trade unions and state owned companies are the only expected losers from the reform in this area. The “potential champions” (stakeholders expected to win the most) from the reforms are consumers, small and medium enterprises (SME), and the law companies (involved in merger and acquisition). All the other stakeholders are expected winners in different degree.

Social inclusion, social assistance and health

The reforms in these areas are not expected generate losers, but just winners with an uneven distribution of gains among stakeholders. There is a strong supportive perspective for reforms in these areas.

On the one side, the stakeholders with the strongest influence are various state institutions at central and local level. They concentrate the most of the available resources. On the other side, the stakeholders with the highest interest are less influent. These stakeholders are the primary beneficiaries of the system, but they completely depend by the centralized decisions. This shows that there is a lot of room for reforms, but also a high potential for corruption.

Conclusions

1. A political economy map could be a powerful tool for the decision makers and those involved in designing public policies. The knowledge provided by such an instrument is relatively easy accessible for policy decision makers. Although a political economy map is not a perfect instrument, it is not costly in terms of money and time necessary to realize it.

2. A political economy map makes possible to identify potential winners and loser from various public policy decisions before reforms or changes are implemented.

For instance, the study on which this paper is based reveals that continuing the “second generation of reforms” would generate more gains than loses for Romania. Most identified stakeholders would be winners (better off compared with their current position). Just few categories would be losers (worst off compared with their current position). Although gains and losses are not precisely defined (i.e. financial, prestige, social position, jobs, privileges, power, etc.), gains could be considered as “better off” compared with the current position and loses as “worst off”.

3. A political economy map makes possible to identify the interest of different stakeholders in various changes.
4. A political economy map makes possible to identify the voice or influence of different stakeholders.

In a significant number of areas may exist significant differences between stakeholders’ interest on reforms and their influence (high interest, but no significant influence or low interest but potential high influence). It is useful to know these aspects to avoid unnecessary or costly opposition from various stakeholders.

Notes

- (1) Trans-Pacific Partnership (TPP) is a trade agreement between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. The agreement, signed on 4 February 2016, was renegotiated after the USA withdrew in January 2017.
- (2) Not all the findings and conclusions of the initial study are presented in the paper. The scope of this paper is limited to show the usefulness of political economy mapping.
- (3) The NBR is not associated with the Government policies. Its failures are motivated by the government inefficiency that pushes the central bank to promote inconsistent policies. Thus, a reform in these areas would allow the NBR to follow appropriate policies and would increase the likelihood to achieve better results.

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Macroeconomic uncertainty and FDI in developing countries

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Abstract. *In this research analysis, the main aspect is to estimate the macroeconomic uncertainty and its impact on Foreign Direct Investment. Keeping in view of the rising importance of developing countries in attracting Foreign Direct Investment (FDI), this study has included 28 developing countries for the empirical analysis. At first, Macroeconomic uncertainty is measured with the help of conditional variance technique i.e. ARCH (GARCH). After measuring the macroeconomic uncertainty, impact of macroeconomic uncertainty along with other macroeconomic variables on the FDI flow is analyzed. Relying on the non-dynamic panel threshold model, the presence of single threshold value is found. The impact of macroeconomic uncertainty on FDI is found to be varied with the change in the level of income of the concerned host country. Others factors like GDP growth, Trade Openness and FDI stock are found to be statistically significant in influencing FDI flow towards an economy.*

Keywords: macroeconomic uncertainty, ARCH (GARCH), Foreign Direct Investment (FDI), developing countries.

JEL Classification: F23, D81.

1. Introduction

Investment kicks off the development process. For a country, the source of investment may be from domestic sources or from abroad. Foreign Capital bridges the gap between required capital and available domestic saving of a country. Foreign Direct Investment (FDI) is one of the major forms of foreign capital. The Organization for Economic Co-operation and Development (OECD) defines FDI as the reported amount corresponding to cross-border equity transactions between residents and non-residents which qualify as FDI (i.e. ownership of at least 10 percent of voting power). It is a form of investment in which business ownership in one country is controlled by the entity in another country. The country from which investment originates is known as home country and the country where the investment settles in is known as host country. FDI being a non-debt form of international capital, has several advantages vis-à-vis the other forms of international capital. FDI involves active participation in management, joint-venture, transfer of technology and expertise. The role of FDI is tremendous in terms of capital stock, employment generation, productivity and technological transfers as emphasized by Bénassy-Quéré, Fontagné and Lahrière-Révil (2001), Goldberg and Klein (1997) and Kiyota and Urata (2004). FDI is found to be less volatile than portfolio investment in the study carried out by Albuquerque (2003). Since FDI is a stable form of international capital it is preferred over Foreign Portfolio investment. Due to the characteristics of a stable international fund it is welcomed by the policy maker and government.

The reason to invest away from the home country is not unique. Some decisions are influenced by the availability of natural resources of the host country while some others are intended to avoid high tariff rate. Some studies disaggregate the FDI into different types like horizontal and vertical FDI and analyze them as such. In this research analysis, no distinction is made regarding the types of FDI and hence aggregate FDI inflow is taken into consideration.

The world is becoming more integrated than before. The need of FDI is more in countries with developing nature. Developing countries, which are more desperate to achieve higher growth rate are following policy framework so as to provide enough competitive advantage for multinationals. Capital inflow is viewed as the as the solution to various problems that developing countries often encounter.

Historically, developed countries were the major recipients of FDI inflow. The trend has changed and developing countries have been attracting a big chunk of FDI share. The United Nations Conference on Trade and Development (UNCTAD) report of 2013 confirms the fact that more than half of the global FDI is shared by the developing countries.

Over the years many theoretical developments have taken place in the field of international capital. The most popular theoretical approach is OLI or eclectic approach. Dunning (1973, 1980) developed OLI approach. The Ownership, Location and Internalization advantages are the factors why a country invests away from home country. Ownership advantages comprise of factors like firm specific assets, patent as well as

sophisticated management skills. Locational advantages are the host country specific advantages. Internalization benefit is reaped if a firm saves cost of transportation.

However, Locational factors of the host country have been the most important aspects and also the center theme of many empirical works over the years. Stable macroeconomic scenario reduces production and transaction cost of multinationals and act as an incentive to operate in the host country. Macroeconomic factors are the Locational factors of the host country and they do matter for the investment decision, macroeconomics uncertainty and macroeconomic variables need a revisit in describing the FDI flow towards developing countries. To assess the impact of potential variables on FDI in developing countries, 28 developing countries are selected for the purpose. These countries come under the developing country classification of UNCTAD. The inclusion of these countries is due to the availability of required data and off course the developing nature of the economy. Countries selected for the study are Algeria, The Bahamas, Bahrain, Bangladesh, Bolivia, Brazil, Burkina Faso, Cambodia, Costa Rica, Guatemala, Honduras, India, Jordan, Kuwait, Laos, Malaysia, Mauritania, Mongolia, Niger, Nigeria, Pakistan, Paraguay, The Philippines, Saudi Arabia, Singapore, Togo, Trinidad and Tobago and Turkey.

In this study an attempt is made to measure the macroeconomic uncertainty of the each host country. After measuring the macroeconomic uncertainty, the impact of macroeconomic uncertainty along with GDP growth, trade openness, FDI stock position and exchange rate of the host country on Foreign Direct Investment are analyzed. To measure the macroeconomic uncertainty, conditional variance technique is used. And to assess the impact of variables on Inward Foreign Direct Investment non-dynamic panel data technique is used.

2. Review of literature

There is plethora of research work which focuses on the reason behind the inflow of FDI towards a particular economy. In this section, earlier works related to macroeconomic uncertainty and other macroeconomic variables on FDI inflow are analyzed.

Xing (2006) in his seminal work has concluded the very fact that real exchange rate is one of the significant variable determining the FDI in Chinese manufacturing sectors from 1981 to 2002.

Klein and Rosengren (1994) find a significant correlation between FDI towards the USA and its real exchange rate. Their study proves a point for seven industrial countries and the period spanning 1979-1991. Their work also points out that the relative wage does not have a significant impact on the determinants of United States' FDI.

Baek and Okawa (2001) investigate the appreciation of yen against the Asian currencies and the US dollar significantly increases Japanese FDI in Asia. They found that high wage rate and import tariff rate in the host country negatively affect Japanese FDI in Asia.

Frenkel et al. (2004) make use of Panel data approach and consider both host and home country factors which play important role in deciding both the amount of capital flow as well as the destination of foreign capital. Home GDP growth is found to be positive and significant in explaining FDI inflow from home to host country. Business cycle of the home country also matters on the decision to invest fund away from home country.

Asiedu (2002) assesses the importance of return on capital along with other determinants that explains capital flow towards different economies. Return on capital is measured as the inverse of the per capita real GDP. This basically implies that other things being equal countries with lower per capita income will yield a higher return and vice versa.

Taking Cambodia as the sample country, Cuyvers et al. (2011) find larger market size at home tends to expand FDI flows towards Cambodian economy. The argument for this is that larger country likely to have more number of firms and those firms expand its business into the international market.

Billington (1999) argues that high GDP, as well as economic growth, positively influence FDI inflows.

Sharifi-Renani and Mirfatah (2012) have investigated the determinants of inward FDI, especially volatility of exchange rate and suggest better measures for attracting FDI in Iran. Their work concludes that GDP, trade openness and exchange rate to have positive relationship with FDI, but volatility of exchange rate and world crude oil prices negatively affect the FDI.

Takagi and Shi (2011) critically survey the link between exchange rate movements on the quantum of FDI. Depreciation of exchange rate impacts positively to the inward FDI movement, however, exchange rate volatility discourages FDI inflow.

Bozozowski (2003) clearly shows the relevance of the size of the host country and the previous level of FDI in affecting the FDI inflow. However, the result finds no evidence of the effect of exchange rate uncertainty on FDI inflow.

Oluseye (2010) concentrates on the factors like policy uncertainty and macroeconomic environment and its bearing on FDI inflow in the case of Nigeria by employing time series data from 1970 to 2010. The author finds negative influence of exchange rate variability on Inward Foreign Direct Investment (IFDI). Lag exchange rate variability and inflation variability are also found to be statistically significant and deter IFDI.

In an analysis of 19 Latin American and Asian countries, Al Nasser (2007) finds macroeconomic stability as one of the variables that affect FDI inflow. Aizenman and Marion (1995) find a negative relation between economic instability and private investment.

Serven and Solimano (1993) made use of panel data technique to ascertain the linkage among different measures of variability and investment. Standard deviation of inflation and real exchange rate were used to measure the variability. These variability measures were found to affect investment negatively.

Solomon and Ruiz (2012) find negative impact of inflation on inward FDI. Openness is found to be positive and significant in explaining the inward FDI. Exchange rate uncertainties, measured by the GARCH variance equation and political risk have negative bearing on the capital flow. One year lag FDI is also found to be positively significant in describing the present FDI flow.

The nature of FDI is still unanswered due to various reasons. The reasons are: the nature of data, country differences or due to less time series observation. There are various factors that tend to attract FDI into an economy. Many studies concentrate on the factors that drive FDI into an economy. However, Factors related to disfavor or undesired situation in the host also have an impact in the degree and dimension of international capital flow, in the form of FDI. Study of Dunning (2009) pointed out lack of research attention on the macroeconomic factors of the host country. The aim of the study is to assess the importance of macroeconomic factors and its influence on FDI decision.

3. Methodology

First of all, macroeconomic uncertainty of the concerned host countries is measured by the ARCH (GARCH) model followed by the assessment of its impact along with other relevant variables on Foreign Direct Investment with the help of non-dynamic panel estimation.

3.1. Measurement of macroeconomic uncertainty

Since two countries are involved in the process of Foreign Direct Investment, investment flows are sensitive to exchange rate movement and believed to influence the investment between countries. Considering exchange rate as the most important macroeconomic variable with respect to FDI decision, a variation of the same is taken as the proxy to measure macroeconomic uncertainty.

Most early literature work used standard deviation or variance as a measure to approximate uncertainty which assumes the unconditional measure of volatility. An unconditional measure of volatility like variance or rolling variance has its own disadvantage to gauge uncertainty as pointed out by Solomon and Ruiz (2012). Conditional variance is preferred to unconditional variance due to its capability to capture unexpected volatility (Diebold and Nerlove, 1989; Bera and Higgins, 1993; Carruth et al., 2000) and hence ARCH (GARCH) model is used for measuring exchange rate uncertainty which is the proxy for measuring macroeconomic uncertainty. To measure the conditional variance of exchange rate monthly exchange rate data from 1996:M1 to 2013:M12 is taken into consideration. During the period of study, each country is believed to operate under flexible exchange rate system. After calculating the monthly conditional variance with the help of ARCH (GARCH) models they are averaged to form the annual series so as to match with annual data series for further econometric exercise.

Augmented Dickey-Fuller (ADF) test confirms that the Exchange rate change which is the percentage change of REER index is found to be stationary at level with an intercept

at 1 percent level of significance in all the country cases. The lag length of the ADF test is determined by the Schwarz Information Criterion (SIC).

3.2. ARCH (GARCH) model

ARCH (GARCH) models deal with conditional variance measurement. ARCH (GARCH) models deal with the volatility of time series data. Many time series follow a pattern in which large variation is followed by large variation and vice versa.

ARCH models suggest that variance of the residual at a given time period depends on the squared error terms from past period. If the possibility of constant variance is limiting then it is better to model the mean and the variance equation simultaneously.

Conditional mean of the time series is estimated by the mean equation. Mean and variance equations are simultaneously estimated by the process of iteration. Mean equation can be modelled by an autoregressive (AR) process or pure time series process that is Autoregressive Integrated Moving Average (ARIMA) or AR process with the option of including other explanatory variables. In this case, mean equation is modelled by an ARMA process. Following Lemi and Asefa (2001), after obtaining the monthly ARCH (GARCH) variance series they are averaged annually to make annual frequency for further econometric analysis.

Mean and variance equation of ARCH (1) Model

$$Y_t = \alpha + \beta'X_t + \varepsilon_t \quad (3.1)$$

Where X_t is a vector of $n \times k$ dimension and β' is a $k \times 1$ vector of coefficient.

$$\varepsilon_t \sim iid N(0, \sigma^2)$$

Error term is assumed to be independently distributed with a zero mean and constant variance.

$$\varepsilon_t | \Omega_t \sim iid N(0, \delta_t^2)$$

Where Ω_t is the set of information.

Engle modeled the variance of residual (σ^2) in the following way:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 \quad (3.2)$$

The equation (3.1) is called mean and (3.2) is called variance equation. Equations of ARCH (1) model clearly reveals that a big shock at past error term likely to influence the present error term. ARCH estimation is done by the method of iteration.

GARCH Model

Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model is an extension of ARCH model.

The GARCH (1, 1) model:

$$Y_t = \alpha + \beta'X_t + \varepsilon_t \quad (3.3)$$

Where, $\varepsilon_t | \Omega_t \sim iidN(0, \delta_t^2)$

$$\delta_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \delta_{t-1}^2 \quad (3.4)$$

Mean and variance equation

Depending on the nature of each time series different ARMA specification is used to model the mean equation of exchange rate change. GARCH (1, 1) model is found to be fit in most of the country cases. In a few country cases, the ARCH model is found to be the best fit. According to Bollerslev et al. (1992), conditional variance is well represented by the GARCH (1,1). The presence of ARCH effect in the residual of the each time series is confirmed by ARCH LM test. The significance of Mean equation specifications as well as the variance equation coefficients is reported in Table 1.

Table 1. Variance equation coefficients of ARCH (GARCH)

Country	ARMA Model	ARCH (GARCH) Specification	Variance Equation Coefficients		
				Coefficient	P-value
Algeria	C AR(1) AR(3)	GARCH (1,1)			
			α_1	0.297403	0.0339
			δ_1	0.491327	0.0082
The Bahamas	C AR(1)	GARCH (1,1)			
			α_1	0.050400	0.1029
			δ_1	0.826470	0.0000
Bahrain	C AR(1)	GARCH(1,1)			
			α_1	0.035040	0.3091
			δ_1	0.853906	0.0000
Bangladesh	CAR(1) AR (2)	ARCH 2			
			α_1	0.022448	0.7511
			α_2	0.188471	0.0661
Bolivia	C AR(1) AR(2)	ARCH1			
			α_1	0.181411	0.0015
Brazil	C AR(1) MA (1)	GARCH(1,1)			
			α_1	0.285303	0.0353
			δ_1	0.489610	0.0151
Burkina Faso	C AR(1) MA (1)	GARCH(1,1)			
			α_1	0.144137	0.0668
			δ_1	0.273171	0.5563
Cambodia	C AR(1) AR(2)	GARCH(1,1)			
			α_1	0.143534	0.0309
			δ_1	0.756257	0.0000
Costa Rica	C AR(1) MA (1)	GARCH(1,1)			
			α_1	0.116104	0.1110
			δ_1	0.759287	0.0000
Guatemala	C AR(1) MA (1)	GARCH(1,1)			
			α_1	0.220662	0.0006
			δ_1	0.741857	0.0000
Honduras	C AR(1) MA (1)	GARCH(1,1)			
			α_1	0.194874	0.0027
			δ_1	0.707146	0.0000
India	C AR(1) MA (1)	GARCH(1,1)			
			α_1	0.048574	0.2566
			δ_1	0.651790	0.0000

Country	ARMA Model	ARCH (GARCH) Specification	Variance Equation Coefficients		
				Coefficient	P-value
Jordan	C AR(1) MA (1)	GARCH(1,1)	α_1	0.035856	0.2465
			δ_1	0.845724	0.0000
Kuwait	C AR(1) AR(2)	GARCH(1,1)		Coefficient	P-value
			α_1	0.055772	0.0956
			δ_1	0.865881	0.0000
Laos	C AR(1) MA (5)	GARCH(1,1)		Coefficient	P-value
			α_1	0.262593	0.0001
			δ_1	0.733008	0.0000
Malaysia	C AR(1) MA (1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.378816	0.0000
			δ_1	0.574101	0.0000
Mauritania	C AR(1) AR(2)	GARCH(1,1)		Coefficient	P-value
			α_1	0.082372	0.0639
			δ_1	0.709979	0.0005
Mongolia	C AR(1) MA(1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.232521	0.0095
			δ_1	0.763488	0.0000
Niger	C AR(1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.090247	0.1267
			δ_1	0.741981	0.0000
Nigeria	C AR(1) MA (1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.237065	0.0003
			δ_1	0.728387	0.0000
Pakistan	C AR(1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.124119	0.0342
			δ_1	0.762193	0.0000
Paraguay	C AR(1) MA (1)	ARCH1		Coefficient	P-value
			α_1	0.269281	0.0103
The Philippines	C AR(1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.141534	0.0000
			δ_1	0.798016	0.0000
Saudi Arabia	C AR(1) MA (1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.031582	0.3254
			δ_1	0.900025	0.0000
Singapore	C AR(1) MA (1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.083215	0.0725
			δ_1	0.772834	0.0000
Togo	C AR(1) MA (1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.062272	0.0374
			δ_1	0.884559	0.0000
Trinidad and Tobago	C AR(1) MA (1)	GARCH(1,1)		Coefficient	P-value
			α_1	0.147726	0.0081
			δ_1	0.762396	0.0000
Turkey	C AR(1) AR(2)	GARCH(1,1)		Coefficient	P-value
			α_1	0.190766	0.0036
			δ_1	0.802401	0.0000

All ARCH (GARCH) parameters are found to be positive. The sum of variance equation coefficients which represents the shock to conditional variance is less than one in all the country cases.

After estimating the macroeconomic uncertainty the next step is to assess the impact of macroeconomic uncertainty along with other relevant variables on FDI flow. To serve the purpose non-dynamic panel estimation of Bruce E. Hansen is carried out. This estimation

is panel data estimation and tries to ascertain the number of threshold in the threshold variable. In order to look at how FDI responds to change in income level, Gross Domestic Product per capita at Purchasing Power Parity (PPP) is the threshold variable of the study.

4. Estimation

To assess the influence of macroeconomic uncertainty and other macroeconomic variables on FDI Hansen's (1999) non-dynamic panel data model is used. Basically this analysis makes use of "pdR" package in R software which is an extension of Hansen's original model.

4.1. Bruce E. Hansen's non-dynamic panel estimation

Hansen's non-dynamic panel estimation is a threshold regression model. Fixed effect transformation is used to estimate threshold value and regression slope coefficients. Threshold regression technique is useful in cases where a sample fall into discrete classes. It means the regression function is not identical across a sample. In the threshold regression observations are classified into different groups depending on the threshold value. Confidence interval of the parameter is derived from asymptotic distribution theory. Bootstrap technique is used to test the statistical significance of threshold value. In this research analysis, threshold model is estimated to investigate whether income level which is the per capita GDP at PPP terms of corresponding host country affect the inward FDI inflow.

4.2. "pdR" package in R

This analysis has made use of "pdR" package in "R" software which is an extension of Hansen's non-dynamic panel model. Explanatory variables can be classified as regime-dependent and regime-independent variables. If an explanatory variable is assumed to be regime-dependent it means the variable influence the dependent variable differently in each regime. In each regime the regression slope coefficients are different. If an explanatory variable is classified as regime-independent variable it means the influence of the explanatory variable does not change throughout the regimes. The "ptm" function in this "pdR" package allows incorporating more than one regime-dependent independent variable unlike the Hansen's original code which allows only one regime-dependent variable. Two regime-dependent variables are taken into consideration for the analysis. In this analysis, GDP per capita at Purchasing Power Parity (LnGDPPPP) and Macroeconomic uncertainty (Garchvar) are considered as the regime-dependent variable. It means depending on the regime both variables will have a different influence on the dependent variable.

The sample consists of 28 developing country and the time period for each cross section ranges from 1997 to 2014. The selection of time period is basically due to the emergence of World Trade Organization (WTO) as an international trade regulator.

4.3. Assessment of threshold effect

With the help of Hansen's (1999) non-dynamic panel data model, number of threshold is estimated. In this model, the whole sample can be divided into different subsamples depending on the value of a variable. The variable on the basis of which the whole sample can be divided is called the threshold variable. It is basically dividing individual observations on the basis of an observed variable. The division of sample into subsamples relies on whether the threshold variable is smaller or larger than the threshold value. Threshold variable is assumed to be time variant. If one threshold value is found to be significant then the sample is divided into two sub samples. If the presence of two threshold values are found then the sample is divided into three subsamples and so on. These subsamples are also called regimes.

Threshold estimation

Single threshold Equation:

$$Y_{it} = \mu_i + \beta_1' x_{it} I(q_{it} \leq \gamma) + \beta_2' x_{it} I(q_{it} > \gamma) + e_{it} \quad (4.1)$$

Subscript i refers to cross section identity and t refers to time series; ($1 \leq i \leq n$, $1 \leq t \leq T$)

Y_{it} is the dependent variable that is FDI inflow in terms of percentage of GDP is a scalar.

q_{it} is the threshold variable.

x_{it} is a K vector regressor.

$I(\cdot)$ is an indicator function.

e_{it} is the error term.

The error term is assumed to be independent and identically distributed with zero mean and finite variance. The analysis is asymptotic with given T (time series) and infinite N (cross section). The assumption of independent and identically distributed error term excludes the possibility of inclusion of lagged dependent variable as an explanatory variable.

The equation (4.1) can be written as following:

$$Y_{it} = \begin{cases} \mu_{it} + \beta_1' x_{it} + e_{it}, & q_{it} \leq \gamma, \\ \mu_{it} + \beta_2' x_{it} + e_{it}, & q_{it} > \gamma, \end{cases}$$

The equation (4.1) can also be written in the following compact form.

$$x_{it}(\gamma) = \begin{pmatrix} x_{it} I(q_{it} \leq \gamma) \\ x_{it} I(q_{it} > \gamma) \end{pmatrix}$$

And $\beta = (\beta_1' \beta_2')'$ so that equation (4.1) becomes

$$Y_{it} = \mu_i + \beta_1' x_{it}(\gamma) + e_{it} \quad (4.2)$$

The evidence of no threshold is same as the linear constraint $\beta_1 = \beta_2$. The null of no threshold effect is tested by bootstrap method. Bootstrap technique is asymptotically valid. In fact, bootstrap technique tests the statistical significance of LR statistics. Null hypothesis is rejected if the estimated p-value is smaller than the critical value.

5. Result

Relying on the non-dynamic panel estimation of Hansen following result is obtained.

Table 2. Result of threshold effects

Test for single threshold

Likelihood ratio test of first threshold	57.43
P- value	0.04
(10%,5%,.1% critical values	48.77, 56.48, 88.65

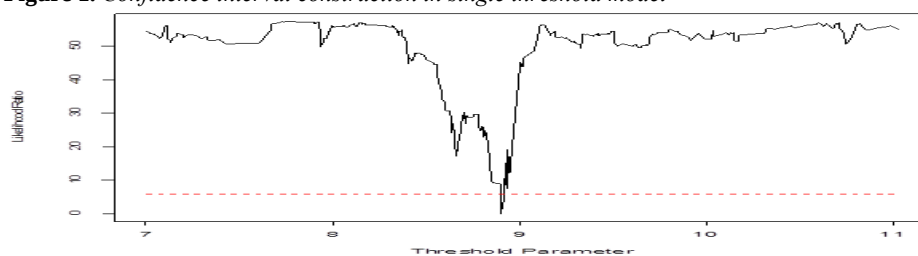
Test for double threshold

Likelihood ratio test of second threshold	15.55
P- value	0.76
(10%,5%,.1% critical values	32.07, 36.62, 60.30

The number of threshold is determined by moving sequentially from zero, one and two thresholds. Likelihood-ratio test for the single threshold is statistically significant with a bootstrap p-value of 0.04. It means the null of no threshold value is rejected at 5 percent level of significance. The null of no threshold effect is rejected after 100 bootstrap replications. The test for double threshold is statistically insignificant with a bootstrap p-value of 0.76.

From the above finding, presence of single threshold in the regression relationship is confirmed. Likelihood-ratio of single threshold is reported in Figure 1. The threshold value is found to be 8.8973. Since the threshold value is in natural logarithm, anti-logarithm of the same will provides the exact level of GDP per capita PPP level at which presence of threshold is found. The exact level of GDP per capita, PPP at 2011 international dollar is calculated to be 7312.2039. Due to the presence of single threshold value the whole sample is divided into two regimes and subsequently coefficients are estimated.

Figure 1. Confidence interval construction in single threshold model



5.1. Impact of macroeconomic uncertainty and other macroeconomic variables on FDI

After finding out the number of threshold the next move is to analyze the macroeconomic factor and its influence on the inward Foreign Direct Investment (FDI).

Variables of the study

The dependent variable of the study is net FDI which is measured as the percentage of the corresponding GDP. Net FDI is defined as new investment less disinvestment.

Explanatory variables of the study are GDP growth, trade openness, exchange rate, FDI stock, macroeconomic uncertainty and Gross Domestic Product (GDP) per capita at Purchasing Power Parity (PPP).

Annual frequencies of variables are employed in the study. ARCH (GARCH) model is employed on Monthly change of REER index to find out the exchange rate uncertainty which is the proxy for macroeconomic uncertainty. After calculating the monthly variance of the ARCH (GARCH) model they are averaged annually to form annual macroeconomic uncertainty for further econometric analysis.

GDP growth is measured as the annual percentage change of GDP. GDP is defined as the sum of gross value added by the producer in the economy plus net taxes. It makes GDP at market price and is based on constant 2005 USD. Hence, GDP growth refers to real GDP growth. GDP growth is one of the important variables that have been used for years to explain the dynamics of Foreign Direct Investment. Growth of GDP is synonymous with market expansion. Market expansion creates additional opportunity for produced output. This is more important if the motive of the multinational to sell the produced output in the host economy. This has a direct link with the profitability and future course of action for the multinational. Market expansion not only influences the present business action but also the future business prospectus. Multinationals feel a sense of security if the host economy achieves market expansion.

Trade Openness which shows the quantum of trade linkage between countries is defined as the ratio of total trade to GDP. Trade is defined as the sum of exports and imports of goods and services. Investing firm may resort on the import of raw material and export of final commodity and hence amount of the flow of goods and services in and out of the host likely to influence investment decision. Percentage change of REER index is estimated as the measure of Exchange rate.

FDI stock is basically to reflect the previous level of FDI in a country. The previous FDI figures give the information regarding profit and risk situation of the destination country. It is also likely that if multinationals avoid crowded market then higher past FDI level may deter fresh FDI inflow. Macroeconomic uncertainty is measured by the ARCH (GARCH) variance series. Gross Domestic Product (GDP) at Purchasing Power Parity (PPP) is included in the analysis to measure the absolute market size of the corresponding economy. GDP per capita PPP is measured in 2011 international dollar. For scaling down, natural logarithm transformation of FDI inward stock and GDP Per Capita at Purchasing Power Parity (PPP) is carried out before moving for empirical estimation. FDI decision takes time and hence one year lag of explanatory variable is considered for further econometric estimation. Study of Cuyvers et al. (2011) also used one year lag of variables for empirical estimation.

Table 3. *Data source*

Variable	Data source
Net FDI (% of GDP)	World Development Indicator, World Bank
GDP growth (annual %)	World Development Indicator, World Bank
FDI inward stock	UNCTAD
Trade openness (X+M)/GDP	World Development Indicator, World Bank
REERchn	Bruegel data set
Garchvar	Estimated
GDP per capita Purchasing Power Parity	World Development Indicator, World Bank

Table 4. *Summary statistics*

Variable	Median	Minimum	Maximum	S.D.
Netfdigdp	2.7542	-2.4988	45.2732	5.4213
Gdpgrowth ₋₁	4.7362	-7.3594	33.7357	3.6765
Openness ₋₁	0.8262	0.1558	4.3965	0.6612
Reerchn ₋₁	1.5499	-75.1383	29.5683	7.0055
Lnfdistock ₋₁	8.7287	2.7628	13.6760	2.1066
Garchvar ₋₁	2.2668	0.3783	63.1178	7.2238
LnGDPPPP ₋₁	8.7138	6.6356	11.4695	1.2034

Net FDI (new investment less disinvestment) which is measured in terms of percentage of GDP is the dependent variable of the study. Other variables with a year lag are explanatory variables.

Table 5. *Regime-independent coefficients*

Variable	Coefficient	White Standard Error	t-stat
Gdpgrowth ₋₁	0.1194	0.0517	2.3110
Openness ₋₁	3.4357	1.6936	2.0285
Lnfdistock ₋₁	1.6126	0.2619	6.1572
Reerchn ₋₁	-0.0275	0.0190	-1.4471

Table 6. *Regime-dependent coefficients*

Variable and Regime	Coefficient	White Standard Error	t-stat
LnGDPPPP ₋₁ (Regime 1)	-5.0513	1.3407	-3.7677
Garchvar ₋₁ (Regime 1)	-0.0762	0.0171	-4.4392
LnGDPPPP ₋₁ (Regime 2)	-3.8682	1.3082	-2.9568
Garchvar ₋₁ (Regime 2)	0.0176	0.0177	0.9948

Regime-independent coefficients and its statistical significance

GDP growth, Trade openness and FDI stock are found to be positive and statistical significant in attracting FDI. Trade openness which is measured by the ratio of total trade of goods and services to GDP is found to have greater influence on FDI. Percentage change in the Real Effective Exchange Rate which is used for measuring exchange rate has no influence on FDI.

Regime-dependent coefficients and its statistical significance

GDP per capita at Purchasing Power Parity (LnGDPPPP) and Macroeconomic Uncertainty (Garchvar) series are considered as regime-dependent variables. A close look on the different regimes reveals that macroeconomic uncertainty has a negative impact on FDI inflow in the first regime. However, in the second regime, it is found to have no influence on inward FDI.

The argument for this is that after a country reaches a certain level of income negative impact of macroeconomic uncertainty fades away. Macroeconomic uncertainty deters FDI if the income level of a country is below a certain threshold. Once income level goes past the threshold level may be due to other factors the negative impact of macroeconomic uncertainty disappears.

6. Concluding remarks

There are many variables that may have an influence on FDI. The basic intention is to explore the linkage between macroeconomic factors and FDI. After measuring macroeconomic uncertainty, the impact of macroeconomic uncertainty along with other potential macroeconomic variables is analyzed.

Relying on the non-dynamic panel data technique presence of the single threshold is found. GDP per capita at Purchasing Power Parity (PPP) is the threshold variable of the study. Among the regime-independent variables, GDP growth, trade openness and FDI stock are found to be positive and statistically significant. However, exchange rate is found to have no influence on the Foreign Direct Investment.

GDP growth indicates market expansion which is found to have positive influence on FDI. Openness has the greatest impact in attracting FDI. Higher FDI stock is found to be positive as past FDI flow ensures of the good business of earlier investment. Past FDI inflows signify the presence of multinationals in the host, reflects business prospect and also a proof for the earlier success story of multinationals. A better past record of capital inflow will increase present FDI flow.

Taking about the regime-dependent variable GDP per capita at PPP is found to be negative in both the regimes. However, the magnitude is low in the second regime. Macroeconomic uncertainty is found to have negative influence in the first regime. In a study on developing countries, Hausmann and Gavin (1995) also find a negative relation between an index of macroeconomic volatility and investment. Darby et al. (1999) by measuring separate real exchange rate variability for five OECD countries find negative link with investment either in the short-run or in the long-run or both.

In the second regime, the influence of macroeconomic uncertainty on FDI disappears. Countries below the income threshold level likely to suffer capital inflow if macroeconomic uncertainty prevails in the concerned economy. Once countries surpass a certain income level due to other favorable factors the negative impact of macroeconomic uncertainty vanishes.

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Impact of foreign direct investment inflows on tax revenues in OECD countries: A panel cointegration and causality analysis⁽¹⁾

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Abstract. *Globalization process has led considerable increases in the global foreign direct investment flows especially as of mid-1980s. Foreign direct investment inflows have potential to affect economic growth, capital accumulation, human capital, competitiveness, development of finance sector and technological progress in the host country and in turn affects the tax revenues. In this study, we analyzed the relationship among foreign direct investment inflows, economic growth and total tax revenues in 33 OECD countries during 1995-2014 period using Westerlund-Durbin-Hausmann (2008) panel cointegration test and Dumitrescu and Hurlin (2012) panel causality test. We revealed a cointegrating relationship among foreign direct investment inflows, economic growth and total tax revenues. Furthermore, there was one-way causality from foreign direct investment inflows to total revenues and bidirectional causality between economic growth and foreign direct investment inflows.*

Keywords: foreign direct investment inflows, tax revenue, panel data analysis.

JEL Classification: E60, F62, H20.

1. Introduction

Global foreign direct investment (FDI) flows have been raised considerably since mid-1980s due to the increases in the production as of industrial revolution, technological advancements and the accelerating globalization. The liberalization of capital flows together with the globalization, corporate tax reductions and fiscal incentives decreased the cost of FDIs and in turn made the opportunity of FDI easier. As a consequence FDI inflows have increased sharply from USD 13.2 billion in 1970 to the USD 1.87 trillion in 2007, then 2008 global financial crisis and Eurozone sovereign debt crisis caused the contractions in the flows of FDI, but FDI inflows again increased after meltdown of the crises and were USD 1.757 trillion in 2016 (World Bank, 2017). However, OECD countries still are the important recipients of FDIs, although both recent crises affected the FDIs negatively.

FDIs have significant implications over the national economies as an important cause and result of the fast growing globalization process. FDI inflows can improve the competitiveness through capital inflows and technology transfer and make contribution to the economic growth and development (Saray, 2011). However, foreign direct investment inflows also have potential to affect the total taxes indirectly, which is an important component of public sector revenues, through economic activity. On the other hand, cuts in the rate of corporation tax or giving exemption from taxes for a length of time and giving legal privileges to the multinational corporations in profit transfer by many countries can affect tax revenues negatively. So the net impact of FDI inflows on the total tax revenues has been unclear theoretically.

In this study, we focus on the long and short run interaction between FDI inflows and total tax revenues in OECD countries during 1995-2014 period employing panel cointegration and causality analysis. In this context, the relevant theoretical and empirical literature are summarized in the coming section, then dataset and econometric methodology are shortly described. Empirical analysis and major findings are given in Section 4 and the study is finished with the Conclusion section.

2. Literature review

The significant increases in the global FDI flows have encouraged the researchers to investigate the economic effects of FDIs. FDI inflows can affect the economic growth positively through raising the capital stock, transfer of technology and know-how, improving the human capital, increasing the competitiveness and enhancing the development of financial sector (Hlavacek and Domanska, 2016). In this regard, FDI inflows can influence the total taxes positively indirectly by boosting economic growth and employment (Grop and Costial, 2000). But FDI inflows can affect the total taxes negatively in case tax reductions, legal privileges in the transfer of income and fiscal incentives such as free land allocation and supports for the labor costs are provided to attract FDIs. In this sense, the net impact of FDI inflows on the total taxes have stayed inconclusive.

A wide range of papers have researched the effect of taxation and taxes on FDI attraction and revealed that taxes and taxation are a crucial determinant of FDI inflows and there was a negative relationship between tax rates and FDI inflows (e.g. see Razin et al., 2005; Beck and Chaves, 2011; Varol et al., 2015). But, relatively few studies have researched the effect of FDI inflows on the tax revenues and most of the limited literature discovered that FDI inflows affected the tax revenues positively (e.g. see Gropp ve Kostial, 2000; Sarisoy and Koc, 2010; Mahmood and Chaudhary, 2013; Okey, 2013; Bunescu and Comaniciu, 2014; Odabas, 2016). However, few studies have reached the contrary findings (e.g. see Tabasam (2014)).

In one of the early studies, Grop and Costial (2000) investigated the interaction among FDI, taxation and revenues of corporate tax in 19 OECD countries during 1987-1997 period employing panel data analysis and revealed that FDI inflows affected the corporate tax revenues positively. On the other hand Mahmood and Chaudhary (2013) researched the effect of FDI inflows on the total tax revenues in Pakistan over the period 1972-2010 and discovered that FDI inflows affected the total tax revenues positively. Okey (2013) also researched the influence of FDI inflows on the tax revenue in 8 West African countries over the period 1989-2009 employing panel regression and discovered that FDI inflows affected the tax revenues positively.

In another study, Bunescu and Comaniciu (2014) investigated the economic and non-economic factors affecting the tax revenues in 27 EU countries during 1995-2011 period with correlation analysis and revealed that FDI inflows had a weak positive effect on the tax revenues. On the other side Tabasam (2014) researched the interaction among tax revenues and FDI inflows in Pakistan over the period 1975-2012 using time series analysis and discovered that FDI inflows affected the tax revenues negatively. Aslam (2015) also analyzed the long run interaction between FDI inflows and tax revenues in Sri Lanka during 1990-2013 period and found that FDI inflows made a significant positive contribution to the tax revenues. Gaalya (2015) researched the same relationship for Uganda during the period 1994-2012 with regression analysis and reached the same findings.

Balıkcıoglu et al. (2016) researched the effect of FDI inflows on the tax payments of the firms with different technology levels in Turkey during 2004-2012 period and discovered that FDI inflows increased the tax payments by the firms and the effect was found to be highest in the firms with high technology level. Finally Odabas (2016) researched the causal interaction between tax revenues and FDI inflows in 7 EU transition economies during 1996-2012 period with causality test of Dumitrescu and Hurlin (2012) and discovered a one-way causality from FDI inflows to the tax revenues.

3. Data and econometric methodology

We investigated the long and short run interaction between FDI inflows and total tax revenues in OECD countries during the 1995-2014 period employing the cointegration test of Westerlund-Durbin-Hausmann (2008) and the causality test of Dumitrescu and Hurlin (2012).

3.1. Data

In the study, we selected total tax revenues (% of GDP) as the dependent variables, because we considered that the countries generally make corporate tax reductions or do not collect the corporate taxes for a determined period to attract FDI inflows. On the other side, our independent variables are FDI net inflows (% of GDP) and growth rate of real GDP per capita as seen in Table 1. The data of total tax revenues was extracted from OECD database, the data of FDI inflows was provided from World Bank database and growth data was provided from IMF database. We took the sample of OECD countries, because the share of the OECD countries in the global FDI inflows was about 60% and the United State, Ireland, the Netherlands, Switzerland and Canada have been major recipients of FDI flows (World Bank, 2016). The existence of data determined our sample and Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States formed our sample.

Table 1. Data description

Variables	Description	Data source
TAX	Total tax revenues (% of GDP)	OECD (2016)
FDI	Foreign direct investment inflows (% of GDP)	World Bank (2016)
GRW	Growth rate of real GDP per capita	IMF (2016)

We made benefit of Stata 14.0, Eviews 9.0, and Gauss 11.0 software packages in the empirical analysis. The descriptive statistics and correlation matrix of the dataset was displayed in Table 2. The correlation matrix revealed a positive correlation between FDI inflows and total tax revenues.

Table 2. Descriptive statistics and correlation matrix

Variable		Average	Standard Deviation	Min	Max	Observation
TAX	overall	33.61953	7.345131	14.84	50.882	N = 660
	between		7.26295	17.35515	46.58845	n = 33
	within		1.649664	26.05738	41.04403	T = 20
FDI	overall	4.38691	7.315445	-16.09109	87.44259	N = 660
	between		4.276202	0.1546755	19.38001	n = 33
	within		5.97971	-21.21643	72.44949	T = 20
GRW	overall	1.993699	3.003981	-14.69132	13.32501	N = 660
	between		1.136132	0.2376984	4.912619	n = 33
	within		2.78753	-17.61024	10.40609	T = 20
Correlation Matrix						
	TAX		FDI		GRW	
TAX	1		0.087481		-0.081626	
FDI	0.087481		1		0.103569	
GRW	-0.081626		0.103569		1	

3.2. Econometric methodology

One of the major problems for the panel data analysis is cross-sectional dependence. Therefore, test of cross-sectional dependence is important for the selection of future econometric tests in the empirical analysis. In this study, we analyzed the cross-sectional

dependence among the cross-section units with LM CD test of Pesaran (2004), because cross-section of the dataset was found to be higher than the time dimension of the dataset. Then homogeneity of the cointegrating coefficients was examined with the adjusted delta tilde test of Pesaran and Yamagata (2008). In the next stage, the stationarity of the series was investigated by CIPS (Cross sectionally Im-Pesaran-Shin, 2003) panel unit root test of Pesaran (2007) taking into account the existence of cross-sectional dependence among the series.

We analyzed the long run relationship among FDI inflows, economic growth and tax revenues with Westerlund-Durbin-Hausman (2008) cointegration test, because the variables of the study were found to have different integration level. The test regards the cross-sectional dependence and also calculates two statistics called as Durbin-Hausman group statistic and Durbin-Hausman panel statistic. The group statistic is used to see whether there is cointegrating relationship among the series in case the panel is found to be heterogeneous. Otherwise panel statistic is used. The cointegrating coefficients were estimated with AMG estimator of Eberhardt and Bond (2009), which takes account of cross-sectional dependence and heterogeneity. Finally, the short run interaction among the series were examined with causality test of Dumitrescu and Hurlin (2012).

4. Empirical analysis

4.1. Cross-sectional dependency and homogeneity tests

The determination of cross-sectional dependency and homogeneity are important for selection of the tests employed in further stages of the empirical analysis. The cross-sectional dependency was investigated by LM CD test of Pesaran (2004), because the cross-section of the dataset ($N = 33$) was found to be higher than the time dimension of the dataset ($T = 20$) and the results were displayed in Table 3. The null hypothesis was rejected considering the test results and we revealed that there was cross-sectional dependency among the cross-sections. On the other side, the homogeneity of the cointegrating coefficients was examined with the adjusted delta tilde test of Pesaran and Yamagata (2008) and the test results were displayed in Table 3. The null hypothesis was declined and the cointegrating coefficients were found to be heterogeneous.

Table 3. Results of cross-sectional dependency and homogeneity tests

Cross-sectional dependency tests		
Test	Test statistic	P value
LM (Breusch and Pagan, 1980)	1764.537	0.000
LM adj* (Pesaran et al., 2008)	34.498	0.000
LM CD* (Pesaran, 2004)	38.052	0.000
Homogeneity tests		
Test	Test Statistic	P value
Delta_tilde	5.698	0.000
Delta_tilde_adj	6.333	0.000

*two sided test.

4.2. Panel CIPS unit root test

In the second stage of the empirical analysis, the integration levels of the variables were analyzed with the unit root test of Pesaran (2007) and the test results were presented in Table 4. FDI and GRW variables were found to be I(0), while TAX variable was found to be I(1) in the light of the test results.

Table 4. Results of Pesaran (2007) CIPS unit root test

Variables	Constant		Constant + Trend	
	$p = 0$	$p = 1$	$p = 0$	$p = 1$
TAX	-0.003 (0.499)	2.134 (0.984)	1.04 (0.852)	3.527 (1.000)
dTAX	-22.829 (0.000)***	-8.366 (0.000)***	-20.968 (0.000)***	-6.622 (0.000)***
FDI	-9.635 (0.000)***	-3.249 (0.001)***	-8.300 (0.000)***	-2.529 (0.006)**
dFDI	-22.132 (0.000)***	-12.644 (0.000)***	-19.155 (0.000)***	-9.117 (0.000)***
GRW	-6.797 (0.000)***	-3.508 (0.000)***	-3.937 (0.000)***	-0.768 (0.221)
dGRW	-18.411 (0.000)***	-8.987 (0.000)***	-15.103 (0.000)***	-5.483 (0.000)***

Notes:

*** indicates that it is statistically significant at 1% significance level.

Lag length (p) was determined by AIC and SIC criteria.

Pesaran (2007) unit root test was implemented by “multipurt” command developed by Markus Eberhardt.

4.3. Westerlund-Durbin-Hausmann (2008) cointegration test

Westerlund-Durbin-Hausman (2008) cointegration test was employed to investigate the cointegrating relationship among the variables regarding the integration levels of the variables and the test results were presented in Table 5. Durbin-Hausman group statistic was taken in considerations, because the panel was found to be heterogeneous. Therefore, the null hypothesis was rejected at 1% significance level and we revealed that there was a cointegrating relationship among the variables.

Table 5. Results of Westerlund-Durbin-Hausman (2008) cointegration test

	Test statistics	P value
Durbin-Hausman group statistic	4.329	0.000
Durbin-Hausman panel statistic	2.129	0.017

4.4. Estimation of cointegrating coefficients

The cointegrating coefficients were estimated by AMG estimator considering the existence of cross-sectional dependence and heterogeneity and the test results were displayed in Table 6. The results suggested that both FDI inflows and economic growth did not have significant effects on the total tax revenues at the panel level. However, FDI inflows affected the total tax revenues positively in Iceland, Israel, Sweden, the United Kingdom, and the United States, while FDI inflows affected the total tax revenues negatively in Austria, France, Italy, and Poland. Furthermore, economic growth had positive influence on the tax revenues in Chile and Poland, but economic growth had negative effect on the total tax revenues in Austria, Estonia, Germany, Hungary, Norway, Sweden, and Switzerland.

Table 6. *Estimation of cointegrating coefficients*

Country	FDI		GRW	
	Coefficient	P value	Coefficient	P value
Australia	-0.0102456	0.932	0.4920851	0.089*
Austria	-0.0627568	0.021**	-0.2547427	0.033**
Belgium	-0.0088029	0.329	-0.0926685	0.338
Canada	0.0219368	0.729	-0.0596248	0.508
Chile	0.0422021	0.746	0.2555512	0.009***
Czech Republic	-0.0974511	0.171	0.0812241	0.206
Denmark	-0.0028367	0.954	0.1542911	0.271
Estonia	-0.0917103	0.257	-0.1725773	0.006***
Finland	-0.0418935	0.598	-0.0433055	0.677
France	-0.2972352	0.053*	0.1095838	0.346
Germany	0.076669	0.421	-0.1650208	0.089*
Greece	-0.803297	0.314	-0.0762441	0.514
Hungary	0.0173207	0.164	-0.3579511	0.000***
Iceland	0.2874083	0.000***	0.0604963	0.611
Ireland	-0.0129701	0.608	0.0944514	0.171
Israel	0.1633896	0.075*	-0.0499847	0.526
Italy	-0.6696029	0.081*	-0.1486518	0.281
Japan	-0.8686863	0.439	-0.0286062	0.714
Mexico	0.0476133	0.892	-0.036182	0.560
Netherlands	-0.0034162	0.805	-0.0313175	0.838
New Zealand	0.1705738	0.460	-0.0295026	0.910
Norway	0.1283616	0.394	-0.4083154	0.030**
Poland	-0.4843183	0.006***	0.5257282	0.001***
Portugal	-0.0156837	0.829	-0.0108433	0.903
Slovakia	-0.2977829	0.003	-0.0643459	0.467
Slovenia	0.0910983	0.424	-0.0935971	0.138
South Korea	-0.5691898	0.229	-0.01123	0.858
Spain	0.2899929	0.198	0.3340188	0.137
Sweden	0.0915475	0.066*	-0.0282276	0.770
Switzerland	0.0346513	0.446	-0.2614478	0.008***
Turkey	-0.6317951	0.121	-0.0790167	0.306
United Kingdom	0.1454205	0.024**	-0.1058898	0.361
United States	0.6705001	0.002***	0.0380561	0.711
Panel	-0.0815451	0.158	-0.0140548	0.690

***, **, and * indicate that it is respectively significant at 1%, 5% and 10% significance levels.

The composition of FDI inflows and the level of financial incentives by host countries are determinative for the relationship between total tax revenues and FDI inflows. Greenfield investments, establishment of new facilities in the host country, have more potential to increase the capital accumulation and in turn enhance the economic activity when compared with the brownfield investments, in other word words mergers and acquisitions. But the investors generally make greenfield investments in case the countries provide financial incentives, legal privileges and privileges in transfer of income. On the other side brownfield investments may not contribute to the capital accumulation, but can make contributions to the economic growth through know-how and technology transfer. Some countries also grant privileges to attract brownfield investments. Therefore it does not seem possible to predict the effect of both greenfield and brownfield investments on the total tax revenues. For example the effect of FDI inflows on the total tax revenues have been found to be negative in Italy and France. We evaluated that the negative interaction was resulted from the relatively low level of green field investments in these countries, because the share of greenfield investments in total

FDI inflows was 17.43% in France and 30.59% in Italy. However, FDI inflows affected the total tax revenues positively, although both greenfield and brownfield investments followed a fluctuating course in Iceland, Israel, Sweden, the United Kingdom, and the United States.

4.5. Dumitrescu and Hurlin (2012) panel causality test

The causal interaction among total tax revenues, FDI inflows and economic growth was investigated with causality test of Dumitrescu and Hurlin (2012) and the test results were displayed in Table 7. The results revealed a one-way causality from FDI inflows to the total tax revenues. Furthermore, a mutual interaction between economic growth and total tax revenues was discovered as a consequence of the test.

Table 7. Results of Dumitrescu and Hurlin (2012) causality test

Null hypothesis	W-Stat.	Zbar-Stat.	P value
Lag length=1			
$\Delta FDI \rightarrow \Delta DTAX$	1.73473	1.81265	0.0699
$\Delta DTAX \rightarrow \Delta FDI$	1.38263	0.71391	0.4753
$\Delta GRW \rightarrow \Delta DTAX$	1.12563	-0.08806	0.9298
$\Delta DTAX \rightarrow \Delta GRW$	1.65514	1.56430	0.1177
$\Delta GRW \rightarrow \Delta FDI$	1.79452	2.07165	0.0383
$\Delta GDI \rightarrow \Delta GRW$	2.00547	2.74229	0.0061
Lag length=2			
$\Delta FDI \rightarrow \Delta DTAX$	3.62090	2.38605	0.0170
$\Delta DTAX \rightarrow \Delta FDI$	2.08944	-0.60693	0.5439
$\Delta GRW \rightarrow \Delta DTAX$	2.14218	-0.50387	0.6144
$\Delta DTAX \rightarrow \Delta GRW$	2.68060	0.54838	0.5834
$\Delta GRW \rightarrow \Delta FDI$	2.21975	-0.29098	0.7711
$\Delta FDI \rightarrow \Delta GRW$	4.24511	3.80473	0.0001

5. Conclusion

Increasing financial and economic liberalization together with the globalization has led substantial increases in FDI flows. The improving integration between international financial markets and increasing mobility of production factors between the countries affect the FDI flows positively. In this context, FDI inflows have potential to affect the national economies through multiple channels. FDI inflows may affect the economic growth and in turn employment positively through increasing the capital stock and improving the human capital or technology and know-how transfer in the host country. Furthermore, FDI inflows also may contribute to the development of financial sector, raising the competitiveness and tax revenues indirectly. However, FDI inflows may affect the economic growth negatively to cause that the local firms are exposed unfair competition against multinational firms. FDI inflows also have potential to affect the balance of payments negatively through profit transfer and contribute to the environmental degradation.

In this study, the short and long run interaction among tax revenues, FDI inflows and economic growth were analyzed in 33 OECD countries during 1995-2014 period with Dumitrescu and Hurlin (2012) causality test and Westerlund-Durbin-Hausmann (2008) cointegration test. The results revealed that both FDI inflows and economic growth did

not have significant effects on the total tax revenues at the panel level. However, FDI inflows affected the total tax revenues positively in Iceland, Israel, Sweden, the United Kingdom, and the United States, while FDI inflows affected the total tax revenues negatively in Austria, France, Italy, and Poland. Furthermore, economic growth had positive influence on the tax revenues in Chile and Poland, but economic growth had negative effect on the total tax revenues in Austria, Estonia, Germany, Hungary, Norway, Sweden, and Switzerland. Furthermore, the results of causality test discovered a one-way causality from FDI inflows to the total tax revenues. A mutual interaction between economic growth and total tax revenues was also seen as a consequence of the test. We evaluated that the composition of FDI inflows and the level of financial incentives by host countries are determinative for the relationship between total tax revenues and FDI inflows. In this regard, many OECD countries have tried to increase the tax revenues by expanding the tax base through reducing the tax exemptions and tax reductions.

Note

- ⁽¹⁾ This study was derived from the PhD thesis entitled “Impact of Foreign Direct Investment Inflows on Tax Revenue: The Case of OECD Countries” of Omer Faruk Ozturk under the advisory of Assoc. Prof. Yilmaz Bayar.

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Macroprudential stability indicators of financial systems: Analysis of Bosnia and Herzegovina and Croatia

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Abstract. *The introduction of macroprudential stability indicators for risk estimation in financial systems is a hot topic in transition countries. Our examination is focused on the repeating rate of instability in financial systems in Bosnia, Herzegovina and Croatia based on the selection of appropriate macroprudential indicators. Empirical investigation analyzed the statistical data of the National Bank of Croatia and the Central Bank of Bosnia and Herzegovina for the period of ten years between 2003 and 2013. With multivariate logistic regression we create a model based for determination of probability of the occurrence of instability in financial systems based on real values of macroprudential indicators.*

Keywords: macroprudential analysis, system risk, financial system.

JEL Classification: E02, B26, E63, G32.

Introduction

The global financial crisis, which escalated in 2008, upset both the financial markets as well as the theorists who analyzed it. Although it was certain that the crisis was not an isolated occurrence, the speed by which the crisis expanded through the global financial system, covering a wide range of financial institutions, prompted an interesting discussion in academic circles.

The causes for the financial crisis are many, however, one of the most significant causes is the risk perception by the many participants in the market. Innovations in the field of risk management gave confidence to careless financial analysts with a false certainty that changes of the financial risk assessment model would eliminate business risks in financial markets. Exposure assessment of risks based on time series which do not contain a complete business cycle, and discounting the specifics of the risk distribution in financial markets created an unrealistic base for analyzing the exposure to system risks.

Many years of stable growth and low inflation encouraged investors to switch to investments with more risk. At the same time, financial engineering created new financial instruments where risk degree was hard to estimate⁽¹⁾ even by experienced agencies such as Moody's and Standard & Poor's. Aforementioned trends slowly led the system to even larger and greater system risks, while giving a false impression of safety and prosperity. Our attention is focused on how the financial system reacted on the occurrence (in this case the crash on the mortgage markets) and led to an extensive growth of instability that many authors describe as "financial contagion".

There are different points of view in terms of the potential consequences from the connection of financial institutions through claims. On the one hand, authors claim that it leads to strengthening of the stability position of the financial market. In addition, disturbances which would occur in a single region or financial institution would be spread onto a larger number of institutions which would be ready to absorb losses. (Allen and Gale, 2000: 1-6)

On the other hand, many authors condemn the new trends in development of the theory of stability of the financial system, pointing out that the interconnection between financial institutions is a catalyst for fast growth of financial disorder (Dasgupta, 2010: 2-6). Many authors point out that financial regulations improved the management of risks at the level of single institutions, but at the same time led to uniform reactions of financial institutions. Since the current regulations primarily focus on the problem of adequate capitalisation and achievement of an adequate level of liquidity, it can prompt a mass sale of certain financial instruments. Due to such an occurrence, the financial institutions lean towards an adequate structure of risk weighted assets. Only instruments with the highest risk degree would be sold. This would result in a price drop of specific segments of the financial market. In this case the regulatory framework which is designed to control risks, can lead to a crash of endangered segments of the financial system. In this way the financial system stops working as a safety network, which absorbs risks, and becomes the cause for further deepening of the crisis.

For the purpose of this paper we will follow the middle path and agree on the fact that the interconnection between financial institutions contributes to the formation of financial systems which is at the same time immune to low instabilities, but fragile in cases where serious disturbances occurred. In the chapter “System risks and stability in financial networks” authors Acemoglu, Ozdaglas and Tahbaz-Salehi introduce a model that shows a dual effect of the current regulatory framework to the preservation of stability of the financial system. According to their model, more complex financial systems can amortize impacts while their number and intensity is small. But if the toleration level is exceeded, the financial system becomes a mechanism for spreading instability, to the level where the question is if the externalities exceed the benefits of the current type of regulation. (Acemoglu et al., 2013: 2-4).

We can conclude that financial regulation has generally contributed to reduction of the management risk of financial institutions, but at the same time, with their actions, increased the importance of proper understanding of system risks. Due to the fact that individual institutions are not able to manage system risks, it is necessary to implement instruments for evaluation and management of system risks on a macroeconomic level, which is actually the mission of the macroprudential analysis.

The researched element in this paper is the role of macroprudential analysis as an instrument for limiting system risks, as well as risks which endanger the functionality of the financial system as a unity. The term macroprudential analysis derives from the words *prudencija* (lat. Prudens-prudence, foresight, experience) and *macroeconomics* (gr. Macro, oikonomia), which draws attention to the attempt to widen the financial regulation framework and the risk estimation in financial markets with the analysis of macroeconomic variables. The use of macroprudential indicators contributes to the neutralization of instabilities through:

- Prevention of financial disturbance escalation and building a fast and efficient defense against spreading consequences for instability of the real sector
- Identification and evaluation of risk exposures, as well as the connection between risks that could lead to risk overflow between different segments of the financial market that could lead to malfunction of the financial system as a unity.

The basic guidelines of macroprudential policy are:

- The goal of macroprudential analysis represents a respond to a system risk and to risks which endanger the functionality of the whole financial system.
- The research field of macroprudential analysis is the whole financial system as well as its interactions with the real sector.
- The key instruments for the implementation of the analysis are macroprudential indicators.

So far there are identified a large number of macroprudential indicators divided in six categories:

- Indicators of economic growth.
- Indicators of payment balance.
- Inflation degree.

- Expansion of loans and real estate prices.
- The effect of financial contagion.
- Interest and exchange rate.

Our goal in this research is to determine whether monitoring the value of macroprudential indicators can help predict instability in the financial system. The main research hypothesis is: Based on the analysis of macroprudential indicators the probability of recurrence of instability of the financial system can be determined.

Macroprudential indicators are independent variables within the framework of the basic research hypotheses. For the independent variable the following macroprudential indicators were selected: real annual rate of growth, balance per unit of GDP, the ratio of reserves to debt, the average annual inflation rate, interest rate volatility, the volatility of national exchange rates, the rate of expansion of public loans, and real estate price index. The probability of instability in the financial system is a dependent variable. The dependent variable, the probability of occurrence of instability in the financial system, takes its values in the interval between 0 and 1. The financial system is considered stable, according to the theory of business cycles, if it is in a phase of expansion or the top, and as unstable if the business cycle is at the bottom or in contraction.

For the purpose of the research section of this paper we will use the statistics of the Central Bank of Bosnia and Herzegovina and the Croatian National Bank, for the period 2003-2013 year. As the main statistical methods will use multivarious logistic regression. With logistic regression, we will try to establish a model for determining the probability of occurrence of economic uncertainty, depending on the selected variables.

Empirical research

In the empirical part of the paper we examine the probability of occurrence of instability in the financial systems of Bosnia and Herzegovina and the Croatian Republic on the basis of the selection of appropriate macroprudential indicators.

With multivariate logistic regression we will create a model to determine the probability of occurrence of instability in the financial system based on the current value of macroprudential indicators. Multivariate logistic regression is used to determine the probability that the dependent variable is found in the requested state, depending on the n independent variables. The mathematical model of logistic regression can be represented in the following form:

$$f(z) = \frac{e^z}{1+e^z}$$

where z is: $z = \sum_{i=1}^n \beta_i X_i$.

In the model, the variable x is the exposure to the risk factor set, and $f(z)$ is the probability of a certain result with regard to the risk factor set. Therefore, the variable z is a measure of the overall contribution of the risk factors that were used in the model (Kvesić, 2012: 321).

The model is due to mathematical transformation⁽²⁾ reduced to the following form:

$$P(y) = \frac{1}{1 + e^{-(\alpha + \sum_{i=1}^n \beta_i X_i)}}$$

where:

P (Y) is the probability of occurrence of favourable events;

e is the base of the natural logarithm;

α is the independent member of the equation;

β_i is the coefficient of the independent variable;

X_i is the independent variable.

By determining the coefficients of the independent variable and independent member of the equation the forecasting model is obtained.

The condition of application of the logit model is that the independent variable is dichotomous, i.e. that it can take only two values, which is for this model needs to be quantified as a value of 0 and 1. The dependent variable of this research is the probability of occurrence of instability of the financial system. In accordance with the requirements of the model we differentiate two states in which the financial system can be. If the financial system is stable the independent variable takes the value 1, otherwise it takes the value 0. A stable financial system will be defined as a system in the expansion phase including the phase of reaching the peak of the business cycle. An unstable system is a system in the contraction phase, including the phase of reaching the bottom of the business cycle.

For the independent variable were selected following macroprudential indicators: real annual rate of growth, balance deficit per unit of GDP, the ratio of reserves to debt, the average annual inflation rate, interest rate volatility, the volatility of the national exchange rate, the rate of expansion of public loans, real estate price index. By determining the coefficients of the independent variable determine the importance of each indicator by determining the probability of financial system stability.

Unlike linear regression, logistic regression assumes a linear relationship between the dependent and independent variables. Since the largest number of macroprudential indicators that will be used to create the model has a cyclic characteristic it is appropriate to use just logistic regression. The advantage of this method lies in the fact that it does not use the Gaussian distribution as its base, which can lead, as we have previously stated, to an inadequate nature assumption of risk in financial markets.

Specifics of financial environment of Bosnia and Herzegovina and Croatia

Before we approach the development of models for determining the probability of occurrence of instability in the financial markets, we will analyze financial systems in the before mentioned countries.

The degree of financial market development can be measured in different ways. Most often as indicators of development are taken: the complexity of the financial structure;

development of the banking system; sophistication of the capital market; the ratio between the banking system and the capital market, the presence of non-bank financial intermediaries (Šonje, 2005: 48-58).

The financial system of Bosnia and Herzegovina is built on the principles of the continental model of organization of the financial markets. This model is characterized by the dominant role of banks as a key player in the financial market. In addition to the banks in the financial market of Bosnia and Herzegovina there are also investment funds, insurance companies and reinsurance companies, microcredit organizations and leasing companies.

The participation of banks in the assets of the sector ranged from 85.61% to 86.56% in the past three years. After the banks, the most important participants in the financial market are insurance companies, whose relative share in the assets of the sector grew in this period from 4.61% to 5.11%. Assets of leasing companies have been decreasing, and are reduced to only 3.24% at the end of 2013. Microcredit organizations and investment funds participate in the total supply of financial services with a share of less than 3%. In the observed period, the share of banks in the total supply of financial services in the market of Bosnia and Herzegovina amounted to 85.95%, which shows that the sector of non-banking institutions is weak developed. As for the organization and regulation of the capital market, it is compounded, organized and multilayered. By the vertical principle there exist two levels, and by the horizontal principle tree. At the state level there are: the Central Bank, the Deposit Insurance Agency and the Agency for assurance. The second level is divided into two separate markets. There are two stock exchanges (Banja Luka and Sarajevo) that are independent and act independently from one another. Regulatory authorities are doubled, so that there are two Securities Commissions, two Registries of Securities and two Banking Agencies (ABRS and FBA). Market participants are active in both markets, but are subject to control and reporting on a geographic basis, depending on the residence. Organizational parts of unregulated institutions by territorial jurisdiction. Organizational parts subject to the regulatory institutions by territorial jurisdiction (Kumalić, 2013: 69).

Shares represent the dominant securities, primarily thanks to the privatization process, which as a result has produced exactly this type of securities. The main characteristic of the shares traded on the stock exchanges in Bosnia and Herzegovina are expressed in their poor quality, which is in the discrepancy between their nominal value and market value (Omerhodžić, 2008: 307). The first bond turnover on the stock exchanges in Bosnia and Herzegovina was registered year 2009. Two years later, the entity governments broadcasted treasury bills, which was the first trade of short-term financial instruments on the market. Bosnia and Herzegovina as a small country with a small market capacity, double institutions and poor coordination, cannot be classified as high-quality financial market. Regardless of the development of some qualitative indicators, the financial market in Bosnia and Herzegovina is basically shallow, underdeveloped, compounded, dysfunctional, centered in banks with high concentration of the banking sector (Kumalić, 2013: 69).

Specifics of financial environment of Croatia

If we compare the financial system of Bosnia and Herzegovina and the Croatia, we can notice that both countries have a similar base structure. As before, the importance of certain groups of intermediaries in the financial market will be measured by the share of their assets in their total financial sector assets. In Croatia, the banks play a dominant role, so that the Croatian financial system is classified into financial systems with continental structure.

The share of assets of commercial banks in the total amount of assets of the financial sector ranged from 76.90% to 73.95%. It is interesting to note that the share of commercial banks fell in favour of the non-banking sector. So that the non-banking sector at the end of 2013, covered more than a quarter of the financial market. The trend of strengthening the non-financial sector is present in more advanced financial systems. From the table above it is possible to see that this strengthening was useful for pension insurance companies whose relative share climbed from 7.75% to 10.68% in the reporting period. Insurance companies are also making progress from 6.04% to 6.49%.

The regulatory framework of the financial system is complex. The Croatian National Bank conducts supervision of credit institutions and supervise payment operations, and regulates the amount of money in circulation. The local currency is the Croatian Kuna, whose exchange rate is formed depending on the supply and demand for funds in the given currency. Banks (and the state) casual trade with foreign currency with the National Bank of Croatia, either directly or on so-called. Foreign exchange auctions, and the National Bank regulates through these transactions the price of the domestic currency in the foreign exchange market⁽³⁾. Supervision of the non-banking sector was organized by the Croatian Agency for Supervision of Financial Services (HANFA).

Croatia has a fairly developed money market and capital market. All transactions are conducted through the Zagreb Stock Exchange. Similar to Bosnia and Herzegovina, the highest number of transactions on the Stock Exchange relating to the purchase and sale of shares, while the rest consists of selling bonds, commercial paper, certificates and rights. Trading is handled completely electronically. Responsible for proper settlement of trade transactions in the domestic capital market is the Central Clearing Depository Association.

Analysis of selected macroprudential indicators

Using instruments of descriptive statistics, we will analyse the collected data. For each indicator we calculated the minimum value, maximum value, the arithmetic mean and standard deviation.

Since we intend to use the data for forming multivariate logistic model it is necessary to check the degree of correlation between the selected indicators. The degree of correlation measures the relationship between two variables. Logarithmic models give the best results when there is no correlation between the individual indicators. A high level of correlation data shows that it is possible to simplify the model, eliminating one of two variables that are mutual dependent.

In the analysis of macro prudential indicators of Bosnia and Herzegovina, we observe a strong negative correlation between ratios of reserves to foreign debt and the amount of public debt per GDP unit (-0.948).

Among the analyzed data for Croatia, the amount of average annual interest rate is correlated with the annual rate of growth, the value of reserves by the ratios of foreign debt and public debt per unit of gross domestic product, so we can conclude that the model would not have lost much of its relevance if you leave out this variable.

Comparative analysis of macroprudential indicators of Bosnia and Herzegovina and Croatia

If we compare values of macroprudential indicators we can notice that in Croatia much larger variations in value of annual growth rate were recorded than in our country. Bosnia and Herzegovina in past 11 years achieved biggest growth rate of 6.30% in 2004. Croatia achieved top of her business cycle in 2003, when general growth of goods and services of 5.4% was recorded. By following just this macroprudential indicator we can perceive that the reactions of market are very slow. Effects of global economical crisis led to a decline of growth rate in 2009, when the negative growth rate of -7.4% was recorded in Croatia and -2.7% in Bosnia and Herzegovina. As we mentioned before, a balance deficit by unit of gross domestic product is derived measure of stability of financial system. It gives us an insight in which amount the deficit of balance of payment is significant through comparison with total production of goods and services of certain country. From the attached data we can perceive that in both countries outflows of balance of payment surpassed inflows, videlicet that both countries recorded payment-balance deficit in last 11 years. Bosnia and Herzegovina really stands out by very high deficit values which in 2003 reached 19.40% GDP. It is important to highlight that the deficit by unit of gross national product has significantly declined after 2009.

It is interesting to compare values of raid reserves by debt. Bosnia and Herzegovina, in the observed period, was covering every KM of public debt with 1,114 KM of national reserves. If we observe the movement trend of this indicator, we can notice that in the period from 2006 to 2008 conservative debt policy was conducting and that the raid took very high values (from 1.34 to 1.69). In Croatia the national reserves are significantly lower and they are on average 26.6% of public debt. This indicator showed small variations in observed period as it was indicated by standard deviation of 0.033.

Price levels in Croatia and Bosnia and Herzegovina have a tendency of gradual growth. Croatia recorded significant rise in level of inflation of 6.1% in 2008. In Bosnia and Herzegovina two sudden rises of price levels were recorded. In 2006, a level of inflation of 6.1% was recorded, while in 2008 the level of prices raised by 7.4%. In next year a partial correction of price levels was recorded which influenced on deflation of 0.4%.

If we look the growth trend of interest rate in Croatia we can notice three phases. In period from 2003 to 2008 interest rates were moving between 4.5 and 4.88%. In 2008 the interest rate raised up to 9%. This interest rates level kept for next three years, whereupon the gradually decreasing of interest rate to 7% came. Rise of interest rates in period of ingoing of crisis is in accordance to increased risk of management in period of financial stress.

Interest rate level which was recorded in Bosnia and Herzegovina doesn't follow this form. Highest values of interest rates were recorded in 2003, when interest rate was 10.50%.

Another unit of indebtedness of country is public debt by unit of gross national product. Again, we can notice that Croatia has a significantly higher affinity towards debt. On every kuna of national product this country took over 81.25 lipas of public debt. In Bosnia and Herzegovina the situation is remarkably different. For every KM gross national product Bosnia and Herzegovina took over on average 23.5 pfening of debt. This indicator showed sudden rise of values in both countries in 2009 which is in accordance with expectations that the state will take over additional financial funds in order to take actions against the crisis. In Croatia the public debt is increased from 84.30 to 100.40, while in Bosnia and Herzegovina rise from 17 to 21.5 was recorded.

Determination of possibilities of instability appearances in financial system of Bosnia and Herzegovina and Croatia

Based on previously presented data for Bosnia and Herzegovina multivariate model of logistic regression was crated:

$$P(y) = \frac{1}{1 + e^{-(369,9+9,5*X_1+3,7*X_2-140,4*X_3+2,8*X_4-0,9*X_5-7,6*X_6)}}$$

Biggest informative significance for financial instability in financial system of Bosnia and Herzegovina probability evaluation has reserve ratio towards external debt. Negative value of coefficient of independence variable ($\beta_3 = -140.39$) shows that with reducing of reserves or debt increase the probability of instability in financial system increases. By increasing of public debt by unit of gross national product stability of financial system is disturbed. On the other side real annual growth rate and decrease of payment-balance deficit are having positive values of coefficients which shows that their growth increases probability that the financial system remains stabile. Average inflation rate in observed period has increased by 2008, after which the decrease of inflation rate was recorded. Because of this in logistic model inflation rate growth is in positive relation with system stability increase ($\beta_4 = 2.84$).

By using identical methodology the model for determination of probability of instability appearances in Croatia was formed:

$$P(y) = \frac{1}{1 + e^{-(329,3+1,6*X_1-0,7*X_2-69,3*X_3+2,8*X_4-36,7*X_5-1,2*X_6-0,4*X_7-0,1*X_8)}}$$

Biggest informative significance has the reserve ratio towards foreign debt. Negative value of coefficient of independent variable ($\beta_3 = -69.3$) shows that by reducing of reserves or by increasing public debt the probability of instability in financial system increases. In model the value of coefficient of exchange rate stands out ($\beta_5 = -36.7$). Decline of course of Croatian kuna in accordance to euro indicates the decline of Croatian financial system. Average inflation rate has a positive coefficient ($\beta_4 = 2.8$). Every decrease of inflation rate by 1% increases the probability of crisis ingoing in financial system by 2.8 times.

Concluding remarks

In this paper we have primarily dealt with the issue of financial system stability conservation. We have focused on analysis of system risks as well as on risks which endanger the functioning of financial system as unity.

As an answer on question how to follow position of system risk in financial system of certain country, we have set the process of macroprudential analysis. This process means the tracking of system risk by selected macroeconomical indicators. By calibration of standard values of macroprudential indicators it is possible to identify disorder on certain segments of financial markets on time, but, also, we can analyze movement of whole business cycle. Development of quality prudential model and its constant perfecting is basic assumption for sup and control on financial market.

In research part of the paper we tried to give humble contribution to development of macroprudential analysis on the territory of Bosnia and Herzegovina and Croatia. Our hypothesis was to determine is it possible to determine, by tracking of values of macroprudential indicators, probability of instability appearances in financial system.

We have confirmed the hypothesis by conducting two independent mathematical models, one for the financial system of Bosnia and Herzegovina, and other for system of Croatia. Models which we conceived are having an assignment to determine probability of instability appearances in financial system on the base of given values of macroprudential indicators. Featured models are based on equation of logical regression. Taking into account the fact that logistic distribution is by its nature nonlinear, and that it is not based on Gaussian distribution, we can use it for risk position simulation on financial market.

Most of the analyzed indicators proved to be significant for determination of stability position on financial market of Bosnia and Herzegovina and Croatia. Biggest informative significance in models which we created had the reserve ratio to debt, annual growth rate and average annual inflation rate. It is determined by research that by reserve reduction or public debt increase the level of stability in financial system decreases. We have also confirmed that positive growth rate of gross national product and stable inflation level are indications of stabile financial system. Despite these indicators, the height of currency exchange of local currency in accordance to euro proved to be significant for position of stability determination in financial system of Croatia. The weakening of kuna course in accordance to euro indicates on weakening of financial system of Croatia.

Furthermore, it has been found that the model could be simplified by eliminating one out of two indicators which showed a high level of mutual correlation. In accordance to our research it has been determined that it is not necessary to follow height of public debt by gross national product unit in neither of listed models, since the position of debt is already covered by ratio of reserve to foreign debt. On territory of Croatia we can exclude the interest rate level analysis from the model because it has been proved that analysis is in the direct relation with gross national product growth.

We are hoping that this paper will stimulate researchers to turn to similar analyzes which would try to improve the quality and informative significance of macroprudential models.

By expanding time series and covering more business cycles could be given a more reliable model. Also, by including more macroprudential indicators in faze of preliminary research and by subsequent elimination of indicators which are showing high level of correlation it is possible to increase the informative significance of model.

Macroprudential analysis of individual segments of financial markets could give an insight in financial market structure. Tracking of macroprudential narrow range indicators, based on time series which would contain several business cycles, would enable better comprehension of financial stress expansion from one segment to other. On this way using the macroprudential analysis financial system infection and the way in which the disorder leads to a financial system crisis could be explained.

An interesting research could be conducted by testing the prognostic values of this model type. It would be necessary to determine if model created on macroprudential indicators base can provide timely information about onset of crisis probability. Creation of prognostic models would enable the regulation which would be aimed to balance the business cycle, unlike the intervention which is aimed to repair the collapse of financial market consequences. Although we could not avoid business cycle recession, a timely information about aggravation of conditions on financial market and system risk increase could enable better entry into recession of business cycle phase.

Notes

- (1) It is recognized that the original market disruption was caused by the expansion of mortgage loans that are following the process of securitization put into circulation in the financial market. Securitized bonds represented financial assets of underrated risks, highly sensitive to movements in the real estate market.
- (2) Logarithming, i.e. equating the natural logarithms of the left and right sides of the equation it is possible to transform the equation into a form that is easier to interpret and process the data. For a detailed look at this process (Kvesić, 2012: 321-232).
- (2) Croatian National Bank; The financial system of the Republic of Croatia http://www.hnb.hr/financijska_stabilnost/hfinancijka_sustav-1.htm

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Annexes

Macroprudential indicators of financial stability of Bosnia and Herzegovina

Review of macroprudential indicators	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
GDP, real annual growth rate (%)	3,80	6,30	3,90	6,10	6,00	5,60	-2,70	0,80	1,00	-1,20	1,60
Current balance of balance of payment (% GDP)	-19,40	-16,30	-17,10	-7,80	-9,00	-14,10	-6,50	-6,10	-9,70	-9,30	-5,50
Reserve ratio towards foreign debt	0,70	0,86	0,97	1,34	1,69	1,48	1,19	1,03	0,96	0,91	0,95
Average annual inflation rate	0,60	0,40	3,80	6,10	1,50	7,40	-0,40	2,10	3,70	2,10	-0,10
Height of average annual interest rates	10,50	9,90	9,00	7,70	7,00	7,40	8,10	7,80	7,10	6,70	-
Public debt by GDP unit	27,70	25,50	25,30	21,10	18,00	17,00	21,50	25,30	25,80	27,80	28,30

Source: Statistics of Central bank of Bosnia and Herzegovina.

Macroeconomic stability indicators of financial system of Croatia

Review of macroprudential indicators	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
GDP, real annual growth rate (%)	5,40	4,10	4,20	4,80	5,20	2,10	-7,40	-1,70	-0,30	-2,20	-0,90
Current balance of balance of payment (% GDP)	-6,20	-4,20	-5,20	-6,50	-7,20	-8,80	-5,10	-1,10	-0,90	-0,10	0,90
Reserve ratio towards foreign debt	0,33	0,28	0,29	0,29	0,28	0,22	0,23	0,23	0,24	0,25	0,28
Average annual inflation rate	1,80	2,10	3,30	3,20	2,90	6,10	2,40	1,10	2,30	3,40	2,20
Exchange rate on 31.12. (HRK: 1 EUR)	7,65	7,67	7,38	7,35	7,33	7,32	7,31	7,39	7,53	7,55	7,64
Height of average annual interest rate	4,50	4,50	4,50	4,50	4,88	9,00	9,00	9,00	7,83	7,00	7,00
Public debt by GDP unit	36,30	38,20	71,20	73,90	76,80	84,30	100,40	103,30	102,60	102,10	104,70
Index of real estate prices	67	74,4	82,8	97,5	109,2	113	108,8	100	96,3	97,3	81,2

Source: Statistics of National Bank of Republic of Croatia.

Does exchange rate always affect the number of inbound tourists significantly in China?

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Abstract. *This investigation examines the time-varying causality between the exchange rate and the number of the inbound tourism of China using the rolling window estimation. The full-sample causality test suggests no causality between the exchange rate and the number of inbound tourists. However, the parameter stability test reveals that this causality is unstable, which suggests that full-sample causality tests cannot be relied upon. Then, we use a time-varying rolling window approach to revisit the dynamic causality, and the results show that the exchange rate has an increasing impact on the number of inbound tourism since 2009, which is consist with the continuous market process of the Renminbi exchange rate. Our result proves that inbound tourists will be more concern about the exchange rate with the expansion of the currency's trading band. The rolling window test reveals that inbound tourism factors should be taken into consideration by China's government with the development of the tourism industry and the marketization of the exchange rate.*

Keywords: exchange rate; inbound tourism; rolling window; time-varying.

JEL Classification: C32; L83.

1. Introduction

Tourism has long been known as “sunrise industry” and “smokeless industry”, as one who has a huge development potential of industry groups and an increasingly position in national economy (Craik, 2001; Leiper, 2008). By continued development, expansion and diversification, tourism has become one of the world’s largest and faster growing economic sectors in the past few decades. According to the world tourism organization, the international tourism transactions has become the largest service industry in international trade. Based on the World Tourism Economic Trends Report (2017), international tourist arrivals firstly reached a record of 10 billion (1.4 times the size of the global population) in 2016, which shows an increase of 4.8% over 2015. Global tourism revenue reached 5 trillion and 170 billion dollars in 2016, which shows an increase of 3.6% over the previous year, and equivalent to 7% of global gross domestic product (GDP). The growth rate of global tourist population and total tourism revenue is significantly higher than the global GDP growth rate. Furthermore, according to Tourism Towards 2030, international tourist arrivals worldwide will reach 1.8 billion by 2030. Tourism is one of the most important driving forces of socio-economic development, through export revenues, the creation of jobs and enterprises, and infrastructure development to promote socio-economic progress (Paramati et al., 2017). The above information fully demonstrates that tourism can bring huge business opportunities to a country and promote its economic growth (Chiu and Yeh, 2017). As a result, the economic impact of the tourism has attracted an increasing attention by governments. Researches about the tourism and other macroeconomic variables are increasing in recent years (De Vita and Kyaw, 2013; Falk, 2015; Tang et al., 2016a, 2016b). Webber (2001) points out that tourism is one particular commodity, which is likely to be affected by the exchange rate. Theoretically, the exchange rate could affect the international tourism in two different ways. First, exchange rate fluctuations may affect international tourist destination choice (Akar, 2012; Webber, 2001), since tourists tend to choose countries in which the exchange rate is more favourable (Wang et al., 2008). Second, the variations of exchange rates are likely to alter visitors’ intended length of stay and expenditure. When the destination’s currency depreciates, international tourists have more money to spend and, thus, may prolong the length of stay and increase spending (Crouch, 1993). It seems that the devaluation of a country’s currency is conducive to increasing the number of inbound tourists however, the researches about this topic shows strong inconsistency (Vanegas and Croes, 2000; Croes and Vanegas, 2005; Quadri and Zheng, 2010; Quadri and Zheng, 2010). As a result, it is important to study the specific relationship between the exchange rate and the number of inbound tourists.

According to the world tourism organization, China has become the world’s third largest inbound tourist destination after the European Union and the US, and it will become the world’s largest tourist destination in 2020. China has abundant natural and human tourism resources. In especial, the number of inbound tourists in China rises substantially with the rapid development of the economy in recent years. Data from People’s Republic of China National Bureau of statistics shows that China receives 133.82 million inbound tourists, which shows an increase of 4.14% over 2014, and creates 113.65 billion dollars in foreign exchange earnings. The increasing number of inbound tourists directly reflects the recognition of China’s political, economic and cultural environment. In addition, China

cancels the fixed exchange rate system against the dollar and begin to implement a managed floating exchange rate system with reference to a basket of currencies in 2005:07. Since then, China continues to introduce a series of exchange rate system reforms in order to promote the exchange rate market. In this context, the RMB exchange rate floating range continues to expand. In 2007, the Central People's Bank expands the exchange rate floating range from 0.3% to 0.5%. In 2012 and 2014, the floating range is further expanded to 1% and 2%, respectively. China's exchange rate flexibility is continuously enhanced with the constant development of the exchange rate market. Santana-Gallego et al. (2010) point that the exchange rate arrangement is a major factor in the determination of inbound tourists. The gradual evolution of China's exchange rate provides us with a good sample to examine the dynamic relationship between the exchange rate and inbound tourism.

Crouch (1994a, 1994b) points out that researches on the effect of the exchange rate on tourism demand can be divided into two groups. First, some empirical studies have found that exchange rate does not have significant effects on tourism demand (Vanegas and Croes, 2000; Quadri and Zheng, 2010). Vanegas and Croes (2000) apply the linear and the double log linear models and find that exchange rate is not statistically significant for tourism demand from the US to Aruba. In addition, Quadri and Zheng (2010) apply a regression approach to examine relationship between exchange rates and international arrivals and find that exchange rates have no effect on 11 out of the 19 nations being examined. On the contrary, other empirical studies find strong significant effects of the exchange rate on tourism demand (Webber, 2001; Wang et al., 2008; Kuo et al., 2009; De Vita and Kyaw, 2013). Webber (2001) studies the cointegration between the exchange rate and the tourism demand in Australia applying both the Johansen and Engle and Granger procedures, and find that fluctuation in the exchange rate is a significant decisive factor that determines 50% of the long-run tourism demand. Wang et al. (2008) adopt a copula approach to study the correlation between tourism demand and exchange rates for some Asian Countries and find that currency appreciation had a greater effect on tourism demand than the currency depreciation. Kuo et al. (2009) use panel data techniques to research the effect of the exchange rate on tourism demand in eight Asian countries and find that the currency of the destination country depreciating relative to the currency of the origin country is advantageous for international tourism business of the destination country, and vice versa. De Vita and Kyaw (2013) test the impact of the exchange rate on Turkey's tourist arrivals from Germany and find that exchange rates are significant determinants of tourism arrivals. Some literatures argues that effects of exchange rate show differences in nationals. Croes and Vanegas (2005) specify a dynamic econometric model and document that exchange rate had a positive effect on tourist arrivals to Aruba from the US, the Netherlands and Venezuela, but the coefficient of exchange rate variables is not significant in other countries. All the above studies mostly focus on the full-sample analysis without considering the pervasive structural changes. However, in fact, the policy and the regime of a country's exchange rate are in constant changes. Unfortunately, only a small amount of literature has examined it (Santana-Gallego et al., 2010; De Vita, 2014). Santana-Gallego et al. (2010) apply panel data techniques to analyze the effect of exchange rate arrangements on international tourism and find that that it is a major factor in the determination of tourist arrivals. De Vita (2014) test the effect of exchange rate regime on

international tourism flows of Economic Co-operation and Development (OECD) and non OECD countries using a system generalized methods of moments (SYS-GMM) estimation and find that it is important to maintain a relatively stable exchange rate to attract international tourist arrivals. However, these studies are more likely to use panel data for inter country comparisons without considering heterogeneity among countries.

Researches about the tourism on China rarely mention the effects of exchange rate. Yang et al. (2010) utilize the annual provincial panel data over the 2000-2005 period to test the determinants of international tourist arrivals in China and find that key determinants include the relative income, population in the original country, cost of travel, and tourism infrastructure. Within the sample range of Yang et al. (2010), China implements a fixed exchange rate system pegged to the dollar, and the effect of the exchange rate is not included in the scope of this study. Most literatures research on China about the tourism demand mainly relate to the trade (Shan and Wilson, 2001), the forecasting of the tourism demand (Goh and Law, 2002; Chen and Wang, 2007; Zhou-Grundy et al., 2014) and the economic contribution (Pratt, 2015). Only a few of studies research on the impact of exchange rate on the tourism demand and draw the opposite conclusion (Kuo et al., 2009; Tang et al., 2016). Kuo et al. (2009) investigate the impact of namely exchange rate on the international tourism demand in China and find that currency of destination country depreciated relatively to currency of origin country is helpful to the international tourism business in destination country. However, Tang et al. (2016) investigate the dependence between tourism demand and exchange rate in China and find the volatility of exchange rate is not a determinant factor in fluctuation of China's inbound tourism demand. Inconsistencies in these results may stem from differences in data and methodological. As discussed above, China's exchange rate regime has gone through a process from fixed exchange rate to continuous marketization in the past decade. This constant change of the RMB exchange rate is not taken into account in the previous literatures.

Different from previous literatures, this paper makes a contribution that taking into account structural changes. The existing literatures exclusively utilize the conventional methods and the full-sample time series, which may suffer from inaccurate results (Balcilar et al., 2010). With the opening up of China's economy and high degree of the dependence on trade in the past few decades, China speeds up the reform of RMB exchange rate system, such as the exchange rate system reform in 2005:07, the expansion of the floating range of the exchange rate in 2007, 2012 and 2014. The series of institutional changes may cause structural changes of the causality between exchange rate and the number of inbound tourism. Structural changes is identified and incorporated into the estimation using several techniques such as sample splitting and the use of dummy variables in most literature. However, these techniques impose a disadvantage of pre-test bias since the specific timing of structural changes cannot be detected intuitively. In order to overcome the parameter non-constancy and avoid pre-test bias, this study proposes the rolling-window sub-samples Granger causality test based on the modified bootstrap estimation. Instead of just testing for causality on the full-sample which assumes a permanent causal relationship, we test for causality on the rolling sub-sample with a fixed -size window to capture structural changes in the model and the evolution of causality across sub-periods. Though the full-sample test suggests no causality between the exchange rate and the number of inbound tourists, the

rolling window approach shows a more complex result. We find an undirectional causality from the exchange rate to the number of tourists in some sub-periods. Specifically, there is no causality before 2009. However, the time interval of causality shows an increasing trend since 2010, which is consistent with China's marketization of exchange rate. China begins to expand its exchange rate fluctuation interval since 2007 (0.3-5% in 2007, 0.5-1% in 2012; 1-2% in 2014). This suggests that the flexibility of the exchange rate can effectively strengthen the causal relationship between the number of inbound tourism and the exchange rate. The influence of changes in the value of RMB cannot be ignored since 2013. With the continuous development of the exchange rate market, the RMB exchange rate floating range will be further expanded. By then, inbound tourists will be more concerned about changes in the value of RMB. Tourism is an important pillar of the third industry, and our results also show that tourism factor should be taken into account in the future exchange rate policy formulation of China.

This study structures as follows. Section 2 explains the theoretical model. Section 3 introduces the methodology. Section 4 describes the corresponding data and empirical results. Section 5 concludes.

2. Interaction of tourism and exchange rate

We reference a dynamic model from Morley (1998) to reveal the dynamic relationship between the number of inbound tourists and the exchange rate. Potential tourists will determine the destination of the travel based on the information they have that include the exchange rate and other factors. These will depend on previous tourism patterns, in that a greater number of tourists from source f to destination d in the past will increase the spread of information about f and d . Suggest that the number of past tourists is a function of exchange rate and other factors which also have an influence on the current tourism level. As a result, current tourism flows are determined by the relevant variables indirectly. The effect of information flows in a population is an aggregate effect and modeled as such over the relevant population at a tourist source, so the lag structure is appropriate for aggregate level models of numbers of tourists between an origin and destination, and not for modeling individuals' choice of holiday. The model of aggregate demand will be dynamic as it incorporates the inherently dynamic concept of information flows. In the following discussion the dependence of the argument on a particular source, f , and destination, d , is suppressed in the notation but a model with subscripts f and d is implicit.

In application to tourism, a population is posited to have a number of potential tourists for whom choosing a particular destination is part of their utility maximizing consumption (Morley, 1992). Not all of these have the tour in their consideration set (Woodside and Lysonski, 1989) from which their choice of destination is actually made. The information flows are means by which an unevoked destination becomes a considered destination, and hence is chosen by these agents. Three channels are proposed as important for tourism information. Let $TOUR^*$ be the number of potential choosers of a particular destination, and $TOUR_\tau$ denotes the number of tourists who have visited the destination at time τ .

Restricting attention, at first, to those who have not previously visited a particular destination, if potential tourists deliberately search for information and access the relevant information about the tour as Bernoulli trials, then the number of new tourists who take the tour at time τ due to deliberately searched out information is $c_1 \cdot (TOUR^* - TOUR_\tau)$ for some constant of proportionality c_1 . If information is propagated essentially randomly with respect to the potential tourists, then it will be encountered unsought by a proportion c_2 of the potential new tourists, and the number of new tourists who take the tour at time τ due to unsought encounter with the information is $c_2 \cdot (TOUR^* - TOUR_\tau)$. The parameter c_2 may be dependent on marketing and advertising of the tour.

Personal communication of information about the destination requires the meeting of a past visitor to the destination and a potential tourist. Assuming independent mixing of past and potential visitors, the probability of such a meeting is the product of the proportion of past visitors $\frac{TOUR_\tau}{TOUR^*}$ and the proportion of potential new visitors $\frac{TOUR^* - TOUR_\tau}{TOUR^*}$, so the expected number of meetings is $\frac{TOUR_\tau}{TOUR^*} \cdot \frac{TOUR^* - TOUR_\tau}{TOUR^*} \cdot TOUR^*$ and the flow of new tourists resulting will be proportional to this expected number. So there will be $b \cdot TOUR_\tau (TOUR^* - TOUR_\tau) / TOUR^*$ new tourists at time τ due to word of mouth information spread. Combining the three channels, the number of new takers of the tour at time τ is as follows:

$$A_\tau = (c_1 + c_2) \cdot (TOUR^* - TOUR_\tau) + \frac{b \cdot TOUR_\tau (TOUR^* - TOUR_\tau)}{TOUR^*} \quad (1)$$

The assumptions made with respect to tourism information flows are very similar to those underlying diffusion models and the form of equation derived is equivalent to a mixed influence diffusion model. The model has an identification problem; it is not possible to distinguish the deliberate search effect (c_1) and the unsought encounter effect (c_2) which are both external influences contributing to the parameter $a = c_1 + c_2$.

The diffusion model derived above is for first time visitors, paralleling diffusion models' concentration on new adopters. Most tourism data do not allow differentiation of first time and repeat visitors, so it is necessary to augment Equation (1) with a term for repeat visitors. Let Z_τ be the number of repeat visitors at time τ . Z_τ is a function of $TOUR_\tau$. If the simplifying assumption of a constant proportion (m) of repeat visitors is made then $Z_\tau = m \cdot TOUR_\tau$.

The number of tourists from a population visiting a certain destination is as follows:

$$Y_\tau = A_\tau + Z_\tau = a(TOUR^* - TOUR_\tau) + \frac{b \cdot TOUR_\tau (TOUR^* - TOUR_\tau)}{TOUR^*} + m \cdot TOUR_\tau \quad (2)$$

As tourism data are available in discrete time periods, to develop an estimable model requires a discrete time form of Equation (2). In the information flows arguments, $TOUR_\tau$ is the number of previous visitors in the population (i.e., not including Y_τ), so in discrete time the relevant term is the cumulative number of visitors up to and including in the previous time period, $TOUR_{\tau-1}$. A straightforward re-arrangement of Equation (2) in discrete time gives the equation for Y_τ as a quadratic function of $TOUR_{\tau-1}$:

$$Y_\tau = aTOUR^* + (b + d - a)TOUR_{\tau-1} - bTOUR_{\tau-1}^2 / TOUR^* \quad (3)$$

Economic utility theory has led economists to specify tourism demand as a function of explanatory variables such as incomes and prices faced by tourists (Crouch, 1994 reviews such specifications and models). For estimation purposes, models specified in log-linear form have been favored. In the notation of Equation (1) to Equation (3), these models are of $TOUR^*$, which varies over time in response to changes in the explanatory variables and random shocks (and so will henceforth be given a time period subscript). The standard theory, by assuming perfect information about destinations, identifies Y_t and $TOUR_t^*$, whereas the theory developed above interposes a diffusion model form between them.

Microeconomic theory (Morley, 1992) indicates that the independent variables in the models should include measures of exchange rate and other factors. Therefore, with the exchange rate and other main factors as the relevant explanatory variables let $\ln(TOUR_t^*) = b_0 + b_1 \cdot \ln(ER_t) + \sum_{k=1}^n b_k \ln(Others_t^k)$, then the model is as follows:

$$\ln(Y_t) = \ln(a) + \ln(b_0) + b_1 \cdot \ln(ER_t) + \sum_{k=1}^n b_k \ln(Others_t^k) \quad (4)$$

Such a model can be expected to be most relevant and useful with cases in which diffusion is important; that is, where information about a destination is initially not widespread but becomes more so in an origin population.

3. Methodology

3.1. Bootstrap full-sample causality test

The Granger-causality statistics assume that the underlying time series are stationary and they may not have standard asymptotic distributions when the stationarity assumption does not hold. In this condition, there will be difficulties in the estimation levels of vector autoregression (VAR) models (Sims et al., 1990; Toda and Phillips, 1993, 1994). Shukur and Mantolos (1997) use Monte Carlo simulations to evaluate power and size properties of the modified Wald test. However, the result indicates that the Wald test does not have the correct size in small- and medium-size samples. Nevertheless, Shukur and Mantolos (1997) indicate that as a result of using the residual-based bootstrap (RB) method, critical values are improved in power and size. Moreover, the excellent performance of the RB method over standard asymptotic tests, regardless of cointegration, has been confirmed in a number of Monte Carlo simulation studies (Mantolos and Shukur, 1998; Shukur and Mantolos, 2000; Mantolos, 2000; Hacker and Hatemi-J, 2006; Balcilar et al., 2010). In particular, Shukur and Mantolos (2000) prove that small sample corrected likelihood ratio (LR) tests exhibit relatively better power and size properties, even in small samples. Their results indicate that in the absence of cointegration, all standard tests that do not use the RB method perform inadequately, particularly in small samples. As a consequence, this article resorts to the RB-based modified-LR statistic to examine causality between the exchange rate and the number of inbound tourists. To show the RB-based modified-LR causality test, the bivariate VAR (p) process is considered as follows:

$$\begin{bmatrix} \Delta ER_{1t} \\ \Delta TOUR_{1t} \end{bmatrix} = \begin{bmatrix} \varphi_{10} \\ \varphi_{20} \end{bmatrix} + \begin{bmatrix} \varphi_{11}(L)\varphi_{12}(L) \\ \varphi_{21}(L)\varphi_{22}(L) \end{bmatrix} \begin{bmatrix} \Delta ER_{1t} \\ \Delta TOUR_{2t} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (5)$$

where $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ is a zero mean, independent, white noise process with nonsingular covariance matrix Σ . The optimal lag length p is determined by the Schwarz information criteria (SIC) in this study. ΔER and $\Delta TOUR$ indicate the changes of the exchange rate and the changes of the number of inbound tourists, respectively. $\phi_{ij}(L) = \sum_{k=1}^{p+1} \phi_{ij,k} L^k$, $i, j = 1, 2$ and L denotes the lag operator, which is defined as $L^k x_t = x_{t-k}$. Based on equation (5), the null hypothesis that the ΔER does not Granger cause $\Delta TOUR$ is tested by imposing the restriction $\varphi_{12,k} = 0$, for $k = 1, 2, \dots, p$. Similarly, the null hypothesis that $\Delta TOUR$ does not Granger cause ΔER is tested by imposing the restriction $\varphi_{21,k} = 0$, for $k = 1, 2, \dots, p$. As discussed, the full-sample causality tests in this paper rely upon RB-based p -values and modified-LR statistics. If the first null hypothesis $\varphi_{12,k} = 0$ is rejected, there is a significant causality running from ΔER to $\Delta TOUR$, which means that ΔER can predict movements in $\Delta TOUR$. If ΔER can cause $\Delta TOUR$, the government can increase the number of inbound tourism by implementing a series of exchange rate policies.

3.2. Parameter stability test

To make sure the empirical result is valid; the full-sample causality tests usually assume that parameters of the VAR model used in testing are constant over time. However, the structural changes of underlying full-sample time series may violate the assumption. The results from the full-sample causality tests would become invalid, and hence, the causal links between series would show instability (Balcilar and Ozdemir, (2013). Granger (1996) stresses the issue of parameter non-constancy as one of the most challenging issues faced by many empirical studies. To overcome parameter non-constancy, this paper conducts short-run parameter stability tests. Andrews (1993), as well as Andrews and Ploberger (1994) developed the Sup- F , Mean- F and Exp- F tests to investigate short-run parameter stability. We apply the L_c test (Nyblom, 1989; Hansen, 1992) to test for all parameters in the overall VAR system. We use these tests to check the stability of parameters to solve the problem of the alternative of a single structural break at an unknown time. The tests are calculated from the sequence of LR statistics. Moreover, because these tests exhibit nonstandard asymptotic distributions, critical values and p -values are proposed by means of the parametric bootstrap procedure (Andrews, 1993; Andrews and Ploberger, 1994). Specifically, the critical values and p -values are obtained using asymptotic distribution constructed by means of Monte Carlo simulations using 10,000 samples generated from a VAR model with constant parameters. In addition, the Sup- F , Mean- F and Exp- F are required for 15% trimming from both ends of the sample (Andrews, 1993). Therefore, apply the fraction of the sample in (0.15, 0.85) to these tests. With respect to the L_c tests, they are calculated in the current paper for equations and the VAR system separately.

3.3. Sub-sample rolling-window causality test

To overcome the parameter non-constancy and avoid pre-test bias, we apply the rolling-window bootstrap estimation (Balcilar et al., 2010). There are two important reasons for using the rolling estimation. First, the causal relationship between variables can change over time in the rolling-window method. Second, rolling estimation can observe instability across different sub-samples owing to structural change, and the rolling-window estimation

captures this process. The rolling-window techniques rely on fixed-size sub-samples rolling sequentially from the beginning to the end of the full sample (Balcilar et al., 2010). In this premise, setting a fixed-size rolling window including l observations, the full sample is converted to a sequence of $T - l$ sub-samples, that is $s - l + 1, s - l, \dots, T$ for $s = l, l + 1, \dots, T$. Then, it can apply the RB-based modified-LR causality test to each sub-sample, instead of estimating a single causality test for a full sample. Possible changes in the causal links between ΔER and $\Delta TOUR$ are intuitively identified by calculating the bootstrap p -values of observed LR statistics rolling through $T - l$ sub-samples. The impact of ΔER on $\Delta TOUR$ is defined as the average of the entire bootstrap estimates derived from the formula with N_b representing the number of bootstrap repetitions; similarly. The impact of $\Delta TOUR$ on ΔER is obtained from the formula are bootstrap estimates from the VAR models in equation (5). The 90% confidence intervals are also computed, for which the lower and upper limits equal the 5th and 95th quantiles of each of the respectively (Balcilar et al., 2010). There are two conflicting objectives in the rolling-window estimation accuracy of the parameter estimates and the representativeness of the model over the subsample period. The window size is the precision of estimations and it controls the number of observations. A large window size may improve the accuracy of estimates but may reduce the representativeness in the presence of heterogeneity. On the contrary, a small window size may improve the representativeness and reduce accuracy. Consequently, we must select a suitable window size to balance the trade-off between representativeness and accuracy. Pesaran and Timmerman (2005) demonstrate that optimal window size depends on persistence and size of the break by assessing the window size under structural change, which is according to square root mean square error. More importantly, based on Monte Carlo simulations, they propose that the minimum limit of window size is 20 when there are frequent breaks. A large window size is needed to ensure the precision of parameter estimates, but a window size that is too large may increase the risk of including some of these multiple shifts in the window sample claims for a smaller window size. As a result, we choose a small window size of 24 months in this study. As for the issue of inaccurate estimates as a result of the selected small window size, it can be addressed by the bootstrap technique employed in the rolling estimation for better precision.

4. Data and empirical results

In order to ensure sufficient sample size, we choose the monthly data covering the period of 2006:01 to 2015:12. Furthermore, China abandoned the pegged exchange rate system against the dollar since 2005:07 in order to mitigate the imbalance of international payments, and began to implement a managed floating exchange rate policy with reference to a basket of currencies. The RMB nominal exchange rate is utilized in this paper in order to fully reflect the exchange rate changes in the process of institutional change. Data of exchange rate (ER) and the number of inbound tourists (TOUR) both source from the National Bureau of statistics of People's Republic of China. Data of TOUR is seasonally adjusted, and we transform all original data into natural logarithms to correct for potential heteroscedasticity and dimensional differences between series. The trend of ER and TOUR is shown in Figure 1.

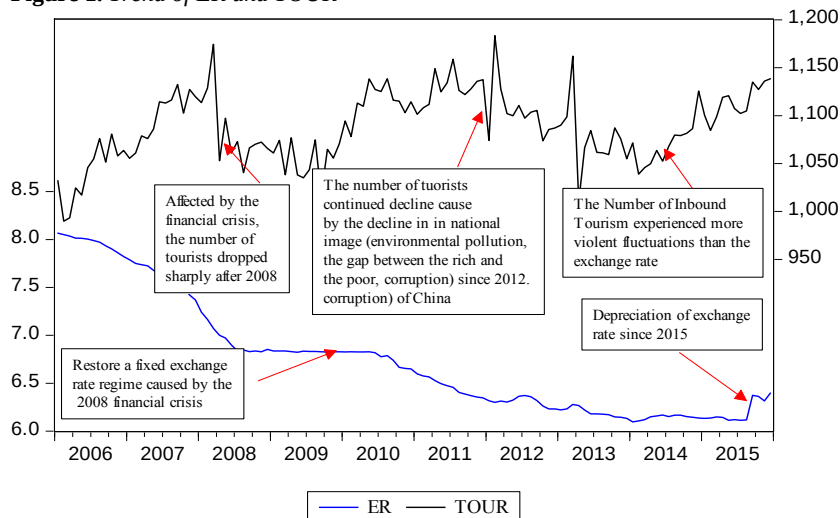
Figure 1. *Trend of ER and TOUR*

Figure 1 indicates that ER and TOUR both experienced a series of fluctuations across the full-sample interval. First, in the period of 2006-2008, the RMB shows a sustained appreciation. During this period, China just implemented a managed floating exchange rate system, and the large trade surplus is the main reason to cause the appreciation of the RMB (Thorbecke and Smith, 2010). Furthermore, the number of inbound tourists has also fluctuated and the general trend is increasing. Since Beijing successfully applied for the Olympic Games, the Chinese government is committed to promote the image of this country (Gibson et al., 2008). Second, the number of inbound tourists falls sharply since the 2008 financial crisis, and it remains at a low level until 2010:06, when the world economy begin to recover. In this period, the RMB exchange rate enters a relatively stable stage. In order to stimulate the economy and maintain export competitiveness, Chinese government restore a fixed exchange rate peg to the dollar (McKinnon and Schnabl, 2014). During 2008-2010, the number of inbound tourists is relatively stable that is affect by the long-term downturn of the world economy. During 2010-2012, the RMB maintained a relatively stable trend of appreciation. After 2010, the People's Bank of China resumed a managed floating exchange rate regime in order to control inflation (McKinnon and Schnabl, 2012). The number of inbound tourists become shows a long-term downward trend since 2012. The RMB exchange rate begins to devaluation since 2015:07, and the number of inbound tourists maintains an upward trend. Overall, the number of inbound tourists shows greater volatility compared with the exchange rate. It seems that the change of TOUR is not always caused by changes of the exchange rate. However, common trends still exist in some sub-periods. As discussed before, some literatures find the exchange rate can significantly influence the tourism demand (Webber, 2001; Wang et al., 2008; Kuo et al., 2009), however, there still exist other literatures that suggest no significant impact from the exchange rate to the tourism demand (Vanegas and Croes, 2000; Croes and Vanegas, 2005; Quadri and Zheng, 2010). The inconsistency of these results may suggest the causality between the exchange rate and the number of inbound tourists may varying over time.

We use the Augmented Dickey-Fuller test (ADF test) proposed by Dickey and Fuller (1981) and the Phillips-Perron test (PP test) proposed by Phillips and Perron (1988) to test the stability of ER and TOUR. Table 1 shows the corresponding result. Both the ADF test and the PP test accept the null hypothesis of non-stationarity for ER and TOUR of China in levels. As a result, we further test their stability in first difference, and the result shows that both of them are stationary, which suggests both ER and TOUR are $I(1)$ process. As a result, the first difference of ER (ΔER) and TOUR ($\Delta TOUR$) are utilized for the next investigation. We can test the full-sample causal relationship between the two variables using the VAR model. The bivariate VAR model of ΔER and $\Delta TOUR$ is constructed as in Equation (5). The optimal lag length based on Schwarz information criterion (SIC) of the VAR model is 1. The full-sample causality results based on the RB-based modified-LR causality tests are reported in Table 2. According to the bootstrap p -values, the results of the sample causality test show that there is no causal relationship between the two variables. This finding is inconsistent with some of the existing literature (Falk, 2015) and argues that the exchange rate has a positive effect on inbound tourism.

Table 1. Univariate unit root tests

Variable	Levels		First differences	
	ADF	PP	ADF	PP
ER	1.671 [0]	0.837 (6)	-8.773 [0]***	-9.034 (6)***
TOUR	-2.885 [2]	0.597 (2)	-12.732 [1]***	-22.447 (4)***

Notes: *** indicates significance at the 1%.

[] indicates the lag length in the ADF test equation based on SIC and () indicates bandwidth in the PP test using the Bartlett kernel.

Table 2. Full-sample Granger causality test

Tests	H_0 : ΔER does not Granger cause $\Delta TOUR$		H_0 : $\Delta TOUR$ does not Granger cause ΔER	
	Statistics	p -values	Statistics	p -values
Bootstrap LR Test	0.111	0.780	0.084	0.800

Note: All statistics are calculated with using 10,000 bootstrap replications.

However, there is a default assumption in the previous literature that in time series structural changes do not exist and there is only a single causal relationship across the whole sample period (Chen, 2006). In the presence of structural changes, the parameters in the above VAR model estimated using full-sample data will shift with time. The causal relationship between ΔER and $\Delta TOUR$ will accordingly be unstable. Therefore, the full-sample causality tests with assumptions of parameter constancy and a single causal relationship across the whole sample period are no longer reliable and the ensuing results prove to be meaningless (Chen, 2007). For this reason, this paper proceeds to test for parameter stability and to determine whether structural changes exist. As mentioned before, we use the Sup- F , Mean- F and Exp- F tests (Andrews, 1993; Andrews and Ploberger, 1994) to investigate the temporal stability of parameters in the above VAR model. The L_c test developed by Nyblom (1989) and Hansen (1992) is also utilized to test for all parameters in the overall VAR system. The corresponding results are reported in Table 3. The Sup- F tests under the null hypothesis of parameter constancy against a one-time sharp shift in parameters are reported in the first row. The Mean- F and Exp- F tests under the null hypothesis that parameters follow a martingale process against the possibility that the parameters might evolve gradually are reported in the second and third rows, respectively. The Sup- F test suggests that a one-time sharp shift exists in ΔER equation at the 1% level

and exists in the VAR system at the 5% level. The Mean- F test and the Exp- F test suggest that equations from the ΔER and the VAR system may evolve gradually with time. The L_c statistics test against the alternative that the parameters follow a random walk process proposed by Gardner (1969), indicative of parameter non-constancy in the overall VAR models estimated. As a consequence, these results provide robust evidence that the parameters of the estimated VAR model using full-sample data show short-run instability.

Table 3. Parameter stability tests

	ΔER Equation		$\Delta TOUR$ Equation		VAR (1) System	
	Statistics	Bootstrap p -value	Statistics	Bootstrap p -value	Statistics	Bootstrap p -value
Sup- F	18.617***	0.007	9.886	0.220	20.661**	0.040
Mean- F	9.350***	0.004	3.443	0.307	12.449**	0.013
Exp- F	5.839**	0.013	2.626	0.223	7.780**	0.026
L_c					2.155***	0.009

Notes: We calculate p -values using 10,000 bootstrap repetitions.

** and *** denote significance at 5% and 1%, respectively.

Hansen-Nyblom parameter stability test for all parameters in the VAR (1) jointly.

Based on the above parameter stability tests, we can conclude that models estimated using full-sample data are unstable because of the presence of structural changes. This means that the result of absence of any full-sample causality between ΔER and $\Delta TOUR$ is not credible. To take into account structural changes, we employ rolling-window estimation to test their causality. Unlike the full-sample causality test, this approach tests the causal relationship between two variables more accurately for the reason of time varying across different sub-samples. In the sub-sample causality test of the rolling window, we use the RB bootstrap-based modified-LR causality test to check the causal relationship between ΔER and $\Delta TOUR$. The null hypothesis of the tests indicates that ΔER does not Granger cause $\Delta TOUR$ and vice versa. The bootstrap p -values of LR statistics can be estimated from the VAR models in Equation (5) using the rolling sub-sample data including 24-month observations⁽¹⁾. After trimming 24 months observations from the beginning of the full sample, these rolling estimates move from 2008:01 to 2015:12.

Figure 2 shows the time-varying causality from ΔER to $\Delta TOUR$. The causality does not significant in most periods at 10% significance. However, different from the full-sample causality test, there do exist causality in some sub-periods (2010:02-2010:04, 2011:08-2011:11; 2013:06-2014:02; 2014:10-2015:08). Figure 3 shows the coefficient that ΔER impact on $\Delta TOUR$. During the time periods that the causality is significant, we find that ΔER positively cause $\Delta TOUR$ in 2010:02-2010:04 and 2011:08-2011:11, which suggests that $\Delta TOUR$ will increase when the RMB devaluates. Furthermore, we find that ΔER negatively cause $\Delta TOUR$ in 2013:06-2014:02, which suggests that $\Delta TOUR$ will increase when the RMB appreciates. The impact of ΔER on $\Delta TOUR$ is significantly negative in 2014:10-2015:05, and it turns to positive in 2015:06-2015:08, which further proves the complexity of this causality. In 2010, countries gradually recovered from the 2008 financial crisis. During this period, the trade between China and Vietnam has increased markedly, and further cause an increase of business contacts between China and Vietnam (Nasreen and Anwar, 2014). Based on the China tourism industry analysis report in 2011, there is a large amount of inbound tourists concentrate in the border area in 2010, and most of them

are business travel. Furthermore, in 2010, China successfully hosted the world exposition in Shanghai and the Asian Games in Guangzhou, which also plays a certain role in attracting foreign tourists. In 2011:11, China successfully holds the “2011 Chinese culture tour” that attracted foreign tourists to some extent. Furthermore, the largest earthquake in the northeastern region of Japan, the ensuing tsunami and the Fukushima Daiichi nuclear power plant leaks changed the tourist pattern of European and American tourists in Asia to a great extent. Before 2015, though the RMB has maintained a steady trend of long-term appreciation, tourism industry continues to flourish and inbound tourism continues to grow. In 2013, the exchange rate still maintains a downward trend, and China's inbound foreign tourist market dropped slightly. Based on the Statistics Bulletin of China tourism industry in 2013, the total number of foreign tourists entering the country is about 26 million, which is 3.3% lower than that in 2012. The main reason is that the details of the city environment (such as the natural environment, barrier free facilities, water supply and water quality) has declined. The appreciation of the RMB exchange rate is also likely to decline of the tourism industry affected to a certain degree. However, the RMB has maintained a long-term appreciation trend since 2010, which indicates that ΔER is not the main factor of reduction of $\Delta TOUR$. In 2015, the RMB has strong devaluation expectations caused by the tapering of quantitative easing policy in the U.S. and the downward trend of China's economy (Yu et al., 2017). The uncertainty of exchange rate changes intensifies the cost of inbound tourism. Furthermore, it reflects the shock of the national economy in the transition period, and is not conducive to the steady growth of $\Delta TOUR$. We also test the time-varying causality from $\Delta TOUR$ to ΔER , the result is shown in Figure 4 that $\Delta TOUR$ does not Granger cause ΔER in most periods. It is obvious that $\Delta TOUR$ has smaller impact on ΔER . As an important macroeconomic variable, the exchange rate is more affected by international payments, foreign exchange reserves, the interest rate, the inflation and the political situation (Hooper and Kohlhagen, 1978; Meese and Rogoff, 1988; Calvo et al., 1993; Taylor, 2001; Fischer, 2001).

Figure 2. Bootstrap p -value of Rolling Test from ΔER to $\Delta TOUR$
Null Hypothesis: ΔER does not Granger Cause $\Delta TOUR$

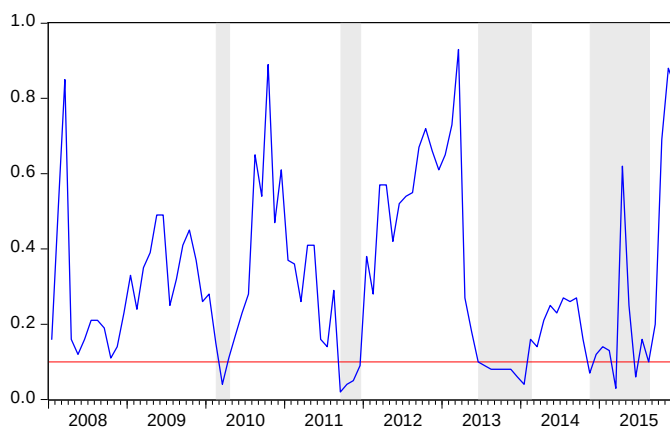


Figure 3. Bootstrap Estimates of the Sum of the Rolling Window Coefficients for the impact of ΔER on $\Delta TOUR$

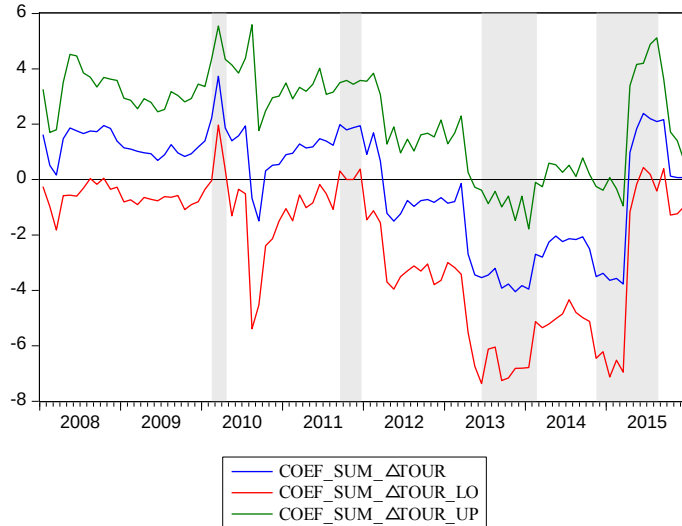
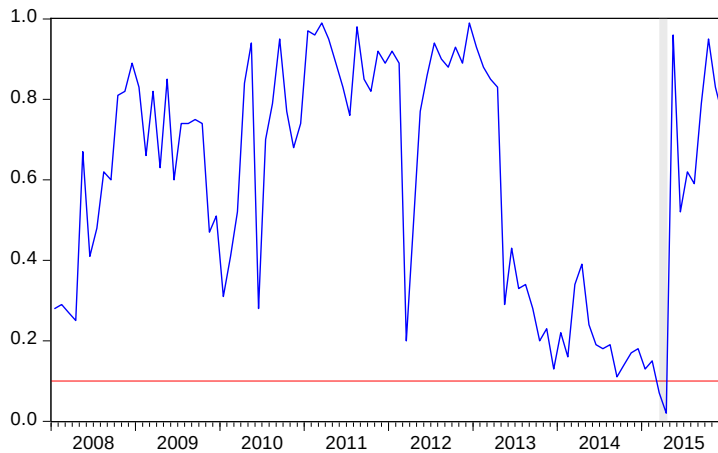


Figure 4. Bootstrap p -value of Rolling Test from $\Delta TOUR$ to ΔER
Null Hypothesis: $\Delta TOUR$ does not Granger Cause ΔER



In this paper, the bootstrap Granger full-sample causality test and sub-sample rolling-window estimation provide additional insight into the dynamic relationship between ΔER and $\Delta TOUR$ in China. In general, this relationship is not always consistent with the view that the number of inbound tourism changes with the exchange rate movement in the same direction. Although many literatures have made some differential conclusions in horizontal cross-country comparisons (Kuo et al., 2009; De Vita, 2014), this paper still finds some more profound conclusions in the longitudinal temporal dimension. The most obvious is the time-varying property between ΔER and $\Delta TOUR$, which suggests that the changes of the exchange rate is not always the main factor for inbound tourists. In fact, as the parameter stability test shows, there exist a series of structural changes prevalent in the full sample VAR model. Many accidental factors (major infectious diseases, major sporting events,

and sudden international political events) can lead to abrupt structural changes and the time-varying causality between ΔER and $\Delta TOUR$ is the embodiment of these structural changes. These structural mutations are common in China, however, their impact on tourist arrivals is generally temporary (Chen and Hong, 2012). For example, the outbreak of the severe acute respiratory syndrome (SARS) during 2002-2003 in China leads to inbound tourists falling sharply. The damage caused by the SARS virus to China's tourism industry does not begin to recover until 2004. $TOUR$ increases considerably during the 2008 Olympic Games in Beijing and quickly backs to normal levels after 2008:10. These short-term events are more random and often have great impacts on tourism, but do not have lasting impacts. In addition to sudden structural changes, the mean- F test shows that the parameters in the exchange rate equation also exist long-term gradual changes. This kind of gradual change is more likely to continue to influence the relationship between ΔER and $\Delta TOUR$, and then the time-varying nature caused by these may show a certain regularity with the gradual change of these parameters. In fact, as can be seen in Figure 2, the time-varying relationship between ΔER and $\Delta TOUR$ shows a certain regularity. Specifically, It was not until 2010 that the impact of ΔER on $\Delta TOUR$ begins to appear (2010:02-2010:04), but only for 3 months. This impact extends to 4 months in 2011 (2011:09-2011:12). As discussed above, China pursues a fixed exchange rate system pegged to the US dollar since 1994. It was not until 2005:07 that a managed floating exchange rate system is introduced with reference to a basket of currencies. Though the RMB exchange rate fluctuation range is expended from 0.3% to 0.5% in 2007, the exchange rate flexibility is still insufficient to attract enough attention of inbound tourists. The time range of ΔER affecting $\Delta TOUR$ further increases to 9 months (2013:06-2014:02) since the People's Bank of China expands RMB exchange rate fluctuation range is expended to 1%. It can be inferred that the time range of ΔER affecting $\Delta TOUR$ is increasing synchronously with the development of the exchange rate regime. This regularity is further confirmed after 2014 when the RMB exchange rate is further expanded (1% to 2%). At the end of 2014, the time range of this effect further increases to 10 months (2014:11-2015:08). In fact, inbound tourists will be more concerned about changes in travel costs resulting from exchange rate changes when its flexibility continues to increase (Santana-Gallego et al., 2010). Although Tang et al. (2016) suggests that exchange rate volatility is not the main reason for the change in inbound tourism of China, our research shows that the impact of exchange rate is increasing as its flexibility continues to increase.

5. Conclusions

This study investigates the causal relationship between the exchange rate and the inbound tourism using a bootstrap full-sample Granger-causality test and sub-sample rolling window-causality estimation in China. The full-sample Granger-causality test provides no evidence that the changes of the exchange rate can cause the change of inbound tourist arrivals. However, taking the presence of structural changes in full-sample data into consideration, parameter stability tests find that the short-run relationships is unstable. Then, we use the bootstrap rolling window method and we do find there exist unidirectional causal relationship from the changes of the exchange rate to the changes of inbound tourist

arrivals. Specifically, the impact of the exchange rate to inbound tourist arrivals shows a regular time-varying property. The influence of exchange rate on the number of inbound tourists is increasing with the increase of China's exchange rate flexibility. The result suggests that government policies need to increase the role of the exchange rate in promoting tourism with the marketization of RMB. On the other hand, the result also helps to make tourism agents pay more attention to exchange rate and to re-evaluate the changes in tourism costs resulting from changes in RMB in the future.

Note

- ⁽¹⁾ We also test the causal link using 20-, 30-, and 36-month window widths, and the results are similar to those from the causality test based on the 24-month window, which further indicates that the results in this paper are robust. The details are available upon request from the authors.

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The effects of Turkish-Russian political relations on bilateral trade balance: Cointegration and causal analysis⁽¹⁾

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Abstract. *The development of political relations between countries usually causes some changes in the volume of countries' foreign trade with each other as well. In this context, every worsening of political relations between the countries is supposed to reduce the foreign trade volume, as well as the betterment of political relations is expected to increase it. Therefore, countries willing to benefit from foreign trade have to maintain good political relations with the other countries. In this paper we examine long run determinants of the trade balance between Turkey and Russia, giving particular thought to the influence of the political relations between two countries on their foreign trade. The model is conducted by using quarterly data over the period from 1996 to 2016. The paper confirms the existence of long run negative relationships between real effective exchange rates, foreign policy crises and trade balance. However, the influence of foreign policy successes turned out to not have any significant effects on the trade balance.*

Keywords: trade-politics relationship, trade balance, Turkey-Russia political relations, cointegration analyse.

JEL Classification: F14, F50, C50.

1. Introduction

Nowadays foreign trade undoubtedly takes an important place in any country's economy. A lot of researches on the factors determining the volume and the structure of foreign trade have been done. Detecting these determinants most of the researchers focuses on the real exchange rate, GDP, relative price and other economic indicators. However, it must be accepted that not only economic factors, but also political relations between involved into the international trade countries has a great influence on their bilateral foreign trade.

In principle, economics and politics are used to be two different sciences, concentrated on absolutely different things. Following the basic theory, economical decisions are been taken without any regard to politics, while politicians, taking economic indicators as given, are developing country's politic strategy. Since the time economic tools have become one of the main leverages on the political arena, economic and political governance are being inextricably linked. Thus, theories of international relations appeared, combining both economic and political aspects of relations between different countries.

Theoretical discussions on international political economy are generally held within the framework of Liberal and Realistic theories. These theories have different points of view on the place of the foreign trade in the international relations system. Focused on both the individual and the state Liberals see foreign trade as a vehicle to achieve state's main goal, which is maximization of social welfare. As the foreign trade takes an important part in the social welfare⁽²⁾, globalization and peace are strongly supported in order to keep international trade volume on track. In other words, according to the liberals, trade relations induce countries to develop political relations. The basic assumption here is that the importance countries give to trade relations prevents trade partners from entering conflicts and foster improving of political relations between them (Çakmak and Ustaoglu, 2017, pp. 304-305). So we can say that, in Liberals opinion, political relations between countries are determined by economical purposes. As for Realists, the most important actor in international relations is the state. With the main goal of political power maximization, trade is considered as one of many instruments available to states in their pursuit of power. The realist view is that all foreign policy, including trade, exists for the purpose of achieving national security or power, so trade relationships are seen as temporary arrangements that can be easily broken when conditions necessitate other strategies to secure national interests (Barbieri, 2003. pp. 18-19). In this case, economic relations are determined by political decisions of countries. Hence, evaluating two different approaches mentioned above, it can be said that the importance given to the foreign trade determines political relations between countries; at the same time political decisions, including the level of country's national security and power, also affects the bilateral trade balance.

Debates about the relationship between Political Relations and Bilateral Trade are also linked to the democratic peace theory. According to this theory, democracies never appeal to fight each other, and often prefer to resolve all the conflicts by establishing peace (Çakmak and Ustaoglu, 2017, p. 305). According to Polachek (1997, p. 296), it's difficult for democracies to take the decision to fight, but non-democracies such as

dictatorships need less justification to go to war. The fundamental factor of democracies' unwillingness to fight is the level of their foreign trade. Indeed, trading partners are less combative than nations which are not connected with trade relations, as countries are trying to preserve the wealth gained through the international trade. The results of another study made by Oneal and Russett (1999), which applies the dyadic time-series analysis for 1950-1992 years, also confirm that economic interdependence and joint democracy have important pacific benefits.

There are numerous empirical studies trying to define the determinants of bilateral trade between countries. However, the majority of them are concentrated on the dependence of the foreign trade on the currency exchange rates. One such study exploring the correlation between real exchange rate and the export volume using econometric analysis methods was Mookerjee (1997), applied Granger causality analysis for data on India 1970-1992. However, in the long term no causality relationship between India's export volume and RER was found. Similarly Wilson and Tat (2001) didn't come up with any significant results on the correlation between trade balance and RER while applying cointegration analysis to data on Singapore and USA 1970-1996. Another research on the exchange rate effects on the trade balance obtained significant results was Lal and Lowinger (2002), examining the determinants of trade balances of seven East Asian countries, using cointegration technique, error correction model and impulse response function, they confirmed the existence of a positive effect of NEER on the trade balance.

As studies on the effect of the exchange rate on the foreign trade appears not to give unequivocal results, thoughts about other affecting on the foreign trade factors' existence emerges among researchers. Therefore, in following years researches, supplementing the standard model of the trade balance, the exchange rate and the gross domestic product correlation with other variables, arose. However, there is still a limited number of empirical studies defining political relations between countries as one of determinants of the foreign trade. Pollins (1989), in the study examining the relation between international politics and bilateral trade flows for 25 countries, including Turkey and Russia, for the period of 1960-1975, concludes that broad political relations of amity and enmity between nations significantly influence foreign trade flows. Polechek (1997), first exploring the relationship between political events and foreign trade for the period of 1948-1978, later examined the relationship between democracy, conflict and cooperation for the period of 1958-1967. The obtained results confirm that the main factor in causing bilateral cooperation is trade. Countries strive for saving the wealth accumulated from the international trade, therefore trading partners are not willing to fight, unlike nontrading nations. Democratic dyads are more involved into foreign trade comparing to non-democratic dyads, and thus exhibit less conflict and more cooperation. Keshk et al. (2004) design the model applying Maddala's estimator⁽³⁾ to estimate recent histories of dyadic trade and conflict. Results of the study show that political conflict indeed restricts foreign trade while the effect of dyadic interdependence on the likelihood of conflict is statistically insignificant. These results imply the possibility that liberal claims about interdependence and conflict are being controversial. Kim and Rousseau (2005), analysed a dataset consisting 223 international disputes between pairs of countries over a period from 1960 to 1988 years. The results show that liberals who claim that peace is promoted

by international interdependence are incorrect; while international conflict reduces economic interdependence. Goenner (2011), basing on empirical studies of Kim and Rousseau (2005) and Keshk et al. (2004), made his own research emphasizing that both relevant and exogenous tools should be used to achieve consistent results. The results indicate that trade has a negative and significant influence on political conflicts, as well as political conflicts has a negative and significant effect on trade, reducing its likelihood. Armstrong (2012), in his study analyse performance of the trade relationship between Japan and China under conditions of political tension using the gravity model. However, the researcher came up with conclusion that political conflicts do not affect foreign trade to a significant extent. Berger et al. (2013), also applied log gravity model of trade to analyse the trade relations of US with 166 other countries in the 1947-1989 Cold War period. In this study researchers provide evidence that increased political influence of United States during the Cold War was used to establish a larger foreign market for American products. In another study Bove et al. (2013), explored bilateral trade between U.S., as the world's largest trading nation and a global power, and other countries for the period of 1950-2010. Results of the study detect that troop deployments and bilateral foreign military financing tools have significant, positive impacts on the shares of bilateral trade between the U.S and the recipient country. Davis et al. (2015), made an analogous study applying the gravity model of trade for China and India. Results of this research indicate that worsening in the political relations between trade partners decrease imports to China and India respectively. Besides, the magnitude of this change is greater in the state-controlled sector of the economy compared to the private sector. Rasoulinezhad (2016) made a research on sanctions and oil price effects on the Iran-Russia trade by using the gravity model. In addition to the regular variables, such as GDP, GDP per capita and transportation cost, dummy variables, representing financial and non-financial sanctions and global oil price shocks had been added to the model. The negative effects of sanctions and oil price shocks on the bilateral trade volume were proved. Çakmak and Ustaoglu (2017), in their study examine if any significant change in political relations between Turkey and Israel influence on their bilateral trade. Results they achieved show that at times of enhanced diplomatic relations between countries, trade relations were sufficiently strengthened as well, whereas with the worsening of political relations between countries, significant decline was observed in the volume of bilateral foreign trade at some critical points. However, this does not regard to a constant decline and is limited to some serious diplomatic crises in bilateral relations.

When dealing with the course of Turkish-Russian relations, in the early ages foreign trade volumes between Osman Empire and Russia were steadily high despite numerous wars and political disagreements between countries. As politics is about states, but foreign trade is about individuals, no strong connection had been seen between these two aspects. International relations between Turkey and Russia certainly supported the Liberal theory. However, over time, after the wide range of legislative leverages over trade were made available to the government (such as the introduction of quotas, the imposition of sanctions, etc.), foreign trade between Turkey and Russia have become very dependent on political relations. So nowadays it can more likely described from the Realists' view.

In this research the connection between economic and political relations is explored on the example of Turkey and Russia relations in the period from 1996 to 2016. The research consists of 3 main parts. In the first part, titled introduction, theoretical background and empirical literature are discoursed. The second part gives a brief history of political and economic relations between Russia and Turkey. In the third part of the work the econometric cointegration model exploring the dependence of the trade balance on the political relations betterment and worsening was constructed and tested. The main results drawn from both theoretical and practical parts of the work are given in the conclusion. Thus, we will test if the development trend of the Turkey-Russia foreign trade balance has any breakage at the times of important changes in political relations between countries. In case both betterment and worsening events occurred in political relations in the same period, it's important to determine which one of them has a stronger effect.

2. Turkey-Russia relations review

The origins of Russian-Turkish relations are deeply rooted in the past. In this part, Turkey-Russia relations will be reviewed first in the political, then in the economic context.

2.1. Political relations

The historical background of Turkey-Russia relations (before 1991 period)

The relations between Turkey and Russia, both of which have many common features, predetermined by their respective histories, geographical locations and cultures, are deeply-rooted. Historians hold that Turkey-Russia political relations began with the formal letter on the maritime trade sent by Russian Czar Ivan III to Sultan of the Ottoman Empire Bayezid II in 1492 (The Encyclopedia Britannica, 1911, p. 446). Official diplomatic relations between countries were established in 1701, when the Embassy of Russia was opened in Constantinople (St. Petersburg Offers, 2015, p. 20).

Since the very beginning, bilateral relations between Turkey and Russia had been tense. In total between the 16th and 20th centuries there were 17 wars fought between the Russian Empire and the Ottoman Empire (Aydintasbas, 2016, p. 2). However, with the collapse of the Ottoman Empire and Russian Tsar Empire in the early 20th century, newly established Soviet Union under Vladimir Lenin and modern Turkey founded by the Turkish General Mustafa Kemal Ataturk were trying to improve good-neighbourly relations and cooperation with each other (Kurban, 2017, pp. 32-34). Nevertheless growing ambitions of the both countries and difficulties appeared during the 2nd World War and the Cold War caused the re-emergence of instability in their relations. In 1952 Turkey joined NATO, placing itself within the Western alliance against the Warsaw Pact (Dumont and Verluise, 2016). So in the political context, the Soviet Union-Turkey relations entered into a secession period.

Turkey-Russia political relations during the 1990s

Nonetheless, after the dissolution of the USSR in the sake of Boris Yeltsin's victory in 1991 and the recognition of the Russian Federation as the successor of the USSR by the

Turkish government, intense efforts were undertaken to transform Turkey-Russia century-long geopolitical disputes into a geo-economic partnership.

In 1992 the Minister of Foreign Affairs of Turkey Hikmet Çetin made the first in the history official visit from Turkey to Russia. During this visit the “Treaty on the Principles of Relations between the Republic of Turkey and the Russian Federation” was signed (MFA, 2017a). In the short period of 1992-1996 in total 15 agreements and protocols on science and technology, education, culture, economic cooperation and armed forces exchange programs were signed by Turkey and Russia (Özdal et al., 2013, p. 20).

However, in spite of apparent improvement of Russian-Turkish political relations, Ankara and Moscow continued to tussle over certain political disagreements. In particular, Turkey and Russia supported opposite sides in the conflict between Armenia and Azerbaijan over Nagorno-Karabakh, which arose in 1988 due to territorial claims of Armenia against Azerbaijan. Russia takes a stance in favor of Armenia, which is an important outpost of Russia, while Turkey, for its part, fully supports its strategic partner, Azerbaijan. In May 1994, the conflict parties reached the ceasefire, and so far unsuccessful peace negotiations are still being held without bringing involved parties any closer to a solution of this “frozen” conflict.

A bigger challenge was the 1st and the 2nd Chechen wars, fought from December 1994 to August 1996 and from August 1999 to April 2009, where Russia accused Turkey of backing separatist rebels. Thus, Chechen anti-government groups had begun receiving military assistance from Turkey before the first fight was opened in Chechnya (Gorsky, 1997, pp. 49-53). Later, on January 16, 1996, in Trabzon, Turkey a ferry *Avrasya* carrying 255 Russian passengers was taken over by Turkish gunmen who were seeking to publicize the Chechen cause. Luckily, the incident was resolved through negotiations and the hijackers surrendered without any fatalities being inflicted (New York Times, 1996). The second sensational terrorist attack carried out by Chechen and strongly connected with Russia-Turkey relations, happened on 15-16 March 2001 during the 2nd Chechen war. In this attack Tu-154M plane, belonging to Russian “Vnukovo Airlines”, on a flight from Istanbul to Moscow was hijacked by three Chechens, who had the crew fly the aircraft to Saudi Arabia. Three people – believed to be one of the hijackers, a Russian air stewardess and a Turkish passenger – were killed (BBC News, 2001). In addition to the three hijackers, there were up to 5 accomplices of terrorists among the passengers of the aircraft. One of accomplices was later identified as a Turkish terrorist Ertan Coşkun, who took part in the terroristic attack on the ferry “*Avrasya*” in 1996 (FSB, 2001).

However, despite obvious political differences on geo-political issues, both countries understood the importance of economic cooperation with each other. This fact did not allow Russia and Turkey to step into the open confrontation and facilitated generally positive disposition last throughout the Russian President Boris Yeltsin system (1991-1999). On 5-6 November 1999 during an official visit of Turkish Prime Minister Bulent Ecevit to Moscow on the eve of the Russian storm of Grozny (Chechnya), several important agreements were signed. The agreements included a “Joint declaration on anti-terrorism” and a formal commitment to the Blue Stream project, an ambitious effort to pipe Russian natural gas to Turkey under the Black Sea (Reynolds, 2002). The Blue

Stream Pipeline Project played an important role in comforting the political relations between Turkey and Russia.

Thus, it can be concluded that at the end of decade, Russia and Turkey became important for each other states, whose relations were based on common regional interests and energy politics.

Turkey-Russia political relations: the current situation

After Vladimir Putin was elected as the President of the Russian Federation in January 2000 and the Justice and Development Party (AK Party) came to power in Turkey at the end of 2002, remarkable improvements had been achieved in the political relations between Turkey and Russia. In this period, two countries relations that have historically seen each other as rivals have turned to partners, increasing multilateral co-operation by means of the governments' initiatives and the rapidly expanding commercial relations (Özdal et al., 2013, p. 21).

Willingness of Russia to lead political relations with Turkey to a new stage became clear yet in October 2000 during the official meeting of Russian Prime Minister Mikhail Khazyanov to Ankara, where he claimed that: "Our main mutual conclusion is that Russia and Turkey are not rivals but partners, and from now on our governments will be built on this basis" (Freedman, 2002). Later the Russian Foreign Minister Igor Ivanov and the Turkish Foreign Minister Ismail Cem signed the "Action Plan to Develop Cooperation between the Russian Federation and Turkey" in November, 2001 (Arafat and Alnuaimy, 2011), which also ensured settling close cooperation on Russia and Turkey in Eurasia. The reformed position of Turkish government first of all appeared in the party program, claiming that "the relations established with the Russian Federation, Central Asia and the Caucasus will be based on friendly cooperation rather than competition" (Ak Parti Kalkınma and Demokratikleşme Programı, 2002, p. 107).

The positive trend in Russian-Turkish relations was supported by the visit of the President of Russian Federation Vladimir Putin to Ankara on 5-6 January 2004. As through the history of Russian-Turkish relations it was the first visit of the Russian leader of such a caliber to Turkey, this visit had a great historic significance. During this official visit 7 important agreements on various sectors (such as oil and gas, nuclear power industries) were signed and adopted, one of them was a "Joint Declaration on increasing friendship and multilateral partnership between the Russian Federation and the Republic of Turkey" (Russia Presidential Executive Office, 2004).

Nonetheless, despite the apparently serene and exceptionally positive attitude of Russia and Turkey to each other, fundamental geo-political disagreement had still been staying unsolved. So, in addition to already mentioned above the Chechen war issue, the Cyprus dispute arose between the countries. Turkey's military actions was followed by the negative reaction of UN, and, thereafter, of Russia as one of UN's members (Belokrenitsky et al., 2010). In 2004 Russia has declared support for the plan put forward by UN Secretary General Kofi Annan to create a new state of the United Republic of Cyprus, divided into two autonomies, what was an inconsistency with the foreign policy of Turkey. In addition, in April 2004, Russia used its veto to block a resolution that

sought to outline new UN security arrangements in Cyprus in case of positive results of Cyprus referendum (Lederer, 2004).

The meeting of the Turkish President Abdullah Gul (elected in 2007) and the Russian President Dmitry Medvedev (elected in 2008) in Moscow in 2009 was a sign of further development Turkey-Russia relations. During this meeting a “Joint Declaration between the Republic of Turkey and the Russian Federation on Progress towards a New Stage in Relations and Further Deepening of Friendship and Multidimensional Partnership” has been issued (MFA, 2009). In a response to the Turkish President Abdullah Gul’s visit to Moscow, the Russian President Dmitry Medvedev paid a three-day official visit to Turkey in May 2010. During this visit, Medvedev held meetings with both the Turkish President Abdullah Gul and the Prime Minister Erdogan, and signed 17 agreements, including agreements on the lifting of visa requirements, trade, agriculture, customs, transportation, tourism and the construction of a nuclear power plant in Turkey ([http1](http://1)). The final step towards the visa-free travel scheme admission were implemented on the 16 March 2011, during the visit of the Turkish Prime Minister Erdogan to Moscow, the entry into force of an agreement between the Government of the Russian Federation and the Government of the Republic of Turkey on the conditions of mutual trips of citizens was declared (Russian MFA, 2011). This step is recognized as one of the greatest achievements in the Russian-Turkish relations in recent years.

However, not just positive agreements, but also one more conflict (albeit not public, but quite significant) happened between Turkey and Russia during those years. In August 2008 the Russia-Georgia war happened. During this war, when NATO and US ships made attempts to enter the Black Sea, making the excuse of wanting to take aid to Georgia, Turkey vice versa earned Russian recognition for remaining neutral, for making peace efforts. It’s obvious that Turkish Prime Minister Recep Tayyip Erdogan played key role in restraining of this war (Torbakov, 2008). Talking about reasons of such an involvement of the Turkey into this war, it must be admitted that as its two essential partners were involved into this conflict, situation became a particular challenge for Turkey. Although Russia’s invasion of Georgia destroyed the Caucasus precarious status quo that Ankara was deftly taking exploiting in pursuing its political and economic ends in the region, Turkey was not in a position to openly confront Moscow (Torbakov, 2008). Still, even though Turkey's apparent dissatisfaction with Russia's actions in Georgia was not avowedly expressed, it had certain influence on the relations between the two countries.

The positive dynamic in development of Russian-Turkish relationships was confirmed by the Turkish Prime Minister Recep Tayyip Erdogan by expressing an acute interest in the membership of Shanghai Cooperation Organisation (SCO) for further expansion of Turkey’s state interest. The Shanghai Cooperation Organisation approved Turkey’s application to become a Dialogue Partner in June, 2012 (MFA, 2001). Turkey understands the need to have a constructive dialogue with Russia, a major member of the organization.

Nevertheless, the Syrian conflict undermined all the efforts in maintaining friendly relations between countries made by Russian and Turkish leaders throughout the 21st

century. Turkey and Russia have totally opposite view points on the Syrian issue. On 24 November 2015, Turkish-Russian bilateral relations were totally destroyed after Turkey shot down Russian Su-24 warplane close to the Turkish-Syrian border (BBC News, 2015). In the result of this incident, sanctions against Turkey were imposed, including the abolition of charter flights between Russia and Turkey and suspending the visa-free regime for Turkish citizens, traveling to Russia. However, after the President of Turkey Recep Tayyip Erdogan officially apologized for this shot down in June, 2016, the relations between Russia and Turkey got under way to the betterment.

Though relations between leaders Vladimir Putin and Recep Tayyip Erdogan began mending their differences, in December, 2016 Russian-Turkish relations faced one more crisis. Russia's Ambassador to Turkey Andrei Karlov was killed in a gun attack in Ankara at the opening of a photographic exhibition. After this attack The Turkish President Erdogan said: "This is a provocation to damage the normalisation process of Turkish-Russian relations. But both the Russian and Turkish administrations have the determination not to fall for this provocation" (ABC News, 2016).

Table 1. *Turkey-Russia political relations overview*

	Turkey-Russia political relations
Positive events	1992 – The first in the history official visit from Turkey to Russia made by Hikmet Çetin 1999 – commitment of the Blue Stream project 2001 – Signing of the "Action Plan to Develop Cooperation between the Russian Federation and Turkey" 2004 – the visit of the President of Russian Federation Vladimir Putin to Ankara 2009 – the meeting of the Turkish President Abdullah Gul and the Russian President Dmitry Medvedev 2010 – Dmitry Medvedev's official visit to Turkey 2011 – admission of the visa-free travel scheme between Turkey and Russia 2012 – The Shanghai Cooperation Organisation approved Turkey's application to become a Dialogue Partner 2016 – Recep Tayyip Erdogan officially apologized for the Russian plane shot down
Negative events	1994 – the conflict between Armenia and Azerbaijan over Nagorno-Karabakh. 1996 – hijacking of the "Avrasya" ferry 2001 – hijacking of the Tu-154M Russian plane 2004 – the Cyprus dispute 2008 – Russia-Georgia war 2015 – Turkey shot down Russian Su-24 warplane 2016 – Russia's Ambassador to Turkey Andrei Karlov was killed

Source: Developed by authors.

In conclusion, we can say that diplomatic relations between Turkey and the Russian Federation has been improving since the early 2000's. The increasing number of official visits, and the meetings held at Presidential or Prime Ministers level show that a huge importance is given to the relations between the two countries. However, numerous geopolitical crises have become a factor regarded as the decisive criterion in assessing the authenticity of the expanding relations between Turkey and Russia. Only time will tell whether Turkey and Russia allow the crises to affect their relationship or despite their dissents continue to strengthen bilateral relations.

2.2. Economic relations

Towards the end of the 20th century Turkey and Russia gathered sufficiently important experiences in trade and economic cooperation. Thanks to the economic relations, the traditional persuasion about Turkish-Russian bilateral relations being conflictual was replaced. The main drivers for the establishment of good economic relations between

Turkey and Russia were mutual economic interests and scientific-technical potential of the both countries.

Modern Russia-Turkey economic relations are based on the “Agreement on Trade and economic Cooperation” signed in 1991. Another critical agreement for the economic relations between Turkey and Russia was the “Agreement on Avoidance of Double Taxation” signed in December, 1997 (Arafat and Alnuaimy, 2011, p. 117). After 1998 financial crisis in Russia the bilateral trade relations have been moved to a negative direction for Turkey. Looking at the data in the Table 2, the level of Turkey export to Russia sharply decreased in 1999, while the level of import from Russia is consistently increasing through the late 90’s. The trade balance of Turkey badly fell down from 0.62 in 1998 to 0.24 in 1999. Though, beginning from the year 2000, Turkish exports to Russia again tended to increase, till now countries bilateral trade balance couldn’t reach the level of 1998.

Table 2. *Turkish-Russian foreign trade volumes (1996-2016)*

Years	Turkey's export to Russia volume		Turkey's import from Russia volume		Total trade between Turkey and Russia		Trade Balance
	Volume (thousand USD)	Share in the Total Exports of Turkey (%)	Volume (thousand USD)	Share in the Total Imports of Turkey (%)	Volume (thousand USD)	Share in the Total Trade of Turkey (%)	
1996	1,510,005	6.50	1,921,139	4.40	3,431,144	5.13	0.785995
1997	2,056,547	7.83	2,174,258	4.48	4,230,805	5.65	0.945862
1998	1,348,002	5.00	2,155,006	4.69	3,503,008	4.81	0.625521
1999	588,664	2.21	2,374,133	5.84	2,962,797	4.41	0.247949
2000	643,903	2.32	3,886,583	7.13	4,530,486	5.51	0.165673
2001	924,107	2.95	3,435,673	8.30	4,359,779	5.99	0.268974
2002	1,172,039	3.25	3,891,721	7.55	5,063,760	5.78	0.301162
2003	1,367,591	2.89	5,451,315	7.86	6,818,906	5.85	0.250874
2004	1,859,187	2.94	9,033,138	9.26	10,892,325	6.78	0.205818
2005	2,377,050	3.24	12,905,620	11.05	15,282,670	8.03	0.184187
2006	3,237,611	3.79	17,806,239	12.76	21,043,850	9.35	0.181825
2007	4,726,853	4.41	23,508,494	13.82	28,235,347	10.18	0.20107
2008	6,483,004	4.91	31,364,477	15.53	37,847,480	11.33	0.206699
2009	3,189,607	3.12	19,450,086	13.80	22,639,693	9.31	0.163989
2010	4,628,153	4.06	21,600,641	11.64	26,228,794	8.76	0.21426
2011	5,992,633	4.44	23,952,914	9.95	29,945,548	7.97	0.250184
2012	6,680,777	4.38	26,625,286	11.26	33,306,063	8.56	0.250919
2013	6,964,209	4.59	25,064,214	9.96	32,028,423	7.94	0.277855
2014	5,943,014	3.77	25,288,597	10.44	31,231,611	7.81	0.235008
2015	3,588,331	2.49	20,401,757	9.84	23,990,088	6.83	0.175883
2016	1,733,035	1.22	15,162,363	7.63	16,895,398	4.95	0.114298

Source: Constructed based on TÜİK (Türkiye İstatistik Kurumu), Ülkelere Göre İhracat and Ülkelere Göre İthalat.

In terms of Turkish export to Russia at the end of the 20th century, knitted or un-knitted wearing apparels were the first for all times until 1999, also electrical materials, plastics and plastic materials, food sector (especially the cereals) have tended to comprise the majority of the export volume. Talking about import from Russia, doubtless, the main part of its volume was formed from the natural gas. Besides natural gas specifically, mineral fuels, mineral oils and derivatives and iron-steel formed the huge part of Turkey’s import from Russia in 90’s. In summary, “following the boom in trade relations, Turkey has been exporting to Russia mainly services and consumer products and

importing from Russia products of heavy industry, inclusive of military equipment, in addition to fuel materials” (Yanık, 2007, p. 361).

Vladimir Putin’s official appointment as the President of Russia in 2000 had a positive impact on economic relations between Russia and Turkey by reflecting the picture of mutual friendship and trust. In Putin period, the level of bilateral trade has increased to enormous numbers. The main reasons of the foreign trade between Turkey and Russia volume growth were increasing dependence of Turkey from Russian gas and oil, developing of tourism sector in Turkey and expending investments. In 2002, the Russian Federation was the sixth among countries Turkey exports goods to and the third among countries Turkey imports goods from (Arafat and Alnuaimy, 2011, p. 118). In 2008 Turkey’s export to Russia reached 6.5 billion dollars, while import from Russia mounted up to the 31.4 billion dollars, what was the apogee of Turkey-Russia trade in Putin period. There were plans to further increase the total trade volume between Turkey and Russia to 100 billion dollars (Kolobov et al., 2006). However, the issue of the Five Day War in Georgia in August, 2008 and the world economic crisis didn’t let this intentions come true.

In 2009 Turkey’s export to Russia decreased for more than 50% to 3.2 billion dollars, while Turkey’s import from Russia sharply fell to 19.5 billion dollars. Still both countries understood each other’s importance on the economical arena of the region and as bilateral trade between two countries had been based on strategic goods such as energy, arms, agriculture and food, both of the countries were willing to recover cooperation despite political disputes (Yanık, 2007). The countries had been successfully augmenting the bilateral trade volumes till the next crisis in their political relations took a place in 2015.

The shooting down of a Russian Su-24 jet on November 24, 2015 was interpreted as the primary cause of the most spectacular crisis in Russian-Turkish both political and economic relations in the 21st century. Russia’s government took a firm decision to inflict economic punishment on Turkey. As of January 1, 2016, Turkish citizens can no longer travel visa-free to Russia. Russia has banned charter flights between Turkey and Russia and agents were forbidden to sell tours to Turkey, a hugely popular destination among Russian tourists. Turkish firms have been denied access to public contracts, notably in the construction sector, which goes second when it comes to Turkey’s export to Russia. Russian nationals are also prohibited from taking pilot courses in Turkey. Rosselkhoznadzor, Russia’s ubiquitous food safety agency, has barred a good deal of Turkish agricultural imports, from tomatoes and apricots to poultry and salt. Russian companies were no longer allowed to recruit Turkish citizens. In addition, Russia has suspended work on Turkish Stream (a new Black Sea pipeline) that was to boost Russian gas exports to Turkey (Girit, 2016). Deputy Prime Minister Mehmet Şimşek estimated the potential loss for Turkey at 9 billion USD, or 0.3 to 0.4% of Turkish GDP (Hurriyet Daily News, 2015). Indeed, a dramatic drop of 30% of the bilateral Turkey-Russia trade volume (including over 50% decrease of Turkey’s export) can be seen in 2016.

An apology of the President of Turkey Recep Tayyip Erdogan for the jet incident made in June, 2016 not only accelerated the advancement of political relations, but also

contributed to improving the bilateral trade between Russia and Turkey. Sanctions on Turkey were partly lifted, what caused 60% export increase for Turkey at the last quarter of 2016 (based on the data of TUIK). However, the process of complete rebuilding Turkey-Russia bilateral relations will take many more years.

Table 3. *Turkish Export to Russia structure (2016)*

Category	Value (million USD)	Share in the total export to Russia (%)
Edible fruits, nuts, peel of citrus fruit, melons	344.01	20
Machinery, nuclear reactors, boilers	185.83	11
Vehicles other than railway, tramway	170.24	10
Electrical, electronic equipment	93.75	6
Plastics	86.31	5
Articles of apparel, not knit or crocheted	57.60	3
Articles of iron or steel	55.23	3
Articles of apparel, knit or crocheted	45.59	3
Miscellaneous articles of base metal	41.37	2
Fish, crustaceans, molluscs, aquatics invertebrates	40.05	2
Other	602.01	35

Source: Constructed based on United Nations Comtrade Database, International Trade in Goods.

As of the Turkish-Russian trade structure in 2016, fruits head the list of Turkey's exported goods to Russia (20%), followed by machinery (11%) and vehicles (10%). It's clearly seen that the majority of the goods exported by Turkey are manufactured with a high elasticity, except for iron-steel products (Table 3). In this regard, Turkey is more receptive to any changes in economic relations with the Russian Federation.

Talking about Turkey's import from the Russian Federation, mineral fuels and oils are undoubtedly the centerpiece of this trade with 56% of the total Turkey's import from Russia volume. Iron and steel also takes an important place in this trade, making its 15%. Oils and fats, aluminum, copper and cereals are other significant import positions (Table 4). So in the majority Turkey demands from Russia natural resources and raw materials, goods produced by just a limited amount of countries. This fact makes Turkey even more sensitive to any bilateral relations changes due to the deficit of countries supplying the natural resources and increasing demands it. In this respect, Turkey is compelled to firmly set a course towards friendly relations with the Russian Federation.

Table 4. *Turkish import from Russia structure (2016)*

Category	Value (million USD)	Share in the total export to Russia (%)
Mineral fuels, oils, distillation products	8,450	56
Iron and steel	2,240	15
Animal, vegetable fats and oils, cleavage products	728.73	5
Aluminum	626.85	4
Cereals	598.33	4
Copper	511.09	3
Fertilizers	271.98	2
Residues, wastes of food industry, animal fodder	270.60	2
Wood and articles of wood, wood charcoal	220.51	1
Paper and paperboard, articles of pulp, paper and board	159.36	1
Other	1,020	7

Source: Constructed based on United Nations Comtrade Database, International Trade in Goods.

The largest Turkish companies operating in Russian Federation are Zorlu Energy, Enka, Ramenka, Şişecam, BEKO and Vestel. Turkish contracting companies definitely have always been the most active players in the Russian construction business. Turkish contractors have taken over more than 1,920 infrastructural and superstructural projects in Russia worth \$62 billion since 1988. According to The Turkish Contractors Association (TCA) data, Turkish contractors top Russia's list of foreign contractors at 19.4 percent (Dailysabah, 2016).

One more important sector in Russian-Turkish economic relations is tourism. Turkish market has fed the tourism sector for decades, going back to the first investments made in the 1960's. Before shooting down of the Russian jet by Turkey in 2015, the Turkish coast was one of the most favorite destinations for Russian tourists. However, after the total number of Russian tourists visiting Turkey peaked in 2014 at 4,479,049 people, in 2015 it fell to 3,537,428, and was only 766,871 for the 2016 season (Özen, 2016). Fortunately, with the normalization of relations, the Turkish tourism sector now has higher hopes about Russia. Turkish tourism sector leaders are expecting the number of Russian tourists visiting Turkey to peak in 2017 due to competitive prices and the normalization of relations between the two countries (Eraz, 2017).

So, despite Turkey having a deficit of the bilateral trade balance with Russia, mostly caused by the import of energy resources, its income from Russian tourists and civil engineering projects in Russia assist closing the gap. A special attention must be paid to the fact that, as bilateral trade between Russia and Turkey has been always based on strategic goods such as natural resources and food, both of the countries obliged to be more prudent while building their political relations.

3. Empirical application

3.1. Dataset

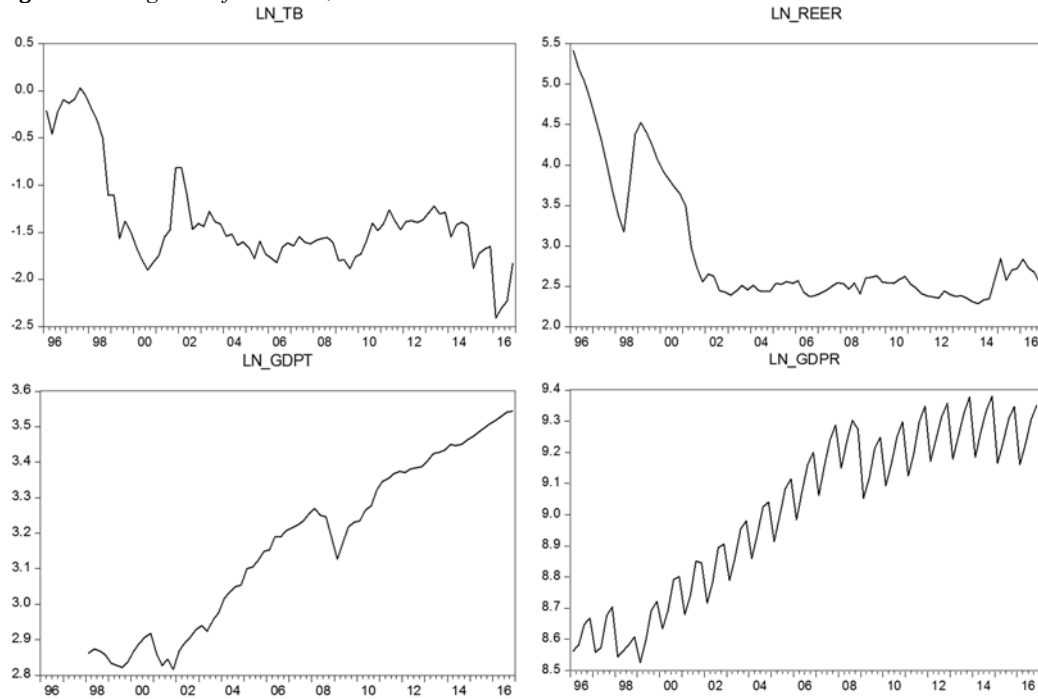
In this research 1996-2016 quarterly data of the Turkey-Russia bilateral trade balance (Turkey's export to Russia divided to Turkey's import from Russia) in thousand U.S. dollars, real effective exchange rate of Turkish Lira and Russian Ruble (counted using TRY/USD and USD/RUR real effective exchange rates as the dollar is the currency payment between Russia and Turkey is made in), real GDP in Turkey and Russia in current million U.S. dollars, and two dummy variables describing betterment or worsening of political relations between countries is analyzed. All the definitions and units of all the variables can be found at the Table 5. TRY/RUR real effective exchange rate was counted basing on the data retrieved from the Organization for Economic Co-operation and Development (OECD) and Russian Federal State Statistics Service (RosStat). Turkey-Russia trade balance was counted basing on Turkish Statistical Institute (TÜİK) data. Real GDP of Turkey data was retrieved from OECD, while Real GDP of Russia data was received from RosStat. As for dummy variables, political events from the Table 1 were used in its generation.

Table 5. *Definitions of variables*

Variable	Definition	Unit
TBt	Turkey-Russia bilateral trade balance (Turkey's export to Russia/Turkey's import from Russia)	–
REERt	Real Effective Exchange Rate of Turkish Lira to Russian Ruble	TRY/RUR
GDPTt	Real Gross Domestic Product of Turkey	Billion TRY
GDPRt	Real Gross Domestic Product of Russia	Billion RUR
D1t	Dummy variable, equal to 1 in case of political relationships betterment, and 0 in case of no betterment	0/1
D2t	Dummy variable, equal to 1 in case of political relationships worsening, and 0 in case of no worsening	0/1

Source: Developed by authors.

As the Jarque-Bera test showed that all of the variables are not normally distributed, its logarithms were used in the model to compose Gaussian distribution. Histograms of the obtained variables are shown at the Figure 1.

Figure 1. *Histograms of variables, used in the model*

3.2. Methodology and model specification

In this research an AR(1) cointegration model was established using the method of least squares. Using of the an autoregression model lets us work with the data stationary at first level I(0). All the tests were performed using EViews 7 software.

The initial model takes the following form:

$$\begin{aligned}
 \ln(TB_t) = & \beta_1 \ln(REER_t) + \beta_2 \ln(GDPT_t) + \beta_3 \ln(GDPR_t) + \beta_4 (D1_t) \\
 & + \beta_5 (D2_t) + [\beta_6 = p = const] \ln(TB_{t-1}) + \varepsilon_t.
 \end{aligned} \quad (1)$$

It should be noted that both of the dummy variables have been added to the model as exogenous variables.

When analyzing the model, it is assumed that political and economic relations are strongly dependent on each other. Furthermore, we pay attention to the fact that in Turkey-Russia bilateral economic relations, Turkey is rather more sensitive to any political shocks due to the high elasticity of demand for goods exported by this country, while the majority of goods exported by Russia, natural fuel and raw materials, have a low elasticity of demand. Therefore, it is expected that any betterment in political relations between Russia and Turkey will rather affect the export from Turkey, what will increase the Turkey-Russia trade balance. Thus, Hypothesis 1 has been put forward as following:

H_I: The betterment in bilateral political relations between Russia and Turkey has a positive effect on Turkey-Russia trade balance

Besides, following the same logic, it is assumed that any worsening of political relations between Turkey and Russia first of all will has its negative effect on Turkey's export rather than on import, what will negatively affect the Turkey-Russia trade balance. Hence, Hypothesis 2 is as follows:

H_{II}: The worsening of political relations between Russia and Turkey has a negative effect on Turkey-Russia trade balance

Before applying the model, we need to find out the order of integration of all the variables by implementing unit root Augmented Dickey-Fuller (ADF) test, defined as following:

$$\Delta Y_t = \beta Dt + \pi Y_{t-1} + \sum_{j=1}^p \varphi_j \Delta Y_{t-j} + \varepsilon_t, \quad (2)$$

where Dt indicates the deterministic term vector (constant, trend etc.). The ε_t represents the error term which is serially uncorrelated and also consider as homoscedastic (Said and Dickey, 1984: 605-606). ADF test results are shown at the Table 6.

Table 6. Augmented Dickey-Fuller (ADF) test results

Variable	ADF Statistics	1% Critical Value	5% Critical Value	10% Critical Value	Stationary	H ₀
ln(TBt)	-2.3370	-3.5112	-2.8967	-2.5856	No	Accept
D[ln(TBt)]	-8.7789	-3.5122	-2.8972	-2.5858	Yes (1%)	Reject
ln(REERt)	-3.0014	-3.5122	-2.8972	-2.5858	Yes (5%)	Reject
D[ln(REERt)]	-5.4142	-3.5122	-2.8972	-2.5858	Yes (1%)	Reject
ln(GDPTt)	0.1689	-3.5203	-2.9006	-2.5876	No	Accept
D[ln(GDPTt)]	-6.6588	-3.5215	-2.9012	-2.5879	Yes (1%)	Reject
ln(GDPRT)	-1.5796	-3.5166	-2.8991	-2.5868	No	Accept
D[ln(GDPRT)]	-4.0122	-3.5166	-2.8991	-2.5868	Yes (1%)	Reject

We can conclude that all the variables are stationary through doing the first difference, i.e. all the time series $I(0)$. Correlograms of variables give us the same result. Therefore, as the dependent variable is also stationary just at the first level, we will apply AR(1) Time Series to exclude autocorrelation in the model. The AR(1) process is a first order autoregressive time series and most commonly defined by the following equation:

$$X_k = \rho X_{k-1} + \varepsilon_k \quad k = 0, \pm 1 \pm 2, \dots \quad (3)$$

where the ε_k 's are regarded as random variables and are referred to as the error terms, and p is the constant. X_k is obtained from knowing the value of X_{k-1} , and in turn X_{k-1} is obtained from knowing X_{k-2} and so on (Horvath and Johnston, 2017, pp. 3-4).

3.3. Empirical results

With the next step the model was estimated by the method of least squares. Results of the estimation are displayed in Table 7. Referring obtained results, at first we should pay attention to the explanatory power of both the model itself, checking R^2 index, and variables included to the model, checking its probabilities.

Table 7. *LS estimation results for the initial model*

Variable	Ln(REER _t)	Ln(GDPT _t)	Ln(GDPR _t)	D _{1t}	D _{2t}
Coefficient	-0.4578	-1.1693	0.3702	0.0142	-0.1987
T-statistic	-3.5548	-2.8381	2.5177	0.3683	-3.3389
P-value	0.0007	0.0060	0.0141	0.7138	0.0014
R ²	0.782070				

As it can be seen, the model is significant by itself, however, the dummy-variable D_{1t} , indicating betterments in political relations between Turkey and Russia is not significant at any level, what means that the betterment in political relations has no effect on the Turkey-Russia trade balance. It means that the Hypothesis 1 is rejected. Thus the model was restructured to the following form:

$$\begin{aligned} \ln(TB_t) = & \beta_1 \ln(REER_t) + \beta_2 \ln(GDPT_t) + \beta_3 \ln(GDPR_t) + \beta_4 (D_{2t}) \\ & + [\beta_5 = p = \text{const}] \ln(TB_{t-1}) + \varepsilon_t \end{aligned} \quad (4)$$

The newly formed final model was also estimated by the method of least squares. Results of this estimation can be found in Table 8. As may be seen, both the model and variables have a strong explanatory power. All the variables, except for Real GDP of Turkey are significant on the 1% level, while Real GDP of Turkey is significant on the 5% level.

Table 8. *LS estimation results for the final model*

Variable	Ln(REER _t)	Ln(GDPT _t)	Ln(GDPR _t)	D _{2t}
Coefficient	-0.4491	-1.1358	0.3562	-0.1982
T-statistic	-3.6186	-2.8469	2.5256	-3.3480
P-value	0.0006	0.0058	0.0138	0.0013
Adjusted R ²	0.784757			

In Ordinary least-squares (OLS) model we make an assumption that the variance of the error term is constant (homoscedasticity). That is, $V(\varepsilon_i) = \sigma^2$ for all i . With the following step, the model will be tested for heteroscedasticity, to make sure our assumption is confirmed. The Breusch-Pagan test will be applied for this purpose. Breusch-Pagan tests the null hypothesis that the error variances are all equal versus the alternative that the error variances are a multiplicative function of one or more variables. (Williams, 2015, pp. 3-4). The results of the Breusch-Pagan test are following:

Table 9. *The results of the Breusch-Pagan test*

F-statistic	1.921426	Prob. F(4,70)	0.1164
Obs*R-squared	7.419998	Prob. Chi-Square(4)	0.1153
Scaled explained SS	8.724399	Prob. Chi-Square(4)	0.0684

As the probability of $F(4,70) = 0.1164 > 0.05$, the null hypothesis is accepted and the heteroscedasticity is not found in the model.

Furthermore, autocorrelation should be tested in the model to exclude skew of the regression results due to the dependency of error terms. We apply the Durbin-Watson test, considering the absence of autocorrelation in the model as the null hypothesis and the presence of autocorrelation in the model as the alternative hypothesis. The test statistic for the Durbin-Watson test on a data set of size n is given by:

$$D = \frac{\sum_{t=2}^n (e_t - e_{t-1})^2}{\sum_{t=1}^n e_t^2},$$

where $e_t = y_t - \hat{y}_t$ are the residuals from the ordinary least squares fit (Young, 2017). The closer this statistic to 2, the stronger the evidence of the autocorrelation absence is. Durbin-Watson statistic for our model $DW=2.0735$, what means the null hypothesis is accepted and autocorrelation is not presented in the model.

Based on the above tests, it can be said that the regression has a high explanatory power and well reflects the real situation.

Looking at the results obtained from the model estimation, we can conclude that Hypothesis 2 is confirmed, and the deterioration of political relations does have a negative effect on the Turkey-Russia trade balance. Detailed results of testing the initial hypotheses of the study are reflected in Table 10.

Table 10. *Hypotheses of the research*

Hypothesis			Variable	Predicted sign	Estimated sign	Result
H _I	H ₀	The betterment in bilateral political relations between Russia and Turkey has a positive effect on Turkey-Russia trade balance	D _{1t}	Positive	Insignificant	H ₀ rejected
	H ₁	The betterment in bilateral political relations between Russia and Turkey doesn't have a positive effect on Turkey-Russia trade balance	D _{1t}			
H _{II}	H ₀	The worsening of political relations between Russia and Turkey has a negative effect on Turkey-Russia trade balance	D _{2t}	Negative	Negative	H ₀ accepted
	H ₁	The worsening of political relations between Russia and Turkey doesn't have a negative effect on Turkey-Russia trade balance	D _{2t}			

Source: Developed by authors.

As can be seen from the regression results, each crisis in political relations between Russia and Turkey causes a decrease in the trade balance by, on average, 0.19 points, which means a 19% decrease in the level of Turkey's exports comparing to imports. It must be admitted that 19% decrease in a trade balance is a quite significant recession for any country's economy. Therefore, countries willing to benefit from foreign trade have to maintain good political relations with the other countries to avoid negative effects of political relations worsening on the trade balance.

Paying attention to the coefficient of the TRY/RUR Real Effective Exchange Rate, it is clearly seen that the growth of the REER has a negative effect on the trade balance. The result we have achieved is expected and confirmed by basic theoretical frameworks. On

the assumption that Real Effective Exchange Rate increase means appreciation of the local currency, the price of exported from Turkey to Russia goods increases for Russian customers, therefore, exports from Turkey to Russia decreases. The same way, meanwhile the nominal price of imported to Turkey from Russia goods remains the same for Russian sellers, for Turkish customers it decreases in terms of Turkish Lira. Therefore, a prerequisite for the growth of imports from Russia to Turkey appears.

In terms of Turkey's Real GDP coefficient, we can see its negative effect on the Turkey-Russia trade balance. It can be explained by the fact that with the growth of the GDP, country accumulates more prosper to spend, what gives more opportunities for increasing of the import. Similarly, Russia's GDP growth positively affects Turkey-Russia trade balance, increasing the volume of exports from Turkey to Russia.

4. Conclusion

In this paper, trade relations between Russia and Turkey were examined through the prism of political relations. We concluded that political and economic relations are inextricably linked.

Through the saturated political relations between the countries, several positive and negative aspects were highlighted. The conflict between Armenia and Azerbaijan, Chechen wars, Cyprus issue, Russia-Georgia war and Syrian conflict are the main political events complicating relations between the two countries. The betterments in relations between Turkey and Russia are mostly caused by frequent bilateral visits at the level of Presidents and Prime-Ministers, numerous political and economic agreements and joint economic projects, such as the Blue Stream.

As for economic relations, Turkey and Russia gathered sufficiently important experiences in trade and economic cooperation. Even though Turkey has a deficit of the bilateral trade balance with Russia, mostly caused by the import of energy resources, its income from Russian tourists and civil engineering projects in Russia assist closing the gap. A special attention must be paid to the fact that, as bilateral trade between Russia and Turkey has been always based on strategic goods such as natural resources and food, what makes both of the countries be more prudent while building their political relations.

It is also worth noting that even in the political relations worsening period, the trade between countries, although significantly reduces, but never trails off. Moreover, in case of the imposition of sanctions, traders find circumvention routes to import prohibited goods through third countries. In case of Russia imposing sanctions against Turkey, the Turkish company established a transfer of vegetables to Russia through neighbouring countries such as Kazakhstan and Belarus. Meanwhile, Russian citizens are keep on buying prohibited to sale and purchase in the Russian Federation tours to Turkey, benefiting from the services of Ukrainian and Belarus travel agencies (Papernaya, 2016).

Having an econometric model built, we confirmed the hypothesis that worsening in relations between Turkey and Russia negatively affects their trade relations. However, betterments in relations between countries do not have a significant impact on trade

relations in the model. It can be explained by the fact that in the relations between Turkey and Russia, negative and positive events are often very close to each other by dates: sometimes they occurred in the same period, or with just a year break. Thus, it can be presumed that the negative effect caused by political relations worsening suppresses the positive effect of political relations betterment. Results obtained in this study bear a resemblance to findings of Pollins (1989), Polechek (1997), Keshk et al. (2004), Rasoulinezhad (2016) and Çakmak and Ustaoglu (2017) studies, mentioned in empirical literature. The findings verified that the realistic approach is dominant in the relationships between Turkey and Russia. That is to say, Turkish and Russian sides should tend to keep their political relations good when they appreciate the importance of each other politically and economically.

When considering these all together and taking into account the damages of negative and tense relationships to the trade, both countries should keep the relationships good, avoid tense political disputes and repair the worsened relationship all of a sudden as this fact is essential for their welfare and security.

Notes

- (1) This paper had been presented in International Economics, Finance, and Econometrics Symposium (EFEOS) in 17-18 May 2017.
- (2) In more detail, the effects of international trade on social welfare generated from: 1) The export of the surplus product manufactured in the country at the external market and the possibility to import necessary for production tools and equipment from abroad, which increase both employment and income of the country. 2) Other visible and invisible contributions such as expanding the market volume, gaining from the division of labor and economies of scale, acquaintance with new information, ideas and production methods, increment of competition, elimination of domestic monopolies, enabling the production of new goods by stimulating domestic demand (Seyidoğlu, 2013).
- (3) Maddala's estimator is a technique of dealing with an equation system consisting of one continuous endogenous variable and dichotomous endogenous variable (Keshk et al., 2004).

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The relationship between financial deepening and economic growth: Bootstrap causality approach for the selected upper middle income countries

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Abstract. *This paper investigates the causal relationship between financial deepening and economic growth for fourteen upper middle income countries for the period during 1987-2015. Broad money supply, private credits, financial system deposit liabilities and deposit money banks' assets are determined as proxies of financial deepening. Kónya (2006) bootstrap panel granger causality approach is used for this relationship based on Seemingly Unrelated Regression (SUR) model. Empirical findings indicate that countries can be clustered according to supply-leading and demand following approach. Besides, there exists evidence for bidirectional causality for some countries.*

Keywords: financial deepening, supply-leading, demand-following, bootstrap, middle income.

JEL Classification: C33, E42, G21, O47.

1. Introduction

Bagehot (1873, p. 8) declares in his famous study providing that people demand a large portion of their money from system, banking and industrial system face a great danger. Capital markets and financial intermediaries contribute the financing process of real investment by facilitating transfers from surplus agents to deficit agents (Tobin, 1984, p. 11). The main task of financial system is to bring close together savers and borrowers, and offering risk management facilities to borrowers and lenders by the way of insurance, hedging, and financial diversifications. While financial system facilitates information flow, it also enables supervision, investigation, risk management, and liquidity opportunities (Orhangazi, 2011, pp. 124-125).

Levine (2005, pp. 869-870) emphasizes five fundamental effect of financial system over economy. Firstly, financial system submits information about practicable investments and capital allocation in advance. After providing finance for investments, it also enables supervision and usage for investments by corporate management. Moreover, it facilitates trade, diversification and risk management in economy. In addition, it fulfils the duty of corporation of savings and prompts it, and also facilitates the exchange of goods and services.

The development of financial system shows differences in lots of countries. The development of financial system increases economic growth and productivity in some countries, and it causes breakups in economic growth and financial crises in some developed and developing countries as well. Reforms and developments in financial system create effects over economic growth by inducing some reconstructions in real sector (Johnston and Pazarbaşıoğlu, 1995, p. 1). Financial deepening means growth of accumulation of financial assets in an economy more than itself. When supply of financial asset increase in an economy, their variety of quality widens, new borrowers participate sector, and financial system develops further (Shaw, 1973, p. 7). Therefore, development of financial system creates a feedback effect between financial and real development along with international integration. So, domestic financial deepening is strongly related with both higher investment and faster productivity growth (World Bank, 1997, p. 157).

Economic growth is the steady process of the economy by which the productive capacity augments over time to bring about increasing levels of national output (Todaro and Smith, 2009, p. 821). Simon Kuznets gained the Nobel Economics Prize due to his working about national income historical growth in 1971. Kuznets (1959, p. 168) described the economic growth as providing various economic goods to its population of a country in the long run capacity. It is discussed for many years that the financial development causes economic growth and these two variables have a relationship with each other. While the causality relation from financial development to economic growth is handled as supply leading, the approach of economic growth stimulates the financial development is expressed as demand following (Patrick, 1966, p. 175). Therefore the question of whether there is a relationship between these two variables comes out. The development of financial sector as supply leading, or demand following, or two-way lead to research of one-way and two way causality relation investigations.

Levine (2002, p. 424) discussed the distinction about financial system, whether is bank base or market base. According to bank based view, at the early age of economic development financial system reflect a weak institutional structure, so that bank based financial system perform its duties as like mobilizing saving, allocating capital, and exerting corporate capital better than market based financial system for the developing economies. On the other hand, classification of countries based on their income level and searching their common structure is another approach for the development of economies. According to Kharas and Kohli (2011, p. 282), countries at the middle income level, which couldn't reorient their growth strategy from resource-driven to productivity-driven, get stuck at this middle income level. Tho (2013, pp. 107-110) explains this situation based upon stages of development. Middle income countries mostly stuck between low income labour intensive industry and high income capital intensive industry, and they couldn't compete with both of them propped up wage, price, innovation and technology. Therefore, searching for economies at the middle income level from the aspect of financial structure and economic growth is the main task of this study whether they have a common trait or distinct from each other for some other reasons.

2. Theoretical background

The financial system emerges as an agent of investment-saving process. The question of whether the development of financial system has an impact over economic growth, or vice versa, states as feedback relationship between two in Patrick's (1966) working paper. This relationship consists of two hypotheses which are called as "supply-leading" and "demand-following". The supply leading hypothesis asserts that financial institutions, financial assets and financial liabilities must be created before the demand of these services. This hypothesis has two functions. First of all, the incentives and progress of entrepreneurs increase by shifting economic resources from traditional sector to modern sectors. Another point, financial intermediaries mediate the flow of financial assets from traditional sector to modern sector, and stimulate economic growth by rapidly increasing credit facilities, deposits, financial liabilities and savings (Patrick, 1966, pp. 175-176). This hypothesis put forward one-way causality relationship going from financial deepening to economic growth, and alleges that the increase in new financial markets and institutions augment financial services, and economic growth accrues as a result (Balago, 2014, p. 254).

Goldsmith (1959, 1969), Shaw (1973) and McKinnon (1973) are the main economists who investigate the impact of financial system to economic growth. According to Goldsmith (1959, p. 114), the differences in financial institutions, financial habits and attitude affect the economic development of a country, and this also affects the economic growth rate. McKinnon (1973, p. 117) emphasizes that the development in monetary reforms can stimulate quality of capital formation and saving propensities, which increases the growth of real output. According to Shaw (1973, pp. 7-8), financial assets will grow more rapidly than non-financial assets, and accelerate economic

growth at the end of financial deepening. As a result financial deepening realizes when financial assets grow faster than income growth.

Pagano (1993, pp. 619-621) supports the view of financial development inclines economic growth via financial intermediations. Bank lending and credit channels are the main sources affecting household decisions through savings. However, amelioration in risk sharing and household credit market can reduce saving rates, so the growth rates. As for Greenwood and Jovanovic (1990, p. 1076), financial intermediation improve growth by increasing rate of return on capital, hereby high priced financial structure can be realized, and investment increases.

Cameron (1963, p. 133) emphasizes this situation with an increment in the demand for financial service cause a rise in means of payment, which contributes the economic development. Bencivenga and Smith (1991, p. 196) investigate this relation in that financial intermediaries revise the compound of saving in favour of capital accumulation, which incline to promote growth. As it can be seen, all these authors are the proponents of the view of supply leading.

Demand following approach is based on the assumption that economic growth leads to the financial development. Patrick (1966, p. 174) emphasizes that demand following approach is related with the demand side of the financial system. When the economy grows up, it creates supplement and new demand for these financial services, which causes development in financial system. Absence of financial institutions in developing economies is a display of the lacks of demand for financial services. As the real side of the economy progresses, the demand for new financial services emerge, these needs are supplied from financial system even a little. At the second step scarce resources are transmitted from small savers to large investors based on rate of return, this fosters hereby financial sector (Jung, 1986, p. 333). Robinson (1979, p. 20) is one of the main supporters of this view. He asserts that financial development goes after economic growth, and expresses it as “where enterprise leads finance follows”.

3. Summary of literature

Gurley and Shaw (1967, pp. 257-258) emphasize when financial system's economic output is at low level, the ratio of financial assets to real wealth oversee at low levels; but when economic output and per capita income increase, the ratio increases more rapidly. Jung (1986) probes the Patrick's (1966) claim of whether the economic growth prompts the development of financial system or financial system triggers the economic growth. Levine and Zervos (1996) support supply-leading approach by reaching positive relationship between securities exchanges and long-run economic growth. As for the approach of demand following, Murinde and Eng (1994, p. 391) define it as the growth of real economy with commercialization and monetization of agriculture and other traditional subsistence sectors determine the demand for financial services. Lucas (1988, p. 6) criticizes all that the development of financial institutions is “over-stressed” and its development has a little impact on economic growth. So, it is called as neutrality hypothesis based on non-causality of relationship (Menyah et al., 2014, p. 386). As it is

seen there are lots of studies dealing with this subject, but it is mostly difficult to reach a common trait for countries based on geography and income level.

Xu (2000) investigates this subject for forty-one developing economies for the period of 1960-1993, by adding the transmission effect of investment as well. Financial development is represented by taking the difference of geometric means of bank deposits in GDP. Empirical results imply that there exists strong positive evidence that financial development affecting growth of the economies, and investment is seen as an important channel for it with robust.

Bangake and Eggoh (2011) assess the relationship between finance and growth for seventy-one developed and developing countries for the period 1980-2007. Liquid liabilities ratio, deposit money bank assets ratio and private domestic credit ratio are taken as proxy for finance. Empirical findings suggest that economic growth have a significant impact on financial development in developed countries. However, there exists no enough evidence to support causality for developing countries in the short-run.

Kar et al. (2011) focus on the subject for MENA (Middle East North Africa) countries, which can be expressed as developing countries, by running Kónya (2006) bootstrapped panel causality approach for the period of 1980-2007. They use six different monetary, credit and deposit indicators to express financial development. After that, heterogeneities of countries and cross sectional dependencies of variables are discussed based on methodology. Empirical evidences point out that the direction of causality for fifteen MENA countries depends on the measurement of financial development. So, there are lots of evidence for supply-leading and demand-following, but there is no any common evidence. Ağır et al. (2011) evaluate this relationship for MENA countries at the same period. According to their findings, demand following approach is dominant for MENA countries and worker's remittances channel for this relationship.

Mirdala (2011) investigates the relationship between financial deepening and economic growth for the European Transition Economies for the period of 2000-2010. Broad money stock, domestic bank deposits and domestic bank loans are used as financial depth indicators. Empirical findings demonstrate that lower per capita income countries utilize more from financial deepening and supply leading evidence appears in the short-run.

Hsueh et al. (2013) deal with the subject for ten Asian countries based on Kónya (2006) panel bootstrapped causality methodology for the period of 1980-2007. They use credit claims and monetary aggregates as representatives of financial development. According to their findings, Asian countries are strongly sensitive to supply-leading hypothesis, especially China. However, demand-following hypothesis is observed for Malaysia based on narrow money aggregate, there is no any causality evidence for Philippines, India and Japan.

Mhadhbi (2014) examines the relationship between financial development and economic growth by introducing a new proxy for financial development for twenty-seven medium income countries for the period of 1970-2012 based on Kónya (2006)

panel bootstrapped causality approach. Empirical results show that there exist validity for supply-leading for three countries and demand-following for six countries. Besides, there is no evidence for this relationship for the remaining countries. Mhadhbi et al. (2017) evaluate the banking sector development with a similar manner for the same period for forty developing countries. According to their findings, there are limited evidence for both supply leading, demand following and mutual relations.

Menyah et al. (2014) assesses the issue for twenty-one developing African countries based on Kónya (2006) bootstrapped panel granger causality for the period of 1965-2008. They developed an aggregate financial development index for African countries by utilizing four financial variables based on principal component analysis. Empirical findings display that there is one demand following and three supply leading evidence for African countries, which imply that there is limited evidence to support finance lead growth or vice versa.

Özşahin and Uysal (2017) examine the relationship between financial deepening and economic growth for twelve MENA countries for the period of 2000-2014. They use domestic credit to private sector, domestic credit provided by financial sector, and liquid liabilities of financial system as a ratio of GDP in order to express financial deepening. Emirmahmutoglu and Köse (2011) methodology is used to determine the direction of causality relation. Empirical evidence imply that five countries demonstrate supply leading hypothesis when domestic credit provided by financial system is considered, and four countries display the same manner from the aspect of liquid liabilities.

Agheli and Hadian (2017) investigate this relationship for fifteen selected emerging and Middle Eastern countries, based on Kónya (2006) bootstrapped panel methodology for the period of 1980-2013. Empirical evidence points out that low level of financial development avoid causality to economic growth due to lack of deep financial sector, but there exist both supply leading and demand following evidence for some others.

4. Data set

Annual data for the period of 1987-2015 are arranged from World Development, and Global Financial Development Indicators of World Bank (2017). According to World Bank country classification, countries have GNI per capita threshold between 4125\$-12735\$ are expressed as upper middle income based on Atlas method calculation (Fantom and Serajuddin, 2016, p. 25). While comprising data set, countries with missing data are eliminated. Besides, countries with a population under one million are also eliminated in order to avoid misspecification and reach an accurate evaluation. As a result fourteen countries are determined, three of them from MENA (Algeria, Tunisia⁽¹⁾, Turkey), two of them from Africa (Botswana, Gabon), five of them from South America (Costa Rica, Dominican Republic, Ecuador, Mexico, Peru), and four of them from South Asia (China, Malaysia, Mauritius, Thailand). The definition of variables and their data set is expressed in Table 1.

Table 1. *The definition of variables and data sources*

Variables	Series	Sources
LGDP=	Real GDP (2010)	World Bank, WDI
LBM=	Broad money (% of GDP)	World Bank, WDI
LFS=	Financial system deposits to GDP (%)	World Bank, GFDD
LDA=	Deposit money banks' assets to GDP (%)	World Bank, GFDD
LPC=	Private credit by deposit money banks and other financial institutions (% of GDP)	World Bank, GFDD

The proportion of liquid liabilities of financial system to GDP is a measure of financial depth. Liquid liabilities comprise of currency held outside the banking system (King and Levine, 1993a, p. 720) other than central government and time, saving, and foreign currency deposits of resident sectors other than the central government (WDI, 2017), expressed as LBM. Besides, this ratio also reflects the measure of the overall size of the formal intermediary sector (King and Levine, 1993b, p. 528). A high ratio of financial deepening means that financial markets perform financial transaction function much better. (Özşahin and Uysal, 2017, p. 155). This indicator is chosen (Alrabadi, 2016; Ang, 2007; Apergis et al., 2007; Čihák et al., 2012; Chisunga 2015; Ghildiyal, 2015; Hamori and Hashiguchi, 2012; Ogbuagu and Ewubare, 2017; Galetovic, 1996; Nazlıoğlu et al., 2009; Osei-Fosu et al., 2017; Rachdi and Mbarek, 2014; Saqib, 2013) as a proxy for financial depth in many studies.

Thornton (1994, p. 42) explains the difference between ratio of broad measure of money supply and total deposits. Total deposits exclude currencies. Currency is not intermediated through the banking system (Xu, 2000, p. 334). An increasing ratio of broad money to GDP may state more widespread use of currency instead of escalating of bank deposits (Demetriades and Hussein, 1996, p. 395). So, LFS variable is introduced to our analysis in order to express the ratio of bank deposit liabilities to nominal GDP. Banks are not the only intermediaries providing the functions of financial system, and banks are strongly affected from governments in many developing countries due to uncertain relationship with central bank (King and Levine, 1993a, p. 721). When the bank deposit liabilities increase, the supply of credit to private sector can remain unchanged due to government allocation of financial savings by rising reserve requirements (Demetriades and Hussein, 1996, p. 395). So that, LPC variable is determined for this situation. Shaw (1973) emphasizes the growing rate of financial asset over income growth. Therefore, deposit money banks' assets ratio is determined to represent financial asset deepening. Moreover, LGDP variable is selected as a proxy of economic growth. All variables are deal with their logarithmic values.

5. Econometrical methodology

Social scientists desire to consider that the feasibility of a case occurring in one part of the world could cause an event at a later time in a different place (Granger, 1980, p. 331). Granger (1980, p. 349) states providing that the past value of one variable is used to forecast the unexplained part of the other variable, then the prima facie causality from one to other can emerge. One of the important points is the "arrow of time". Past value of one variable gives a predicted power to forecast the present and

future values of other, but not reversible. In order to adopt Granger causality to a panel understanding, estimation method takes importance.

A method of generally encountered sets of regression equation, which is Seemingly Unrelated Regression (SUR), is more efficient in coefficient estimation rather than equation by equation application of least squares for the aggregation bias of temporal cross section data, which imply cross section dependency (Zellner, 1962, pp. 348-363). But, Zellner (1962, p. 363) did not establish an iterative procedure in coefficient estimation for small sample data. Pesaran (2006, p. 992) presents a Monte Carlo simulation to test the importance of cross section dependency. As a result, if the cross section dependence is overlooked, bias and size distortion comes out. So, the cross section dependency situation of data becomes more of an issue in panel sense. Another point is the homogeneity of the data. Even if we construct a panel data based on per capita income level of upper middle income developing countries, their development level can differ from each other based on the structure of their development (Menyah et al., 2014, p. 389). So that, testing the slope homogeneity is another important issue in panel sense.

5.1. Cross section dependency

Cross section dependency tests can be collected under four subtitles based on literature. Breusch and Pagan (1980, p. 247) introduce Lagrange Multiplier⁽²⁾ (LM) test procedure in order to test cross sectional dependency.

$$LM = M \sum_{i=1}^m \sum_{j=1}^{i-1} \rho_{ij}^2 \quad (1)$$

ρ_{ij}^2 is the estimated correlation coefficient, and it has a chi-squared (χ^2) distribution with $(m(m-1)/2)$ degrees of freedom. This test has an advantage that it does not necessitate measurement of maximum likelihood estimators, because it is based on the ordinary least square (OLS) residuals (Greene, 2003, p. 350).

$$y_{it} = \alpha + \beta_i' x_{it} + \varepsilon_{it} \quad \text{for } i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (2)$$

Individual OLS regression is expressed in equation 2, where x_{it} is vector of $k \times 1$ explanatory variable. α and β_i are respectively individual intercept and slope coefficients. The null hypothesis of no cross section dependence $H_0: \text{Cov}(\varepsilon_{it}, \varepsilon_{jt}) = 0$ for all t and $i \neq j$ is tested against the alternative hypothesis of $H_A: \text{Cov}(\varepsilon_{it}, \varepsilon_{jt}) \neq 0$ for at least one couple of $i \neq j$. LM test is more appropriate for small amount of N and large amount of T .

Pesaran (2004, p. 5) bring a solution for the size problem of LM with CD_{LM} test, which is applicable for large T and large N .

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N (Tp_{ij}^2 - 1), \text{ where } CD_{LM} \sim N(0,1) \quad (3)$$

On the other hand, this test is not appropriate for large N , and small T . Thereby, Pesaran (2004, p. 9) introduce a new CD test for this situation.

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij}, \text{ where } CD \sim N(0,1) \quad (4)$$

CD test is valid for T and N goes to infinity in any order, and test displays proper feature for small samples of both T and N . However, this test has an important disadvantage, which deprived from the power in certain situations where the population mean bilateral correlation is zero under heterogeneous alternatives (Pesaran, 2004, p. 14). Therefore, Pesaran et al. (2008, pp. 106-108) introduce a bias-adjusted LM test, which use exact average and variance of the test statistic with strictly exogenous regressors in the event of panel data models.

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \frac{(T-k)\rho_{ij}^2 - \mu_{Tij}}{v_{Tij}}, \text{ where } LM_{adj} \sim N(0,1) \quad (5)$$

where k is the number of explanatory variables, μ_{Tij} is exact mean, and v_{Tij} is variance of $(T-k)\rho_{ij}^2$.

5.2. Slope of homogeneity test

Pesaran and Yamagota (2008, p. 57) propose two test statistics, $\tilde{\Delta}$ (delta) and $\tilde{\Delta}_{adj}$ (delta-adjusted), in order to test slope of homogeneity of the panel data.

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - k}{\sqrt{2k}} \right) \quad (6)$$

$$\tilde{\Delta}_{adj} = \sqrt{N} \left(\frac{N^{-1} \tilde{S} - E(\tilde{Z}_{it})}{\sqrt{\text{var}(\tilde{Z}_{it})}} \right) \quad (7)$$

The null hypothesis of homogeneity, $H_0: \beta_i = \beta_j$ for all i and j , based on a Hausman type testing against the alternative hypothesis of $H_A: \beta_i \neq \beta_j$. Moreover, delta test is more appropriate for big panel data, while delta-adjusted is more proper for small panel data.

5.3. Panel Granger causality test

Kónya (2006, p. 979) proposes SUR panel approach in order to test Granger causality relations of variables based on a bootstrap procedure in panel sense. This test brings some competitive edge compared to other panel studies. First of all, it does not necessitate joint hypothesis for all panel members, but permits simultaneous correlation across them. Second, this test does not require pretesting for unit root situations of variables and their cointegration relations. Besides, it also considers the cross section dependency situation of variables, and the direction of causality is determined by Wald test with country specific bootstrap critical values. The only essential condition is to identify optimal lag structure of variables before analysing.

$$\begin{aligned}
y_{1,t} &= \alpha_{1,1} + \sum_{l=1}^{ly_1} \beta_{1,1,l} y_{1,t-l} + \sum_{l=1}^{lx_1} \phi_{1,1,l} x_{1,t-l} + \varepsilon_{1,1,t} \\
y_{2,t} &= \alpha_{1,2} + \sum_{l=1}^{ly_1} \beta_{1,2,l} y_{2,t-l} + \sum_{l=1}^{lx_1} \phi_{1,2,l} x_{2,t-l} + \varepsilon_{1,2,t} \\
&\vdots \\
y_{N,t} &= \alpha_{1,N} + \sum_{l=1}^{ly_1} \beta_{1,N,l} y_{N,t-l} + \sum_{l=1}^{lx_1} \phi_{1,N,l} x_{N,t-l} + \varepsilon_{1,N,t}
\end{aligned} \tag{8}$$

and

$$\begin{aligned}
x_{1,t} &= \alpha_{2,1} + \sum_{l=1}^{ly_2} \beta_{2,1,l} y_{1,t-l} + \sum_{l=1}^{lx_2} \phi_{2,1,l} x_{1,t-l} + \varepsilon_{2,1,t} \\
x_{2,t} &= \alpha_{2,2} + \sum_{l=1}^{ly_2} \beta_{2,2,l} y_{2,t-l} + \sum_{l=1}^{lx_2} \phi_{2,2,l} x_{2,t-l} + \varepsilon_{2,2,t} \\
&\vdots \\
x_{N,t} &= \alpha_{2,N} + \sum_{l=1}^{ly_2} \beta_{2,N,l} y_{N,t-l} + \sum_{l=1}^{lx_2} \phi_{2,N,l} x_{N,t-l} + \varepsilon_{2,N,t}
\end{aligned} \tag{9}$$

Simultaneous system equation of SUR model is expressed in (8) and (9) (Kónya, 2006, p. 981), where y represent dependent variable, which is economic growth variable, and x represent independent variables, which is financial depth variables in our model. N is the number of members of the panel ($j = 1, \dots, N$), t is the time period ($t = 1, \dots, T$), and l is the predetermined lag length (Kar et al., 2011, p. 689).

Based on these SUR systems, there is one-way Granger causality operating from X to Y in a country i if in (8) not all $\phi_{1,i}$'s are zero but in (9) all $\beta_{2,i}$'s are zero; there is one-way Granger causality from Y to X if in (8) all $\phi_{1,i}$'s are zero but in (9) not all $\beta_{2,i}$'s are zero. Moreover, there is two-way Granger causality between Y and X if all $\beta_{2,i}$'s and all $\phi_{1,i}$'s are not zero; and there is no Granger causality between Y and X if all $\beta_{2,i}$'s and $\phi_{1,i}$'s are zero (Kónya, 2006, p. 981).

6. Empirical findings

Kónya (2006, p. 982) emphasises the proper usage estimator method depending on the structure of the error terms. If there is a cross section dependency across countries (as proffered by Zellner (1962, p. 363), SUR estimator is more appropriate than OLS equation by equation estimation. Therefore, we investigate the cross section contemporaneous correlation of countries at first.

Table 2. *Cross section dependency and homogeneity tests*

Tests	Statistic
LM (Breusch and Pagan, 1980)	234.815***
CD _{LM} (Pesaran, 2004)	10.660***
CD (Pesaran, 2004)	9.008***
LM _{adj} (Pesaran et al., 2008)	10.640***
$\tilde{\Delta}$ (Pesaran and Yamagata, 2008)	19.264***
$\tilde{\Delta}_{adj}$ (Pesaran and Yamagata, 2008)	21.537***

Note: *** denotes statistical significance at 0.01.

The cross section dependency of across countries and homogeneity structure of panel is displayed in Table 2. So, there exist cross section dependency and our panel is heterogeneous based on empirical results. Causality test findings rely strictly on the lag length structure of the panel.

Table 3. *Bootstrap panel causality results I*

Countries	Ho: LBM does not cause LGDP				Ho: LGDP does not cause LBM			
	Wald Stat	Critical Values			Wald Stat	Critical Values		
		1%	5%	10%		1%	5%	10%
Algeria	1.686	7.007	4.172	3.046	11.233***	7.805	6.088	5.317
Botswana	5.068	13.983	8.233	6.095	9.898	22.362	16.61	14.11
China	15.428***	10.165	6.392	4.835	0.923	26.173	18.728	15.302
Costa Rica	0.216	6.352	3.414	2.334	6.484	14.773	10.119	8.336
Dominican [^]	3.72	22.234	13.497	10.195	8.44	14.773	10.741	8.982
Ecuador	6.191	75.488	46.881	36.854	8.478	73.474	50.936	43.201
Gabon	8.955*	15.556	9.723	7.262	10.712**	11.211	7.816	6.281
Malaysia	0.255	23.156	10.115	6.112	16.796**	22.075	11.914	8.709
Mauritius	4.475**	7.903	4.111	2.751	9.842	50.565	36.682	30.996
Mexico	1.619	29.349	16.078	10.954	99.959***	55.711	41.619	35.281
Peru	0.019	16.314	8.655	5.855	25.94	56.947	42.114	36.389
Thailand	0.284	9.856	5.382	3.789	8.693	28.31	21.396	18.476
Tunisia	1.572	10.169	5.695	3.991	14.684**	16.138	13.269	11.889
Turkey	7.469**	13.515	7.046	4.781	46.468**	59.536	42.975	36.194

Note: ***, **, * denote significance at 1, 5, 10 percent, respectively. Critical values attained with 10,000 replications. [^] imply Dominican Republic.

Too few lags imply some crucial variables are left from the model and this misspecification will usually induce bias and incorrect findings. At the same time, too many lags waste observations and this misspecification will usually augment the standard errors of estimated coefficients, lead to imprecise conclusions. Therefore, we let different maximal lags for Y and X in each system, but do not permit to vary across countries. We let 1-4 range for yearly data and estimate (8) and (9) for each possible pairwise of ly_1 , lx_1 , and ly_2 , lx_2 respectively, and determine the combination which minimize Schwartz Information Criteria (Kónya, 2006, pp. 982-983).

Table 3 displays the results for bootstrap panel causality between financial deepening and economic growth ($LBM \leftrightarrow LGDP$) based on the indicator of broad measure of money supply. The neutrality hypothesis is valid for Botswana, Costa Rica, Ecuador, Peru and Thailand due to there is no any causality running from any direction. There is strictly unidirectional causality running from financial depth to economic growth for China. So, supply-leading hypothesis is valid for China for this period. Besides, supply-leading hypothesis is supported for Mauritius as well. Algeria and Mexico have strict evidence for demand following hypothesis, Malaysia and Tunisia also demonstrates the same manner. Moreover, there is bidirectional causality for Turkey and Gabon, which supports feedback effect.

Remaining causality relations are reported in Appendix. First of all, the results of bootstrap panel granger causality of financial system deposit liabilities ($LFS \leftrightarrow LGDP$) are taken. According to findings, there is weak evidence for China and Turkey supporting supply-leading hypothesis, but there is evidence for Peru and strong evidence for Ecuador and Mauritius. Besides, there is evidence for Algeria and Malaysia supporting demand following, and there is some evidence for Gabon and Dominican Republic displaying bidirectional causality.

Second, panel causality results from the aspect of private credits ($LPC \leftrightarrow LGDP$) are also shown at the Appendix. There is weak evidence for Mauritius and Thailand supporting supply-leading hypothesis. There is weak evidence for Botswana supporting demand-following. There is strong evidence for Algeria and Dominican Republic for bidirectional causality supporting feedback effect. Besides, there is evidence for Gabon and Tunisia and strong evidence for Costa Rica supporting demand-following hypothesis. On the other hand, there is no evidence for causality for the remaining countries.

Finally, panel causality results based on deposit money banks' assets ($LDA \leftrightarrow LGDP$) are reported at the Appendix as well. There is evidence for supply-leading hypothesis for Peru and Thailand, and weak evidence for Mauritius. On the other hand, there is evidence for Botswana, Mexico, weak evidence for Malaysia, and strong evidence for Algeria supporting demand following hypothesis. Moreover, there is evidence for bidirectional causality for Algeria and Dominican Republic.

7. Conclusion

This study aims to investigate the relationship between financial deepening and economic growth from the aspect of fourteen upper middle income developing countries for the period during 1987-2015. This period is seen important, because it includes financial liberalization period of lots of developing countries. The main purpose of the study is to search whether there is a common trait for these developing countries from the aspect of finance and growth. On the other hand, these developing countries have a common structure according to their stages of development. These countries get rid of low income level by increasing their development. But, they face with a new difficulty of replacing their import oriented investment to domestic

innovations (Eichengreen et al., 2012, pp. 42-44). Our main source of inspiration is Partrick's (1966) study. He emphasizes that underdeveloped countries face a demand-following process for their development stage due to lack of necessary financial institutions and services. As a result, we can't mention a common trait for whole upper middle income countries. We consider the main reason of this result is the different development experiences of countries. However, empirical results can be generalized from some aspects. China, Ecuador, Mauritius, Peru, Thailand and Turkey have evidence for supply-leading hypothesis based on overall findings. So, it can be asserted for these countries as "finance led growth". In addition to this, Algeria, Botswana Costa Rica, Gabon, Malaysia, Mexico, Tunisia have evidence to classify based on demand following hypothesis. So that it can be claimed for these countries as "growth led finance". At the same time, Algeria, Dominican Republic, Gabon and Turkey have some bidirectional causality mean that feedback effect can be considered for these countries. In addition to this, Dominican Republic has more strong evidence for bidirectional causality. However, neutrality hypothesis couldn't be considered for these countries leaning on overall findings. So, Lucas (1988) criticise is not valid for these countries. As a result, there are lots of evidence to allege that there is relationship between financial depth and economic growth, which can be divided into two as supply-leading and demand-following for upper middle income countries.

Notes

- (1) Tunisia is considered as upper middle income country by looking its 2014 per capita income level, because we decided to take into consideration whether its slowdown temporary, or not, leaning on Atlas Method country classification of World Bank.
- (2) N refers to T, which is time dimension; and m refers to N, which is cross section dimension in many studies as like (Pesaran, 2004; Kónya, 2006; Menyah et al., 2014; Ağır et al., 2011; Hseuh et al., 2013, Kar et al., 2014, Özşahin and Uysal, 2017; Mhadhbi, 2014, 2017).

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Appendix. Bootstrap Panel Causality Results II

Countries	Ho: LFS does not cause LGDP				Ho: LGDP does not cause LFS			
	Wald	Critical Values			Wald	Critical Values		
		1%	5%	10%		1%	5%	10%
Algeria	0.617	3.587	1.991	1.372	9.785**	9.875	7.24	6.118
Botswana	4.036	20.651	12.074	9.197	15.35	33.538	25.68	21.798
China	20.451*	38.591	24.118	19.334	0.043	13.174	9.229	7.446
Costa Rica	0.000	6.038	3.367	2.289	0.594	2.004	1.094	0.784
Dominican^	4.042*	8.316	4.443	3.015	7.185**	9.346	5.681	4.192
Ecuador	11.13***	10.114	5.351	3.743	11.212	35.554	25.926	22.009
Gabon	6.458**	10.38	6.36	4.669	18.06***	13.993	9.797	7.905
Malaysia	0.000	12.431	6.122	4.111	15.47**	23.166	14.013	10.735
Mauritius	9.997**	10.901	6.244	4.54	19.768	46.261	34.234	28.819
Mexico	0.023	6.843	3.667	2.53	5.035	16.585	10.396	7.994
Peru	32.445**	36.419	26.758	22.415	1.873	38.334	27.701	23.299
Thailand	0.002	9.655	5.718	4.139	4.048	18.312	13.119	10.883
Tunisia	0.934	19.862	11.085	7.974	23.291	38.613	30.33	26.691
Turkey	8.009*	17.45	9.604	6.95	22.981	65.001	47.272	40.089
	Ho: LPC does not cause LGDP				Ho: LGDP does not cause LPC			
Algeria	11.557***	6.237	3.926	2.953	5.99**	8.677	6.126	4.926
Botswana	1.516	10.928	5.85	4.065	30.878*	43.127	33.316	29.25
China	0.121	8.457	4.533	3.147	6.029	21.274	16.126	13.863
Costa Rica	0.448	5.716	3.285	2.363	30.719***	30.23	23.947	21.331
Dominican^	22.381***	17.23	11.058	8.448	3.504***	3.164	1.984	1.512
Ecuador	2.057	13.347	7.915	5.94	1.353	3.346	2.175	1.649
Gabon	0.198	8.844	4.671	3.098	4.45**	6.351	3.717	2.549
Malaysia	3.047	10.682	6.943	5.299	1.487	4.401	2.652	1.939
Mauritius	9.838*	20.124	11.269	8.093	31.957	103.681	72	59.723
Mexico	0.078	5.686	3.267	2.314	0.328	3.193	1.977	1.43
Peru	9.085	22.663	15.171	12.257	0.516	18.288	12.519	10.27
Thailand	19.148*	29.268	20.005	15.882	2.138	8.097	5.73	4.66
Tunisia	0.614	8.386	4.448	3.12	5.625**	7.181	5.145	4.214
Turkey	0.377	13.215	8.313	6.413	5.898	16.949	13.425	11.772
	Ho: LDA does not cause LGDP				Ho: LGDP does not cause LDA			
Algeria	3.284*	6.923	4.258	3.175	8.404***	4.679	2.811	1.997
Botswana	1.235	9.979	5.359	3.716	31.72**	40.417	29.178	25.076
China	1.167	5.985	3.147	2.179	2.03	19.113	14.826	12.936
Costa Rica	0.136	4.915	2.912	2.09	23.536**	27.504	21.951	19.235
Dominican^	20.584***	14.433	9.2	6.918	4.515**	5.516	3.475	2.686
Ecuador	3.426	13.705	8.356	6.467	2.763	5.242	3.518	2.799
Gabon	0.371	7.866	4.126	2.801	2.17	9.097	4.9	3.466
Malaysia	5.142	20.447	12.767	9.676	2.215*	5.281	3.105	2.207
Mauritius	10.137*	18.705	10.766	7.766	19.598	90.242	65.339	55.462
Mexico	0.629	12.596	7.816	6.012	2.409**	4.046	2.246	1.552
Peru	23.941**	25.824	18.563	15.438	1.955	24.055	16.745	14.041
Thailand	26.074**	28.855	19.628	15.985	0.071	3.655	2.195	1.57
Tunisia	0.371	13.852	7.78	5.822	8.764**	11.209	8.715	7.651
Turkey	1.939	11.612	7.067	5.222	15.653	42.396	32.563	27.99

Note: ***, **, * denote significance at 1, 5 and 10 percent, respectively. Critical values attained with 10.000 replications. ^ imply Dominican Republic.

Financial development, trade openness and growth in India

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Abstract. *This paper studies the relationship between the financial development, trade openness and economic growth in India. The Phillips-Perron (PP) test is used to check the order of integration of the variables. We apply both Johansen co-integration and Granger causality methodologies for a long run relationship and the direction of the Causality between the variables. Our findings confirm that there exist the long run relationship among financial development, trade openness, and growth. Results also support the idea that country may experience faster per-capita growth with a growing degree of trade openness through gains in country productivity associated with capital accumulation. Finally, the direction of the causality results followed mixed.*

Keywords: financial development, trade openness, economic growth, co-integration, India.

JEL Classification: F43, G21, O16.

1. Introduction

The effectiveness of the liberalization policies are of vital importance for the financial development and international trade environment for promoting economic growth and performance of an economy. The economic growth is a highly debated issue all across the world. Growth is one of the imperative criteria to deem the performance of an economy. It identifies the main drivers and the key source of economic growth. A vast number of empirical studies have been investigated on this view. These studies have used various drivers of growth encompassing both foreign and domestic investment, financial development and export. The present study aims to explore the link between financial development, trade openness and economic growth by employing the time series techniques.

The strength of the finance and economic growth relationship is ultimately a matter empirical evidence (King and Levine, 1993b; Levine, 2005). The empirical financial literature has now widely accepted that financial sector development constitutes a potentially important mechanism for long-run economic growth (Levine, 2003; Demetriades and Andrianova 2004; Demetriades and Hussein, 1996; Goodhart, 2004). The earliest authors are of the notion that finance could be an engine of economic growth (Gurley and Shaw, 1955; McKinnon, 1973; Shaw, 1973). Furthermore, Beck, 2002; Sachs and Warner, 1995, have argued that the level of financial development and global trade openness are among the most important variables of economic performance. The linkage between financial development, trade openness and economic growth is one of the most vibrant research topic in economic literature and has been taken at length by many researchers. There have been a number of studies both theoretically and empirically in the field of financial development and economic growth. In additional following studies have shed light on the present study to a great extent (Kletzer and Bardhan, 1987; Demetriades and Hussein, 1996; Rousseau and Wachtel, 1998; Kar et al., 2011; Kónya, 2006). Most of the literature have explored that exports has positive impact on growth (Ullah et al. 2009). Although export-led growth or growth led exports empirically has been investigated by pioneer authors (Krugman, 1979; Bahmani, 1993; Medina-Smith, 2000; Clare et al., 2002; Gabrielle, 2004; Tang, 2006; Ummalla and Chandrashekar, 2015). However, Blackburn and Hung (1998), in their theoretical model also predict that economic growth attributed to the both financial development and international trade liberalization. Furthermore, the direction of causality still shows conflicting results (Romer, 1986; Lucas, 1988; Grossman and Helpman, 1991; Rebelo, 1991; Pagano, 1993; Khan, 2001, among others).

Although there is a vast literature about the association among growth, exports, imports and financial development but there is a dearth of literature on financial development, trade openness and growth literature on India is limited. The present study contributes to the literature by extending the financial development, trade openness and growth nexus for emerging country in India for the period 1975-2014. Firstly, previous time series studies for India which concentrated on the three financial development indicators, we include gross savings and gross capital formation as a two more variable. Secondly, financial development indicators to capture the individual dimension of financial

development. Thirdly, causality test results as followed mixed, but previous study shows that both unidirectional and bidirectional, but this study also find a no causality on gross savings and broad money with all variables.

The keen question ramble in the mind of many scholars is that whether there is any inter-linkage among financial development and international trade to accelerate economic growth. This study aims to investigate the existence of the long run relationship between financial development, trade openness, economic growth and direction of causality between these variables. The rest of the article is structured as follows: Section 2 the literature on the relationship between financial development and economic growth and international trade and financial development. Section 3 defines description of the data and methodology. Section 4 presents a brief outline of financial development in India economy with estimations. Section 5 provides empirical results and discussion. Section 6 presents in summary and concluding remarks.

2. Financial development, trade openness and economic growth: An overview

2.1. Financial development and economic growth

The rich debate on the role of the financial sector development in economic growth is still flourishing and is still interesting to both theoretical as well as empirical studies that investigate the links between the two variables (Ang, 2008; Murinde, 2012). Central to the debate is whether the economic growth can explain the financial sector growth or development of financial sector that drives economic growth. The first hypothesis, usually known as ‘demand-following’ contends that finance is led by rather than leads economic growth and also finance plays a minor role in economic growth. In this line of reasoning, finance is merely a by-product or an outcome of overall growth in the real side of the economy (Robinson, 1952). It is argued that when an economy grows, expands the financial products, financial institutions, and financial services emerge in the financial market in response to higher demand for financial services. Consequently, the real sector of the economy grows, the financial system develops thereby increasing the opportunities for acquiring liquidity for funding investment and for reducing risk. In contrast to the above, second hypothesis commonly known as ‘supply-leading’ contends that financial sector development is a necessary pre-condition for economic growth; consequently, finance leads economic growth and causality runs from financial sector development to economic growth. According to (King and Levine, 1993a) economic growth can be induce by the quantity and the composition of financial development variables through increasing savings which consist of financial assets, thereby spawning capital formation.

In addition to the above two hypotheses, contrast of prominent author emphasize that (Blackburn and Hung, 1998, Blackburn et al., 2005; Greenwood and Smith, 1997) financial sector development and economic growth can mutually complement each other making financial sector deepening and economic growth. Where bi-directional causality running between economic growth and financial development. And also other strand argue that financial development do not promote economic growth (De Gregorio and Guidotti, 1995). For the conflicting empirical evidence outlined above is true

for Sub-Sahara African countries (Murinde, 2012). For some pioneer authors view that there is a long run association between financial development and economic growth but ambiguous of the direction of causality. For instance, Wolde-Rufael (2009) and Fowowe (2011) are found a bi-directional causality between financial development and economic growth. And also Agbetsiafia (2004) found a unidirectional causality between the two variables, finally where financial sector development can act as an 'engine of growth' and also can play a key role in the process of economic development.

2.2. Trade openness and financial development

According to (Baltagi et al., 2009; Kim et al., 2010a, 2010b) research that views into the relationship between international trade and financial development is now emerging. The link between international trade and financial development the theoretical Rajan and Zingales (2003), as well as empirical Wolde-Rufael (2009), Gries et al. (2009) as explained in the literature. According to Rajan and Zingales (2003), Law and Demetriades (2006) hypothesis that financial development promoted competition when a country opens borders to both trade and capital flows. In a similar vein, Beck (2002) Stated that economies with a better-developed financial system have a two advantages higher export share and trade balance in manufactured goods. Svaleryd and Vlachos (2002) showed that there was an economically significant connection between trade policy and financial markets with where causation running in both directions of variables. Kim et al. (2010a) found that there were a positive long run association and a negative short-run association between trade openness and financial development.

Finally, above literature concludes that there is some evidence that financial sector development may be important for long-run economic growth, neither the cross-section nor the time series empirical evidence is unambiguous in its findings that financial development leads to economic growth. Moreover, this is also true for the association between financial development and trade openness.

3. Data and empirical methodology

Our study used annual data from the period of 1975-2014 containing variables, GDP per capita (proxied by Economic growth (Y)). Openness (TO) (sum of imports and exports as percentage of GDP). We use Financial development indicators such as (M1) domestic credit to private sector by banks, (M2) money and quasi money including gross savings, (M3) domestic credit to private sector refer to gross capital formation and broad money and this three indicators are in percentage of GDP. The data is collected from the 2016 edition of the world development indicators (WDI). The study applied unit root test to detect the stationaries, Johansen cointegration to test to see the long run long run relationship between variables and also applied granger causality.

3.1. Econometric analysis

This study investigates the relationship among the financial development, international trade and economic growth by using time series econometric methodology. To this aim first Phillips-Perron unit root test to confirm the stationarity of the variables. Then

Johnsen and Juselius (1990) co-integration is employed to investigate the cointegration association between financial development, international trade openness and economic growth with the variables as GDP and the explanatory variables. Furthermore, to determine the direction of causality between the variables, the research study has employed the granger causality test.

In our empirical study log-linear specifications of the variables are used and to the following estimation equation as:

$$\ln G_t = \beta_0 + \beta_1 \ln M1_t + \beta_2 \ln M2_t + \beta_3 \ln M3_t + \beta_4 \ln TO_t + \varepsilon_t$$

where:

G_t , $M1_t$, $M2_t$, $M3_t$, and TO_t represent economic growth, domestic credit to private sector by banks, money and quasi money, and domestic credit to private sector and trade openness respectively. β_1 , β_2 , β_3 , and β_4 , contribute for the elasticity of the explanatory variables.

Test for order of integration

We have used the Phillips-Perron (PP) unit root test for empirical analysis. The order of integration of the selected variables has to be investigated to check whether series are stationary. The null hypothesis for PP test is that series has unit root. If the PP series is non-stationary at level, the PP series should be taken in order of first difference to make the series stationary. pp stationary series at the level denoted by I (0) and pp stationary series at the first differences denoted by I (1). The unit roots tests should be started from the most general models such as trend and intercept (Enders, 1995).

The estimation equation can be written as follows

$$\Delta y_{t-1} = a_0 + \lambda y_t - 1 + a_2 t + \sum_{i=2}^p \beta_j \Delta y_{t-1+j} + \varepsilon_t$$

where:

y , t , a , ε_t and P are variables used which refers to the dependent variable, trend, intercept, Gaussian white noise and the lag level respectively.

Johansen's cointegration procedure

To analyse the long-run link between three variables such as financial development, trade openness and economic growth and confirm they are stationary at first difference, the results in the Table 1 indicate that according to the PP procedures variables have the same order of integration I(1). The next step is to investigate the long-run co-integration equilibrium relationship between variables. We have used Johansen, 1988 model to test the co-integration. Johansen test help to identify the long-run association among variables.

The Johansen methodology can be written equation as follows;

$$X_t = \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + \mu + e_t \text{ (for } t = 1, \dots, T)$$

where:

X_t , X_{t-1} , and X_{t-k} are vectors of level and lagged values of the variables respectively which is integrated order of $I(1)$; $\Pi_1, \dots, \Pi_k$ are coefficient matrices with $(P \times P)$ dimensions. μ , and e_t are intercept vector and vector of random error (Katircioglu et al., 2007).

Granger causality test

In third step, after determining existence of co-integration relationship (Katircioglu et al., 2007) then causality must exist either unidirectionally or bidirectionally. Further step is to investigate the time series data test for the direction of causation purpose we have used granger causality method as proposed by granger (1988). Granger causality test is run by retaining the Vector Error Correction (VEC) model framework. Furthermore, as emphasized in granger (1988) both the relationship between co-integration and granger causality is estimated.

Granger (1988) suggests the following equation of causality model;

$$Z_t = \sum_{j=1}^m a_j Z_{t-j} + \sum_{j=1}^m b_j Y_{t-j} + \varepsilon_t$$

$$T_t = \sum_{j=1}^m c_j Z_{t-j} + \sum_{j=1}^m d_j Y_{t-j} + \eta_t$$

where:

b_j is statistically significant; Y_t Granger causes Z_t . However if c_j is different than zero; Z_t Granger causes Y_t respectively.

4. Financial development, trade openness and economic growth in India

India's dismal economic growth can be attributed to multitude of factors, there is financial intermediaries providing finance to industries, it has been argued, that can that can lead to increasing economic growth. The developing economy foster through various channels: relatively well financial developed system have a comparative advantage in domestic industries and sectors such as technical modernizations, manufacturing, and technology allocation that rely on via external finance which is called foreign direct investment (FDI). Expanding the Industries while increasing production capacity actively contribute towards economic growth. The financial system provides a broad range of services to entrepreneurs and government sectors which have a contributory role to economic growth. Finally, widely evident from the fact that economies with a well-developed financial system and motivated international trade with a higher share of exports, flourishing have been registering higher economic growth compared to the economies with low-developed financial system.



Table 1. Average annual percentage of GDP of each our variable in the model: 1975-2014.

Year	DCPSB	DCPS	GCF	GS	BM	OPENNESS
1975-1980	18.35	23.51	18.96	19.18	30.23	4.60
1981-1985	22.73	29.87	21.77	20.70	36.26	4.28
1986-1990	25.15	32.78	23.74	22.37	41.62	3.63
1991-1995	18.86	32.50	23.45	23.55	43.63	4.48
1996-2000	24.45	35.43	24.20	24.75	48.50	4.44
2001-2005	33.18	49.26	28.68	29.58	61.67	4.99
2006-2010	46.69	60.20	36.45	34.69	73.62	5.35
2011-2014	51.46	67.56	36.64	34.12	77.84	4.71

Note: percentage of GDP according to World Bank (WDI).

India the graph above shows that all selected variables spanning the period from 1975-2014. For instance, while the Broad money, domestic credit to the private sector by banks, gross savings, gross capital formation, domestic credit to private sector, and, trade openness, 23.84%, 18.83%, 14.64%, 18.47%, and 17.80%, respectively in 1975. And 53.70%, 41.13%, 27.85%, 24.11% and 24.9% in 2000. Similarly, 77.7%, 68.44%, 51.57%, 34.09% and 33.14% in 2014. Which is measured as percentage of GDP, financial performance in the India has continuously increasing annual average and also gross domestic product (per capita) except unparalleled trade openness.

Table 2. Results of Phillips-Perron unit root test

	Statistical level	Statistics 1 st difference
BM	-0.309623	-4.944107*
DCPS	0.480678	-4.935499*
DCPSB	0.275307	-5.998803*
GCF	-1.079581	-7.821477*
GS	-0.863671	-9.401235*
EX	0.164296	-8.040721*
IM	-0.081216	-5.243315*
GDP	13.04816	-5.045076*

Note: The table report the results of PP tests. PP test is selected based on the Bartlett kernel and for Bandwidth is Newey-West method and Where (*) denote significance level at 1 percent ant. ⁽¹⁾

Table 3. Johansen's cointegration estimation results

Unrestricted Cointegration Rank Test (Trace)					
Rank	Eigenvalues	Statistics: Trace	0.05 Critical Value	Prob.**	Conclusion (H0)
0	0.784102	188.3154*	125.6154	0.0000	Rejected
1	0.643965	130.0634*	95.75366	0.0000	Rejected
2	0.619634	90.81981*	69.81889	0.0004	Rejected
3	0.571090	54.08824*	47.85613	0.0116	Rejected

Note: Trace test indicates 4 cointegrating equation (s) at the 0.05 level and (*) denotes rejection of the hypothesis at the 0.05 level and (**) Mackinnon-Haug-Michelis (1999) p-values

Table 4. Granger Causality results

	GDP	DCPSB	DCPS	GCF	GS	BM	OPEN
GDP	-	0.96385 (0.3922)	0.13292 (0.8760)	1.11304 (0.3409)	0.81082 (0.4534)	3.18956 (0.0546)	1.44908 (0.2498)
DCPSB	0.54908 (0.5828)	-	0.74339 (0.4835)	0.03687 (0.9638)	0.86781 (0.4295)	0.68098 (0.5133)	4.56176 (0.0181)
DCPS	2.90570 (0.0693)	0.94640 (0.3987)	-	0.59401 (0.5581)	1.03653 (0.3663)	0.74339 (0.4835)	4.04710 (0.0271)
GCF	3.36160 (0.0473)	0.07917 (0.9241)	0.72288 (0.4931)	-	0.03687 (0.9638)	0.86781 (0.4295)	0.91719 (0.4099)
GS	0.24046 (0.7877)	0.26767 (0.7669)	0.70891 (0.4997)	0.07917 (0.9241)	-	0.68098 (0.5133)	0.72288 (0.4931)
BM	4.88192 (0.0141)	0.20795 (0.8133)	0.94640 (0.3987)	0.26767 (0.7669)	0.20795 (0.8133)	-	0.70891 (0.4997)
TO	0.19046 (0.8275)	0.69541 (0.5063)	0.23886 (0.7889)	1.77291 (0.1861)	0.59401 (0.5581)	1.03653 (0.3663)	-

Note: significance at 5% level. P-values and F-statistics, respectively.

5. Empirical results and discussion

In testing for Phillips-Perron (PP) we then determine the stationary nature of the variables. Table 1 presents the results for PP unit root test. PP test indicates that all variables are found non-stationary at their level, null hypothesis is rejected and stationarity found at first difference which confirms that all variables are integrated order of first difference or I (1) level alternative hypothesis is accepted.

Table 2 reports the long-run relationship from the Johansen cointegration estimation in order to evaluate the long-run association among the variables which are GDP per capita, trade openness and financial development indicators. Furthermore, in our proposed model of economic growth (Y) is a dependent variable while two are explanatory variables which is trade openness and financial development indicators. The evidence from

Johansen cointegration estimated results shows that the trace statistic values is greater than (188.3154) their (125.6154) critical values at 0.05 level. Our proposed model indicates that if null hypothesis rejected then there is no co-integration between the variables, while accepted alternative hypothesis confirms that there is cointegration between the variables. Results show that there is a long-run equilibrium association between economic growth, trade openness and financial development.

Table 3 provides results of Granger causality test after determining existence of long run link. This method is based on Granger causality estimations of a set of each variables and represents on seven variables in the system. To ensure that the empirical estimated values are in order as vertical values are independent variables and horizontal values are dependent variables, which is the lagged differenced coefficients of F statistical values which is determined as direction of short run Granger Causality. In our proposed model, the null hypothesis indicates that there is non-causality between variables. If null hypothesis rejected then the model confirms that independent variables cause the dependent variables.

There is Granger causality from economic growth cause the broad money ($p = 0.0546$) while the reverse causation from broad money to economic growth ($p = 0.0141$) is confirmed as bidirectional, its implying that the “complementarity hypothesis” was supported. The domestic credit to private sector by banks cause trade openness ($p = 0.0181$) and the causality from the domestic credit to private sector to trade openness ($p = 0.0271$) both having some *predictive power on each other*. The gross capital formation causes the economic growth ($p = 0.0473$), and also running causality from broad money to economic growth ($p = 0.0141$) confirms unidirectional causality where the “supply-leading hypothesis” was supported and the main finding is that the remaining two variables are shown that “neutrality hypothesis” does not seem to have any significant causality relationship between the variables.

The present study evidence presented results seems to indicate that there is running any causality in any direction financial development indicators and economic growth or financial development indicators and trade openness or between trade openness and economic growth in the majority of the emerging India.

6. Summary and concluding remarks

The objective of the study is to explore the long run relationship and direction of causality between financial development, international trade openness and growth in Indian context. To this aim, first Phillips-Perron (PP) unit root tests were applied and at this level all the variables were non-stationary, which means that null hypothesis cannot be rejected. However, the stationarity found at their first difference of the series is significant. Next step was to analyse the cointegration relationship between the variables by employing Johansen Test and found that there exists a long run relationship between financial development, international trade openness and growth. Furthermore, the direction of the causality was evaluated by Granger Causality method. Our Granger causality results show that causality follows both the unidirectional and bidirectional and

some variables do not provide any causality relationship between the variables. We find support for the *complementarity hypothesis, supply-leading hypothesis, and neutrality hypothesis in India*. And also argue that economic growth and financial development indicators may evolve independently of each other (Lucas, 1988), pioneer authors Shan (2005) and Shan et al. (2001) are found that the empirical support in some countries. Overall, the empirical findings indicate that a change in financial development precedes change in trade openness and this leads to increase in the economic growth.

Based on empirical analysis the study suggest following points for the economy, first, in India a change occurs in the per capita will leads to impact on financial development which will further affect the financial sector of the country and developed financial sector will be helpful to maintain stable economic growth. Secondly, economic growth stimulates broad money while broad money stimulates economics which is important to maintain a financial development for India. And also small influence on trade openness. Thirdly, to encourage the private sector by providing incentives for production, the total production of the economy will be increased which will promote international trade and which can take more active role in the development of the economy. Broadly study conclude that Indian financial development and Trade openness hypothesis has a positive impact on the economy.

Note

- ⁽¹⁾ Johansen's cointegration test results are same both trace test and maximum test but we keeping only trace values. If anyone requesting we will provide.

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The impact of carbon dioxide (CO₂) emissions on tourism: Does the source of emission matter?⁽¹⁾

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Abstract. *Tourism is often cited as an important driver of environmental degradation worldwide by previous literature. Butler (2000) alleges that tourists will not travel back to polluted and dirty destinations if they have alternative destinations available at comparable prices. It is thus likely that carbon emissions affect tourism industry as well. The goal of this paper is therefore to investigate the impact of carbon emissions on tourism receipts in the top ten country destinations around the world. We employ panel ARDL approach using the annual data for the period 1995-2010. Findings show that emissions from gaseous fuel have a positive impact whereas total emissions, emissions from solid fuel (only in the short-run) and liquid fuel have negative impact on tourism receipts. Policy implications depending on these results are also discussed.*

Keywords: environmental degradation; tourism; carbon dioxide emission; panel ARDL.

JEL Classification: L83, Q51, Q53.

1. Introduction

The current and future potential of tourism-oriented mobility, and therefore tourism-oriented activities, have posed an even more serious challenge for environment ever before. The World Tourism Organization's 2008 report (UNWTO, 2008) on Climate Change and Tourism propound an urgent requirement of an adoption of a range of policies which encourages truly sustainable tourism that reflects a quadruple bottom line of environmental, economic, social and climate responsiveness. To address this, tourism economics frequently draws attention to the interaction between tourism and the environment. Cadarso et al. (2014) remark that intensive use of energy required for tourism production activities leads to the emission of high amounts of greenhouse gases. In addition, UNWTO (2008) estimates indicate that emissions generated by tourism sector are at around 5% across the globe.

The impact of tourism on environmental degradation is certainly well-documented (see, literature review). In those studies, it is illustrated that carbon (CO₂) emission is an appropriate indicator for representing the level of degradation. CO₂ emissions stemming from burning fossil fuels are perceived as the main source of environmental degradation such as air and/or water pollution, climate change and soil erosion. Thus, in a country where tourism makes major contributions to economic activity, one might also expect CO₂ emissions to affect tourism. The question has to be answered hereunder should be as follows: What if environment really matters for tourism as well? The goal of this paper is therefore to investigate the impact of CO₂ emissions on tourism receipts. To this end, empirical models are estimated using panel ARDL approach. The analysis is conducted on annual panel data observations ranging from 1995 to 2010 and considers 10 countries that are mostly visited around the world in the last decade.

The contribution of this paper to existing literature is two-fold. First, we model tourism receipts as a function of CO₂ emissions unlike the bulk of the studies in which CO₂ emissions are described as a function of tourism activities (see, literature review). Butler (2000) states that although determinants like price, infrastructure and marketing are still more likely to attract more tourists, are not enough to deny the importance of quality of the environment. He notes that tourists will not return to polluted, dirty and unattractive destinations if they have alternative destinations available at comparable prices. In addition, energy economics literature provides some evidences indicating the impact of CO₂ emissions on GDP (Halicioglu, 2009; Pao and Tsai, 2011; Tang and Tan, 2015 among others) as well as tourism economics literature indicating the significant impact of GDP on tourism (Tang and Jang, 2009; Apergis and Payne, 2012; Caglayan et al., 2012). It therefore makes sense that one should expect CO₂ emissions to significantly affect tourism sector given the implicit role of income.

Second, we use disaggregated data for CO₂ emissions with regard to source. Although environmental degradation per se has a detrimental impact on tourism, main point here should be the degree of degradation. If consumption is resulted from the burning of a fuel which emits lower quantities of greenhouse gases than do other fuels, this might even leave a favorable impact given that energy has to be consumed anyway. Under such a positive impact, economic impact of CO₂ emissions distinguishes oneself as well in

addition to the environmental impact on tourism industry. Therefore, by decoupling the impact of CO₂ emissions, we measure how volatile the impact is across different fuels of CO₂ emissions as well as what kind of impact they have on tourism income.

The balance of the paper appears as follows: the next section reviews related literature motivating the empirical framework. The data, methodology and results come into view in section 3. The final section concludes with the key remarks.

2. Review of literature

As tourism has attained new levels of importance with 1980s, its engagement with social, cultural and environmental issues has paid special attention. Pioneer theoretical explanations have put forward a sustainable relationship between tourism and the environment (see, Pigram, 1980; Hunter and Greene, 1995; Lukashina et al., 1996; Hughes, 1996; Butler, 2000 among others). Accordingly, the literature that looks into this relationship is voluminous and the bulk of these studies designate CO₂ emissions as a function of tourism activities. One and expanded stream of studies intends to measure how much imprint tourism leaves on the environment. Gossling (2002) argues the global environmental consequences that tourism causes and lists 5 major aspects that tourism promotes: (i) change of land cover and land use, (ii) energy consumption, (iii) biotic exchange and extinction of wild species, (iv) exchange and dispersion of diseases, and (v) changes in the perception and understanding of the environment via travel. Gossling (2013) calculates national emissions resulted from tourism sector in different economies and reach the conclusion that emissions from tourism matter more day by day which are equivalent to 5-150% of official national emissions. Gossling and Peeters (2015) assess the tourism sector's global environmental impact and note that one night in accommodation cause greenhouse gas emissions of between 0.1 and 260 kg CO₂. Furthermore, they conclude that global tourism system have caused 1.12 Gt (gigatonnes) CO₂ over 1900-2010. Gossling et al. (2015) analyze the impact of carbon emissions that are caused by air travel from international tourism markets on 11 selected economies over 1995-2010 periods. Results reported by the author show that if comparing individual markets for the whole range of destinations, variations in inter-market emission intensities of up to a factor 30 (127-3930 kg CO₂/tourist). On the other hand, if comparing average emission intensities between destinations, they are up to a factor 5 (370-1830 kg CO₂/tourist). Becken et al. (2003) examine the impact of different travel choices like transport, accommodation, and attraction on the total energy bill of international and domestic tourists in New Zealand. It is found that the dominant impact comes from transportation whose contribution to international tourists 65% while it is nearly 73% for domestic tourists. Dubois et al. (2011) discuss how it would be possible to reduce emissions in the tourism sector and the possible consequences of mitigation for global mobility induced by tourism by 2050. They conclude that if we change the way we travel considerably, this might reduce emissions in a situation where the tourism and transportation related to tourism are required to reduce emissions by a percentage as high as in all other economic sectors. Stefanica and Butnaru (2015) who believe tourism depends on environment argue that environmental issues like pollution, global warming,

waste increase etc., affect tourism as much as other global indicators like economic crisis or terrorism. One stream of studies, on the other hand, tackles with carbon footprint of tourism activities (Becken and Patterson, 2006; Dwyer et al., 2010; Munday et al., 2013; Sun, 2014 among others).

Deriving from tourism-induced energy function, there appears a few empirical studies as well, which econometrically measures the impact that tourism-related variables have on CO₂ emissions. In the case of a popular destination with more than 30 million tourists per year, Katircioglu (2014) finds an evidence of a long-run equilibrium among tourism, CO₂ emissions and energy consumption in Turkey and a 1% change in tourist arrivals to Turkey leads to a 0,10% change in CO₂ emissions in the long-run. Looking into the same issue in a different attractive tourism destination, Katircioglu et al. (2014) find CO₂ emissions, energy consumption and tourism are cointegrated in Cyprus and a 1% increase in tourist arrivals increases CO₂ emissions by 0.03%. In addition, there exists uni-directional causality from CO₂ emissions to tourist arrivals in the short-run while causality runs from tourist arrivals to CO₂ emissions in the long-run. Including foreign direct investments into the model, Lee and Brahmasrene (2013) study with the data of 27 European Union countries. Their findings show that variables under question are cointegrated and a 1% increase in tourism receipts decreases CO₂ emissions by 0.10% (Lin, 2010).

According to UNWTO (2008) estimates, 75% of tourism sector CO₂ emissions are being caused by transportation (in particular, 40% air transport, 30% car transport, and 3% other transport) while 21% and 4% of those by accommodation and tourist activities, respectively. Given these estimates, recent attempts on decoupling the influences of tourism-related CO₂ emissions have become attractive as well. Adopting bottom-up approach, Tang et al. (2014) find for China that CO₂ emissions from tourism industry in 2012 are approximately 8 times higher than in 1990. Moreover, CO₂ emissions from tourism industry are dominated by tourism transport (80% of total emissions) in China. In one of the provinces of China, Heilongjiang, Tang (2015) investigates the relationship between tourism and the environment by developing a combining method using the coupling coordination degree model and information entropy weight. Results reveal that the degree of coupling coordination shows an upward tendency. Robaina-Alves et al. (2015) focus to identify the effects of tourism on CO₂ emissions in five tourism subsectors in Portugal. Results, in general, indicate that tourism activity has the most important effect. Applying bottom-up approach, Lin (2010) determines the amount of CO₂ emissions from domestic tourism transport in five national parks in Taiwan. The results indicate that CO₂ emissions per person are different in each national park, influenced by the attributes of travel distance and transport mode.

The above having been mentioned, what we have learnt in this section so far is that there is a large body of literature examining the impact of tourism on CO₂ emissions. The vice versa, however, still remains unanswered and can only be resolved through empirical analysis.

3. Data, methodology and results

3.1. Data

The data set includes international tourism receipts in current US dollars, CO₂ emissions from total energy consumption (kt), CO₂ emissions from solid fuel (coal) consumption (kt), CO₂ emissions from liquid fuel (petroleum) consumption (kt), CO₂ emissions from gaseous fuel (natural gas) consumption (kt), GDP in current US dollars, consumer price index (2010 = 100) and real effective exchange rate index (2010 = 100). All the data are sourced from the World Bank, World Development Indicators database. The data set covers annual panel data for the period 1995-2010. The sample panel⁽²⁾ was constructed under the available data constraint according to information attained from the UNWTO.

3.2. Methodology

The present study employs a panel ARDL methodology for investigating the impact of CO₂ emissions on tourism receipts in top ten country destinations. Our model incorporates with the Pooled Mean Group estimator (PMG) that was developed by Pesaran et al. (1999). The considered model is formulated in the following manner:

$$\begin{aligned} \ln RCPT_{it} = & \alpha_i + \sum_{j=1}^{ki} \beta_{ij} \ln RCPT_{i,t-j} + \sum_{j=0}^{fi} \delta_{ij} \ln CO2_{i,t-j} + \sum_{j=0}^{hi} \phi_{ij} \ln GDP_{i,t-j} + \\ & + \sum_{j=0}^{ri} \partial_{ij} \ln CPI_{i,t-j} + \sum_{j=0}^{di} \tau_{ij} \ln EXCH_{i,t-j} + \varepsilon_{it} \end{aligned} \quad (1)$$

where RCPT is international tourism receipts in current US dollars, CO₂ is the vector of independent variables related to CO₂ emissions (i.e. total CO₂ emissions (TOTAL) and emissions from burning coal (COAL), petroleum (FUEL) and natural gas (GAS)). GDP, CPI and EXCH are the control variables that represent gross domestic product in current US dollars, consumer price index (2010=100), and real effective exchange rate index (2010=100), respectively. Finally, ε is the error term.

In order to see the separate effects (i.e. short and long) of CO₂ emissions on tourism receipts, the Eq (1) can be parameterized as follows:

$$\begin{aligned} \Delta \ln RCPT_{it} = & \alpha_i + \varpi_i \ln RCPT_{i,t-1} + \delta_i^* \ln CO2_{it} + \phi_i^* \ln GDP_{it} + \partial_i^* \ln CPI_{it} + \\ & + \tau_i^* \ln EXCH_{it} + \sum_{j=1}^{ki-1} \beta_{ij}^{**} \Delta \ln RCPT_{i,t-j} + \sum_{j=0}^{fi} \delta_{ij}^{**} \Delta \ln CO2_{i,t-j} + \\ & + \sum_{j=0}^{hi} \phi_{ij}^{**} \Delta \ln GDP_{i,t-j} + \sum_{j=0}^{ri} \partial_{ij}^{**} \Delta \ln CPI_{i,t-j} + \sum_{j=0}^{di} \tau_{ij}^{**} \Delta \ln EXCH_{i,t-j} + \varepsilon_{it} \end{aligned} \quad (2)$$

where ϖ represents error correction coefficient, the notations $\delta^*, \phi^*, \partial^*, \tau^*$ and $\delta^{**}, \phi^{**}, \partial^{**}, \tau^{**}$ illustrates the long and short-run coefficients, respectively.

Pesaran et al. (1999) developed two estimators namely the Mean Group (MG) and the Pooled Mean Group (PMG) which both can be utilized to estimate the Eq (2). However, since the MG does not allow certain parameters to be distributed homogenously across cross-section units, this study utilizes the PMG for the estimation of Eq (2).

As both pooling and averaging, the PMG estimator allows the intercepts, short-run coefficients, and error variances to differ freely across groups, but constraints the long-run coefficients to be the same (Pesaran et al., 1999). Since the initial conditions or some structural factors may have a possibility to influence all groups in a similar way, it is suggested to utilize the PMG estimator for the purpose in consideration (Menegaki and Tugcu, 2017).

Pesaran et al. (1999) points out that, in the case of cross-country studies, the likelihood ratio that is used for testing homogeneity of error variances and/or short- or long-run slope coefficients usually rejects equality of error variances or slopes at conventional significance levels. Because of this problem, it is suggested to employ Hausman (1978)-type tests. Under long-run slope homogeneity, although the PMG and the MG estimators are supposed to be consistent, only the PMG estimator is assumed as efficient. Therefore, in this study, the effect of heterogeneity on the means of the coefficients is tested by a Hausman-type test applied to the difference between the MG and the PMG.

3.3. Results

First of all, we present descriptive statistics of the variables under consideration in Table 1. Results show that variables exhibit mixed patterns in terms of normality. They are mostly platykurtic and positively (TOTAL, COAL, FUEL, GAS) as well as negatively skewed (RCPT, GDP, CPI, EXCH).

Table 1. *Descriptive statistics*

	RCPT	TOTAL	COAL	FUEL	GAS	GDP	CPI	EXCH
Mean	23.982	13.470	12.110	12.472	11.824	27.814	4.239	4.575
Median	24.125	13.069	11.671	12.364	11.712	28.007	4.420	4.603
Maximum	25.862	15.930	15.608	14.710	14.069	30.336	4.605	4.834
Minimum	21.897	11.589	8.558	10.831	9.491	25.002	0.199	3.853
Std. Dev.	0.905	1.179	1.643	0.999	1.158	1.246	0.675	0.153
Skewness	-0.311	0.625	0.388	0.670	0.521	-0.203	-3.696	-1.726
Kurtosis	2.622	2.241	2.465	3.087	2.491	2.782	17.564	8.150
Jarque-Bera	3.535	14.258	5.938	12.029	8.962	1.422	1778.573	230.700
Probability	0.17	0.00	0.05	0.00	0.01	0.49	0.00	0.00

Prior to estimation, it is necessary to ensure that the variables in interest are level or first-difference stationary (Erdem and Tugcu, 2012). Otherwise, it gets impossible to run an ARDL model. In this context, panel unit root tests developed by Levin et al. (2002, LLC) and Im et al. (2003, IPS) were utilized and findings were reported in Table 2. Accordingly, there seems no restriction for conducting the analysis.

Table 2. Panel unit root test results

Variables	LLC				IPS			
	Constant		Constant Trend		Constant		Constant Trend	
RCPT	-1.332	(0.091)	-1.829	(0.033)	1.911	(0.972)	-0.799	(0.212)
TOTAL	0.092	(0.536)	-1.824	(0.034)	1.333	(0.908)	0.612	(0.729)
COAL	0.222	(0.588)	-1.365	(0.086)	1.252	(0.894)	-0.128	(0.448)
FUEL	0.360	(0.640)	-0.759	(0.223)	1.245	(0.893)	0.770	(0.779)
GAS	-2.962	(0.001)	-1.652	(0.049)	-0.767	(0.221)	-2.078	(0.617)
GDP	1.654	(0.951)	-1.697	(0.044)	3.750	(0.999)	-0.444	(0.328)
CPI	-0.838	(0.200)	-3.074	(0.001)	2.832	(0.997)	-0.286	(0.387)
EXCH	-2.099	(0.017)	-2.257	(0.012)	-1.405	(0.080)	-0.361	(0.359)
ΔRCPT	-8.213	(0.000)	-6.760	(0.000)	-6.573	(0.000)	-4.164	(0.000)
ΔTOTAL	-9.610	(0.000)	-9.678	(0.000)	-4.198	(0.000)	-7.745	(0.000)
ΔCOAL	-6.545	(0.000)	-9.294	(0.000)	-6.420	(0.000)	-7.138	(0.000)
ΔFUEL	-9.523	(0.000)	-9.301	(0.000)	-7.923	(0.000)	-7.275	(0.000)
ΔGAS	-11.832	(0.000)	-11.171	(0.000)	-4.668	(0.000)	-4.899	(0.000)
ΔGDP	-6.186	(0.000)	-5.748	(0.000)	-3.763	(0.000)	-2.402	(0.008)
ΔCPI	-3.801	(0.000)	-6.528	(0.000)	-4.758	(0.000)	-4.977	(0.000)
ΔEXCH	-6.960	(0.000)	-6.393	(0.000)	-4.962	(0.000)	-3.887	(0.000)

Δ is first-difference operator.

Numbers in parentheses are p-values.

Spectral estimation was conducted by using Newey-West bandwidth selection with Bartlett kernel for the LLC.

The optimal lag lengths were determined by the SBC.

Following the unit root analysis, estimation was conducted by running Eq (2) with the PMG estimator and findings were reported in Table 3. As seen, the joint Hausman test statistics prove that the null of the long-run homogeneity is accepted at 1% level of significance in each model indicating the PMG estimator is consistent and efficient under the long-run homogeneity assumption. This also supports that the interpretation of the coefficients obtained from the PMG estimator rather than the MG is an appropriate choice.

Table 3. Panel ARDL estimation results

Dependent Variable: RCPT	CO ₂ from			
Long-run coefficients	Total	Coal	Fuel	Gas
TOTAL	-0.547 (-3.696)**			
COAL		-0.011 (-0.239)		
FUEL			-0.937 (-23.886)*	
GAS				0.526 (7.733)*
GDP	0.401 (5.752)*	0.322 (3.357)**	1.561 (30.671)*	0.015 (0.228)*
CPI	-0.292 (-2.387)***	-0.650 (-11.954)*	-0.837 (146.698)*	-0.332 (-6.972)*
EXCH	-0.857 (-4.728)*	-0.668 (-3.858)**	-3.255 (-34.687)*	-0.500 (-6.580)*
Joint Hausman Test	10.27 [0.04]	8.20 [0.08]	11.47 [0.02]	4.55 [0.34]
Error correction parameter	-0.532 (-3.112)**	-0.398 (-2.715)**	-0.715 (-1.698)***	-0.413 (-3.072)**
Short-run coefficients				
TOTAL	-0.291 (-3.095)**			
COAL		-0.004 (-2.000)***		
FUEL			-0.671 (-1.698)***	
GAS				0.217 (3.056)**
GDP	0.214 (3.101)**	0.128 (2.723)**	1.117 (1.700)***	0.006 (3.000)**
CPI	-0.156 (-3.120)**	-0.259 (-2.726)**	-0.599 (-1.696)***	-0.137 (-3.044)**
EXCH	-0.456 (-3.102)**	-0.266 (2.714)**	-2.329 (1.698)***	-0.206 (-3.074)**

Numbers in parentheses are t-statistics and in brackets are p-values.

The Newton-Raphson method which uses both the first and the second derivative of the log-likelihood function was utilized.

In order to avoid common factor problem, demeaned data were used for the estimations.

*, **and *** indicate 1, 5 and 10 percent levels of significance, respectively.

According to findings illustrated in Table 3, models that we try to solve have stable equilibrium. It is proved by negative and statistically significant error correction coefficients. Besides, estimates reveal that, either in the long or in the short-run, CO₂ emissions caused by natural gas consumption positively affects tourism receipts, whereas emissions originated from the consumption of total energy, coal (just for short-run) and petroleum have negative impacts. As expected, higher prices and real exchange rate indexes⁽³⁾ are the factors that decrease the receipts, and increases in GDP which basically denotes the improvement in the quality or quantity of services provided by tourism industry let to an increase in tourism receipts.

4. Concluding remarks

The literature on tourism and the environment is large and still growing. To the best of our knowledge, most of this literature has described environment as a function of tourism activities. As discussed earlier, however, tourists will not be willing to travel back to dirty and polluted destinations. Given this learning, the goal of this paper is to investigate the impact of CO₂ emissions on tourism receipts. To this end, we estimate how emissions omitted by different fuels affect tourism receipts in top ten country destinations by using a dynamic panel data analysis.

Empirical analysis has ended with expected results in terms of control variables. One might expect that countries with higher GDPs are better able to provide services such as transportation, accommodation and catering. These countries also have an advantage to market and protect tourist attractions relative to their competitors with less income. Thus, *ceteris paribus*, the more GDP they have, the more tourism receipts they earn. On the other hand, tourists are not willing to visit countries where prices are higher and foreign currency is worthless. In this sense, stabilizing prices and exchange rates may help policy makers in increasing tourism income.

Emissions from petroleum consumption have a significant negative impact on tourism receipts either in the short or in the long-run. This evidence clearly points out that consuming liquid fuels leaves only an environmental-based impact on tourism industry and increasing usage of petroleum decreases tourism receipts⁽⁴⁾ through the channel stressed in Butler (2000). In the meantime, it is very understandable if one would expect emissions omitted by liquid fuels to affect tourism receipts positively given the importance of liquid fuels in transportation services as a crucial stakeholder of tourism industry. However, the main purpose of this study is to measure the impact of CO₂ emissions on tourism receipts in an environmental perspective. The main model presented in Eq (1) therefore includes GDP variable in order to avoid double counting based upon the expansion of economic activity. Thus, the negative impact either in the short-run or in the long-run is a sole and exclusive sign of environmental degradation on tourism industry.

The impact of emissions from natural gas consumption on tourism receipts is positive and statistically significant. At the first glance, this might be a bit surprising given the epiphany that larger values of emissions are supposed to leave a detrimental impact in

any case, regardless of which fuel is burnt⁽⁵⁾. However, it makes sense after clutching that emissions of greenhouse gases are much lower with the consumption of natural gas compared to other fossil fuels'. Unlike the case in the consumption of petroleum, in addition, results prove that economic impact of natural gas consumption is dominant over its environmental impact on tourism industry because the estimated coefficient on natural gas consumption is positive even with the presence of GDP variable.

Although the impact of CO₂ emissions from coal consumption on tourism receipts is negative in the long run, it is not statistically significant. This insignificant relationship, however, gives way to a negative significant relationship in the short-run with a very small coefficient. This evidence basically shows that emissions from coal consumption have little short-run environmental impacts on tourism receipts in the countries under investigation.

The strongest result supporting the hypothesis that environmental degradation really matters for tourism industry comes from the model using total CO₂ emissions. The estimated coefficient on total CO₂ emissions is negative and statistically significant. This is important in establishing that CO₂ emissions do impact tourism receipts in highly attractive tourism destinations in a negative and statistically significant way. In previous studies, tourism industry has been found to increase CO₂ emissions (Katircioglu, 2014; Katircioglu et al., 2014) and in this paper CO₂ emissions are found to decrease tourism receipts.

As a rapidly growing industry, tourism has positive impacts on balance of payments, employment and production. Therefore, increasing tourism receipts could be of a great concern for these countries as they are all prominent tourism destinations. Energy, on the other hand, is a key production factor for tourism industry due to growing demand so as to provide a wide range of tourism-related services. Specifically, bulk of the literature draws attention to tourism-induced CO₂ emissions either at national or global level (Holden, 2009; Filimonau et al., 2013; Filimonau et al., 2014 among others). Thereby, the results of this study assign policymakers and tourism planners some fundamental responsibilities due to the complicated relationship between CO₂ emissions and tourism receipts as well as the implications for tourism marketing and greenhouse gas emissions. One apparent implication is the encouragement of natural gas usage. Consuming natural gas does not only have less damage on the environment⁽⁶⁾, but also leads to increase tourism receipts. In addition, units in tourism industry such as hotels, restaurants, shops and tourist site facilities should prefer natural gas in providing hospitality services like cooking and water and space heating considering its economic benefits as well as the property of instant heating. In a similar manner, energy conservation policies designed to reduce greenhouse gas emissions emitted from liquid and solid fuels could also assist host countries in increasing tourism receipts, concomitant with reducing environmental degradation and ecological destruction. Another implication appeared herein, which is very coherent, is related to the difference between short-run and the long-run results. If a fuel is intensively consumed in tourism industry, emissions depending on its consumption are then anticipated to exhibit a long-run impact on tourism receipts. Less-intensive fuels consumed in tourism industry, on the other hand, may affect tourism potential only in the

short-run. Finally, consuming solid and liquid fuels have merely environmental impacts on tourism industry whereas consuming gaseous fuel has a preponderant economic impact in addition to environmental one.

Tourism development policies in highly attractive tourism destinations are an area where the results of this study could have an impact. Overall, this study suggests tourism planners to pay more attention on impacts of CO₂ emissions in designing tourism development policies cooperatively with energy planners. Picture drawn by the findings presented herein shows that the impact that CO₂ emissions have on tourism receipts vary across different fuels. Energy conservation policies designed to reduce greenhouse gas emissions should be directed to lessen the emissions from liquid and solid fuels, which, in turn, contribute to generate more income from tourism. In other words, findings of existing paper go with the environmental concerns towards limiting CO₂ emissions worldwide, in which natural gas is addressed as a relatively benign fossil fuel for the environment and is projected to play an important role in meeting the targets associated with the reduction of greenhouse gases.

This study makes a new way for subsequent researchers. Countries under investigation in this study are among must-see destinations for an average tourist around the world. It would be interesting to see if existing results hold for a sample in which less visited destinations fall within as well. Besides, this study does not consider the influence of aggregation bias, which is very difficult to overcome in panel data. Future studies, if done on a single-country-case, should also take this into account by appointing tourist arrivals by country as dependent variable. By doing so, it would be possible to compare the results of cross-sections with the results provided by pooled panel to see if there is any bias.

Notes

- (1) The earlier brief version of this paper was presented at MAC-EMM International Conference held on August 5-6, 2016 in Prague, Czech Republic.
- (2) The panel includes mostly visited ten country destinations in the last decade: France, the US, Spain, China, Italy, Turkey, the UK, Germany, Russia and Malaysia.
- (3) Since it is a measure of the value of a currency against a weighted average of several foreign currencies, an increase in the real exchange rate index represents an appreciation of the local currency.
- (4) A further estimation in which GDP is kept out of the regression shows that the impact of emissions from liquid fuels on tourism receipts is positive with a high correlation coefficient (0.864).
- (5) Especially subsequent to eliminating the impact of economic expansion as mentioned before.
- (6) The figures on how much CO₂ is produced when different fuels are burnt are provided by EIA (<http://www.eia.gov/tools/faqs/faq.cfm?id=73&t=11>).

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Effect of exchange rate policy on GDP and GDP components: The Kyrgyz Republic Case

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Abstract. *The choice of exchange rate regimes in the countries to take advantage of stabilization policies was quite difficult. After the breakdown of the USSR, the KR among the former member countries in the Central Asia was the first to introduce its national currency on 10th of May 1993. After that time, it has done several adjustments in the exchange rate policy to preserve the value of the som from external shocks. In the study, the effectiveness of the exchange rate policy on GDP and GDP components is examined by using the ARDL model by Pesaran et al. (2001). The estimation results show that the depreciation of som has positive significant short- and long-run effects on GDP growth. However, while it has insignificant effect on most of the GDP component variables in the short-run, it has negative significant long-run effect.*

Keywords: exchange rate regimes, som, external shocks, ARDL, GDP, GDP components, short-run effects, long-run effects.

JEL Classification: E00, E52, E69, F41.

1. Introduction

Since increasing level of financial and trade, integration the choice of appropriate and adjusted foreign exchange controls by countries is important in persisting of healthy financial and economic state. Within the last fifty decades, the change of foreign exchange controls by authorities was indicated for most of the countries. More than half of the International Monetary Fund (IMF) members replaced or tend to move to opposite foreign exchange controls form implemented one (IMF, 2014). Whether to move from fixed regime to floating is suitable in current dynamic financial and economic condition is large discussion of researchers and institutions.

Opinions are varied and opposite to each other, most studies on this issue starts with contemplation of foreign exchange controls theory (by most informally named conventional view) and declaring of contradicting empirical evidences. Although, most agrees that the choice of foreign exchange control is closely related with whether country is developed industrial economy, emerging market economy or less involved in world financial and economic system state. Some incline to view those industrial developed economies should practice floating regimes where others despite temporally benefit from fixed regimes will need to move to more free regimes (Mussa et al., 2000). Another groups assert opposite view, if one of them questions the generally accepted in classic theory effectiveness of floating regimes through analysis of empirical case (Fukao, 1990), others aggressively argue the coincidence of theory of foreign exchange controls and advocates fixed toward fixed regimes (Hausmann et al., 1999).

Beside other opinions on the relation of foreign exchange controls with other economic aggregates, there are also opinions, which explore and state the insignificance of the choice of foreign exchange regime to real economic growth to country (Rose, 2011). There are many studies made on other directions of issue of foreign exchange controls and its effect, but for the purpose of paper's efficiency, the range is limited.

The exchange rate movements or fluctuations affect economy of a country starting from the famous "interest rate parity". There is a difference in the interest rates of the countries due to the depreciation or the appreciation of the domestic currency. Investors want to gain high return (interest rate on assets) with low risk (risk premium). Interest rates do not only affect FDI, but also lending opportunities of governments and consumption behavior of the households. It can also affect the trade balance by its effect on the domestic exchange rates.

Being very vulnerable to the external financial, trade shocks, and the high contagion property of crises the validity of current foreign exchange regime is need to be reviewed. The number of foreign exchange regimes is practicing in it like transition economies as the Kyrgyz Republic (KR). The reason of that, despite the same level of economic stage, is obviously for most the fact of variety economic conditions, geographical trade concentration and other individual characteristics. The fact of not high level of foreign market, low and mostly inflow of capital and assets to the country, import orientation, comparatively fewer financial transaction and other economic characteristics defines its own path to manage foreign exchange. The frequent noticed in studies view of difference

of foreign exchange regimes between in empirical implementation and conventional wisdom raises necessity for Kyrgyz Republic authority to deviate from theory of exchange rate arrangement. The behavior of closest economic partners of the country and more important the recent gained partnership in “tight” economic union – Eurasian Economic Union which closes some doors and opens others, the members different economic level increments the real effectiveness of current foreign exchange regime. Examining the generally bad economic performance of the country especially in integration to global increasing financial and economic systems it comes the idea of, among other possible problems in economic administration, the irrelevance of current foreign exchange regime in Kyrgyz Republic.

The aim of the paper is to estimate the effect of exchange rate on GDP and GDP components by using interest rate parity and relative purchasing power parity identities. The theoretical backgrounds of the models are based on the behavioral equations like interest rate parity, intertemporal consumption behavior, etc. As a result of the estimation results, the effectiveness of the exchange rate in the short- and long-run will be discussed and then alternative policy variables will be proposed. In the next chapter, the general literature review will be discussed. Then the evolution of the exchange rate policy in the KR is discussed. The data sample variables and methodology will be discussed in detail. Lastly the model estimations are interpreted and as a result of the findings some policy implications are introduced.

2. Literature review

The differential condition in terms of economy, geographical trade concentration, level of industrialization or its potential development, monetary and fiscal policy design; and in terms of financial tightness to outside, intensity of capital and asset flow, development of financial market in the region are both became the source of evolution of variety kinds of foreign exchange controls. Depending on individual condition of country's economic, financial and even political factor except polar exchange, regimes fixed and floating many intermediate regimes were developed to current days. The classification of foreign exchange controls by IMF (2014), gives 10 categories dividing them into main four type *Hard peg*, *Soft peg*, *Floating regimes (market-determined markets)* and *Residuals*. In Ribnikar's (2004) study there is given 11 classification of regimes, except IMF classification author has added other scholars defined regimes as *Monetary Union*, *'Truly' fixed exchange rate regime*, *Crawling peg or basket peg* and *Free or pure float* (as cited in IMF, 2004; Von Hagen and Zhou, 2002; Frankel, 1999; and Crockett 2003). Conceptual section, the classification of foreign exchange regimes will be covered closer and detailed. However, among scholars and practitioners it is well known that often country's responsible authority's officially declared foreign exchange regime (*de jure*) fairly differ from the way it manages foreign exchange (*de facto*).

The view to the rational foreign exchange regime in speeding financial and economic globalization is shown in research of Mussa et al. (2000). According to Mussa et al. (2000), the main factor in determining foreign exchange regime is dependent on external

conditions, these economic, financial and there is cannot one specific regime classified as most effective for the country. Considering accelerating integration of financial and economic (especially monetary) systems, authors point, that in case of raising international capital and asset flow, despite the advantages of fixed and close to it kinds of regimes countries need to adopt float regime and there is tendency of. Mussa et al. (2000) states that is especially recommended for financially expanding countries, which are mostly emerging market economies. Floating regime as argue Mussa et al. (2000) more suitable in case when highly linked financial system and monetary policy country is at risk of larger external financial and trade shocks. For the most transition economies which are less developed the fixed (pegged) foreign exchange regime is best, implying appropriate policies by related right institutions supporting the exchange regime, noticed authors. However, in spite well-adjusted monetary and other policies to fixed foreign exchange regime from which country will benefit, the continuation of the regime cannot last for longer period in time of frequent external financial and trade shocks and raising globalization of them (Mussa et al., 2000). Finally, Mussa et al. (2000) bring out based the study, that in grouped economies as ASEAN there is importance to consider moving from one currency pegged regimes to major currencies (dollar, euro, yen) pegging to persist instability of one currency. This may be the case in integration to unified economy of Kyrgyz Republic as the member of Eurasian Economic Community (EurAsEC). As neither ruble nor tenge is being currency to peg for other members and all states is quite vulnerable to dollar. It makes member countries fragile in case if one of them will be affected by outside shock the contagion effect can harm others without strong instrument against it.

One part which foreign exchange control has economic effect is for the balance of payment of country. In the article of M. Fukao (Liberalization of Japan's Foreign Exchange Controls and Structural Changes in the Balance of Payment, 1990), author studies the total effect to the capital inflow and outflow and balance of payment in tight fixed foreign exchange controls in early period after World War Second and movement to the floating foreign exchange controls and its liberalization. As author compares, the replacement of fixed foreign exchange controls to floating exchange controls very significantly increased capital inflow and outflow. The foreign trade also has been enlarged due to liberalization of exchange controls and enhances the relation of the country to international monetary system and international trade. Besides these changes, the weakening of yen in short period raised foreign investment and export to USA. However, as author mentioned, along with strong changes due to the floating foreign exchange controls, which strengthened the economic relationship of the country with world and gave many positive outcomes, it raised the conventional problem of floating exchange controls comparing to fixed exchange controls is high fluctuation of exchange rate. M. Fukao comments it as follow: "even with both exchange controls and interventions, it is impossible to achieve simultaneously both the stabilization of exchange rates and a monetary policy that is independent of world financial and economic conditions".

The study of Hausmann, Gavin, Pages-Serra and Stein (1999), analyzed the floating exchange regime and fixed exchange regime based on theoretical claims of these theories

and empirical practice of them. As the case authors focused on Latin America countries in 1960-1999 periods. According to Hausmann, Gavin, Pages-Serra and Stein (1999), despite the literatures, which states beneficial properties of floating exchange regime in coping external trade and financial shocks and evidence of experience of European countries, Latin American states practice shows other if not opposite effect. Briefly, concerning interest rate because of highly volatile currency in floating exchange regime or other close regimes, the depreciation of domestic currency will lower the real value of domestic assets and deposits; thus, the only way to make more attractive the interest rate will be raised. In case of fixed exchange, regime stable exchange rate savers will be ensured and the real interest rate will be in lower level than other case, thus deepening financial market. As authors describes, this was the case in terms of interest rate in Latin America. Authors also argued the theoretical property of floating exchange regime, which supposed to have low inflation rate. As it was case in Latin America the states having floating exchange regime faced higher wage inflation. The quantitative analysis made in the study, shows that most Latin America countries after moving to more free exchange regime perceived higher inflation. The question of pro-cyclical monetary policy according to regression analysis made in the study of authors, is shows that fixed exchange regime has been proven as less pro-cyclical monetary policy, which is also contradictory to theories about exchange rate regimes. In addition, conclusion made in Hausmann, Gavin, Pages-Serra and Stein (1999) study, shows that countries practicing fixed exchange regime (often despite officially is floating exchange regime) in Latin America the domestic interest rate was more sovereign to foreign interest rate fluctuations.

On the other hand, differing conclusion made by Rose in his research (2011) arguing that foreign exchange controls do not have real significant effect on country's economic growth. According to study of author, the regressions estimated to identify the correlation between first inflation rate and foreign exchange regime practicing by country mainly fixed or floating show that generally in case of floating foreign exchange control has larger inflation but it not significant. Second determining relationship between economic growth and foreign exchange controls systems there was not found significant effect and difference of type of exchange rate system on major economic aggregates. Although author study consolidates with conventional view of that fixed and pegged foreign exchange controls are more protected against inflation he states that it mainly impacted by other factors as "precise measure of the exchange rate regime". And finally, Rose end up, summarizing that most studies and evidence are contradictory and there is no direct relationship between of type of foreign exchange rate regime and inflation, economic growth.

3. Establishment of som, and exchange rate evolution in the KR

After the collapse of the USSR, the former members continued to use the ruble. By that time, the ruble zone was seen as well-behaved currency area (Pomfret, 1993). After a while it was seen that it was indeed unstable due to the facts: (i) the demand for ruble created a hyperinflation, (ii) former trade channels no more existed, (iii) there were

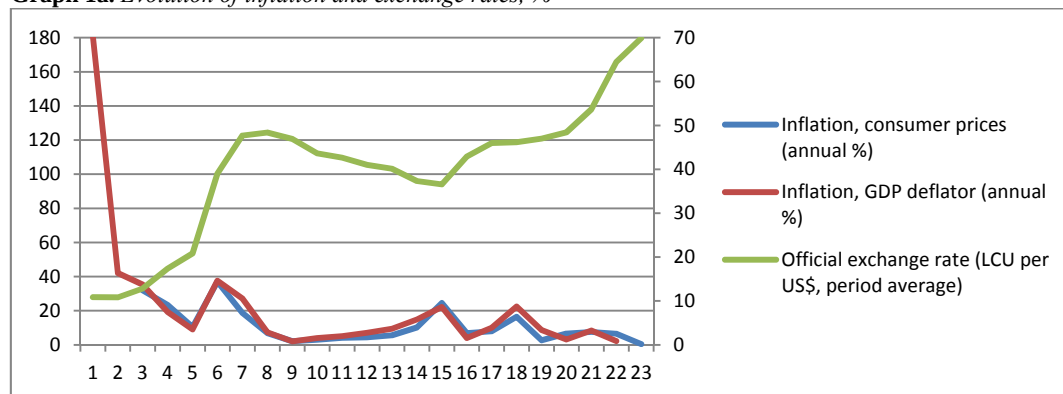
asymmetry in the local policies. Thus, the members had 2 choices: to make reforms in the existing monetary system to establish their own currencies.

Estonia was the first country to introduce its own currency kroon in June 1992. In the autumn of 1993, the Central Asian countries started to leave the ruble. Among the others Kyrgyzstan was the first to establish the som on 10th of May in 1993 (Pomfret, 2014). The starting exchange with respect to ruble was 1 som for 200 rubles, and to US dollar was 2 soms for 1 dollar (Olcott, 1997). International organizations like IMF and IDA gave away 23 million dollars, 39 million dollars by standby agreement, and a 60 million dollars respectively. Other developed countries lend to Kyrgyzstan of 70 million dollars (Pomfret, 2014).

However, the establishment of the domestic currency was not enough to solve trade problems with neighboring countries as they were not willing to accept the som in the inter-trade agreements.

The instability of the som when it is in first years was caused by high inflation expectations, and high demand for US dollar. By restrictive monetary policy and foreign exchange interventions, the government stabilized the domestic currency. When the exchange rate of dollar became 11.20, by 10.3% devaluation, the economic growth stayed stable. This stability ended in 1996 when the government emitted money to pay its debts. The effect on the exchange rate was the depreciation of som by 33% which in turn led to the inflation of 35%. Thus the confidence for the currency deteriorated.

Graph 1a. *Evolution of inflation and exchange rates, %*



Source: WB, WDI.

The next year the depreciation became 3.9%. On the other hand, in 1998 by the effects of external and internal factors like precipitation of liquidity of banking system and the financial crisis in Russia, the outflows of capital increased. To stop these NBKR made interventions through “Trading Informational Electronic System” but due to the insufficient level of gold reserves, it limited the liquidity of banking system.

When the Kazakh tenge and Russian ruble devalued on 5th of April 1999, the Kyrgyz goods lost the competitiveness which in turn led to the decrease of exports and increase of imports. The gradual actions of the NBKR devalued som by 40%. Also, the rise in the

exports of agricultural goods and the foreign currency inflow by the tourism season appreciated som. Again in 2000, the tourism season influenced som and to decrease the fluctuations in exchange rate the NBKR started new tool, SWAP operations to provide the slow overvaluation of the domestic currency to save the competitiveness of the domestic goods. In 2001, the som appreciated against dollar for the first time since it was introduced.

In 2002-2003, the som kept to appreciate. This is also fueled (fired) by positive balance of payments, and the set of the military base of the antiterrorist coalition, and the global devaluation of dollar. In 2004-2005, in addition to this export growth and inflow of capital appreciated the domestic currency. The appreciation continued till the end of 2007.

With the onset of the effect of the 2008 Financial Crisis the exchange rate became 1 dollar = 34.60 soms. In one year som depreciated and the exchange stayed 1 dollar = 44.24 soms in September of 2009. The appreciation affected manufacturing and agriculture sector negatively which finally destroyed the agricultural sector. This all-time deteriorated the trade balance and current account as well. The trade deficit was tried to eliminate by the remittances. The only positively affected sector was the textile sector in which Kyrgyzstan reexport the textile goods imported from China to Kazakhstan and Russia.

In summary, the exchange rate policy should have been used to increase the exports which in turn accelerate the capital inflow and employment, and thus the growth of the domestic production. Whereas the KR officially used managed floating exchange rate, the NBKR targeted certain level of foreign currency which led to the stable som. However, this decreases the circulation velocity of money which is very essential in the efficiency of the monetary policy by shrinkage of money.

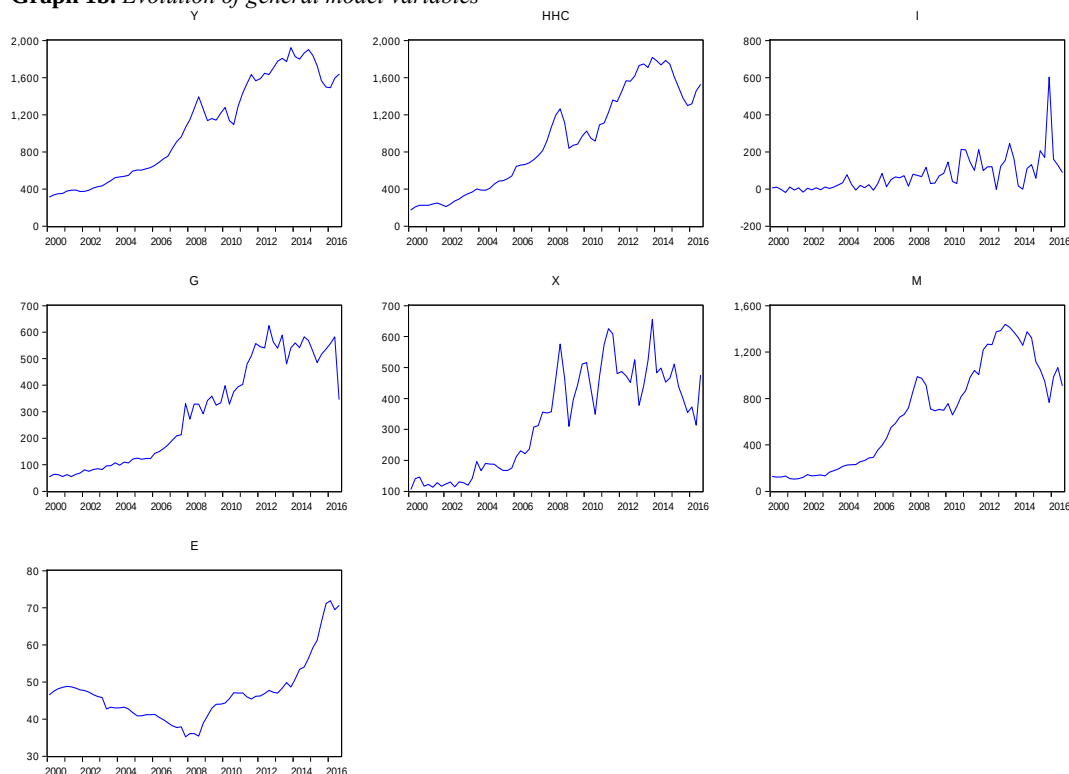
4. Data sample

Y is current GDP in million US dollars, HHC is current household final consumption expenditure in million US dollars, GEXP is current government expenditure in million US dollars, X is current export of goods in (FoB) million US dollars, M is current import of goods in (FoB) million US dollars, I is current foreign direct investment in million US dollars, E is the exchange rate between Kyrgyzstani som and US dollar. Other variables and their descriptions are given in Table 1. The notation on the variables, Ln, is natural logarithm. The motivation to take natural logarithm is to decrease their variances or standard deviations. Rate and percentage variables are not transformed. All variables are seasonally adjusted by Census X13 and TRAMO/SETS (only I) and then the natural logarithm is taken except I. Some variables are converted from annual frequency to quarterly by using Chow-Lin interpolation method due to the no availability (absence) of the quarterly data (Chow and Lin, 1971). The data for Kyrgyzstan for 2000Q1-2016Q3 is collected from the websites of NBKR, National Statistical Committee of the KR, Interstate Statistical Committee of the CIS countries, and World Bank. Other used websites are of Fed Prime Rate and Investing.

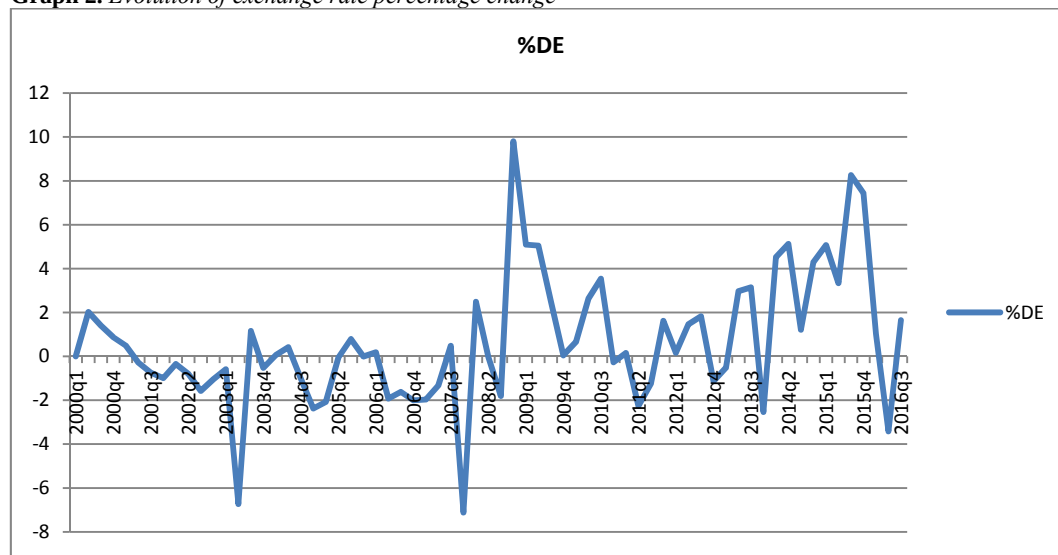
Table 1. *Data source of variables and their descriptions*

Variable	Description	Transformation	Data Source
Y	current GDP in million US dollars	Ln	Interstate Statistical Committee of the CIS
HHC	current household final consumption expenditure in million US dollars	Ln, Chow-Lin Interpolation	World Bank (WB)
I	current foreign direct investment in million US dollars	No	National Bank of the Kyrgyz Republic (NBKR)
G	current government expenditure in million US dollars	Ln	National Statistical Committee of the Kyrgyz Republic
X	current export of goods in (FoB) million US dollars	Ln	National Statistical Committee of the Kyrgyz Republic
M	current import of goods in (FoB) million US dollars	Ln	National Statistical Committee of the Kyrgyz Republic
E	exchange rate between Kyrgyzstani Som and US Dollar	Ln	NBKR
INTERESTDOM	interest rate of Som deposits, percent	No	NBKR
LIBOR6	US Dollar 6 month LIBOR Rate, percent	No	FedPrimeRate.com
INFKG	Inflation Rate of the KR, percentage change of CPI to the previous year's same quarter, 2010=100	No	National Statistical Committee of the Kyrgyz Republic
INFUS	US Inflation Rate, percentage change of CPI to the previous year's same period, 2010=100	No	Saint Louis Fed
DEBT	Current budget balance (Government Revenue-Government Expenditure) as a percentage of GDP	No	National Statistical Committee of the Kyrgyz Republic
INFPOILFAO	oil price inflation, 2010=100, % change with respect to the last year's same period	No	Food and Agriculture Organization of the UN (FAO)
INFPFOODFAO	food price inflation, 2010=100, % change with respect to the last year's same period	No	Food and Agriculture Organization of the UN (FAO)
YGAP	Difference between natural logarithms of Actual and Potential GDP values	No, Chow-Lin Interpolation for Potential GDP	National Statistical Committee of the Kyrgyz Republic
YWORLD	Current World GDP in million US dollars	Ln, Chow-Lin Interpolation	WB

Ln: natural logarithm; Chow-Lin interpolation method to convert annual data to quarterly data.

Graph 1b. *Evolution of general model variables*

Now look at the graphs of the variables. Actually the behavior of GDP and Household Consumption is the same. This means household consumption is one of the important determinants of GDP. They both have upward trend which stagnated in 2008-2010 and decreased 2014-2015 due to the 2008 Global Financial Crisis and the Euro Asian Economic Union negotiations. This interpretation can be done for the government expenditures with more cyclical movements and it stagnated one more year, 2016. This is true for the components of trade as well. Export stagnated 2000-2003 and 2008-2010 and decreased after 2014 with high volatility and cyclical movements. Whereas Import is less volatile with few cyclical movements, its behavior is the same as of Export. Most volatile part of GDP is FDI in the macroeconomics literature. It is also the case in the graph. FDI becomes more volatile year by year after 2005 due to the political upheaval (Revolution and collapse of the Parliament). The exchange rate policy of the NBKR leads to the appreciation of som against US Dollars till 2008. After the crisis, the local currency depreciated in most of the periods till nowadays. The huge depreciations between 2008Q3 to Q4 and 2015 Q2 to Q3 were 9.80% and 8.257% respectively.

Graph 2. Evolution of exchange rate percentage change

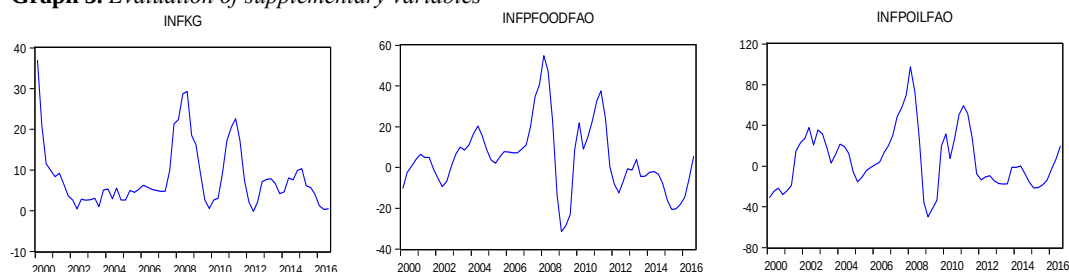
Descriptive statistics show that while HHC, Grev, X, and M are normally distributed, others are non-normal. GDP is 1059143000 dollars on average.

Table 2. Summary statistics for general model variables

	Y	HHC	I	G	X	M	E
Mean	1059.143	915.1358	73.96014	297.7765	328.3444	668.4145	46.93533
Median	1137.233	883.6431	50.10492	324.8545	353.3007	697.1608	46.14528
Maximum	1924.588	1818.685	603.1395	624.8133	655.3063	1438.731	71.92187
Minimum	313.4038	174.2846	-17.87281	54.97013	106.5397	104.2981	35.21141
Std.Dev.	540.2648	536.6728	94.11002	195.5821	163.1584	444.7940	8.332505
Jarque-Bera p-value	0.040896	0.066224	0.000000	0.030008	0.076532	0.070818	0.000000
Number of Observations	67	67	67	67	67	67	67

HHC is about 86.40% of GDP, which is the largest component of the GDP. Government expenditures take 28%. There is instability in the trade. The country suffers from trade deficit; that is to say on average import of goods is more than two fold than export of goods, about 2.036. Again the FDI is the most volatile variable with respect to its mean with little percentage, 7%.

Evolution of other variables used in the model of GDP components are given in Graph 3. CPI in the KR has flatter slope till 2007 and then exponential slope thereafter. In 2008 and 2010, it gets steeper with no cyclical components. As a result of all these, inflation (*INFKG*) is always positive. It has the highest values in 2000, 2008, and 2011 due to the effects of Russian crisis, 2008 Financial Crisis, and 2010 political tension in the country. World inflation has the same behavior as the inflation in the KR. Price of crude oil has the same behavior with more fluctuations and steep decrease after 2014.

Graph 3. *Evaluation of supplementary variables*

The World inflation (truly the inflation of food prices) and price of crude oil (fuel) feeds the domestic inflation. In summary, price inflation of World Food products, Oil products, tend to have similar behaviors. Since the US economy products huge volume of the World GDP by using oil products, and nearly 30% of World GDP is consumed by US citizens, then the prices in the US tend to move together with these two prices. GDP gap of the KR with always negative values has a fixed slope except it has the highest value in 2002Q3 with 72000 US dollars. The reason for this is the decrease of employment.

Government debt as a ratio of GDP is increasing after 2008 Financial Crisis. Due to the political upheaval in 2010, it decreased till 9.10% in 2012Q3. The inverse is the case in 2015Q2 with 9.4% budget surplus. However, it decreased thereafter. Interest rate for some deposits decreases steeply till the start of 2004, and continues to increase till 2016Q3 with 6.70%. While in 2008Q3-2009Q3, in which the world economies including the KR felt the 2008 Financial Crisis, it stayed rather constant, from 5.60% to 5.80%. In 2010 political upheaval, from the mid 2010 till end of 2010, it decreased from 4.90% to 4.50%. Afterwards it continues to increase gradually. US dollar 6 month LIBOR rate till 2004 (1.20%) and then steeply increased to 5.80% in 2007Q1. Then it decreased steeply till 2010 and got more fixed afterwards. The 9/11 Terrorist Attacks and 2008 Financial Crisis are the main factor. After 2010, the world becomes more peaceful and as a result World GDP started to increase.

The summary statistics are given in Tables 3 and 4.

Table 3. *Summary statistics for supplementary variables I*

	INTERESTDOM	LIBOR6	INFKG	INFUS	DEBT
Mean	6.152751	2.235603	8.182076	2.185665	-1.569870
Median	5.356569	1.344735	5.623795	2.046754	-0.814236
Maximum	19.60703	6.784434	36.90878	5.252946	9.374428
Minimum	3.470075	0.325788	-0.176940	-1.606843	-9.107639
Std.Dev.	3.183283	2.019985	7.734901	1.297894	2.863542
Jarque-Bera p-value	0.000000	0.007938	0.000000	0.384373	0.000432
Number of Observations	67	67	67	67	67

All variables except US, oil price, and food price inflation rates are non-normal. Domestic inflation rate based on 2010 (8.1821) is greater more than two fold (3.744) than the World inflation (2.185665). Oil and food price inflations are on average 6.89653 and 4.500767. While the country inflation rates are always positive, the price inflations have negative values till 50%. Therefore, the standard deviations of price inflations are very high relative to their means.

Table 4. Summary statistics for supplementary variables II

	INFPOILFAO	INFPFOODFAO	YGAP	YWORLD
Mean	6.896530	4.500767	-0.020455	14419345
Median	1.488568	3.967442	-0.017758	15097905
Maximum	97.56844	54.95025	-0.003695	19814901
Minimum	-49.92678	-31.38127	-0.071993	8324119.
Std.Dev.	29.56525	16.94377	0.013298	4105404.
Jarque-Bera p-value	0.072766	0.066903	0.000000	0.043916
Number of Observations	67	67	67	67

Government budget has a deficit of 1.57% of GDP due to the unavailability of tax system and natural resources. GDP is always below its potential. Deposit interest rates are 6.153% and US dollar 6 month LIBOR rate is 2.236%. As deposit interest rates are between 5.36% and 19.61%, and then this rate is not so high. It is important for both consumption and investment. However, as it is higher than the foreign interest rates, then there is a possibility of inward capital flow to gain from this return.

5. Empirical methodology

When ordinary least squares (OLS) is estimated, the series are assumed to be stationary, which means their means and variances are constant over time. On the other hand, Nelson and Plosser (1982) argue that most macroeconomic variables are non-stationary or have a unit root; that is to say their means and variances depend on time. These kinds of series or variables have random shocks and therefore follow a random walk. This can cause serious problems like serial correlation (in residuals) and spurious regression, in which variables seem to have a significant relationship indeed they do not have due to the existence of seasonality, time trend, and structural break(s). So, we should use stationary variables to avoid all these problems. One of the ways to detect a unit root in time series is Augmented Dickey Fuller (ADF) unit root test (for AR(p) process):

$$\Delta y_t = \delta x'_t + \alpha y_{t-1} + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \dots + \beta_p \Delta y_{t-p} + v_t \quad (1)$$

Where x'_t are optional exogenous variables that include a constant or constant and time trend, v_t is a White Noise process; Δ is a 1st difference operator. In this test, zero hypotheses is

$$\begin{aligned} H_0 : \alpha &= 1 \text{ (the series has a unit root)} \\ H_1 : \alpha &< 1 \text{ (the series is stationary (around a constant or/and trend))} \end{aligned} \quad (2)$$

The 2nd unit root test is of the Phillips Peron (PP). PP Test uses non-augmented Dickey Fuller equation, $\Delta y_t = \alpha y_{t-1} + \delta x'_t + \varepsilon_t$, and modifies the t-value of α so that serial correlation does not influence the asymptotic distribution of the test statistic;

$$\hat{t}_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0} \right)^{1/2} - \frac{T(f_0 - \gamma_0)se(\hat{\alpha})}{2f_0^{1/2}s} \quad (3)$$

where $\hat{\alpha}$ is the estimate, and t_{α} is the t-value of α , $se(\hat{\alpha})$ is coefficient standard error, and s is the standard error of the test regression. Also, γ_0 is a consistent estimate of the error variance computed as $\frac{(T-k)s^2}{T}$. Lastly, f_0 is an estimator of the residual spectrum at frequency zero. Here zero hypothesis is the same as the zero hypothesis in ADF unit root test.

On the other hand, the potential weakness of the ADF and PP unit root tests is their misdetection of structural breaks in the series and as a result the wrong decision rule; that is to say they may fail to reject the H_0 (the series has unit root) if the series has structural break. The series that are stationary around a structural break in level seems to be first difference stationary. To solve this kind of problem, Perron (1989) advises to include exogenous structural break in the ADF Unit Root Test. After this breakthrough, Zivot and Andrews (1992) and Perron (1997) proposed to add the structural break “endogenously”. If the date of the structural break is unknown, it is appropriate to use the model proposed by Perron and Vogelsang (1992). To detect the “endogenous” structural break, the model of Perron-Vogelsang (1992) is more successful than that of Zivot and Andrews (1992). Both tests do not need a priori information about the date of the structural breaks.

Clemente-Montanes-Reyes (1998) bases their studies on Perron-Vogelsang (1992). Their test allows two structural breaks in the mean of the series. The test is as the following:

$$\begin{aligned} H_0 : y_t &= y_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + u_t \\ H_1 : y_t &= \mu + d_1 DU_{1t} + d_2 DU_{2t} + e_t \end{aligned} \quad (4)$$

where DTB_{it} is a pulse variable equal to 1 if $t=TB_i+1$ and 0 otherwise. In addition, $DU_{it} = 1$ if $t > TB_i$ ($i = 1, 2$) and 0 otherwise. TB_1 and TB_2 represents the time periods when the mean is being modified. Now, suppose that $TB_i = \lambda_i T$ ($i = 1, 2$) where $0 < \lambda_1 < 1$ and $\lambda_2 > \lambda_1$.

If the two breaks belong to the innovational outlier, which allows for a gradual shift in the mean of the series, we can test the H_0 (the series has a unit root with structural break(s)) against H_1 (the series is stationary with break(s)):

$$y_t = \mu + \rho y_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + d_1 DU_{1t} + d_2 DU_{2t} + \sum_{i=1}^k c_i \Delta y_{t-i} + e_t \quad (5)$$

In this regression, the minimum value of the simulated t-ratio is obtained and this can be used for testing if $\rho = 1$ for all break time combinations (Clemente et al., 1998).

If the shifts are better described as additive outliers (which captures a sudden change in the mean of a series), the H_0 can be tested through a two-step procedure: (1) eliminate the deterministic part of the variable by estimating the following model:

$$y_t = \mu + d_1 DU_{1t} + d_2 DU_{2t} + \tilde{y}_t \quad (6)$$

(2) take residuals in the previous model and estimate the following by assuming $\rho = 1$:

$$\tilde{y}_t = \sum_{i=0}^k \omega_{1i} DTB_{1t-i} + \sum_{i=0}^k \omega_{2i} DTB_{2t-i} + \rho \tilde{y}_{t-1} + \sum_{i=1}^k c_i \Delta \tilde{y}_{t-i} + e_t \quad (7)$$

the dummy variable DTB_{it} is included in the model to make sure that $\min t_p^{AO}(\lambda_1, \lambda_2)$ converges to the distribution (Clemente et al., 1998):

$$\min t_p^{IO}(\lambda_1, \lambda_2) \rightarrow \inf_{\lambda=\Lambda} \frac{H}{[\lambda_1(\lambda_2 - \lambda_1)(1 - \lambda_2)]^{1/2} K^{1/2}} \quad (8)$$

The critical values are provided by Perron and Vogelsang (1992), as they do not follow the standard “Dickey-Fuller” distribution (Baum, 2001).

Bu using Perron’s (1989) approach, Zivot and Andrews (1992) uses three separate regressions to detect structural breaks:

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \gamma DU_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \varepsilon_t \quad (9)$$

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \theta DT_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \varepsilon_t \quad (10)$$

$$\Delta y_t = c + \alpha y_{t-1} + \beta t + \gamma DU_t + \theta DT_t + \sum_{j=1}^k d_j \Delta y_{t-j} + \varepsilon_t \quad (11)$$

Where in (9) the models allows for one-time change in the intercept of the dependent variable, in (10) it allows for one-time change in the trend of the dependent variable, and in (11) it allows for both the change in the intercept and the trend of the dependent variable. In addition here DU_t is a dummy variable that takes 1 at the break date (TB) of the intercept, and DT_t is a dummy variable that takes 1 at the break date (TB) of the trend of the dependent variable:

$$DU_t = \begin{cases} 1 & \text{if } t > TB \\ 0 & \text{otherwise} \end{cases} \text{ and } DT_t = \begin{cases} t - TB & \text{if } t > TB \\ 0 & \text{otherwise} \end{cases} \quad (12)$$

In all of the models, the hypotheses are

$$\begin{aligned} H_0 : \alpha &= 0 \text{ (the series has a unit root)} \\ H_1 : \alpha &< 0 \text{ (the series is stationary around a structural break)} \end{aligned} \quad (13)$$

The method takes every point of time as a potential break date and among all available break points it chooses the break date that minimizes the t-statistic for $\alpha = 1$ where $\alpha = \alpha - 1$. When there are end points, the test statistic diverges to infinity (Zivot and Andrews, 1992).

If we compare the tests of Clemente et al. (1998) and Zivot-Andrews (1992), there are researches that say to identify the “endogenous” structural break(s), the Clemente et al. is more successful (Shrestha and Chowdhury, 2005). According to Baum (2004), if the estimates of the Clemente-Montanes-Reyes unit root tests provide evidence of significant additive or innovational outliers in the time series, the results derived from ADF and PP tests are doubtful, as this is evidence that the model excluding structural breaks has misspecification problem. On the other hand, if the results of the Clemente-Montanes-Reyes unit root tests show no evidence of two significant breaks in the series, the results from the Perron–Vogelsang unit root tests are considered. If both of them do not show the significant results then the method of Zivot-Andrews should be used. If all these tests show no evidence of a structural break (s), the ADF and PP tests can be considered.

In our analysis, at first Clemente et al. (1998) test is conducted, then if it does not give significant results Perron-Vogelsang test is considered. Simultaneously the Zivot-Andrews test results are calculated. The significant dates are included in the necessary models by using dummy variables. Then to check the degree of integration, the conventional unit root tests are calculated.

The models are separated into two parts:

(i) General model for the equality of the aggregate demand and output; that is to say the equilibrium identity for the goods market $Y = AE$ where $AE = HHC + I + G + (X - M)$. The first function becomes

$$\ln Y = f(\ln HHC, I, \ln G, \ln X, \ln M, \ln E) \quad (14)$$

(ii) The behavioral models for the components of GDP, interest rate and inflation. In all these models exchange rate is an exogenous monetary variable changed with respect to the domestic and international shocks. It has direct and indirect effects on the level of the dependent variables. First of all, the interest rate parity should be introduced as it is necessary in most of the behavioral equations. To start with

$$i^d = f(i^f, \pi^d, \pi^f, debt, \ln E) \quad (15)$$

$$\pi^d = f(\pi^{oil}, \pi^{food}, Y^{gap}, i^d, \ln E) \quad (16)$$

More appropriate variable seems to be the interest rate for credit as it stimulates private consumption (wedding expenditures, mortgage, and cars) and investment (for agriculture, and running own business). In (16), π^d domestic inflation (in the KR) are caused by oil (fuel) prices, and overall food prices due to the large part of CPI consists of consumer goods. Both prices affect it positively. Output gap, Y^{gap} , is negatively correlated with prices according to Aggregate Demand curve in macroeconomics course books. Last two variables come from the equation (15).

In (15), the interest rate for som deposits (i^d) is assumed to be used for savings and credit in the KR. US Dollar 6 months LIBOR (i^f) is assumed to be perfect substitute for the interest bearing domestic assets (som deposits). The relationship among domestic interest

rates (i^d), foreign interest rates (i^f), and the nominal exchange rate (lnE) can be explained by using interest rate parity condition. It says that if there is no arbitrage return, investors become indifferent between foreign currency deposits (US Dollar 6 month LIBOR) in the foreign country (the USA) and domestic currency deposits (interest rate of som deposits) in the domestic economy (the KR). Two assumptions needed are: (i) capital is mobile across borders, (ii) perfect substitutability of som deposits and US deposits. There are two different forms of the interest rate parity: (i) uncovered interest rate parity in which the assets are exposed to the exchange rate fluctuations, (ii) covered interest rate parity in which the uncertainty in the exchange rate is offset or covered by a forward sale (swap). The uncovered interest rate parity can be written as

$$(1 + i^d) = \frac{E_{t+k}^e}{E_t} (1 + i^f) \quad (17)$$

Here i^d is the interest rate on som deposits, i^f is the LIBOR rate, E_t is the current exchange rate of som and US dollar, and E_{t+k}^e is the expected future exchange rate at time $t+k$. (21) can be written in natural logarithms as

$$\begin{aligned} i^d &= i^f + (\ln E_{t+k}^e - \ln E_t) = i^f + \% \Delta E_{t+k}^e \\ i^d &= i^f - \% \Delta (E_{t+k}^e)^{-1} \end{aligned} \quad (18)$$

where $\% \Delta E_{t+k}^e$ is the expected depreciation rate of som against US dollar, and $\% \Delta (E_{t+k}^e)^{-1}$ is the expected appreciation of som against US dollar (Salvatore, 2013). So if som depreciates 0.6753% point (the average value obtained from the actual data) against US dollar, c.p., then foreigners come to get interest return from som deposits. Since som deposits (6.1528%) have a higher return than a US Dollar 6 month LIBOR (2.2356%), investors would sell American assets and buy Kyrgyz assets. Thus, som will be expected to depreciate as the demand for som increases, and US Dollar will be expected to appreciate as the demand for US Dollar decreases; that is to say a shortfall in return of US Dollar 6 month LIBOR must be offset by some gain from depreciation of som against US dollar. Conversely, any excess return from US Dollar 6 month LIBOR must be offset by some loss from the appreciation of the som against US dollar (Salvatore, 2013). Secondly, as the return of foreign asset (US Dollar 6 month LIBOR) increases, c.p., som appreciates against dollar as investors sell Kyrgyz assets and buy American assets. Thus, the return of domestic assets will remain constant if the percentage appreciation of som equals the percentage increase in the return of foreign assets. Otherwise, if the initial change is less than the latter then domestic interest rates will also increase.

When domestic inflation rises, then som loses its purchasing power then it will depreciate against dollar. Thus, the interest rates on som deposits will increase. The relationship between inflation and interest rates can be seen from the relative purchasing power parity:

$$\% \Delta E_{t+k} = \pi_{t+k}^d - \pi_{t+k}^f \quad (19)$$

where $\% \Delta E_{t+k}$ is the percentage depreciation of som against US dollar in the future period (t+k), π_{t+k}^d is the inflation rate for the KR, and π_{t+k}^f is the inflation rate for the US.

$$\text{In the long-run equilibrium, } \% \Delta E_{t+k}^e = \% \Delta E_{t+k} \quad (20)$$

should be the case; that is to say the expected depreciation rate should be accurately foreseen then by using (22), (23) and (24) we can write

$$i_t^d - i_t^f = \pi_{t+k}^d - \pi_{t+k}^f \text{ then } i_t^d - \pi_{t+k}^d = i_t^f - \pi_{t+k}^f \quad (21)$$

This condition is known as the real interest rate parity (Sorensen and Jacobsen, 2010). Again when domestic inflation increases, by (23) the som depreciates against the US dollar; that is to say loses its purchasing power, and by (25) the interest rates on som deposits will increase to keep the right side fixed. Similarly when the interest rate in the US increases, the US dollar depreciates against the som, and US Dollar 6 month LIBOR rate increases to keep the left side fixed. Lastly, if the government borrows too much debt, then it can make repress the Central Bank to print money. Thus, the domestic inflation goes up, the nominal interest goes up as well to protect the falling real value of the assets.

$$\ln HHC = f(\ln Y, i^d, \ln E) \quad (22)$$

According to the Keynes' Absolute Income Hypothesis, GDP or income is a long-run determinant of the private household consumption. It has positive effect on the consumption. Furthermore, interest rates (for som deposits) can have negative effect on the consumption due to the substitution effect between saving and consumption, and positive effect on the consumption due to the income effect, in which lenders get higher income and borrowers get lower income (Corugedo, 2004). In summary, a higher interest rate influences the level of financial wealth which includes variables like capital stock and housing capital, and labor income (human capital) negatively. Thus it leads to a decrease in the consumption expenditure (Sorensen and Witta-Jacosen, 2010). The exchange rate has a negative effect on the consumption by the way its effect on import prices and domestic prices (by inflation rate and/or inflation), and by its effect on the domestic interest rate by interest rate parity. While stabilization policy variables or nominal variables like nominal exchange rate are assumed to effect the consumption in the short-run and "neutral" in the long-run, they can affect the consumption in the long-run by the expectations channel from the interest rates channel.

$$I = f(\ln Y, i^d, \ln E) \quad (23)$$

As income or GDP affects the private consumption, it affects the private investment or FDI in the long run. Countries with high income are seen as the safe places for the FDI due to the low level of corruption and political instability, and high level of infrastructure. As interest rate is an opportunity cost for investment, it is assumed to have a negative

effect. The effect of the exchange rate is ambiguous; that is to say while an increase in nominal exchange rate may have positive effect on the investment by increase in the competitiveness of domestic goods and as a result of increasing production in the exporting firms it encourages an additional FDI, it may hamper FDI by increasing the interest rates through interest rate parity.

Government expenditure is assumed as the exogenous variable, so it will not take part in the first and second type models. Nowadays, consumers can make choice between domestic and foreign goods by trade. Improvement of trade gives them more choices of bundles to choose from. One of the components of the trade is export of goods and services. The determinants of export can be written as the following

$$\ln X = f(\ln Y^{world}, Y^{gap}, i^d, \ln E) \quad (24)$$

Demand for export goods has a positive income effect proxied by foreign buyers (World GDP) and a negative price effect by the appreciation of som against US dollar. When the som depreciates against US dollar, then the domestic goods become cheaper and foreign goods become more expensive. So the foreign and domestic consumers prefer the domestic goods. When foreign customers' get richer, they will demand more domestic goods and when the domestic currency appreciates against the foreign currency, the local goods lose the competitiveness (the domestic goods become more expensive compared to the foreign goods). Domestic output gap measured by the difference between actual and potential GDP negatively affects export capacity (Goldstein and Mohsin, 1985).

$$\ln M = f(\ln Y, i^d, \ln E) \quad (25)$$

When the income of the domestic economy increases, the citizens become wealthier and they differentiate their consumption by buying more foreign goods and services. Appreciation of the local currency positively affects the demand for foreign goods as the domestic goods become more expensive compared to the foreign goods. Interest rate (and inflation) influences trade variables by the interest parity condition. A country that has a higher interest rate (by the higher inflation rate) will suffer from the depreciation of local currency against foreign currency. So whereas the depreciation will increase the exports by making domestic goods cheaper compared to the foreign goods, it will decrease the imports.

$$\text{The models can be shown by using the general function: } Y = f(IndVars) \quad (26)$$

where Y and $IndVars$ is the relevant dependent variable and vector of regressors in the equations from (14), (15), (16), and (22)-(25). The coefficients are in the form of elasticities and semi- elasticities.

Since OLS has some problems as explained above, the autoregressive distributed lag (ARDL) model will be estimated. It has several advantages over other techniques:

- (i) It can be applied to the variables with mixed order of integration (Pesaran and Pesaran, 1997).
- (ii) In this model, sufficient number of lags is estimated to capture the dynamic framework.

- (iii) The error correction model (unrestricted ECM) could be obtained from ARDL. Pesaran et al. (2001) calls it “conditional ECM”. It integrates short-run adjustments with long-run equilibrium without losing long-run information.
- (iv) It can be applied to the small sample estimations so is superior to that of Johansen and Juselius’s cointegration technique (Pesaran and Shin, 1999).
- (v) Endogeneity is no longer a problem.
- (vi) Pesaran and Shin (1999) optimal lags in ARDL removes the problem related with serial correlation and endogeneity.

ARDL framework for the function above is

$$\Delta Y_t = \beta_0 + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{q_m} \delta_i^m \Delta IndVars^m_{t-j} + \lambda_0 Y_{t-1} + \lambda_m IndVars^m_{t-1} + \varepsilon_t \quad (27)$$

where β_0 is a constant and ε_t is a well-behaved white noise process, Y is the dependent variable, and $IndVars^m$ is the list of independent variables. While α and δ corresponds to short-run coefficients, λ_m , for the regressor m , corresponds to the long-run coefficients.

The ARDL model testing starts with the bounds test where $H_0 (\lambda_0 = \lambda_m = 0)$ (there is no long-run relationship between Y and the independent variables) against $H_1 (\lambda_0 \neq \lambda_m \neq 0)$ (there exists a long-run relationship between Y and the independent variables). Since we do not F-statistic values for mixed integration degree of variables, F-statistics value is not compared to conventional F-statistic values rather compared to values calculated by Pesaran et al. (2001). There are two bound values: upper and lower. If F-statistic is lower than the lower bound value then all variables are $I(0)$ and cointegration does not exist. If it is greater than the upper bound value then there is cointegration between Y and the independent variables. If it is between the lower and upper values then the test is inconclusive (Pesaran and Pesaran, 1997).

To choose optimal lags for Y and the independent variables the ARDL estimates $(p+1)^k$ and $(q+1)_m^l$ for Y and the independent variables respectively number of regressions where p and l_m are maximum number of lags (there is a lag for each independent variables) (here 1). The optimal lag length is selected by Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC). While AIC selects maximum relevant lag length, SC selects the smallest possible lag length. Since the abundance of the observations, we use AIC in our analysis.

After the ARDL is estimated, the unrestricted ECM can be estimated as the following:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \sum_{j=1}^{q_m} \delta_i^m \Delta IndVars^m_{t-j} + \theta ECT_{t-1} + \varepsilon_t \quad (28)$$

The coefficient of lagged error correction model θ is the speed of adjustment to long-run equilibrium. By using this value, the half-life (the time in which half of the derivations from long-run equilibrium is corrected): $t_{1/2} = \ln(0.5)/\theta = 0.693/\theta$. The long-run multipliers can be calculated as $-(\lambda_m/\lambda_0)$ for each regressor m .

Lastly, diagnostic tests for the residuals from the ARDL and stability test are conducted. These are Breusch-Godfrey Serial Correlation LM Test, Breusch-Pagan-Godfrey Heteroskedasticity Test, Jarque-Bera Normality Test, and Ramsey RESET functional form misspecification Test. As a result of these, we will decide whether the model estimates are reliable or not.

6. Empirical results and discussion

6.1. Unit root test with structural breaks

Table 5. *Clemente-Montano-Reyes Unit Root Test Results*

Variable	(rho-1) (t-statistic) – optimal break point(s)	Variable	(rho-1) (t-statistic) – optimal break point(s)
<i>lny</i>	-3.347 – 2005Q4, 2010Q2 (IO) -3.401 – 2006Q2, 2011Q3 (AO) -2.955 – 2005Q4 (IO) -3.044 – 2008Q4 (AO)	<i>libor6</i>	-6.404 – 2004Q2, 2007Q3 (IO)** -0.131 – 2005Q1, 2008Q1 (AO) -3.67 – 2010Q2 (AO)**
<i>lnhhc</i>	-3.381 – 2001Q4, 2010Q4 (IO) -3.205 – 2006Q2, 2011Q4 (AO) -2.822 – 2001Q4 (IO) -2.58 – 2006Q2 (AO)	<i>infkg</i>	-3.886 – 2007Q1, 2008Q4 (IO) -4.039 – 2008Q1, 2008Q3 (AO) -1.685 – 2008Q1 (IO) -3.688 – 2007Q4 (AO)**
<i>I</i>	-8.968 – 2010Q2, 2015Q3 (IO)** -2.989 – 2007Q2, 2015Q1 (AO) -2.378 – 2010Q1 (AO)	<i>infus</i>	-5.372 – 2004Q2, 2008Q2 (IO) -1.105 – 2004Q3, 2008Q1 (AO) -4.496 – 2008Q2 (IO) -1.224 – 2008Q1 (AO)
<i>lnG</i>	-3.278 – 2001Q2, 2005Q3 (IO) -3.326 – 2006Q1, 2010Q1 (AO) -3.278 – 2005Q3 (IO) -3.265 – 2007Q1 (AO)	<i>debt</i>	-5.632 – 2009Q4, 2013Q1 (IO)** -0.778 – 2009Q4, 2013Q1 (AO) -5.793 – 2009Q2 (AO)**
<i>lnx</i>	-4.152 – 2003Q1, 2006Q3 (IO) -5.042 – 2004Q1, 2007Q2 (AO) -3.32 – 2005Q3 (IO) -4.542 – 2006Q2 (AO)**	<i>infpoilfao</i>	-3.661 – 2006Q4, 2007Q4 (IO) -1.776 – 2007Q3, 2012Q2 (AO) -3.212 – 2007Q4 (IO) -1.364 – 2007Q3 (AO)
<i>lnm</i>	-4.545 – 2002Q4, 2005Q3 (IO) -3.086 – 2004Q2, 2007Q1 (AO) -2.155 – 2002Q4 (IO) -2.483 – 2007Q1 (AO)	<i>infpoofao</i>	-2.487 – 2007Q4, 2011Q1 (IO) -0.89 – 2007Q3, 2012Q4 (AO) -2.394 – 2007Q4 (IO) -0.477 – 2007Q3 (AO)
<i>lne</i>	-2.251 – 2008Q2, 2013Q4 (IO) -2.415 – 2007Q2, 2014Q3 (AO) -1.802 – 2013Q4 (IO) -2.033 – 2014Q3 (AO)	<i>ygap</i>	-4.226 – 2001Q3, 2002Q3 (IO) -1.488 – 2002Q2, 2003Q4 (AO) -6.424 – 2003Q1 (IO)** -0.971 – 2001Q3 (AO)
<i>interestdom</i>	-4.874 – 2000Q4, 2008Q1 (IO) 0.066 – 2002Q3, 2008Q1 (AO) -2.071 – 2000Q4 (IO) -2.382 – 2014Q3 (AO)	<i>lnyworld</i>	-2.78 – 2005Q4, 2011Q2 (IO) -2.78 – 2005Q4, 2011Q2 (AO) -2.198 – 2009Q1 (IO) -2.765 – 2008Q3 (AO)

Critical Values (5% significance level): (i) for Two Breaks, IO = -5.49, AO = -5.49, (ii) for One Break, IO = -4.27, AO = -3.56.

As we explained before, firstly we should run the unit root with structural break(s) by Clemente et al. (1998). Table 5 shows that for the general model variables only FDI and export have significant break dates at 2012Q2, 2015Q3 in innovational model, and 2006Q2 in Additive Outlier Model respectively.

Table 6. *Zivot-Andrews unit root test results*

Variable	Break Type	Minimum t-statistic – optimal break point(s)	variable	Break Type	Minimum t-statistic – optimal break point(s)
<i>lny</i>	Intercept Trend Both	-3.131 – 2014Q1 -3.69 – 2013Q1 -3.649 – 2012Q4	<i>libor6</i>	Intercept Trend Both	-4.105 – 2008Q4 -3.191 – 2006Q2 -4.19 – 2008Q4
<i>lnhhc</i>	Intercept Trend Both	-3.076 – 2014Q1 -3.598 – 2008Q2 -3.561 – 2007Q3	<i>infkg</i>	Intercept Trend Both	-4.96 – 2007Q3** -4.095 – 2008Q3 -5.075 – 2007Q3*
<i>l</i>	Intercept Trend Both	-7.161 – 2010Q4*** -7.032 – 2005Q3*** -7.451 – 2014Q1***	<i>infus</i>	Intercept Trend Both	-5.256 – 2008Q4** -4.498 – 2006Q2*** -5.408 – 2008Q4**
<i>lngexp</i>	Intercept Trend Both	-1.115 – 2013Q3 -3.239 – 2012Q2 -3.212 – 2011Q2	<i>debt</i>	Intercept Trend Both	-4.207 – 2013Q1 -3.541 – 2012Q1 -4.205 – 2010Q1
<i>lnx</i>	Intercept Trend Both	-3.884 – 2014Q1 -4.394 – 2011Q2 -4.774 – 2007Q1	<i>infpoilfao</i>	Intercept Trend Both	-4.901 – 2011Q3** -4.681 – 2007Q3** -4.876 – 2008Q3*
<i>lnm</i>	Intercept Trend Both	-1.79 – 2013Q4 -2.67 – 2008Q2 -2.705 – 2006Q1	<i>infpoofao</i>	Intercept Trend Both	-6.094 – 2011Q3 *** -6.279 – 2007Q4*** -6.452 – 2008Q3***
<i>lne</i>	Intercept Trend Both	-1.511 – 2014Q1 -2.78 – 2007Q3 -2.587 – 2006Q2	<i>ygap</i>	Intercept Trend Both	-4.416 – 2004Q1 -3.967 – 2007Q2 -5.718 – 2003Q3***
<i>interestdom</i>	Intercept Trend Both	-7.172 – 2009Q4*** -6.474 – 2014Q1*** -6.635 – 2014Q1***	<i>lnyworld</i>	Intercept Trend Both	-2.736 – 2014Q1 -3.869 – 2010Q2 -3.827 – 2010Q1

Critical Value: (i) Intercept: For 1% = -5.34, for 5% = -4.80, for 10% = -4.58, (ii) Trend: for 1% = -4.93, for 5% = -4.42, for 10% = -4.11, (iii) Both: for 1% = -5.57, for 5% = -5.08, for 10% = -4.82.

* 10% significant, ** 5% significant, *** 1% significant.

In the Zivot-Andrews test, only FDI have significant structural breaks in the mean at 2005Q3 and 2014Q1, Q4. The break dates are given for other (behavioral) variables in Tables 5 and 6. Oil price and World GDP have no breaks. In summary to catch the structural breaks, the Clemente et al. and Perron-Vogelsang tests are more successful than the Zivot-Andrews test, which is consistent with the anticipation of Shrestha and Chowdhury (2005). The break dates are controlled in the models by using the dummy variables in Table 7.

Table 7. *Dummy variables*

Dummy Variable	Variable	Dummy Variable	Variable
dumi, dumi2	I	duminfus	INFUS
dunlnx	LNx	dumdebt	DEBT
duminterestdom	INTERESTDOM	dumygap	YGAP
dumlibor6	LIBOR6	duminfpoilfao	INFPOILFAO
duminfkkg	INFKG	duminfpoofao	INFPOOFDAO

6.2. ADF unit root test results

In ADF test, FDI, US Dollar 8 Month LIBOR rate, price inflations, and domestic output gap are level stationary, I(0) (ADF and PP unit root test results are given in the Appendix). Others are first difference stationary, I(1). In the PP test, FDI, interest rate of som deposits, domestic inflation, and budget balance are level stationary. Others are first difference stationary. Therefore, the ARDL models can be estimated. Dummy variables in Table 7 are included as fixed regressors. The models are selected by AIC. The top three models for the general model for (14) are as follows:

Table 8. *Top three general models by information criteria*

Model	Information Criterion		
	AIC	SC (BIC)	HQ
ARDL(6,1,3,0,4,1,1)	-4.565620	-3.700508	-4.226574
ARDL(1,1,1,0,1,1,3)	-4.555237	-3.914319	-4.302747
ARDL(3,1,1,1,2,1,1)	-4.447623	-3.806705	-4.195133

While according to the AIC, the best is ARDL(6,1,3,0,4,1,1), the ARDL(1,1,1,0,1,1,3) is better in other information criteria. The other is poor model. The ARDL Bounds Test Results for these are given in the Table 9.

Table 9. *ARDL bounds test for top three general models (LNY)*

Model Dependent Variable: LNY	F-Statistic, k, significance
ARDL(6,1,3,0,4,1,1)	5.432, k=6***
ARDL(1,1,1,0,1,1,3)	4.095, k=6**
ARDL(3,1,1,1,2,1,1)	4.9723, k=6***

* 10% significant, ** 5% significant, *** 1% significant.

First and third models have significant Bounds Test at 1% level, and the middle model's is significant at 5% level. Thus, H_0 Hypotheses of no long-run relationship between GDP and its components and exchange rate is rejected. So there is a long run relationship. The long-run model for top three models and diagnostic test results are given in the Table 10.

Table 10. *Top 3 general models, long-run coefficients*

Variable	ARDL(6,1,3,0,4,1,1)		ARDL(1,1,1,0,1,1,3)		ARDL(3,1,1,1,2,1,1)	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
LNHHC	0.302514	0.0006	0.475539	0.0003	0.279222	0.1123
I	-0.000481	0.0013	0.000020	0.8922	-0.000137	0.5217
LNGEXP	0.109448	0.0699	0.182065	0.0096	-0.145015	0.2609
LNK	0.262737	0.0000	0.142123	0.0256	0.352354	0.0001
LNK	0.174594	0.0224	0.239768	0.0304	0.355582	0.0698
LNE	0.443298	0.0000	0.527507	0.0054	0.425872	0.0000
DUMLNK	-0.056926	0.1973	-0.101551	0.0957	-0.095906	0.3014
DUMI	-0.062360	0.0609	-0.035116	0.4155	-0.059977	0.3837
DUMI2	0.004039	0.8810	0.044920	0.2396	0.023602	0.6838
C			-1.196790	0.3175		
@TREND			-0.011564	0.0323		
Diagnostic Tests	Serial Correlation: 0.8254 (0.3636) Heteroskedasticity: 22.101 (0.63) Normality: 1.318 (0.52) Functional Form: 1.89 (0.178)		Serial Correlation: 0.49 (0.4841) Heteroskedasticity: 7.3032 (0.4841) Normality: 3.26 (0.196) Functional Form: 0.4145 (0.521)		Serial Correlation: 0.0136 (0.9073) Heteroskedasticity: 13.95 (0.7867) Normality: 3.3546 (0.187) Functional Form: 0.606 (0.4405)	

In the first model, all variables except government expenditures are significant at 1% level. Government spending is also significant if the right tail is considered. Only the coefficient of FDI is not consistent with the economic theory. When FDI increases by 10 million dollars, c.p., GDP decreases by 0.481%. This sign is due to the low correlation between FDI and GDP in the KR, and the marginal efficiency of the capitals are low. Some infrastructure investments are needed to take the benefit from new capital inflow as Harrod-Domar-Singer Model proposed. When the household consumption increases by 10%, c.p., GDP increases by 3%. This rate is somewhat lower than the marginal propensity to consume for the developing country. The top three items in the government spending for the KR are: (i) Education (27.31%), (ii) Social Protection (22.98%), (iii) Economic Affairs (20.42%), and (iv) Health (13.97%). Three items except Economic Affairs are the structural policy variables as they have effect on GDP in the long-run.

Only Economic Affairs, in which the expenditures on different sectors in the economy are included, has short-run effect. The healthier the citizens, the more intensive they have to take education and thus contribute to the domestic production. As Economic Affairs for mostly agriculture sector increases, the export of goods increases, and thus GDP increases. Import has unexpected positive sign. This can be because of the major part of the imported items are consumption goods (about 60%). Export increases GDP as usual. Lastly as the som depreciates against US dollar by 1%, c.p., GDP increases by 0.4433%. The depreciation of domestic currency indeed increases the competitiveness of domestic goods with respect to the foreign goods. So as a result of an increase in the export and decrease in the import, trade balance improves and GDP increases.

In the 2nd model, FDI coefficient is positive but insignificant. Others are significant and have signs as anticipated. In the last model consumption, FDI, and government spending are insignificant. The rest two models are poor with regard to the significance of the coefficients. The diagnostic test results are desirable in all models. The residuals are normally distributed with homoskedastic variances, and do not follow serial correlation. Moreover, there is no functional form misspecification in the models. Thus, the coefficients are reliable and can be used in the policy implications.

The error correction models for top three general models are given in the Table 11.

Table 11. Top 3 general models, error correction model

ARDL(6,1,3,0,4,1,1)		ARDL(1,1,1,0,1,1,3)		ARDL(3,1,1,1,2,1,1)	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
D(LNY(-1))	0.310822***	D(LNHHC)	0.287049***	D(LNY(-1))	0.154230*
D(LNY(-2))	-0.163938*	D(I)	0.000061	D(LNY(-2))	-0.139544*
D(LNY(-3))	0.307074***	D(LNGEXP)	0.072556**	D(LNHHC)	0.267943***
D(LNY(-4))	-0.001126	D(LNX)	0.119188***	D(I)	0.000045
D(LNY(-5))	0.132222*	D(LNM)	-0.003747	D(LNGEXP)	0.042493
D(LNHHC)	0.263167***	D(LNE)	-0.471811***	D(LNX)	0.116502***
D(I)	-0.000009	D(LNE(-1))	-0.362667*	D(LNX(-1))	-0.044418
D(I(-1))	0.000027	D(LNE(-2))	0.254918**	D(LNM)	0.036142
D(I(-2))	0.000124***	D(DUMLNX)	-0.040470	D(LNE)	-0.549622***
D(LNGEXP)	0.060232*	D(DUMI)	-0.013994	D(DUMLNX)	-0.026369
D(LNX)	0.125844***	D(DUMI2)	0.017901	D(DUMI)	-0.016490
D(LNX(-1))	-0.082340**	D(@TREND())	-0.004608**	D(DUMI2)	0.006489
D(LNX(-2))	0.068609**	CointEq(-1)	-0.398516***	CointEq(-1)	-0.274941***
D(LNX(-3))	-0.058962*				
D(LNM)	-0.001855				
D(LNE)	-0.414609**				
D(DUMLNX)	-0.031327				
D(DUMI)	-0.034318*				
D(DUMI2)	0.002223				
CointEq(-1)	-0.550323***				
Cointeq = LNY - (0.3025*LNHHC -0.0005*I + 0.1094*LNGEXP + 0.2627 *LNX + 0.1746*LNM +0.4433*LNE - 0.0569*DUMLNX -0.0624*DUMI + 0.0040*DUMI2)		Cointeq = LNY-(0.4755*LNHHC + 0.0000*I +0.1821*LNGEXP +0.1421*LNX + 0.2398*LNM + 0.5275*LNE -0.1016*DUMLNX -0.0351*DUMI +0.0449*DUMI2 -1.1968 - 0.0116*@TREND)		Cointeq = LNY - (0.2792*LNHHC -0.0001*I - 0.1450*LNGEXP + 0.3524 *LNX + 0.3556*LNM + 0.4259*LNE - 0.0959*DUMLNX - 0.0600*DUMI + 0.0236*DUMI2)	

* 10% significant, ** 5% significant, *** 1% significant.

Error correction term coefficients are significant and negative in all models. The highest speed of adjustment is of the first model, -0.550323, meaning that about 55.0323% of disequilibria in the short-run is eliminated in one quarter. Consumption, export, and

exchange rate have a short-run effect on GDP. FDI, government spending, and import do not affect GDP in the short-run. This can be because of the poor correlation between FDI and GDP, most of the items in government spending have long run effect, and consumers prefer domestic goods to foreign goods. To take the advantage of these variables, the General Government Expenditure should be used to stabilize the domestic institutions by Legislative and Executive Affairs, to raise the public budget and to make stabilization policies more effective by Financial and Fiscal Affairs, and to stimulate capital inflows by General Research.

The models for GDP components start with the model for the interest rate parity and relative purchasing power parity. The ARDL Bounds Test results for all models are demonstrated in the Table 12.

Table 12. ARDL bounds test for models of GDP components

Dependent Variable and Model	F-Statistic, k, significance
Interestdom: ARDL(1,0,4,0,1,4)	13.46374, k=5***
lnfkg: ARDL(6,0,6,6,5,5)	7.038748, k=5***
lnHHC: ARDL(2,7,3,5)	7.18 k=3***
I: ARDL(12,12,12,12)	15.63, k=3***
lnX: ARDL(1,0,0,0,0)	5.205, k=4***
lnM: ARDL(1,9,9,9)	6.942204 k=3***

* 10% significant, ** 5% significant, *** 1% significant.

All Bounds Tests are significant at 1% level. So there is a long run relationship between the relevant dependent and independent variables for each behavioral model. The models for INTERESTDOM (interest parity model), INFKG (relative purchasing power parity), and LNHHHC (Intertemporal Consumption Model) are as follows:

Table 13. Effect of exchange rate on GDP components I, long-run coefficients

INTERESTDOM		INFKG		LNHHHC	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
LIBOR6	0.293170**	INFPOILFAO	-0.047596	LNLY	1.170837***
INFKG	0.252546***	INFPPFOODFAO	0.435061***	INTERESTDOM	0.020702
INFUS	0.052214	YGAP	-107.538081	LNE	-0.323689***
DEBT	0.244218***	INTERESTDOM	1.685445***	DUMINTERESTDOM	0.000395
LNE	8.737877***	LNE	-10.994323**		
DUMINTERESTDOM	0.299733	DUMINFKG	3.089099		
DUMLIBOR6	0.732750	DUMINFPOILFAO	-2.761283		
DUMINFKG	-0.930212	DUMINFPPFOODFAO	5.604509***		
DUMINFUS	0.200251	DUMYGAP	2.824367		
DUMDEBT	0.833826	DUMINTERESTDOM	0.120076		
C	-32.850474***	C	35.859209**		
@TREND	0.065967***				
Diagnostic Tests					
Serial Correlation: 0.262337 (0.6085)		Serial Correlation: 0.909434 (0.3403)		Serial Correlation: 0.41 (0.523)	
Heteroskedasticity: 14.09536 (0.8655)		Heteroskedasticity: 39.82315 (0.3889)		Heteroskedasticity: 17.943 (0.6526)	
Normality: 3.63773 (0.16221)		Normality: 0.46864 (0.79111)		Normality: 0.22557 (0.8933)	
Functional Form: 3.92125 (0.0546)		Functional Form: 0.47272 (0.4993)		Functional Form: 2.07 (0.1584)	

* 10% significant, ** 5% significant, *** 1% significant.

In the first equation, US 6 Month LIBOR increases by 1% point, c.p., the interest rate on SOM deposits increases by 0.2972% point. This is caused by the appreciation of som against the US Dollar due to the increasing demand for US Dollar and decreasing demand for the som. The signs of coefficients on domestic inflation (INFKG) and exchange rate are found as anticipated. When the prices in the domestic economy rises, the som loses its

purchasing power so it will depreciate against US Dollar, in turn this will increase the interest rates on som deposits. When Kyrgyz government seeks for the resources of the NBKR to pay its debt, the domestic inflation will rise, which in turn increases the domestic interest rates as well as interest rates on SOM deposits. The prices in the US economy does not have significant effect.

In the second model, whereas the world food prices feeds the domestic inflation, the world oil prices does not have significant effect. Furthermore, when domestic interest rates increases, c.p., the domestic currency need to depreciate to satisfy the interest rate parity. Then the domestic prices should rise to keep the real purchasing power of the domestic currency.

In the 3rd model, domestic interest does not have significant effect on private consumption. Maybe credit interest rates can be used instead of deposit interest rates. Exchange rate depreciation is supposed to have positive effect as increasing the competitiveness of domestic goods; it will increase the exports and decreases imports. When GDP increases by 1%, c.p., private consumption increases by 1.171% which is not consistent with the consumer behavior as consumers do not consume all their disposable income rather they keep some part for future consumption. Diagnostic results show that the residuals in three models are normally distributed, have fixed variance, and do not follow autocorrelation. Lastly, the models are truly specified.

The short-run coefficients are given in the Table 14.

Table 14. Effect of exchange rate on GDP components I, error correction model, overall effects

INTERESTDOM		INFKG		LNHHC	
Variable	Overall Effect	Variable	Overall Effect	Variable	Overall Effect
D(LIBOR6)	0.061505**	D(INFKG)	0.646247***	D(LNHHC)	0.295286**
D(INFKG)	0.020527**	D(INFPOLFAO)	-0.03658	D(LNY)	0.194091**
D(INFUS)	0.010954	D(INFPFOODFAO)	0.175734**	D(INTERESTDOM)	0.017522**
D(DEBT)	0.025270**	D(YGAP)	-72.0136***	D(LNE)	-1.2547*
D(LNE)	1.015757**	D(INTERESTDOM)	1.937028**	D(DUMINTERESTDOM)	0.000170
D(DUMINTERESTDOM)	0.062882	D(LNE)	5.027999**	CointEq(-1)	-0.430792***
D(DUMLIBOR6)	0.153725	D(DUMINFKG)	2.373938		
D(DUMINFKG)	-0.195151	D(DUMINPOLFAO)	-2.122015		
D(DUMINFUS)	0.042011	D(DUMINFPFOODFAO)	4.307004***		
D(DUMDEBT)	0.174930	D(DUMYGAP)	2.170495		
D(@TREND())	0.013839***	D(DUMINTERESTDOM)	0.092277		
CointEq(-1)	-0.209792***	CointEq(-1)	-0.768489***		

* 10% significant, ** 5% significant, *** 1% significant.

The coefficients are the sum of the significant lags of the relevant variables, and the p-value is the average p-value of those variables. In overall, in the interest rate parity, only US inflation does not have short-run effect on interest rate on som deposits. Other variables have significant and expected effect as in the long-run model. Coefficient of error correction term is negative and significant meaning that there is a long-run link from the regressors to the deposit interest rate, and about 20.9792% of the disequilibria in the short-run is cancelled in one quarter. Half-life is $-0.693/(-0.209792)=3.3033$ quarters, about 298 days. The time needed to eliminate 50% of the disequilibria is about 298 days.

Conversely to the long-run model, all variables except oil prices affect the domestic prices in the short-run positively. When the domestic production increases, there is abundance of goods and services in the domestic economy, the prices tend to decrease which is consistent with the AD relationship. When som depreciates against dollar, c.p., domestic interest rates increase which in turn increases the domestic prices. In summary, only global Food prices the domestic prices both in short- and long-run due to the high ratio of agricultural products in the nation's economy. So the signaling systems for the future fluctuations of World Food Prices and their effect on domestic consumer's utility through hampering the purchasing power of their incomes should be analyzed and the appropriate models like ALPS (alert for price spike) of the UN model should be derived. Oil prices have neither short- nor long-run effects as most of the imported products are consumption goods rather intermediate raw materials. The adjustment mechanism works and really fast. Half-life is 81 days.

In the 3rd model, exchange rate depreciation has negative effect both in short- and long-run as it hampers consumption expenditures by making foreign goods more expensive relative to the domestic goods. This does not only decrease GDP in the short-run but only continue to decrease GDP by decreasing imports and consumption expenditures. Income is also short run determinant of the household consumption with marginal propensity rate of about 20%; that is to say consumer use only 20% of their income in the short-run and save the rest to take advantage of the increasing opportunity cost of savings by deposit interest rates. However, interest rates does not affect private consumption in the long-run as the domestic households are pessimistic about the situation of the economy due to the political tensions in every 5 years and corruption.

The rest behavioral models are exhibited in the Table 15.

Table 15. *Effect of exchange rate on GDP components II, long-run*

I		LNX		LNM	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
LN Y	208.372177***	LN YWORLD	1.513162***	LN Y	1.612468***
INTERESTDOM	14.958141*	Y G A P	-51.734517*	INTERESTDOM	-0.052235
LNE	-338.524196***	INTERESTDOM	0.517667**	LNE	-1.052490***
DUMI3	71.437936*	LNE	-6.076333***	DUMINTERESTDOM	0.147488
DUMINTERESTDOM	-22.101379	DUM LNX	0.775541		
		DUM Y G A P	-0.234811		
		DUMINTERESTDOM	-0.638185		
Diagnostic Tests					
Serial Correlation: 0.4525 (0.5012)		Serial Correlation: 2.47 (0.1161)		Serial Correlation: 0.00452 (0.9464)	
Heteroskedasticity: 12.5664 (0.1277)		Heteroskedasticity: 22.872 (0.1535)		Heteroskedasticity: 22.487 (0.8358)	
Normality: 3.73551 (0.1545)		Normality: 0.189 (0.91)		Normality: 4.1868 (0.1233)	
Functional Form: 0.4347 (0.5125)		Functional Form: 0.1972 (0.66)		Functional Form: 1.608 (0.215)	

* 10% significant, ** 5% significant, *** 1% significant.

When the economy or the market size of the KR increases, c.p., the environment in the domestic economy improves to provide the safe place for new capital inflow. Every 1% increase in GDP leads to 2083722 dollars increase of FDI. When som depreciates, c.p., by interest rate parity the domestic interest rates increase and in turn this hampers new capital inflows by increasing the opportunity cost.

In the 2nd and 3rd models, exchange rate depreciation has expected effect on import of goods and unexpected effect on the export. When som depreciates with respect to the US

dollar domestic goods get cheaper and foreign goods get more expensive. So it should increase the demand for the domestic goods and decrease the demand for foreign goods. The economic activity improvement abroad increases the demand for the Kyrgyz goods and their sale. The interest rate decays the purchasing power of the domestic currency, which in turn increases the competitiveness of the domestic goods, and their sale. When GDP of the KR increases, the Kyrgyz citizens become richer which in turn this leads them to differentiate their preferences by purchasing more foreign goods and services.

The ECMs are given in Table 16. Since the lag lengths are very long, we should look at the overall coefficients.

Table 16. *Effect of exchange rate on GDP components II, error correction model, overall effects*

I		LNX		LNM	
Variable	Overall Effect	Variable	Overall Effect	Variable	Overall Effect
D(I)	64.10**	D(LNX)	-2.75138**	D(LNY)	-0.09513**
D(LNY)	-330.817**	D(LNYWORLD)	7.040654***	D(INTERESTDOM)	-0.10292**
D(INTERESTDOM)	-107.029**	D(YGAP)	14.24177*	D(LNE)	-1.53194*
D(LNE)	1782.825**	D(INTERESTDOM)	0.632903**	D(DUMINTERESTDOM)	0.044438
D(DUMI3)	307.416493**	D(LNE)	2.533886**	CointEq(-1)	-0.301302***
D(DUMINTERESTDOM)	-95.108131**	D(DUMLNX)	0.159418		
CointEq(-1)	-4.303267*	D(DUMYGAP)	-0.048267		
		D(DUMINTERESTDOM)	-0.131184		
		CointEq(-1)	-0.205558***		

* 10% significant, ** 5% significant, *** 1% significant.

In the FDI model, GDP has unexpected negative effect on FDI. Other variables' signs are calculated as anticipated. Interest rate increases the opportunity cost of investment which discourages FDI. Whereas it has no effect in the long-run, it has effect on FDI in the short-run. Depreciation of som increases the competitiveness of the domestic products. So by the improvement in the exports volume and increasing the employment and production in exporting sectors it causes new capitals flow to these sectors. By interrelationship between exchange rate and interest rate, both improve the export of goods in the short-run. In the last equation, GDP negatively influences imports, which is nonsense. When interest rates rises, the consumers prefer to delay their consumption (substitution effect) by keeping their financial wealth in the deposits accounts, which in turn leads to the fall for the demand of foreign goods. The coefficients of error correction terms are all negative and significant which justifies the existence of long-run relationship from the control variables to the dependent variables. The speed of adjustment is between 20% and 30%, which give the half lives of 303 and 207 days respectively. The diagnostic results are desirable. The residuals are well-behaved, so the estimates are reliable.

7. Conclusion

The evolution of the exchange rate regimes are rather complex. There were periods when some fixed exchange rate regimes dominated, and in last years most countries use floating exchange rate regime because of the deep financial sectors over the world.

To decrease the effect of the external shocks like remittances, food and oil price fluctuations, and exchange rate policies of the trade partners, the exchange rate policy plays a major rule to stimulate GDP and its components.

On the other hand, the most literatures state that effectiveness of foreign exchange regime in economy of the country depends on tightness with world financial market and trade. The literatures reviewed converges in idea of moving toward more floating foreign exchange regime if the country increasing its integration in global financial market and economy. Which is case in the Kyrgyz Republic, the joint to integrated economic union EAEU should theoretically increase the country international financial and economic activities. Therefore, it is recommended to update or change existing Foreign Exchange regime of the country to more floating one.

In the paper the behavioral equations for the KR for period 2000Q1-2016Q3 are analyzed. The models include the interest rate parity and relative purchasing power parity, and the behavioral equations for the GDP components. Models are estimated by using the ARDL model by Pesaran et al. They are divided into two categories; the model for the GDP in general and the models for the GDP components.

As a result of model estimations, exchange rate has short- and long-run effects on the GDP growth. An increase in the exchange rate increases the growth in the long-run. The speed of adjustment is normal. Furthermore, it influences GDP components mostly in the long-run. It negatively contributes to all of the component variables. The speed of adjustment is not very high. The diagnostic results show that the residuals obtained from the models are well-behaved. The negative effect long-run effect of depreciation of som says that we should be careful to use the exchange rate policy. In this case, the attention of the policymaker should be more focused on inflation, money supply and other variables like overnight interest rates. However, there is still sensible reason for raising question to update or replace current official Foreign Exchange regime of the country.

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Appendix

ADF and PP Unit Root Test Results

	ADF Unit Root Test Results (Schwarz Info Criterion, Max.Lag=10)					
	Level (ADF Test Statistics and p-values in parentheses)			1 st Difference (ADF Test Statistics and p-values in parentheses)		
	None	Constant	Constant and Trend	None	Constant	Constant and Trend
<i>lny</i>	2.056	-1.421	-1.237	-4.937***	-5.54***	-5.743***
<i>lnhhc</i>	1.813	-1.41	-1.571	-5.254***	-5.727***	-5.793***
<i>l</i>	-2.282**	-4.843***	-7.021***			
<i>lngexp</i>	2.393	-1.755	0.763	-2.6542***	-10.558***	-10.961***
<i>lnx</i>	0.936	-1.6453	-2.355	-8.544***	-8.602***	-6.77***
<i>lnm</i>	2.081	-1.426	-0.104	-6.169***	-6.56***	-6.767***
<i>lne</i>	1.141	0.69	0.204	-5.395***	-5.52***	-6.364***
<i>interestdom</i>	-0.9451	-2.422	-3.733**	-5.4745***	-5.2544***	-4.7103***
<i>libor6</i>	-2.526**	-3.2848**	-4.1845***			
<i>lnfkg</i>	-2.2004**	-3.161**	-3.2115*			
<i>lnfus</i>	-1.3375	-2.4957	-3.08	-8.0411***	-8.0434***	-7.9734***
<i>debt</i>	-1.34	-1.844	-5.5356***	-9.85***	-9.785***	-9.8142***
<i>lnfpoilfao</i>	-4.14931***	-4.360356***	-4.392***			
<i>lnfpfoodfao</i>	-4.91***	-5.1865***	-5.26413***			
<i>ygap</i>	-2.7357***	-3.5677***	-5.518***			
<i>lnyworld</i>	2.44	-1.82	-0.3166	-2.768***	-3.7977***	-4.6963***
	PP Test Results (Newey-West Automatic using Bartlett Kernel)					
	Level (PP Test Statistics and p-values in parentheses)			1 st Difference (PP Test Statistics and p-values in parentheses)		
	None	Constant	Constant and Trend	None	Constant	Constant and Trend
<i>lny</i>	2.90	-1.773	-0.332	-4.993***	-5.4982***	-5.571***
<i>lnhhc</i>	2.66	-2.028	-0.97	-5.254***	-5.681***	-5.646***
<i>l</i>	-3.26***	-4.733***	-7.228***			
<i>lngexp</i>	1.80	-1.851	0.523	-9.80***	-10.48***	-10.94***
<i>lnx</i>	2.173	-1.513	-2.344	-8.595***	-9.96***	-13.0625***
<i>lnm</i>	1.682	-1.364	-0.464	-6.297***	-6.6183***	-6.795***
<i>lne</i>	1.17	0.723	-0.1574	-5.637***	-5.754***	-6.388***
<i>interestdom</i>	-3.493***	-6.7061***	-9.017***			
<i>libor6</i>	-2.17**	-2.2105	-2.083	-3.747***	-3.83***	-4.036**
<i>lnfkg</i>	-3.497***	-4.3158***	-4.2448***			
<i>lnfus</i>	-1.7215*	-3.068**	-3.472**			
<i>debt</i>	-4.3458***	-5.316***	-5.844***			
<i>lnfpoilfao</i>	-2.84553***	-2.576*	-2.615511	-4.665322***	-4.62555***	-4.57***
<i>lnfpfoodfao</i>	-2.35244**	-2.4817	-2.5927	-3.74013***	-3.6975***	-3.6222**
<i>ygap</i>	-1.3654	-2.50342	-2.76616	-2.9744***	-2.951**	-3.3806*
<i>lnyworld</i>	3.3001	-1.1444	-0.944	-2.2376**	-2.9566**	-3.074

* 10% significant, ** 5% significant, *** 1% significant.

Dynamic linkages between corruption, economic growth, and income inequality in Pakistan: Say 'No' to corruption

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Abstract. *The objective of the study is to examine the dynamic linkages between corruption, economic growth and income inequality in the context of Pakistan by using an annual time series data from 1992-2016. The study used conventional cointegration techniques including unit root test and cointegration tests for analyzing the stationary properties of the candidate variables and long-run relationship between the variables, while robust least square regression technique is used to minimize the possible outliers from the given models and estimate robust parameter estimates for conclusive findings. The statistics show that the mean value of corruption index is less than the value of 3 out of 6 (1 - low corruption index and 6 - high corruption index), hence we classified that the country has a minimal level of corruption, which somehow support to country's economic growth via the channel of increase in government saving and consumption, hence the identity matrix of saving and consumption in total income function empirically valid in a given country context. In another regression model, the results confirm that poverty decreases income inequality through the channel of increase gross saving in a country. The impact of corruption on income inequality is largely invisible during the study time period. The study conclude with the fact that high mass level of corruption not only break the country's economic vision and strategic objectives, while it effects political stability and good governance reforms that ultimately damages the country's image. The policies should be made in a way to reduce corruption by empowering judiciary, intelligence department, and National Accountability Bureau (NAB) that responsible for creating and presenting healthy image of the country with say 'No' to corruption.*

Keywords: corruption; income inequality; poverty; economic growth; robust least square regression; Pakistan.

JEL Classification: C32; D73; I32.

1. Introduction

Defilement distinguish as abuse of depended be in charge of for classified benefit is unluckily common in developing countries like Pakistan. No arrangement, no stage and no place of work of unlock element is safe from it. Its results spread are marvelous. It has accomplish each limb of condition – past executive it has put its hooks on officially permitted and leading remains even. It would be no decoration to define that the whole stiff of the land of Pakistan is practice this disquietude and weeping beneath its dead burden, so its incidence that Pakistan is located at 139th in the comity of countries on the dimension of debasement free management. This location isn't at all fortunate or sufficient.

While market forecaster distinguishes the part of defilement in monetary implementation, most actions in the characters has determined on the reason for debasement and the collision on monetary growth. As of late, a couple of studies have endeavored to attach debasement to income stealing in an example of homelands. None of the assessment on debasement has investigated either the reason or conclusion of defilement in Asian countries. As showed above, even though low prospect for daily basis relieve, earnings is similarly extremely unequally appropriated in Asian homelands. In addition, defilement in Asian nations is initial and takes in uncharacteristic condition political power. This belief attached with the view of unlimited defilement in Asian nations weep for an assessment regarding the relationship among financial implementation and debasement in Asian nations.

Debasement demonstrates itself in poles apart composition in Pakistan, as well as wide budgetary and political defilement, preferential treatment, and ill-treatment of power. Both insignificant and magnificent defilements are familiar in the state (Chene, 2008). Defilement steams all stage of government; it is all obvious and overpoweringly established in. The rank of debasement in the wide-ranging community at most recent relies in the lead of the character and morals of that social order (Vittal and Mahalingam, 2004). Over the era sufficiency of defilement has rather long-drawn-out in the wide-ranging public and at hand is modest evidence that persons experience regretful concerning their own exacting element in debasement. The dimension of defilement is the majority remarkable life form urbanized happenings and acquirement (counting barrier and open area enterprises) and the bank go forward to benefits. Although magnificent debasement is mostly being urbanized behavior, bank move forward and obtainments which shake the organization of the financial system, the standard gentleman is extra enthusiastic on the insignificant and middle stage defilement that he/she practices in the day by day transactions in the management workplaces

Destitution, reasonable financial expansion, and not the same pay and riches dissemination are widespread in Asian country. In realism, Pakistan has increase negligible position in ornamental expectations on daily basis calm in the middle of the generate districts of the world. Dincer and Gunalp (2008) look at that development in defilement at the appointed time addition in income inequality and destitution.

Furthermore sky-scraping inequality is connected with more remarkable debasement (Barreto, 2001). An enormous contract of observational job has been completed to stop working the association of defilement, inequality and financial expansion for panel type examination. On the other hand, no examination has been led yet to look at such kind of relationship for Pakistan. The present audit fills this gap and explores the relationship among defilement, imbalance and financial development in Pakistan.

In Pakistan, defilement is seen as endemic on the grounds that among many creating nations, Pakistan is constantly included as the most astounding in the rankings that are delivered by worldwide associations (Kaufman et al., 2005) This is additionally apparent from a current discernment study of Transparency International (2012) which positioned Pakistan as 139th in the comity of countries on the size of defilement free-administration. Almost certainly, the observation introduced by Transparency International can be challenged, however inside Pakistan, the same has picked up energy increasing the thought that open organization of Pakistan is tormented with defilement. Despite the fact that hard confirmation of debasement's rate is hard to get, yet unique reviews, news reports, chronicled records and contextual investigations demonstrate that defilement is inescapable in Pakistan at all levels (Pellegrini 2011). Debasement has turned into a lifestyle in Pakistan (Islam, 2004), which therefore made establishments in Pakistan to a great degree wasteful (Abbasi, 2011). This has prompted a general impression that routine with regards to defilement has expanded in volume after some time and there is less confirmation that individuals feel regretful about it (Javaid et al., 2010). The predominance of debasement on such a wide scale can be expressed through Ehtisham's (2009) articulation, i.e. from policemen to most astounding positions, from legitimate agents to judges, from minor income authorities to senior heads, from vendors to high-positioning designers, all legislature and private organizations are associated with defilement. Thus a normal Pakistani national witnesses defilement each time he/she experiences administration – from paying bills, enrolling births, announcing a wrongdoing, getting a power association, endeavoring to get youngsters admitted to a school, to recording the offer of a house; the grasping of defilement at such huge scale talks about extreme ramifications for open on the loose.

A land continue living to provide its area under discussion with opportunity from want, elasticity from repression and a personal approval wherever they able to live devoid of fear of awful appearance and domination. Not anything harm these objectives more than debasement in the organs of the state. The principal victim is only the upgrading process as disparity acquire established in and fairness break up. Debasement in such a nation does not hang about incomplete to one separation; it oversupplies the whole civilization. Pakistan has been, disgracefully, a scamper of the mill case. In the last fifty-five years we are the eye witnesses of an exponential increase in the scourge of debasement with perhaps the steepest ascent coming in the period 1985-1999. It was in the nineties that the interest for responsibility turned out to be more vociferous than any other time in recent memory. The consequence of such broad defilement has been lost authenticity of state foundations (NACS, 2002).

In Pakistan defilement is distant attainment, more than ever in the parliament and inferior stage of police authority. Nowadays, the situation is dreadful, the dropped guardian angel of debasement is reining each ground of national act, and the crooked sharpen up is out of control to the point that a typical man experience mystified. People groups scream that debasement is an insult and it has stolen the true stillness. These dimensions reveal that in Pakistan defilement is superior to all further SAARC part country with the exemption of Bangladesh. In spite of the information that Pakistan has observe transform on the world defilement judgment box file in 2013 from 27 to 28 and location from 139 to 127 out of 177 homelands which is a civilized symbol for our country yet it is superior to all further SAARC country sideways from Bangladesh. So there is rising need to transform liability and hostile to debasement policy at more prominent quantity within the state government. Debasement does not pressure just monetary growth of a country but somewhat similarly develop salary disproportion. Wage inconsistency can be set apart as the irregular transportation of collective national income in the middle of families. Little pay persons are for the most element unfair by debasement as it engaged in unlock expenditure from the undertakings which are precious for deprived persons like teaching and comfort to those everyday jobs which are enormous for lofty income gather. This therefore prompts rise in pay inequality and deprived finish up obviously not as good as more to the point that disparity convey about monetary extravagance, common flimsiness and unfairness in the country. Disparity pressure financial growth and in addition destitution, it pressure defiantly the monetary growth speed (Bagchi and Svejnar, 2015), and as well, able of superior road bad behavior (Shrivastava and Ivanova, 2015).

The inequality in Pakistan has long-drawn-out absolutely in excess of the most current eight years and the outline continues unabated regardless of all cases of poverty reduction. The primary feature that supervise human being's income broadcasting slot in spreading of advantages helpful pay movement; relations from dissimilar relative's element management and rest of the humankind and estimation and use arrangement of the management. It might similarly be addition for the reason that of addition in defilement. As a variety of examinations has exposed the encouraging and remarkable relationship between inequality and debasement, thus, this study initiate to explore the impact of corruption on economic growth and income inequality under the premises of number of socio-economic factors that derive the road of justice to say 'no' to corruption in country like Pakistan.

2. Literature review

Debasement implies distinctive things to various individuals relying upon the person's train, social foundation, and political inclining. Along these lines debasement can happen in any exchange that includes an open official as characterize here. Characterized thusly, defilement is viewed as an uncommon instance of the primary specialist issue, with the overall population as the main, and people in general official as the operator.

According to the Li et al. (2000), the blow of debasement on earnings and income disparity delivered exploit knowledge from Asian, OECD, and Latin American states. They uncover that corruption enlarge income inequality quadratically, as income inequality coefficient is superior for states with central point of corruption level at the same time, it is near to the ground for states with elevated or small levels of defilement. They moreover discover that corruption manipulate inequality coefficient from side to side government utilization. Jain (2001) spotted three classes of corruption – impressive linking political cream of the crop, bureaucratic concerning dishonest performance by selected bureaucrats, and legislative corruption linking how legislative take part in a ballot are influenced by the personal attention of the legislator. The three category of corruption fluctuate only in conditions of the judgment that are influenced by dishonest practice. The decisive consequence of corruption in each case is the similar – the misallocation of possessions and inefficiency. This examination just focuses on how debasement could convey causes to financial expansion from beginning to end of few broadcast canal while neglect the switch causes of monetary growth to defilement. The two-route causality in the middle of debasement and monetary growth may be remarkable in such a way, the rotate collision from GDP to defilement may insert to a variety of consequence for more widespread range of assessment (Dzhumashev, 2014)

Peev and Mueller (2012) investigate the association between defilement and monetary growth for 24 development state from 1990 to 2007. Make the most of extra financial incentives (EFI) as a mediator for defilement, they originate that more monetary issues easy to get to in a state, the superior the financial growth is knowledgeable. Peev and Mueller similarly bring into being that, far above the ground the extra financial incentives in a state is an after effect of fine association. The observational conclusions, furthermore, reveal that the majority necessary division of financial growth pressure is occasion from debasement. An expansion in defilement by one unit is related with a diminution in monetary growth by 2.76 for every coinage. The understanding of this finding is that monetary flexibility empowers interest in a nation, which, thus, prompts more development. An existing dissertation by Bertrand and Morse (2016) discover that up to a fourth of the diminishing in the cautious rate in the path of the most current three decades could be attributed to these utilization sprays.

Corruption mainly troubles small state, for instance, Malaysia. In Malaysia, unfasten that defilement stage is far above the ground and the monetary growth is reverse off by debasement. A concrete relationship surrounded by debasement and powerless community management is revealed (Caron et al., 2012). The dissatisfaction for mutually government transform agenda and financial transform agenda are originated by weak government in the state. Debasement wreck citizens is universal belief in government association and injury the social resources and also human resources. As point toward by an examination completed by Ray (2012) on financial collision of foreign direct investment in India from 1991 to 2011, foreign direct investments optimistically have a consequence on monetary growth. The study nominates that this optimistic affiliation is that foreign direct investment improves human resources and underpinning, generate

locality business venture, and makes a well-mannered state of affairs for money-making venture. Alemu (2012) attempt the correlation surrounded by defilement and foreign direct investment for 16 Asian countries from 1995 to 2009. Make the most of the extra financial incentives as a measure of debasement, the study establish that debasement unfavorably manipulate financial growth. The precise conclusions demonstrate that an expansion in the rank of defilement by 1 for each coinage at the appointed time abatement in Foreign direct investment by 9.1 for every coinage. As point toward by him, the unenthusiastic relationship surrounded by debasement and Foreign direct investment for the reason that of the financial helplessness that come out from defilement and, from now on, influence the belief of speculators in the marketplace, which in the end influences monetary growth.

In 2004-2005 movement expanded once more, now to a great extent in view of a deluge from new European Union part states, yet they touched base to an economy that was always recuperating. For the foreigners who came amid the 1990s, the down-hand over the economy was hindering for their monetary reconciliation – they thought that it was hard to get a balance in the work advertise, and many wound up with low pay and with high and continuing neediness and social help rates (Jonsson et al., 2010; Mood, 2011). The improvement amid the principal years of the 1990s implied that the spending deficiency expanded and as a reaction the administration looked to diminish welfare state uses by limiting the levels, terms, and additionally qualification states of different advantages, for example, ailment, parental and joblessness benefits, and the all-inclusive youngster advantage (Regnér, 2000, Palme et al., 2002). Normally, these progressions added to the officially expanding dangers of destitution. Duvanova (2014) spoken that requirement is a fountain of managerial heaviness and without delay disintegrate practices. Requirement is an impending origin of rents. In a situation wherever political and legitimate organization don't propose adequate preclusion beside debasement, civil servants might advantage from manufacture unrestricted impediment to administrative consistence.

Defilement may show the way superintendent to channel government utilize into unproductive segments, for illustration, confrontation, that propose open doors for charter run after (Gupta et al., 2001). Debasement might similarly moderate the competence of possessions in view of the fact that it crooked the nature of such possessions. For case in point, debasement can punctual diminishments in the natural world of tutoring and therapeutic services afterward weaken human capital. At long last, debasement increments the cost of generation as well as vulnerability, particularly on account of decentralized defilement, henceforth diminishing interest in both physical and human capital. Defilement weakens confidential attention in substantial assets and in adding together weaken in human capital, benevolent one more channel all the way through which debasement manipulate monetary growth (Wei, 2000; Mauro, 1995; Gupta et al., 2002). Reasonable growth and defilement work in partnership to get bigger wage imbalance. Debasement, speculation, and different regressors could not be exclusively exogenous in the progress and shell out transportation situation.

3. Data source and methodology

The literature suggested that the impact of corruption is harmful on economic growth with the help of two main channels which are as: by specially diminishing the profitability of existing assets through lower beneficial exertion, non-ideal info blend, neediness of the nature of assets, or through a general misallocation of existing assets, and in a roundabout way, through decreases in interest in both physical and human capital and also corruption of organizations (Wei, 2000; Gupta et al., 2002; Mauro, 1997; Tanzi and Davoodi, 1998). Corruption creates impact on economic growth by its on impetus. Dishonesty creates in the society due to the decreases in the corruption which allows more corrupt activities in the society. This paper used statistical model to see the relationship between the corruption and the economic growth in Pakistan's context by using reasonable time series data for conclusive results.

Different variable used in this study, which is described as follows, i.e.:

CPI: Consumer price index.

CPIA: Accountability, and corruption in the public sector rating (1 = low to 6 = high).

GCE: Government consumption expenditure.

GDPPC: Growth domestic product per capita.

GINI: Income inequality coefficient.

GS: Gross saving.

POV: Poverty.

CPI: The Consumer Price Index (CPI) is a measure of the normal change after some time in the costs paid by urban purchasers for a market load of customer products and business enterprise.

CPIA: CPIA is the transparency index which is used to make sure the corruption and even do accountability in the society.

GCE: General government last utilization use incorporates all administration current uses for buys of merchandise and ventures. It additionally incorporates most consumptions on national protection and security, however avoids government military uses that are a piece of government capital arrangement.

GDPPC: Per capita GDP is a measure of the aggregate yield of a nation that takes GDP by total population.

GINI: The Gini coefficient measures the degree to which the appropriation of pay among people or family units inside an economy veers off from a consummately rise to circulation. The Gini coefficient measures the region between the Lorenz curve and the theoretical line of outright balance, communicated as a level of the most extreme zone under the line.

GS: National reserve funds meet a country's wage less utilization and government uses, and

POV: Poverty is about not having enough cash to address essential issues including food, clothing, and house. In any case, destitution is all the more, substantially more than just not having enough cash.

3.1. Model

The study used the following equations to analyze the impact of corruption on economic growth and income inequality, i.e.

MODEL I: Impact of corruption (CPIA) on economic growth (GDPPC)

$$\ln(GDPPC) = \alpha_0 + \alpha_1 CPI + \alpha_2 GS + \alpha_3 POV + \alpha_4 GCE + \alpha_5 CPIA + \varepsilon$$

Where ε is the stochastic error term and α 's the coefficient which is to be estimated and all the other are the variables which is explained above briefly.

MODEL II: Impact of corruption (CPIA), poverty (POV) and government saving (GS) on income inequality (GINI)

$$\ln(GINI) = \alpha_0 + \alpha_1 CPI + \alpha_2 GS + \alpha_3 POV + \alpha_4 GCE + \alpha_5 CPIA + \varepsilon$$

Where ε is the stochastic error term and α 's are the coefficient which, in this study to be estimated all the other variables are mentioned above in detailed.

Both the model is estimated with the time series cointegration technique by using a data set from 1992 to 2016. The data is collected from the source of World Development Indicator published by World Bank (2016). The Robust Least Square (RLS) technique is used to estimate parameter coefficients for conclusive findings. First, the unit root estimation is implemented on the selected variables to assess stationary properties of the variable series, while in order to find the long-run co-integrated relationship between the variables, the study used cointegration technique that shows the long-run relationship between the variables at 5% significant level. Finally, the study used robust least square method for parameter estimates that is less sensitive to the outliers in the response variables and the regressors. These techniques endeavor to rinse the impact of distant cases so as to give a superior fit to most of the information. Estimates based on levels, first difference, or on robust least square method.

4. Results

Table 1 shows the descriptive statistics of the variable. The statistics shows that the mean value of CPI is 8.506% with maximum value of 20.286% and minimum value of 2.539% with standard deviation value of 4.298%. The statistics shows positively skewed distribution with considerable peak of distribution. The mean value of CPIA is 2.286 with the maximum value of 3 and minimum value of 2 with the standard deviation of 0.325 and shows the positive skewed distribution. Whenever we saw the statistics of GCE, the statistics shows the mean value of 1.41E+10 with the maximum value of 2.73E+10 and the minimum value of 8.03E+10 and have a standard deviation of 5.77E+10 which is positively skewed and have a considerable peak of the distribution. GDPPC has the mean value of US\$ 945.373 having the maximum value of US\$1181.598 and the minimum value of US\$787.794, and the standard deviation of US\$125.885 with the skewness of 0.253. The mean value of income inequality is

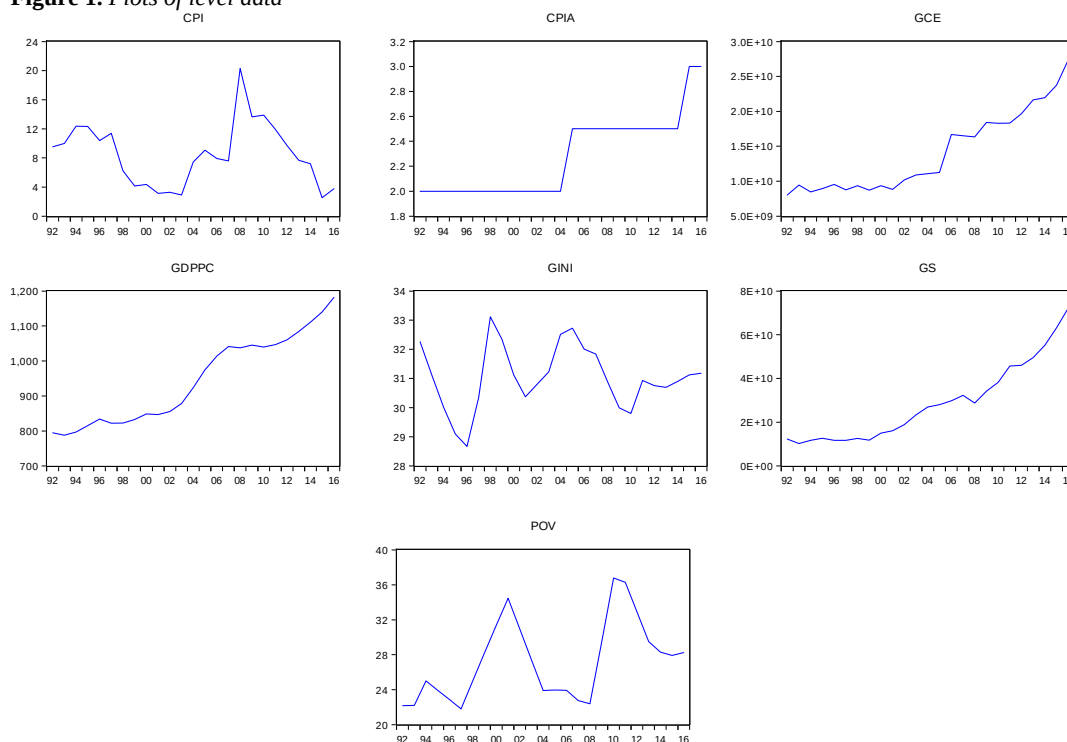
31.032% have a maximum value of 33.120% and minimum value of 28.670% with the standard deviation of 1.089%. GS has the mean value of $2.87\text{E}+10$ with the maximum value of $7.21\text{E}+10$ and the minimum value of $1.02\text{E}+10$ and have standard deviation of $1.79\text{E}+10$, which shows the positively distribution with considerable peak of distribution. According to poverty statistics, the mean value of poverty headcount is about 27.268% with the maximum value of 36.800% and the minimum value of 21.8000% which have the standard deviation value of 4.563%.

Table 1. Descriptive statistics

Variables/Methods	CPI	CPIA	GCE	GDPPC	GINI	GS	POV
Mean	8.506	2.280	$1.41\text{E}+10$	945.373	31.032	$2.87\text{E}+10$	27.268
Maximum	20.286	3	$2.73\text{E}+10$	1181.598	33.120	$7.21\text{E}+10$	36.800
Minimum	2.539	2	$8.03\text{E}+09$	787.794	28.670	$1.02\text{E}+10$	21.800
Standard Deviations	4.298	0.325	$5.77\text{E}+09$	125.885	1.089	$1.79\text{E}+10$	4.563
Skewness	0.618	0.701	0.686	0.253	-0.082	0.867804	0.626
Kurtosis	3.365	2.483	2.217	1.601	2.729	2.769	2.326
Observations	25	25	25	25	25	25	25

Figure 1 shows the plots of level data for ready reference.

Figure 1. Plots of level data



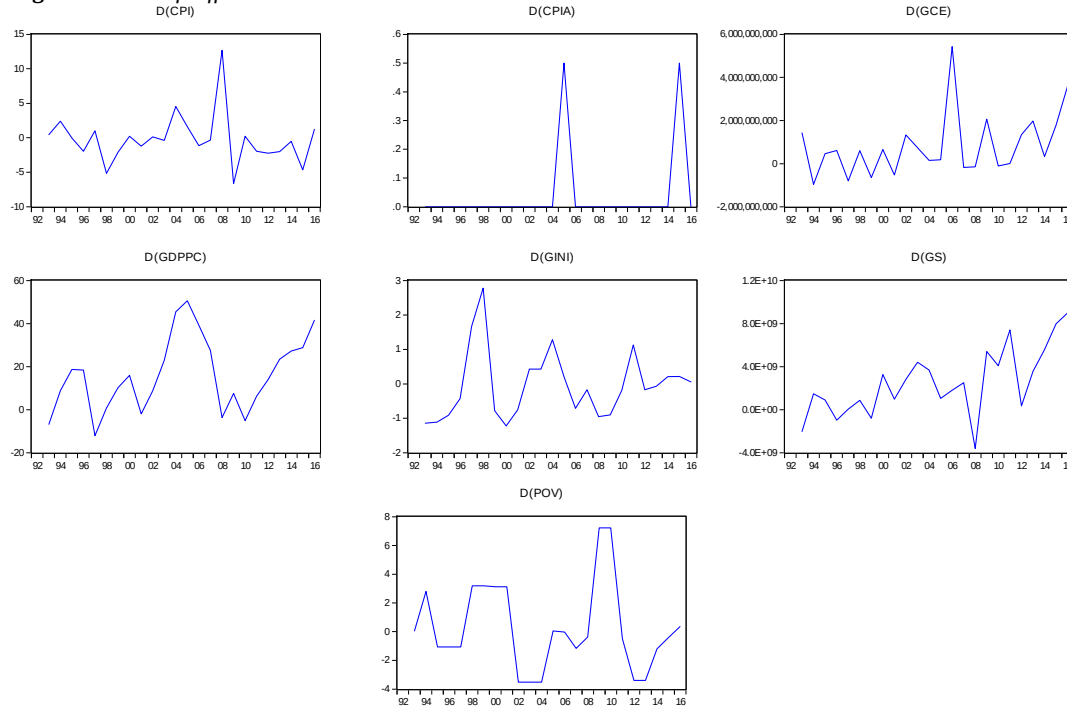
Source: World Bank (2016).

Table 2 shows the estimates of unit root test. The results show that CPI is insignificant at level, while it is significant at first difference, which means that the CPI is non-stationary variable at level, while it is stationary at their first difference. The CPIA variables is insignificant at level, while like CPI, it is significant at first difference it means that CPIA is differenced stationary variable. According to the unit rule estimation, at level, the GCE show insignificant values but at first difference it shows significant value which means that GCE is non-stationary at level and stationary at first difference. Result also shows the trend level of GDPPC that is insignificant at both the level and first difference. So at both, the level and first difference shows non-stationary series. As far as income inequality and poverty estimates, it shows the significant series at both the level and first difference. The result shows that GS is insignificant at level but it is significant at first difference which means that it is non-stationary at level while it is stationary at first difference. The order of mixture of cointegration implies that the response variable and their regressors are highly volatile data, hence it is imperative to use sophisticated econometric technique that minimizes the possible outliers both from endogenous and exogenous variables series, therefore robust least square –MM estimator is employed to serve this purpose.

Table 2. Unit root estimates

Variables	Level		First Difference		Remarks
	Constant	Constant+Trend	Constant	Constant+Trend	
CPI	-2.027 (0.273)	-1.989 (0.5775)	-5.927 (0.0001)	-5.829 (0.0005)	First differenced stationary
CPIA	8.08E-16 (0.9497)	-2.157 (0.4899)	-5.041 (0.0005)	-5.260 (0.0016)	First differenced stationary
GCE	1.374 (0.9982)	-1.091 (0.9096)	-4.827 (0.0009)	-5.973 (0.0004)	First differenced stationary
GDPPC	0.177 (0.9648)	-2.415 (0.3626)	-2.135 (0.2337)	-2.242 (0.4460)	Insignificant at both the level and their first difference
GINI	-4.428 (0.0022)	-4.335 (0.0118)	-4.414 (0.0024)	-4.277 (0.0140)	Level stationary series
GS	3.910 (1.0000)	0.249 (0.9970)	-2.920 (0.0583)	-4.523 (0.0080)	First differenced stationary
POV	-3.543 (0.0159)	-4.097 (0.0194)	-3.846 (0.0084)	-3.725 (0.0419)	Level stationary series

Figure 2 shows the plots of first differenced data for ready reference.

Figure 2. Plots of differenced data

Source: World Bank (2016). 'D' shows first difference.

Table 3 shows the cointegration estimates for per capita GDP model. The results show that there are three co-integration equations for poverty model, which implies that the given variable exhibit a long-run cointegrated relationship between the variables. The trace statistics confirmed the 3 cointegration equations, therefore, we safely conclude that the poverty model accompanied with the significant correlated factors, which is deemed desirable for policy inferences.

Table 3. Johansen cointegration estimates for poverty model

Unrestricted Co integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.923668	161.8323	95.75366	0.0000
At most 1 *	0.882390	102.6611	69.81889	0.0000
At most 2 *	0.651025	53.43233	47.85613	0.0137
At most 3	0.610404	29.21895	29.79707	0.0582
At most 4	0.270398	7.538115	15.49471	0.5160
At most 5	0.012411	0.287234	3.841466	0.5920

Note: Trace test indicates 3 cointegrating equations at the 0.05 level.

Table 4 shows the estimates of cointegration for income inequality model. The results show four cointegration equations exist, which implies that the given variables exhibit a long-run association between them. Both the eigenvalue and trace statistics confirmed the four co-integration equations, therefore, we safely conclude that inequality model accompanied with the significant correlated factors, which can be seen desirable for policy inferences.

Table 4. *Johansen cointegration estimates for income inequality model*

Unrestricted Co integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.886935	170.4564	95.75366	0.0000
At most 1 *	0.864818	120.3211	69.81889	0.0000
At most 2 *	0.784615	74.29509	47.85613	0.0000
At most 3 *	0.668975	38.98256	29.79707	0.0033
At most 4	0.278751	13.55463	15.49471	0.0960
At most 5 *	0.230920	6.038891	3.841466	0.0140
Unrestricted Co integration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.886935	50.13533	40.07757	0.0027
At most 1 *	0.864818	46.02601	33.87687	0.0011
At most 2 *	0.784615	35.31253	27.58434	0.0042
At most 3 *	0.668975	25.42793	21.13162	0.0117
At most 4	0.278751	7.515735	14.26460	0.4301
At most 5 *	0.230920	6.038891	3.841466	0.0140
Trace test and Max-eigenvalue test indicates 4 co integrating eqn(s) at the 0.05 level				

By using the robust least square regression (see Table 5) we found the positive relationship between per capita income and corruption index value, i.e., if there is 1% increase in corruption index, country's per capita income increases by 0.205 percentage points, it does not mean that corruption is good for developing countries like Pakistan, while it is evident that low level of corruption might be gain some low insights economic objectives that should not be encourage in the long-run. The previous studies also documented the positive relationship between corruption and per capita income, for example Acemoglu and Verdier (1998) concluded that corruption bring some low positive effect on the country's economic growth through the channel of increase domestic investment, which create some employment opportunities in a country. The impact of gross saving on country's economic growth is positive, as if there is 1% increase in gross saving, economic growth increases by 0.116%. The result is consistent with the previous study of Misztal (2011), which confirmed the positivity of saving in national income accounting. A positive relationship exists between government consumption expenditures and per capita income and found that if there is 1% increase in government consumption expenditures, per capita increases by 0.086%, thus according to Keynesian theory an increase in government consumption expenditures lead to increase in the employment and investment, which ultimately increases country's economic growth through multiplier effect that support the Keynesian notion of consumption function.

Table 5. *Estimates of robust least square regression for Model I*

Dependent Variable: LOG(GDPPC)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
LOG(CPI)	0.010226	0.008094	1.263309	0.2065
LOG(GS)	0.116975	0.026210	4.462986	0.0000
LOG(POV)	-0.020888	0.030968	-0.674524	0.5000
LOG(GCE)	0.086457	0.046094	1.875677	0.0607
LOG(CPIA)	0.205952	0.089212	2.308580	0.0210
C	1.914672	0.671218	2.852536	0.0043
Robust Statistics				
R-squared	0.872988	Adjusted R-squared		0.839563
Rw-squared	0.985292	Adjust Rw-squared		0.985292

Table 6 shows the estimates of robust least square regression for Model II and found the negative relationship between poverty headcount and income inequality, as if there is 1% increase in poverty headcounts, income inequality decreases by 0.09%, this result does not infer that high poverty incidence is good for reducing income disparity between rich and poor, while it illustrates that government should have to focus on pro-growth and pro-poor growth policies to reduce poverty and income inequality in a country. Jonsson et al. (2013) indicated the negative cross sectional relationship between poverty and income inequality and argued that poverty is anti-cyclical and income inequality as pro-cyclical association, which may emerged the indirect relationship exists between them. There is a positive relationship between income inequality and the government saving which means that if the government increases saving by 1% than there will ultimately be increase income inequality by 0.075%, hence, we need pro-poor saving reforms in a country for judicious income distribution.

Table 6. Estimates of robust least square regression for Model II

Dependent Variable: LOG(GINI)				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
LOG(CPI)	-0.011136	0.013322	-0.835920	0.4032
LOG(GS)	0.075690	0.043138	1.754589	0.0793
LOG(POV)	-0.094282	0.050968	-1.849813	0.0643
LOG(GCE)	-0.125630	0.075864	-1.655980	0.0977
LOG(CPIA)	0.065082	0.146831	0.443247	0.6576
C	4.831714	1.104735	4.373641	0.0000
Robust Statistics				
R-squared	0.293042	Adjusted R-squared		0.107000
Rw-squared	0.410458	Adjust Rw-squared		0.410458

5. Conclusions

The objective of the study is to examine the relationship between corruption, income inequality, poverty, and economic growth in the context of Pakistan by using a time series data from 1992-2016 and found that corruption mediates in the process of economic development through the channel of government saving and consumption function, while poverty changes income inequality under the premises of corruption and gross saving. Hence, it is imperative to device strong policies to reduce corruption, income inequality and poverty by macroeconomic policies and pro-equality growth arguments in a country. The World Bank Group works at the nation, territorial and worldwide level to construct skilled, straightforward, and responsible establishments and outline and execute anticorruption programs. Our work spins around changing results by helping both state and non-state on-screen characters set up the capabilities expected to execute arrangements and practices that enhance results and assemble open uprightness. Following the Anti-Corruption Summit in May 2016, the Bank Group reaffirmed its responsibility regarding defy defilement as a center improvement issue wherever it exists and to help respectability in broad daylight part foundations. The Bank Group likewise consented to:

- manufacture the limit of nation customers to convey on their duties regarding upgrade straightforwardness and diminish defilement,
- upgrade its help for usage of hostile to tax evasion prerequisites and for the recuperation of stolen resources, and

- broaden its work on assess change, illegal money related streams (IFFs), acquisition change, and keeping degenerate organizations from winning state contracts.

Over numerous existences anti-corruption policy makers have well thought-out it to be a purpose of enforcement only. The consequence has been a sequence of commandment and groups approaching up over the years that concerted on strict act only. Community demand has also promoter an enforcement support which come near, hence the motto of Ehtesab (answerability). on the other hand, our skill and that of comparable states across the globe has exposed that unless the reason of corruption are speak to, the society give power to stand up for its human rights, and the political determination to take disgusting judgment is produced, corruption will carry on unabated. Unless a wide-ranging approach is worn, hard work to bring back to life that support of nationwide honesty method will be unsuccessful. National Anti-corruption Strategy proposes precisely this approach.

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Impact of defence expenditures on external debt: An econometric analysis for Turkey and Turkic Republics

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Abstract. *Defense spending is one of the major public expenditure items for many states around the world. Today, defense expenditures for internal and external security are not less than past decades. In addition to the hostilities arising from historical disputes and traditional conflicts, today's governments have to endure higher defense spending for national security in the face of new threats than in previous periods. Turkey and the Central Asian Turkic Republics, which have been in geography where geopolitical and strategic positions have not always been in conflict and threats, are also trying to cope with the increasing burden of military and security expenditures. In this study, the relationship between defense expenditures and external debt is investigated in the context of Turkey, Kazakhstan, Kyrgyzstan and Azerbaijan. Findings from alternative methods suggest that there is a positive relationship between defense spending and external debt in the four countries.*

Keywords: defence expenditures, external debt, panel data analysis.

JEL Classification: C23, H56, H63.

1. Introduction

Interest related to the impact of defense spendings on the economic structure is increasing. In this framework, the effects of defense spending on economic growth, internal/external debt, employment and budget deficits have been empirically explored for various countries and groups of countries. Although defense spending has always been a significant cost to governments, this cost has increased, especially as military equipment has become technology-intensive in modern times. Emerging economies those have difficulties in financing public spending are trying to meet the burden of defense spending with external debt. Defense spending is one of the major public expenditure items for many states around the world. Today, defense spending for internal and external security is not less than in previous years. In addition to hostilities stemming from historical disputes and traditional conflicts, present-day governments have to endure higher defense spending for national security than previous times in the face of new threats such as international terrorism, energy-related conflicts, ideological disputes, and cyber attacks. Due to their geopolitical and strategic locations, Turkey and the Central Asian Turkic Republics, which have been in a geographical region where conflicts and threats have not been lacking for a long time, are also trying to cope with the increasing burden of military and security expenditures.

In this study, the relationship between defense spendings and foreign borrowing is being investigated in the context of Turkey, Kazakhstan, Kyrgyzstan and Azerbaijan. Different results have been reached regarding the relation mentioned in the empirical literature. In some studies it has been reported that there is a positive relationship between defense spendings and external debt, and a negative relationship in some cases. Nevertheless, an empirical research on the subject in the context of the Turkic republics has not been conducted until today, so the present study is a first step in this respect. Findings from alternative methods suggest that there is a positive relationship between defense spending and external debt in the four Turkic republics.

2. Turkey and Central Asian Turkic Republics: Political and economic structure

The Turkic Republics, which have a very fragile and weak economic structure due to tight state control, weak private sector, inadequate capital accumulation and entrepreneurial spirit that is cursed during long Soviet domination, are also faced with serious security and public order threats. On the one hand, the difficulties encountered on the way of liberalization and administrative confusion that is caused by the state organization which is not yet fully established, on the other side, the Russian-dominated political structure leads to serious problems and congestion in many areas, from the democratization to the development, for the Turkic republics. The political and economic dependence on Russia and the fact that two big powers like Russia and China are right next to them make these countries an important element of global accounts and plans. It is not surprising that this situation brings with it high security requirements and defense spending.

Although the Azerbaijani economy, which is predominantly dependent on hydrocarbon resources, has accumulated a considerable amount in the previous years, economical troubles live in recent years due to low oil prices. Because of the declining oil revenues, public debt is increasing and economic growth is becoming difficult. Nevertheless, it can be said that the ratio of external debt is still low. The strains experienced with Armenia since its establishment and the troubles with Russia about the Caspian Sea have pushed Azerbaijan to high military spending.

Kazakhstan, the largest of the Turkic republics in terms of population and land width, has an economic structure based on underground resources such as oil, coal and grain. Low oil prices and some problems with Russia have also caused difficulties in the Kazakh economy and a high rate of devaluation has been achieved in 2015. The contraction seen in global demand weakened the demand for Kazakh goods. As the budget deficit rises, the volume of foreign borrowing increases.

Kyrgyzstan, which in general has an economy based on agriculture and light industrialization, has serious problems especially in domestic politics despite the relatively low population and land size. The coup attempts and the political contests are losing energy and the country is also suffering from the dependence on Russia and Kazakhstan. Due to the economic stagnation in these countries, the decline in foreign exchange and foreign trade leads to hard times in the economy. Internal tensions as well as border issues with Uzbekistan are causing pressure on defense spending.

Turkey is at the forefront in terms of population and economic size among the countries in the sample, and she is in the upper class both politically and economically. Turkey, which is an important actor on the international scale with its economic and political power, has a relatively long history of industrialization and development. The transition from agriculture to industrialization, which started in the 1950s, gained a different impetus with the liberalization wave of development based on exports in the early 1980s. Turkey has been struggling with many internal and external economic crises in the aftermath of the outward opening, and has lost its 1990s with many shocking economic and political turmoil. These years have taken its place in history as economically and politically turbulent periods in which public finance is now at the brink of bankruptcy due to unsustainable debts, and chronic and high inflation could not be broken anyhow. At the same time coalition governments followed one another, ethnic and ideological terrorist organizations were added alongside traditional military threats such as Greece, Iran, and Armenia. Apart from worrying about jumping in conflicts that are not lacking in neighboring countries, terrorist incidents, especially in eastern and southeastern Anatolia, have caused tens of billions of dollars to be spent on armed struggle. Although the economy and political environment have been relatively calm since the beginning of the 2000s, it can not be said that terrorism and external threats have shown the same tranquility. This means that there is no decline in Turkey's defense spending.

3. Related literature

When the empirical literature on the economic effects of defense spending is examined, it is seen that the focus is mainly on the impact of military spending on economic growth. However, there is an increasing interest in the economic effects of military expenditures, which can reach huge proportions in public expenditures for some countries, on the basis from employment to budget deficit, from external debt volume to foreign trade. In this regards, the impact of defense spending on the external debt volume has been the subject of various researches in recent years in the context of single country examples as well as country groups.

When the studies are examined, it is seen that researches on developing countries from Asia and Africa have been carried out more extensively. The common result obtained with the exception of a few is that defense expenditures have an effect on the enhancing factor on the debt stock. Even though there is not a perfect fit in terms of the models used in the studies and the explanatory variables involved, defense expenditures, GDP, foreign exchange reserves and foreign trade components, which are mainly derived from the World Bank or SIPRI and are partly based on estimations, are the main explanatory variables. No studies have been carried out so far for developed countries such as the United States, which has one of the world's largest defense budget and one of the countries with the highest budget deficit.

4. Empirical analysis

4.1. Model and data

It can be expected that defense spending will have an impact on foreign borrowings from the three main channels which are not mutually exclusive, rather they might be contemporaneous. First, budgetary allocation is required to cover defense spending. When tax incomes are insufficient, the budget deficit must be financed in some way. If domestic borrowing opportunities are limited, the financing of defense spending will be provided by external borrowing, which will increase the debt stock. However, it is hard to identify directly to what extent defence expenditures contribute to external debt accumulation since as non-defence spending items might also press on the budget and function-specific borrowing is not a common budgetary practice (Günlük-Şenesen, 2004). The second channel is based on the lack of foreign exchange. If there is not enough foreign exchange to buy imported defense items in the country, foreign exchange needs will be provided through outsourcing, which again will result in an increase in external debt volume. The last channel is the increase in external borrowing due to the demand for high-tech imported goods and machines required by the defense industry (Smyth and Narayan, 2009).

Table 1. *Literature summary*

Paper	Unit	Period	Method	Explanatory Variables	Findings
Azam and Feng (2015)	10 Asian countries	1990-2011	Panel data analysis (REM, FEM)	ME/GDP, GDP, Tax Revenues/ GDP, inflation, foreign exchange reserve, per capita GDP growth	Positive relationship between military expenditures and external debt volume
Ahmed (2012)	25 Sub-Saharan countries	1988-2007	Panel data analysis (FMOLS, DOLS, DFEM)	Military expenditures, GDP, export, import, current account deficit	Positive relationship between military expenditures and external debt volume
Anfomum et al. (2014)	Nijerya	1986-2011	VAR, Granger causality	Military expenditures, GDP, debt service ratio, gross capital formation	Positive relationship between military expenditures and external debt volume
Dunne et al. (2004a)	Argentina, Brazil, Chile	1970-2000	ARDL model	ME/GDP, GDP, export/GDP, interest rate, foreign exchange reserve /GDP	Positive relationship between military expenditures and external debt volume for Argentina and Brazil. No relationship for Chile.
Dunne et al. (2004b)	11 developing countries	1960-2000	Panel data analysis (REM, FEM, GMM)	Growth, defense burden, foreign exchange reserve, external funding, interest payments, public sector size, tax revenues, debt service, arms imports, exports	Positive relationship between military expenditures and external debt volume
Karagöl (2004)	Turkey	1955-2000	Johansen Cointegration, Granger causality	Defence expenditures	Bidirectional causality between military expenditures and external debt volume
Karagöl and Sezgin (2004)	Turkey	1955-2000	Probit model	Debt/export ratio, export/GNP ratio, public expenditures/GNP, defence expenditures share	Growth in defense expenditures does not increase debt reschedule possibility
Kollias et al. (2004)	Greece	1960-2001	Regression analysis	Military expenditures, budgetary balance, GDP, political stability	Positive relationship between military expenditures and external debt volume
Narayan and Narayan (2005)	Fiji	1970-2005	Cointegration, VAR	Military expenditures, GDP	Positive relationship between military expenditures and domestic/external debt volume
Sezgin (2004)	Turkey	1979-2000	E-G Cointgeration	GDP, foreign trade balance, defence expenditures, arms imports, expenditures on defense equipments	No relationship between defense expenditures and external debt volume
Shahbaz et al. (2016)	Pakistan	1973-2009	Cointegrated regression, error correction model	Military expenditures, GDP, investment expenditures	Positive relationship between military expenditures and external debt volume
Smyth and Narayan (2009)	6 Middle Eastern Countries	1988-2002	Panel data analysis (FMOLS, DOLS)	Military expenditures, GDP	Positive relationship between military expenditures and external debt volume
Georgantopoulos and Tsamis (2011)	4 North African countries	1988 - 2009	Granger causality, error correction model	Military expenditures	Causality from military expenditures to external debt volume for Egypt
Muhanji and Ojah (2014)	10 African countries	1970-2010	Dynamic stochastic general equilibrium model	Military expenditures, domestic consumption, imports	Positive relationship between military expenditures and external debt volume

In response to these three channels, different models have been used in empirical literature to investigate the relationship between external debt and defense spending. Differences arise as to the explanatory variables used, depending in part on the sample and partially emphasized case. However, as Dunne et al. (2004a) pointed out, when modeling the relationship between defense spending and external borrowing, since the ultimate goal is not to fully explain the dynamics of borrowing, it can be faced with various model structures from simple to complex. In the current study, in order to keep the analysis simple, external debt volume has been associated with defense spending and the country's ability to borrow from international markets. The use of GDP as an approximate measure of the borrowing capacity of countries is a common practice (Looney, 1989; Dunne et al., 2004a, 2004b; Sezgin, 2004; Ahmed, 2012; Azam and Feng, 2015). There are two opposing views on the impact of the rise in GDP on the external debt volume. According to the first opinion, the country will be able to borrow more easily and much more, as the international creditors' debt ceiling will rise due to the increase in income (Smyth and Narayan, 2009). According to the other opinion, since the income increase will also increase the public revenue by the tax channel, both the borrowing requirement will decrease and the direct payment capacity of the country will increase. Another reason for the low number of variables in the model is that the panel used is small ($T = 21$, $N = 4$). Accordingly, the model to be estimated is as follows:

$$\ln DS_{it} = \beta_{0i} + \beta_{1i} \ln DE_{it} + \beta_{2i} \ln GDP_{it} + \varepsilon_{it}$$

where, $\ln$ denotes the natural logarithm, DS stands for external debt stock, DE for level of defense expenditures, GDP is the gross domestic product volume, and ε is the white noise error term. All figures are in million US dollars and the sample period covers the years 1994-2015. Total external debt and GDP data were obtained from the World Bank online database (WDI) and defense spending data were obtained from Stockholm International Peace Research Institute (SIPRI) database. The model is estimated for Turkey, Kazakhstan, Kyrgyzstan and Azerbaijan. Due to lack of data, Uzbekistan, Turkmenistan and Tajikistan could not be included in the sample.

4.2. Methods

In order to estimate the above model, stationarity of the series is first investigated via unit-root tests. The significance of the long term relationship between the non-stationary variables is examined by panel cointegration methods and coefficient estimates of cointegration relation are obtained by dynamic least squares (DOLS), fully modified least squares (FMOLS) and fixed effects (FE) models. The estimation of the model for each country in the sample is not preferred due to the lack of sufficiently long time series regarding the variable of defense expenditures for the other three countries except Turkey. Another reason for the use of panel data analysis is that, as emphasized by Smyth and Narayan (2009), there is not much variation over time, especially in the series of defense spending. In order to overcome this problem, panel data analysis, which allows to make use of the differences between units, offers a suitable tool. Thus, with more information, more variability, a higher degree of freedom, more efficient estimates are possible.

The panel data analysis applied here consists of three steps: In the first step unit-root tests are used to check whether the series are stationary and the integration orders are being investigated. Because the test processes can give conflicting results from time to time, existence of unit-root is examined with two different tests (Breitung, 2000; Im et al., 2003). In the second step, the existence of cointegration relation is questioned with the Fisher type-Johansen test and Kao test. In the last step, long term coefficients are estimated with DOLS, FMOLS and FE model.

4.3. Findings

The data used is in the form of a long panel and the time dimension is long enough to allow for non-stationary behavior. For this reason, the stationarity of the variables was investigated firstly. The results reported in Table 2 consist of test statistics and probability values obtained according to both test methods mentioned above. According to the tests carried out all three series become stationary in their first difference, while they are not stationary in levels (have unit-root). Accordingly, the existence of a cointegration relationship between the variables should be investigated so that a regression relation to be established is not to be spurious.

Table 2. Panel unit-root test results

Panel A. Breitung test	Test statistic	p-value
$\ln DS$	0,5525	0,7097
$\Delta \ln DS$	- 3,5473	0,0002
$\ln DE$	1,3941	0,9184
$\Delta \ln DE$	- 3,8617	0,0001
$\ln GDP$	2,8175	0,9976
$\Delta \ln GDP$	- 0,2154	0,4147
Panel B. Im, Pesaran and Shin test	Test statistic	p-value
$\ln DS$	- 0,7132	0,2379
$\Delta \ln DS$	- 5,3943	0,0000
$\ln DE$	- 1,2280	0,1097
$\Delta \ln DE$	- 2,4874	0,0064
$\ln GDP$	1,3794	0,9161
$\Delta \ln GDP$	- 1,3466	0,0890
Panel C. Levin, Lin and Chu test	Test statistic	p-value
$\ln DS$	0,9309	0,8240
$\Delta \ln DS$	- 6,6655	0,0000
$\ln DE$	- 0,6328	0,2634
$\Delta \ln DE$	- 3,0594	0,0011
$\ln GDP$	1,3799	0,9162
$\Delta \ln GDP$	- 2,9602	0,0015

The significance of the long-run relationship between the variables was investigated by Kao test based on Fisher-type Johansen and Engle-Granger methods, having found that all variables were first-order integrated (I (1)). The results presented in Tables 3 and 4 point to the existence of a statistically significant long-term relationship between variables.

Table 3. Fisher type Johansen panel cointegration test result

Number of C. E.	Fisher statistic (trace)	p-value	Fisher statistic (Max-Eigen value)	p-value
$r = 0$	80,03	0,0000	53,89	0,0000
$r \leq 1$	40,25	0,0000	25,98	0,0011
$r \leq 2$	30,35	0,0002	30,35	0,0002

Table 4. *Kao panel cointegration test result*

ADF	t-statistic	p-value
	-3,1815	0,0007
Residual variance	0,0459	
HAC variance	0,0701	

The long-term effect of *DE* and *GDP* on *DS* is estimated by Panel DOLS developed by Kao and Chiang (2000), panel FMOLS proposed by Pedroni (2000) and fixed effects (FE) model (Table 5). The coefficient of *DE* was statistically significant (at 10% level) according to DOLS and FE model with positive sign according to all three methods. Accordingly, a 1% expansion in defense spending increases the foreign borrowing rate by 1.39% (DOLS) and 0.39% (FE) respectively. The coefficient of *GDP* is negative with DOLS and FMOLS methods and positive with FE. However, only the FE estimate (at the 1% level) is significant. According to this result, an increase of 1% in the yields raises the foreign debts by 0.66%.

Table 5. *Long run elasticities*

	lnDE	lnGDP
DOLS	1,3856* (1,9558)	-1,3052 (-1,6814)
FMOLS	0,2686 (0,8419)	-0,2793 (-0,7778)
FE	0,3894* (1,7979)	0,6620** (2,6925)

Notes: Figures in parentheses are t-statistics.

* and ** denote significance at 10% and 1% level, respectively.

The short-term effect of defense spending and income on foreign debt stock is also estimated and the results are given in Table 6. Both variables seem to have an enhancing effect debt stock in the short-term, but the coefficients are not significant. On the other hand, the coefficient of a one period lagged error correction term, which indicates the speed of adjustment of the system to the equilibrium after a shock, is statistically significant and negative. Accordingly, when a sudden change in defense spending and / or income occurs, the fluctuation in the outbound debt stock tends to return to the equilibrium level. It can be said that the rate of return to the equilibrium is not too high if the magnitude of the coefficient is taken into consideration.

Table 6. *Short run elasticities*

Variable	Coefficient	t-statistic
Intercept	0,1315**	6,0611
$\Delta \ln DE_t$	0,0099	0,9344
$\Delta \ln GDP_t$	0,2581	0,1080
ECT_{t-1}	-0,1761**	0,0002
R^2	0,2581	
$\bar{R}^2$	0,2004	

Note: ** denotes significance at 1% level.

The causality relationship between defense spending and external debt stock was investigated by the dual Dumitrescu-Hurlin panel causality test (Table 7). The results indicate that there is a stable causality relationship from defense spending to the amount of external debt in 1-5 lag lengths (at the level of 10% significance). Accordingly, a change in defense spending (upwards or downwards) contains information about the change that will occur in the level of external debt within the next few years.

Table 7. Pairwise Dumitrescu-Hurlin panel causality test resultH₀: Defence spending does not cause to external debt.

Lags	W-statistic	Z-statistic	p-value
1	9,5977	9,6655	0,0000
2	10,0184	5,7227	0,0000
3	7,7895	2,2362	0,0253
4	19,8859	5,4666	0,0000
5	15,8803	1,6657	0,0958

Conclusion

In this study, the effects of defense expenditures on external debt stock were investigated empirically, in the case of four Turkish republics (Turkey, Kazakhstan, Kyrgyzstan and Azerbaijan), each of which struggles with serious internal and external threats. Findings from panel data analysis indicate that the increase in defense spending in the sample countries has an enhancing effect on the external debt. On the other hand, evidence has been obtained that the increase in income has a statistically insignificant negative effect on external borrowing. The error correction model estimates also show that the fluctuations caused by shocks in defense spending and/or income tend to return to the equilibrium level. According to the causality test conducted, there is a causality relation from defense spending to external debt volume. This relationship is maintained at different lag lengths.

Findings from the study suggest that the governments should take into account the negative effects of defense spending on the country's level of external debts, and hence economic growth and development. In this respect, it is of utmost importance that governments develop policies that will ensure economic stability and sustainability in external debts without causing a weakness in the defense of the country.

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