Openness-Inflation Nexus in South Caucasus Economies

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ABSTRACT

Following Romer (1993), openness-inflation nexus has been subject to many empirical researches. However, South Caucasus economies are not studied yet. The aim of this research is to fill this gap in empirical literature by using multiple regression models and impulse-response function analysis for the region countries, Georgia, Armenia, and Azerbaijan, separately for the period 1996-2012. To define the level of openness, methodology in Ashra (2002) is used. Findings provide no significant impact of the openness on inflation level in all region countries, except partially Georgia. However, the direction of the relationship differs across countries because of the international trade patterns.

Keywords: Openness, inflation, Georgia, Armenia, Azerbaijan, time-series analysis, impulse-response analysis

INTRODUCTION

Towards the end of 20th century, openness-inflation nexus was studied by Romer (1993) empirically for the first time. Further, the relationship between openness and inflation has been subject to many empirical studies. However, there are different views on the definition of the degree of openness for a country. Although Romer (1993) found negative association, other studies could not come to a common conclusion. As the traditional view on defining openness is the ratio of total trade to GDP, this association becomes much more attractive to study the benefits of foreign trade. However, Ashra (2002) found out that imports and exports affects inflation in opposite directions.

One of the main economic policy goals in developing countries is to maintain price stability or lower level of inflation. As the interdependence of economies increase day by day and international trade grow rapidly, the role of trade openness in macroeconomic policies gains much attention. South Caucasus economies (Georgia, Armenia, and Azerbaijan) had been under the control of the Former Soviet Union with centrally planned economic system until 1991. In 1991-1995, severe economic crisis and high level of inflation were observed in all region economies but, increasing the degree of openness required a long transition process to the market economy (Aliyev 2014, p. 69).

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This research investigates the impact of degree of openness over inflation level in the case of South Caucasus economies by using time-series data for the period 1996-2012. The paper is structured as follows: The second section provides theoretical consideration in the analysis and review of existing literature. Information about employed estimation strategy and empirical methodology are given in the third section. Empirical results are presented in the fourth section. And in the last section, authors discuss consistency of empirical results with the reality and its reconciliation with the findings in existing empirical literature.

Theoretically, this nexus is explained through different channels. In New Growth theory, the link is studied on the basis of quantitative restrictions, called as the quantity link impact (Jin 2000) as well as decreasing price fluctuations derived from production volatility in domestic farm sector (Sanyal 1996, Okun 1981, Kalecki 1972). Moreover, as the economy opens to the international markets, domestic price level of goods and services changes as price of lower priced commodities tend to increase while the reverse happens in higher priced commodities in comparison with international price level (Ashra 2002).

1. THEROTICICAL CONSIDERATION AND EMPIRICAL STUDIES

Discussions around openness-inflation relationship are not new. There are already sufficient amount of studies investigated openness-inflation relationship by many scholars in the case various countries. In empirical studies, there are different approaches to define the proxy variable of openness. As traditional approach, openness is defined as the ratio of international trade to GDP of an economy (Leamer 1988, Wynne and Kersting 2007).

In this context, many studies adopt total trade/GDP ratio as the proxy variable for openness (Bowdler and Malik 2005, Jin 2006, Hanif and Batool 2006, Shahbaz et. al. 2007, Farvaque and Shah 2009, Zakaria 2010, Lotfalipour, Montazeri, Seidghi 2013, KurihaRa 2013, Yiheyis 2013). However, scholars such as Romer (1993), Terra (1998), Temple (2002), Bowdler and Nunziata (2006), Jin (2006) and Hsin-Yi Lin (2010) use imports/GDP ratio as the proxy variable. Alfaro (2005) uses both imports/GDP and exports/GDP ratios to define openness in his research. Combes et. al. (2003) measure the degree of openness by using the ratio of exports to availability of commodities or exports/(GDP + imports). Gruben and Mcleod (2004) define openness as total trade/GDP calculated by Purchasing Power Parity (PPP) method. The globalization indices computed by Dreher et al. (2008) is also employed as the openness indicator by Syed (2012).Used

in this research also, Ashra (2002) uses three proxies for openness: total trade/GDP, imports/GDP, and exports/GDP.

In empirical literature, openness-inflation relationship was studies initially in 1990s. For the first time, Romer (1993) studied openness-inflation relationship empirically. In his studies, Romer has found "strong and robust negative" relationship between inflation and the openness in economies (Romer 1993, Romer 1998). Although Romer's finding has been supported by several studies (Sachsida et. al. 2003, Lane 1997, Ashra 2002, Mukhtar 2010, Hanif and Batool 2006) in the following years, there is not still a commonly adopted decision on the direction of this relationship. Even, Sachsida et al. (2003) mention that this negative relationship is not typical for some countries or a defined time period. However, further studies show that direction and strength of the impact of openness on inflation differs across different economies or group of economies as well as depend on applied methodology.

After controlling for country and time-fixed effects, Alfaro found that in the short-run, openness does not cause to reducing inflation (Alfaro 2005). Samimi et al. (2011, 2012) found existence of negative and significant impact of openness on inflation in the short-run but, positive impact in the long-run in case of Iran. With panel data analysis of both developed and developing countries, Samimi et al. (2012) found positive and significant relationship of openness measured in traditional way ((imports + exports)/GDP) over inflation which is opposite to Romer's (1993, 1998) findings. For a selected group of developing countries, Tashchi et. al. (2009) also found the effect of openness over inflation significant and positive.

In case of Asian 4 and G 7 countries, Wu and Lin tested Romer's hypothesis and concluded that there is not clear relationship between openness and inflation for the sample countries as stated by Romer (Wu, Lin 2006). In another research, Wu and Lin (2008) stressed the importance of considering special structures of the economies which causes to different openness-inflation relationship (Wu and Lin 2008). In this context, openness-inflation relationship does not comply with Romer's findings. There is not a "uniform" relationship (Wu and Lin 2008). Between openness and inflation, the relationship is negative in developing countries, but positive in advanced economies (Kim and Beladi 2005). On the other hand, the effect of openness on inflation differs at different inflation levels which has negative impact in case of higher inflation, but does not have any impact if lower inflation exists (Lin 2010).

Ashra (2002) uses a different approach to study the relationship between openness and inflation in terms of defining openness as total trade/GDP ratio, imports/GDP ratio and exports/GDP ratio, separately, for the 15 countries within a panel (Ashra 2002). Correlation outputs provide that impact of the openness on inflation is found mixed when trade/GDP ratio is taken as the proxy variable of openness. The coefficients are negative for 7 countries and positive for remaining 8 countries (Ashra 2002). However, when openness is defined as exports/GDP ratio, openness seems to have a positive impact on inflation, on the other hand, when openness is defined as imports/GDP ratio, generally negative effect of openness on inflation is found (Ashra 2002). In this sense, Ashra (2002) considers that openness variable as ratio of exports/GDP and imports/GDP significantly affects inflation in opposite directions.

By using unbalanced static panel data method to investigate openness-inflation relationship in the case of Middle East and North African countries for the period of 1990- 2010, Lotfalipour et. al (2013) found positive correlation between international trade and inflation. Moreover, Yiheyis (2013) investigated the relationship between openness and inflation for African countries. Unlike the expectations, he found that openness is acting as endogenous factor for higher inflation while holding constant significant determinants such as food supply constraint and level of economic development level (Yiheyis 2013).

However, Syed (2012) studied openness and inflation relationship by using panel data model and found that openness negatively impacts the inflation in developed countries. Afzal et. al. (2013) researched openness – inflation link in the case of Pakistan for time period between 1970-71 to 2008-09 by using ARDL approach. Their conclusion also supports Romer's (1993) findings or existence of inverse relationship between openness and inflation which this relationship shows itself more evidently for short run time periods rather than long run (Afzal et. al. 2013). The authors also found that there is bidirectional causality between openness and inflation. Nevertheless, by using annual time-series data for 1947-2007, Zakaria (2010) found positive relationship between trade openness and inflation in Pakistan.

Bowdler and Nunziata (2003) researched the probability of inflation start caused by impact of trade openness in the case of OECD countries after the Boschen and Weise (2003). They enlarged the borders of investigations in this field and found that there is negative relationship between increase in openness and probability of inflation start. Kurihara (2013) studied whether there is a relationship between trade openness and inflation or not in the case of Asian and OECD

countries for the period 1990s and 2000s. He found that the relationship between openness and inflation in the subject group of countries exists. More precisely, Kurihara (2013) found that there is positive relationship between international trade openness and inflation both in Asian and OECD countries. However, this relationship is more evident in Asian countries.

The results of paper by Terra show that relationship between openness and inflation is meaningful just for indebted countries during the crisis (Terra 1998). Author explains that with the resource transfer for paying debts. Gruben and Mcleod's (2004) findings are similar with Terra's (1998) results. By using general dynamic panel framework, authors found that there is positive relationship between openness and inflation in some indebted countries at 1980's.Bowdler and Malik investigated negative effect of openness on inflation volatility by using dynamic panel model (Bowdler, Malik 2005). According to their findings there is negative link between openness and inflation volatility and this relationship is much stronger in developing and emerging economies (Bowdler, Malik 2005). Authors explain this fact with that openness decreases the reserve money volatility and terms of trade growth which increases the probability of relationship between openness and inflation volatility.

2. ESTIMATION STRATEGY AND EMPIRICAL METHODOLOGY

In this research, all used data is obtained from the World Development Indicators of the World Bank. Inflation and M2 (money and quasi money) variables are measured as percent change. Calculation method of the inflation level refers to the Consumer Price Index (CPI) indicators for the each country. M2 embodies percentage growth in amount of money and quasi money in circulation. The value of total consumption expenditures, Gross National Income (GNI) per capita, imports, exports and GDP are all taken in current USD, and converted to the real value by using CPI values. As the proxy variable for openness, this research uses three different variables: export/GDP ratio, import/GDP ratio, and total trade/GDP ratio, all measured as percentage.

The research covers the period of 1996-2012, based on yearly data. However, to increase the number of observations in the regressions, all series are converted into quarterly data by using linear match last method in E-Views 8. Because all series have been subject to this conversion through application of the same method, this removes the problem of seasonality as well as insufficient number of observations issues.

Following Ashra's (2002) openness specification approach totally, and his empirical methodology partially, this research focuses on controlling other main variables affecting inflation,

and aims to find out the impact of openness over the inflation levelin the subject economies. Like Ashra (2002), this research also measures openness in three different ways:

1) Proxy variable as the total trade/GDP ratio (Model 1)
2) Proxy variable as the import/GDP ratio (Model 2)
3) Proxy variable as the export/GDP ratio (Model 3)

The first way of measurement of the openness is traditional measure used by various researchers which directly addresses openness-inflation relationship. However, here, imports and exports are assumed to have opposite impacts on inflation (see Ashra 2002). That is why the second and third ways indicate the impacts of imports sourced openness, and exports sourced openness on inflation in the subject countries, separately.

The general model structure for all subject countries is as below:

$$Infl = \beta_0 + \beta_i \sum_{i=1}^{i=8} X_i + \theta Y + \varepsilon$$

Here,

$X_i \in [Infl(\text{-}1), Infl(\text{-}2), M2, M2(\text{-}1), Log(GNI), Log(GNI(\text{-}1)), Log(Con.Expend), t]$

$$Y \in [\frac{Total trade}{GDP}, \frac{Imports}{GDP}, \frac{Exports}{GDP}]$$

In this general model structure, dependent variable $Infl$ represents inflation as percent in the subject economies. $\sum_{i=1}^{i=8} X_i$ coversabove mentioned control variables in all regressions which is expected to affect significantly the inflation in the subject economies.

- $Infl(-1)$ and $Infl(-2)$ represents one and two year lagged inflation level respectively, in order to cover the impact of expected inflation based on theinflation in previous years.

- $M2$ and $M2(-1)$ are the money and quasi money growth indicators in corresponding and previous year, aimed to take the money supply-inflation relationship into consideration.

- $Log(GNI)$ and $Log(GNI(-1))$ are the logarithmic forms of GNI per capita indicators in corresponding and previous years, aimed to cover income effect on inflation.

- Log(Con. Expend) is the logarithmic form of total consumption expenditure series, targeted to control demand effect on inflation due to change in consumption expenditures.
- t is the trend variable, used to remove the trend effect over inflation in the subject economies.

In this research, main variable of interest is Y as a proxy variable for openness which gets three different values in the regressions for each economy. Therefore, three different regressions are estimated for each subject economy - Georgia, Armenia, and Azerbaijan on the basis of change in proxy variable for openness, but all regressions include the same control variables and intercept. However, based on different order of integration among used variables, general model structure has been subject to some adjustments in all regressions.

Authors expect:

$\theta<0$ when $Y = \frac{\text{Imports}}{\text{GDP}}$, $\theta>0$ when $Y = \frac{\text{Exports}}{\text{GDP}}$ AND $\theta<0$ when $Y = \frac{\text{Total trade}}{\text{GDP}}$ if $imports > exports$

Authors also use *Impulse Response Function analysis with Cholesky–dof adjusted decomposition method* which takes the order of integration difference between used series into consideration. This analysis allows demonstrating the response of inflation to the one standard deviation in the degree of openness. In the same way, authors carry out this analysis with the all three proxy variables of openness which was mentioned above.

To implement *Impulse Response Function analysis,* authors apply Vector Error Correction model with all proxies of openness for Georgia, and with total trade/GDP ratio proxy of openness for Azerbaijan. Unrestricted VAR model is applied to the analysis for Azerbaijan with remaining proxies of openness, and for Armenia with all proxies of openness.

3. EMPIRICAL RESULTS

Unit root test results obtained from application of the ADF test to the used data series in regressions for Georgia, Armenia, and Azerbaijan are represented in the Appendix A. The results imply that all series have unit root problem at the level for Georgia. After differencing all series once and testing for unit root problem, "imports/GDP" and "trade/GDP" series are found to be stationary. Remaining other series avoid unit root problem only after differencing two times. In short, for Georgia, "trade/GDP" and "imports/GDP" series are I(1) or integrated of order one at the 5% level of significance, "exports/GDP", "total consumption expenditures (con.expend)", "GNI per capita", "inflation", and "money and quasi money (M2)" are I(2) or integrated of order two at

the 1% level of significance.That is why the variables with I(2) has been differenced once before running the regression in Model 1 and 2.

Application of the ADF test for the series used in regressions about Armenia also produces different order of integration. "Exports/GDP", "inflation", and "money and quasi money (M2)" series are I(0) at 5% level of significance, and "imports/GDP" and "trade/GDP" series are I(0) at 10% level of significance. "Total consumption expenditures (con.expend)" and "GNI per capita (GNI)" series are I(2) at 1% level of significance. In this context, the variables with I(2) has been differenced twice before running the regressions in all models for Armenia.

For the case of Azerbaijan, ADF unit root test results indicate that "inflation", "money and quasi money (M2)" and "trade/GDP" series are all stationary at level at 5% level of significance. However, remaining others are I(2) at 1% level of significance. For this reason, "imports/GDP", "exports/GDP", "Total consumption expenditures (con.expend)", and "GNI per capita (GNI)" variables are differenced twice before running the all models related to Azerbaijan.

3.1. Empirical results for Georgia

Results of estimations on Georgia seem to be partially on the same way with Ashra's (2002) findings. Like in Ashra (2002), import/GDP ratio is found to have negative impact, and export/GDP ratio is found to have positive impact over inflation performance of Georgia. However, the estimated impact of openness measured as total trade/GDP ratio for Georgia is found to be positive. More precisely, while holding other factors constant an increase in total trade/GDP ratio causes to increasing yearly change of inflation in Georgia but, the impact is not statistically significant.

Differences in integration of order of variables unable to see the direct relationship between openness defined as total trade/GDP as well as imports/GDP ratio and inflation level. Nevertheless, the impact of imports/GDP ratio on yearly change of inflation in Georgia is not also statistically significant despite of embodying negative sign. As expected, openness measured as export/GDP ratio is positively correlated with inflation performance of Georgia which the impact is statistically significant at 1% level of significance. Appendix A provides detailed information obtained from OLS estimations for Georgia.

In case of Georgia, results obtained from impulse response function analysis supports findings of linear regression estimations. As expected, response of inflation to the one standard deviation in exports/GDP ratio is always positive. This implies the fact that in Georgia, share of

increasing exports in making the economy more open positively affects inflation. Because of unit root problem, the impact of openness with the proxy variables imports/GDP, and total trade/GDP ratios is tested for over yearly change in inflation.

According to the graph above, change in imports/GDP ratio affects yearly change in inflation positively. Response of yearly inflation change to the one standard deviation in imports/GDP ratio is positive until 5th period after the impact does not appear.

Figure 1: Impulse-response analysis for Georgia
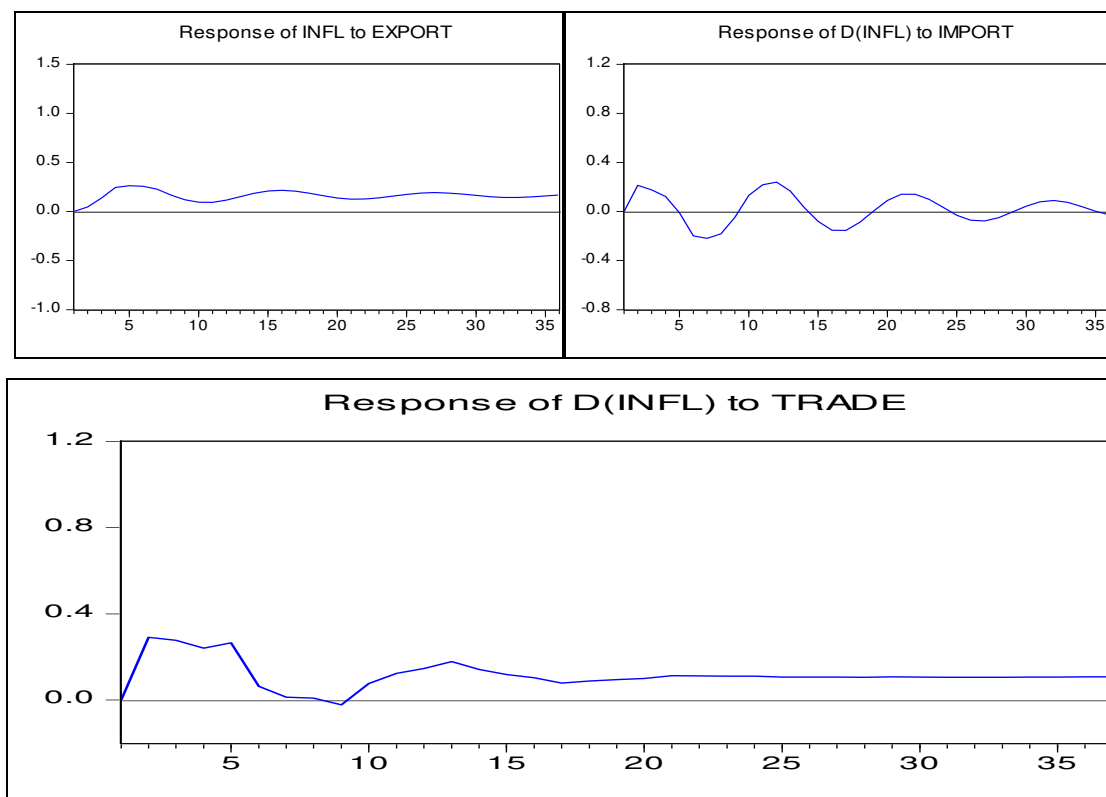
When openness is defined as total trade/GDP ratio, the analysis provides that openness affects yearly inflation change in Georgia almost always positively. Yearly change in inflation responds always positively to the one standard deviation in the total trade/GDP ratio until the 8[th]which later disappear.

3.2. Empirical results for Armenia

Ashra's findings also partially comply with the results obtained from regressions for Armenia. In this case, like Ashra (2002), the impact of openness defined as total trade/GDP and imports/GDP ratio is negative but statistically and economically insignificant. However, unlike Ashra (2002), when openness is measured as export/GDP ratio, the impact is found also negative

but statistically and economically insignificant. Estimation outputs are given in the Appendix B at the end.

In the case of Armenia, impulse response function analysis results are also on the same line with linear regression outputs. According to this analysis, inflation is negatively related with the changes in exports/GDP ratio. Thus, response of inflation to the one standard deviation in exports/GDP ratio is always negative. Only in the very long-run, after 25th period, the impact becomes zero.

Figure 2: Impulse-response analysis for Armenia
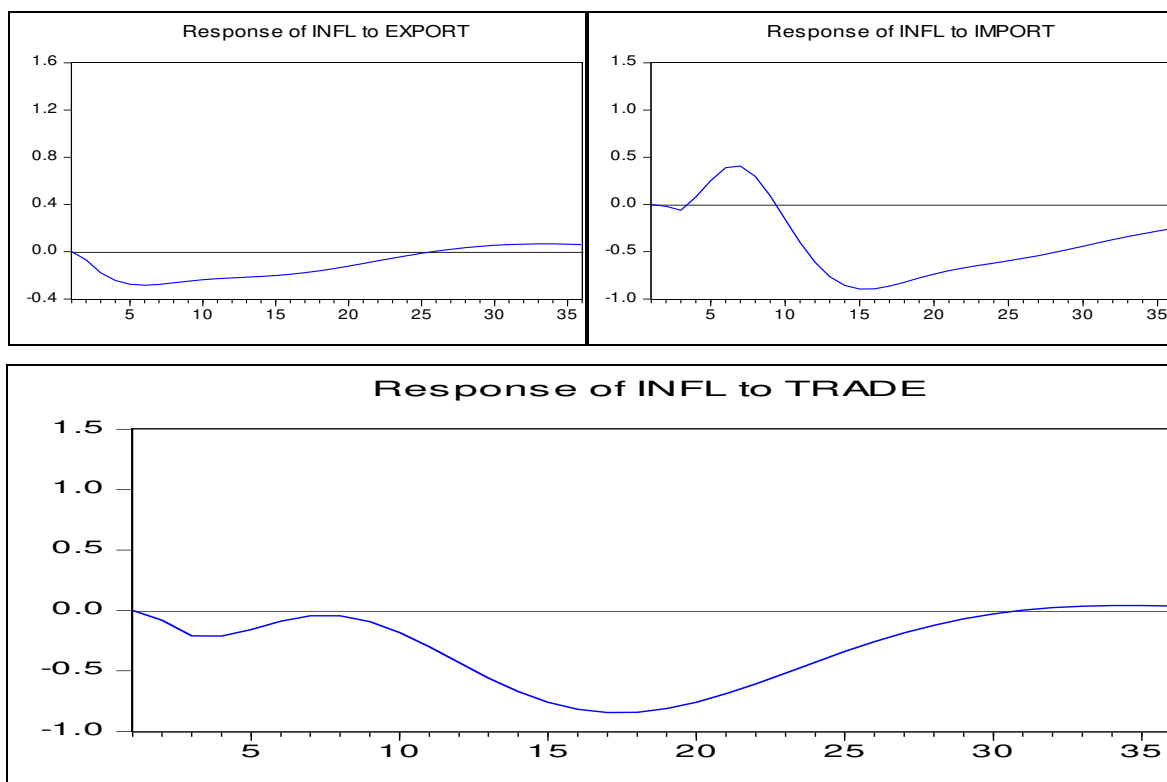
On the other hand, inflation responds to the one standard deviation in the imports/GDP ratio only for a few periods. Thus, change in imports/GDP ratio affects negatively the inflation in Armenia unless just the 4th period. Openness-inflation relationship is also negative in case of Armenia when openness is defined as total trade/GDP ratio. Thus, response of inflation to the one standard deviation in the total trade/GDP ratio is always negative.

3.3. Empirical results for Azerbaijan

For the case of Azerbaijan, the impact of openness defined as total trade/GDP ratio over inflation is opposite to the finding in Ashra (2002). Although the impact is not statistically and economically significant, it is unexpectedly positive. Because of unit root problem in model 2 and

3, the findings are less meaningful that imports/GDP and exports/GDP series are differenced twice before running the regression. For more information, look over the Apendix C.

For Azerbaijan, it is meaningful to observe the response of inflation to one standard deviation in openness only when openness is measured as the total trade/GDP ratio. As given below graphically, the response almost does not exist for the initial two periods. It is around zero which firstly response seems to be negative.

Figure 3: Impulse-response analysis for Azerbaijan

Response of INFL to TRADE
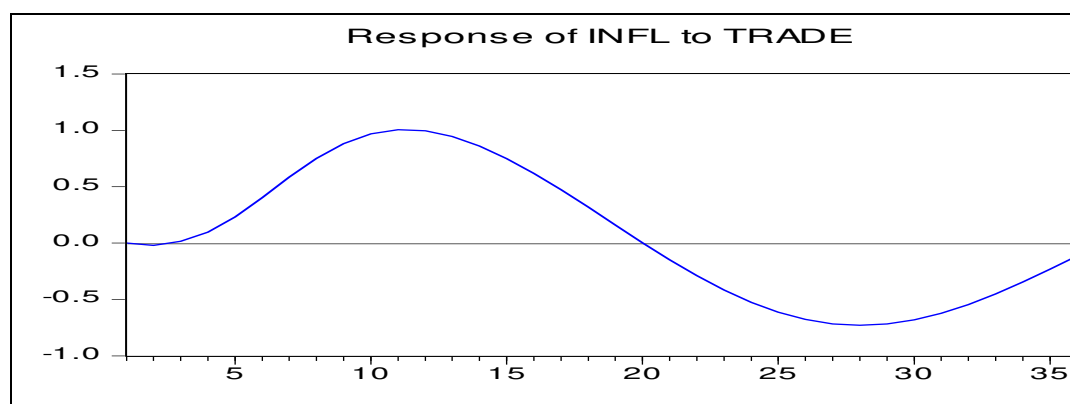
4. DISCUSSION

In Georgia and Armenia, we found that as imports/GDP ratio increases, inflationary pressure decreases while assuming the influence of other factors constant. However, none of the coefficients are statistically significant. In Georgia, exports have an increasing and significant impact over inflation where in Armenia it is not statistically significant.

The impact of these two proxies of openness separately also defines direction of the relationship in total trade/GDP ratio and inflation. As imports and exports are found to influence inflationary situation oppositely, total trade/GDP ratio affects positively the inflation in Georgia but not statistically significant whilein case of Armenia, the impact is still negative but again not statistically significant. As we can obtain meaningful results from only using total trade/GDP as the proxy variable, insignificant positive impact is found for Azerbaijan. Almost the same findings are obtained from impulse response analysis estimations.

What all these findings contribute to the literature? Firstly, this research confirmed the approach in Ashra (2002) that exports and imports affect the level of inflation in opposite directions in case of South Caucasian economies. This means if openness is defined by only considering trade/GDP ratio, suspicious findings could be obtained.

Another main contribution of this research is that openness does not play a significant role in determining the level of inflation in the economies of South Caucasus region. Only Georgia observes significant inflationary pressure of the openness derived from the exports.

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APENDIX A: OLS RESULTS FOR GEORGIA

Ind. Variables	Dep. Variables	D(INFL)	D(INFL)	INFL
TRADE/GDP		0.106553	-	-
IMPORT/GDP		-	-0.021370	-
EXPORT/GAP		-	-	0.474230***
INFL(-1)		-	-	1.219208***
INFL(-2)		-	-	-0.456212***
M2		-	-	0.036918
M2(-1)		-	-	-0.023739
LOG(GNI)		-	-	-90.53344***
LOG(GNI (-1))		-	-	82.74575***
LOG(CON.EXP)		-	-	5.808308***
D(INFL(-1))		0.717445***	0.812217***	-
D(INFL(-2))		-0.055622	-0.059476	-
D(M2)		-0.034694	-0.027406	-
D(M2(-1))		0.025462	0.028486	-
D(LOG(GNI_PPP))		-97.50814***	-109.7432***	-
D(LOG(GNI_PPP(-1)))		93.80805***	113.7096***	-
D(LOG(CON_EXP))		-18.04543*	-7.117452	-
C		-6.111970	0.454796	-69.16466***
t		-0.054552	0.015456	-0.237313***
R^2		0.781242	0.767472	0.947915
S.E. of regression		1.108665	1.143025	0.985676

APENDIX B: OLS RESULTS FOR ARMENIA

Ind. Variables	Dep. Variables	INFL	INFL	INFL
TRADE/GDP		-0.007096	-	-
IMPORT/GDP		-	-0.000164	-
EXPORT/GAP		-	-	-0.013861
INFL(-1)		1.614709***	1.614707***	1.621105***
INFL(-2)		-0.677739***	-0.678006***	-0.690088***
M2		-0.039749**	0.051495***	-0.038260**
M2(-1)		0.050141***	-0.040551**	0.049149***
D(LOG(GNI),2)		-9.542392	-9.699332	-9.892157
D(LOG(CON.EXP),2)		17.70064*	17.39371*	17.89847*
C		0.401231	-0.155518	0.224953
@TREND		0.002690	0.004278	0.003384
R^2		0.978087	0.977963	0.978205
S.E. of regression		0.591810	0.593489	0.590224

APENDIX C: OLS RESULTS FOR AZERBAIJAN

Ind. Variables	Dep. Variables	INFL	INFL	INFL
TRADE/GDP		0.008399	-	-
D(IMPORT/GDP,2)		-	-0.217864	-
D(EXPORT/GAP,2)		-	-	-0.343541***
INFL(-1)		1.630442***	1.645673***	1.738790***
INFL(-2)		-0.706970***	-0.714656***	-0.802870***
M2		0.016894	0.016184	0.008644
M2(-1)		-0.005754	-0.007747	0.001541
D(LOG(GNI),2)		-61.66586***	-69.94436***	-48.24749***
D(LOG(CON.EXP),2)		3.994953	15.61441	30.65625***
C		-0.860222	-0.092608	-0.056563
@TREND		0.005896	0.004594	0.002734
R^2		0.978288	0.979166	0.987642
S.E. of regression		0.982137	0.962087	0.740977