EMPIRICAL ANALYSIS ON FOREIGN TRADE RELATIONS BETWEEN CENTRAL ASIA AND EU

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Abstract

Central Asia serves as a bridge for the EU that links to China, Afghanistan and the Middle East. This region is also an important source for EU's energy imports. The most exported products from Central Asia to EU are crude oil, gas, metals and fibres. EU exports machinery and transportation equipment and other manufacturing industry products to Central Asia, which is equivalent to half of trade volume of regional exports. The Generalized Preferences System (GPS) provides four other Central Asian countries except Kazakhstan, benefit from easy access to the EU market. The aim of this study is to find out bilateral foreign trade relations between EU and Central Asian countries. For this reason, the yearly data from 1998 (based on the WTO membership of Kyrgyzstan) to 2017 is analysed using the SVAR method. The purpose is to determine the effects of imported and exported products among the regions on each other. According to the empirical data obtained, crude oil and gas are the most internal variables while machinery and transportation industry equipment are the most external variables. Therefore, the EU's import dependence on energy is the main reason for the trade relations with Central Asia. Central Asian countries are dependent on the EU in the context of medium-level technology products.

Keywords: Central Asia, European Union, Central Asia

Jel Codes: B27, Q43

ORTA ASYA VE AB DIŞ TİCARET İLİŞKİLERİ ÜZERİNE AMPİRİK BİR İNCELEME

Özet

Orta Asya, AB için Çin, Afganistan ve Orta Doğu'ya açılan bir köprü niteliği taşımaktadır. Ayrıca bu bölge AB'nin enerji ithalatı için önemli bir kaynaktır. Orta Asya ülkelerinden AB'ne en çok ihraç edilen ürünlerin başında ham petrol, doğal gaz, metaller ve elyaf gelmektedir. AB ise Orta Asya'ya makine ve ulaşım ekipmanları ile diğer imalat sanayi ürünlerini ihraç etmekte olup bu ürünlerin ticaret hacmi bölge ihracatının yarısına denk gelmektedir. Genelleştirilmiş Tercihler Sistemi (GPS), Kazakistan hariç diğer dört Orta Asya ülkesinin AB pazarlarına kolay erişim imkanını sağlamaktadır. Bu çalışmanın amacı AB ve Orta Asya ülkeleri arasındaki karşılıklı dış ticaret ilişkisini ortaya koymaktır. Bu nedenle 1998 (Kırgızistan'ın DTÖ'ne üyeliği baz alınarak)-2017 yıllarına ait yıllık veriler SVAR yönteminden yararlanılarak analiz edilmiştir. Amaç bölgeler arasından ithal ve ihraç edilmekte olan ürünlerin birbirleri üzerine etkilerini saptayabilmektir. Elde edilen ampirik verilere göre en içsel değişkenler ham petrol ve doğal gaz iken en dışsal değişkenler makine ve ulaşım sanayi ekipmanlarıdır. O halde AB'nin ithal enerji bağımlılığı Orta Asya ile olan ticari ilişkilerin asıl sebebidir. Orta Asya ülkeleri ise orta-düzey teknoloji ürünleri bağlamında AB'ye bağımlıdır.

Anahtar kelimeler: Orta Asya, Avrupa Birliği, Dış Ticaret

Jel Kodları: B27, Q43

1. Introduction

Trade is one of the main drivers of the development. Trade relationship between Central Asia and European Union are a part of the 'EU's overall political and economic relations with Central Asia'. Being a member of World Trade Organization is a pre-condition for closer trading and investment relations with the EU. The Central Asian countries, namely Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, hold a position in bridging the European Union (EU) to China, Afghanistan and to the Middle East. The region is identified as the 21st centuries silk road by World Trade Organization (WTO). The five Central Asian countries were part of the Soviet Union until they became independent in December 1991 (Pomfret, 2015). Since then, these countries have tried to be strong economically. Being a neighbour of emerging markets (three of the four BRICs), increases the geopolitical importance of Central Asia (Pomfret, 2013). For the Central Asia region, Russia is the most important trade partner, and recently China, Turkey and EU came forward as new trading partners. In the recent years, the trade relations between EU and Central Asia increased gradually, and EU become one of the main trading partners of the region.

Central Asian countries except Kazakhstan, benefit from easy access to the EU market with the Generalized Scheme of Preferences (GSP). The countries which are member of GSP pay fewer or no duties on exports to the EU, so it is much easier to trade with the region. The mostly exported products from Central Asia to EU are crude oil, gas, metals and fibres, and the mostly exported products from EU to Central Asia are machinery and transportation equipment and other manufacturing industry products to Central Asia, which is equivalent to half of trade volume of regional exports. For example, as released by European Commission, in 2017 the exports from Central Asia to Europe has increased from 13.7 billion euro to 18.3 billion euro relative to the previous year.

With the increase in the trading relation between Central Asia and EU, a few researchers examined this relationship between these two regions. Magilevskii (2012) analyses the foreign trade in Central Asia from 2000 to 2010 including Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Findings indicate that main export partners are EU, Russia and China and the portion of EU and China as an export partner has increased between the analysed period. Another finding is higher the investment on oil and gas pipelines, higher the export. Peyrouse (2009) emphasises that the relationship between EU and Central Asia is both economically and socially important. According to author, it is difficult to strengthen the trade relationship apart from the energy sector due to the fact that EU is dependent in terms of energy usage to Central Asia. Şeker (2010) investigates the trade performance in Eastern Europe and Central Asia (ECA) on firm level by using a total of 11306 firms from 29 countries. It is found that countries with a high percentage of exports leads to high percentage of imports. Also, exporting countries are larger than others and tend to invest in R&D.

Although these studies were interested in the trade relation between two regions, there are still uncovered phenomena about the effects of trade among the regions. Therefore, the aim of this study is to find out bilateral foreign trade relations between EU and Central Asian countries. For this reason, the yearly data from 1998 (based on the WTO membership of Kyrgyzstan) to 2017 is analysed using the SVAR method. The purpose is to determine the effects of imported and exported products among the regions on each other.

The rest of the study is structured as follows: Section 2 provides explanations on SVAR methodology. In Section 3 the empirical findings are presented. Finally, Section 4 concludes with the discussion of the findings.

2. SVAR Methodology

The VAR is a system that explains how endogenous variables behave together, has developed by Sims (1980), Litterman (1979) and Doan (1992). As macroeconomic variables interact with each other according to Robust and Eagle (2014), it is difficult to distinguish between explanatory and dependent variables and to solve simultaneous equations at the same time.

The VAR technique generally describes dynamic relationships without constraints on the structural model. However, it is difficult to understand the VAR models that are not based on a specific economic theory. According to Lucas Critique, it is difficult to deduce many coefficients from a VAR system. The parameters in VAR system have no economic meaning unless they are associated with structural parameters that shows technological changes, preferences, equilibrium state (within their first and second derivative, minimization or maximization). The Cooley-Leroy/Bernanke Critique suggests that economists tend to be more descriptive constraints and that the effects of certain specific shocks on some sub-group variables, both long and short term, can be distinguished by technology or fiscal policy as an oddity rather than by coincidental (Sarte, 1997: 45).

For this reason, Structural VAR analysis has been used frequently to investigate the dynamic relationship between economic variables. According to Cooley and Leroy (1985), structural VAR model is an identified form of VAR system and it is a simpler analysis tool that summarizes the dynamic properties of data. The logic of structural VAR models developed by Sims (1981-1986), Bernanke (1986), Shapiro and Watson (1988) for the first time and it is based on the distinction of error terms in the system, which is the linear composition of external shocks, rather than determining autoregressive coefficients. For this reason, the VAR system developed by Sargent (1978) and Sims (1980) puts some constraints on the shocks that is already exist in the instantaneous or simultaneous relations between the variables instead of the Cholesky decomposition of the covariance matrix.

Since these constraints are laid out in a recursive, repetitive form which is called Wold Casual Chain System and has developed by Herman Wold, it is necessary to have a specific theory behind the one that is searched for. The non-theoretical constraints are arbitrary or vary according to the order of the variables. In addition, the structural VAR technique allows decomposition of structural shocks, which makes the method itself attractive as it is directly and transparently analysed even working with small samples (Pedroni, 2013: 184).

The data has been downloaded with their annual forms from World Bank development indicators. The membership of Kazakhstan to the World Trade Organization is accepted as a starting point and the period is selected between 1998 and 2016. Uzbekistan, Tajikistan, Turkmenistan and Kyrgyzstan are the members of Central Asia and compared with European Union as an aggregated unity. First of all, stationary of variables has been checked with ADF test and their level does not have unit root. After that seasonal effects of variables have been eliminated with Census X-13 test.

SVAR model can be written as follow for this study; GDP per – GDP per unit of energy use, NG - natural gas rents (% of GDP), OR - Oil rents (% of GDP), MTE - Machinery and transport equipments (% of value added in manufacturing), MI - Manufactures imports (% of merchandise imports).

$$GDPper_t = a_{11} - a_{12}NG_t - a_{13}OR_t + a_{14}MI_t + a_{15}MTE_t + a_{16}GDPper_{t-1} - a_{17}NG_{t-1} - a_{18}OR_{t-1} + a_{19}MI_{t-1} + a_{20}MTE_{t-1} + \varepsilon_{1t} \quad (1)$$

The dependent variable can be replaced with independent ones on the left side to rewrite the

equation for each of them (a takes a different value (-, +) for each equation). According to equation (1), an increase in natural gas and oil rents will affect the use of energy per unit negatively. According to economic theory, a shock in oil prices can be the reason of rising import in manufacturing, machinery and transport equipment due to increasing domestic prices.

Matrix form of the system can be written as follows:

$$\begin{bmatrix} 1 & a_{12} & a_{13} & a_{14} & a_{15} \\ a_{22} & 1 & a_{23} & a_{24} & a_{25} \\ a_{32} & a_{33} & 1 & a_{34} & a_{35} \\ a_{42} & a_{43} & a_{44} & 1 & a_{45} \\ a_{52} & a_{53} & a_{54} & a_{55} & 1 \end{bmatrix} \begin{bmatrix} GDPper_t \\ NG_t \\ OR_t \\ MI_t \\ MTE_t \end{bmatrix} = \begin{bmatrix} a_{11} \\ a_{21} \\ a_{31} \\ a_{41} \\ a_{51} \end{bmatrix} + \begin{bmatrix} a_{16} & a_{17} & a_{18} & a_{19} \\ a_{26} & a_{27} & a_{28} & a_{29} \\ a_{36} & a_{37} & a_{38} & a_{39} \\ a_{46} & a_{47} & a_{48} & a_{49} \\ a_{56} & a_{57} & a_{58} & a_{59} \end{bmatrix} \begin{bmatrix} GDPper_{t-1} \\ NG_{t-1} \\ OR_{t-1} \\ MI_{t-1} \\ MTE_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{bmatrix}$$

The constraints on variables in SVAR models are divided into two as short run and long run. Vector B contains restricted elements, while in practice Vector A contains all unrestricted elements. The Amisano-Giannini (1997) method, which is composed of these two components and is called the AB model, forms a selection matrix consisting of zero and one.

In the recent structural VAR studies, short term constraints are replaced by long term constraints. In addition, SVAR models require fewer restrictions than simultaneous equation models. This is because the effect of some shocks is temporary, and the long-term effect is assumed to be zero, and it is also applied to long-run multipliers of the VAR model. Blanchard-Quah (1989) suggests using the long-term constraint to distinguish structural VAR coefficients in his work. According to Gartner and Wehinger (1998), the long-run multiplier implies the effects of structural shocks on a specific endogenous variable. The long-term multiplier is derived from the cumulative representation of the moving average coefficients.

According to Aktas (2010) and Zengin (2000), the long-term effects of shocks are measured by impulse-response functions. Impulse-response functions show of how long the effect of these shocks lasts (periods). Dashed lines indicate confidence intervals, while the continuous lines represent the response of the dependent variable to the shocks occurring in the error term (Robust and Egeli, 2014: 4). The impulse-response functions are calculated by Monte-Carlo simulations and according to Runkle (1987), they are statistically significant within (± 2) standard deviation, confidence interval. Structural variance decomposition determines the most effective explanatory variable on a macroeconomic magnitude, while impulse-response functions helps to decide whether this variable can be used as a policy tool.

3. Emprirical Results

The VAR system is included as an external variable @trend. In this section, not only long-term but also short-term structural variance analysis and structural variance decomposition of shocks are given. The aim is to be able to see whether short-term shocks are permanent in the long run and to compare what the economic theory claims.

Table 1: Lag Order Selection Criteria

Lags	FPE	AIC	SC	HQ
0	4517991.	29.512	29.779	29.620
1	441.187	20.277	21.212*	20.655
2	230.446*	19.622*	21.225	20.270*
3	259.595	19.729	22.000	20.647

The optimal lag length for structural VAR analysis was selected according to Hannan-Quin (HQ), Schwarz (SC), Akaike (AIC), Final Prediction Error (FPE) and Likelihood Ratio (LR) information criteria (their lowest values). The lag length is two according to Table 2 (* indicates lag order selected by the criterion).

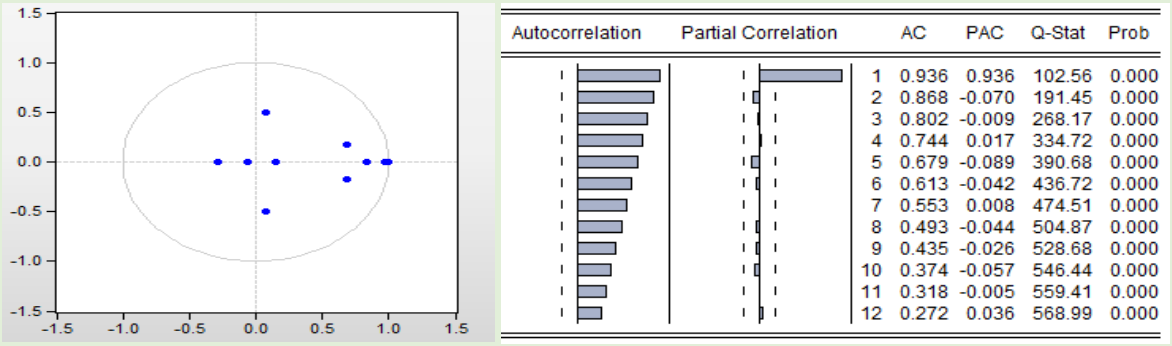

Figure 1: Inverse Roots of AR Characteristic Polynomial

The VAR (2) model is estimated. Because, AR inverse roots and modules of VAR (1) model were not in the unit circle. Figure 1 shows that VAR (2) model has no stability or autocorrelation problem between the error terms and all inverse roots are inside of the unit circle.

Table 2: Short-run SVAR Estimations

	Coefficient	**Std. Error**	**z-statistic**	**Prob.**
C(1)	0.008147	0.007318	1.113302	0.2656
C(2)	-0.030804	0.014023	-2.196726	0.0280*
C(3)	0.009259	0.010474	0.883976	0.3767
C(4)	0.040391	0.020148	2.004744	0.0450*
C(5)	0.002574	0.002649	0.971420	0.3313
C(6)	0.000734	0.005195	0.141301	0.8876
C(7)	-0.013315	0.050491	-0.263716	0.7920
C(8)	0.300876	0.021066	14.28286	0.0000*
C(9)	4.166232	0.291695	14.28286	0.0000*
C(10)	2.899700	0.203020	14.28286	0.0000*
C(11)	11.24561	0.787350	14.28286	0.0000*
C(12)	0.590034	0.041311	14.28286	0.0000*

Loglikelihood: -1048.321 Chi-square (3): 20.36893 Probability: 0.0001

Std. error represents the standard errors of estimated coefficients with SVAR and prob. indicates probability values (significance, % 5) of z-statistics. C (1), C (2), C (3), C (4), C (5), C (6) represent

constraints of A matrix and C (7) C (9), C (10), C (11) and C (12) represent the constraints of B matrix. As seen from the probability values, while the variance matrices are constructed, some of the constraints according to the economic theory are significant while some are insignificant. The effects of variables on each other or trade are taken into account in the written matrix. However, it is not explained in detail to not to dispense the subject of this research. The null hypothesis of the SVAR system ''Central Asia and EU are independent in terms of trade'' is rejected. Because, the probability value of the SVAR system is 0.0001 is smaller than 0.05 and it is statistically significant.

The purpose of VAR analysis is not to estimate regression coefficient, so the parameters will not be interpreted. C(2) = -0.030, C(4) = 0.0403 which are statistically significant from the unrestricted elements of the matrix A, while all of the constricted elements of the matrix B have statistically significant and positive coefficients. Thus, the coefficients indicate that there is a positive relationship between traded products in Central Asia and EU, in the short-term.

Table 3: Long-run Variance Decompositions

$GDPper_t$					
T	$GDPper_t$	MI_t	MTE_t	NG_t	OR_t
1	0.307327	0.000000	0.000000	0.000000	0.000000
2	0.318569	-0.051690	0.012153	0.018723	0.013424
3	0.303519	-0.020869	0.093629	0.010824	0.013939
4	0.296255	-0.025298	0.152517	0.002330	-0.009691
5	0.289882	-0.014928	0.190345	0.004516	-0.025137
6	0.284190	-0.004777	0.208384	0.005857	-0.033269
7	0.279931	0.006522	0.215964	0.002886	-0.041199
8	0.277541	0.015336	0.218129	-0.002047	-0.049868
9	0.276347	0.021611	0.217340	-0.007094	-0.057460
10	0.275791	0.025677	0.215061	-0.012100	-0.063519

MI_t					
T	$GDPper_t$	MI_t	MTE_t	NG_t	OR_t
1	-0.846521	11.27504	0.000000	0.000000	0.000000
2	0.256693	5.155342	-2.294869	-0.913284	0.709921
3	0.699277	4.402014	-2.736530	-1.667828	1.206932
4	1.140531	2.621837	-2.653240	-2.219498	1.276325
5	1.398720	1.570636	-2.162566	-2.350823	1.392571
6	1.533288	0.756513	-1.626911	-2.292116	1.563135
7	1.584876	0.264153	-1.108916	-2.167176	1.697215
8	1.598173	-0.032071	-0.657855	-2.009848	1.769529

9	1.591026	-0.183992	-0.294716	-1.832346	1.805666
10	1.574167	-0.241900	-0.022552	-1.656139	1.820335

MTE_t

T	$GDPper_t$	MI_t	MTE_t	NG_t	OR_t
1	0.011259	0.034866	0.603429	0.000000	0.000000
2	0.023539	-0.106341	0.419842	0.066095	-0.039265
3	0.010772	0.031445	0.285199	0.093506	0.010087
4	0.015472	0.051094	0.174543	0.061153	0.008742
5	0.026106	0.068040	0.112450	0.033629	-0.010568
6	0.036660	0.061297	0.072101	0.020017	-0.018592
7	0.043588	0.052391	0.046658	0.010576	-0.017544
8	0.048577	0.041937	0.032815	0.001310	-0.016592
9	0.052404	0.031924	0.027400	-0.005784	-0.016936
10	0.055078	0.023135	0.026640	-0.009965	-0.016953

NG_t

T	$GDPper_t$	MI_t	MTE_t	NG_t	OR_t
1	-0.578736	0.197166	0.647888	4.093436	0.000000
2	-1.206996	0.481909	-0.280867	4.914293	2.774323
3	-1.395675	0.893508	-0.762077	3.444157	2.549538
4	-1.203219	0.901351	-0.628379	2.485202	1.434467
5	-1.047202	0.717687	-0.580831	2.229117	0.986709
6	-0.998125	0.614900	-0.660143	2.015521	0.923473
7	-0.962940	0.545044	-0.707909	1.693673	0.800320
8	-0.913184	0.460575	-0.694823	1.402195	0.615189
9	-0.867480	0.370188	-0.665029	1.191698	0.471000
10	-0.834885	0.292721	-0.638772	1.027813	0.376750

OR_t

T	$GDPper_t$	MI_t	MTE_t	NG_t	OR_t
1	-0.269816	-0.846282	-0.406182	0.942005	2.510087
2	-0.492431	-0.213992	-0.638921	0.217949	2.440645

3	-0.402065	-0.098071	-0.463391	-0.130294	1.732939
4	-0.339561	-0.088432	-0.407248	-0.011878	1.527929
5	-0.343518	-0.040347	-0.474720	0.066096	1.570720
6	-0.344133	0.013949	-0.526924	0.016130	1.534237
7	-0.324121	0.035543	-0.537639	-0.043089	1.433748
8	-0.300829	0.035786	-0.535987	-0.069377	1.352250
9	-0.282441	0.031366	-0.533539	-0.084811	1.296719
10	-0.266573	0.026213	-0.526373	-0.102531	1.246269

T represents periods (and number of the periods are selected by the program automatically). When we examine the variance decomposition table, a shift in energy use GDP per unit affects negatively manufactures imports (in the long and short run) and oil rents (in the long run). An increase in machinery and transport equipment decreases natural gas rents only % 1 percent during last 2 periods. Generally, it has positive effects on all traded goods and energy usage. According to Table 3, it is possible to list in order from most exogenous variable to endogenous one; oil rents, natural gas rents, machinery and transport equipment and manufacture imports. Energy use GDP per unit is a control variable.

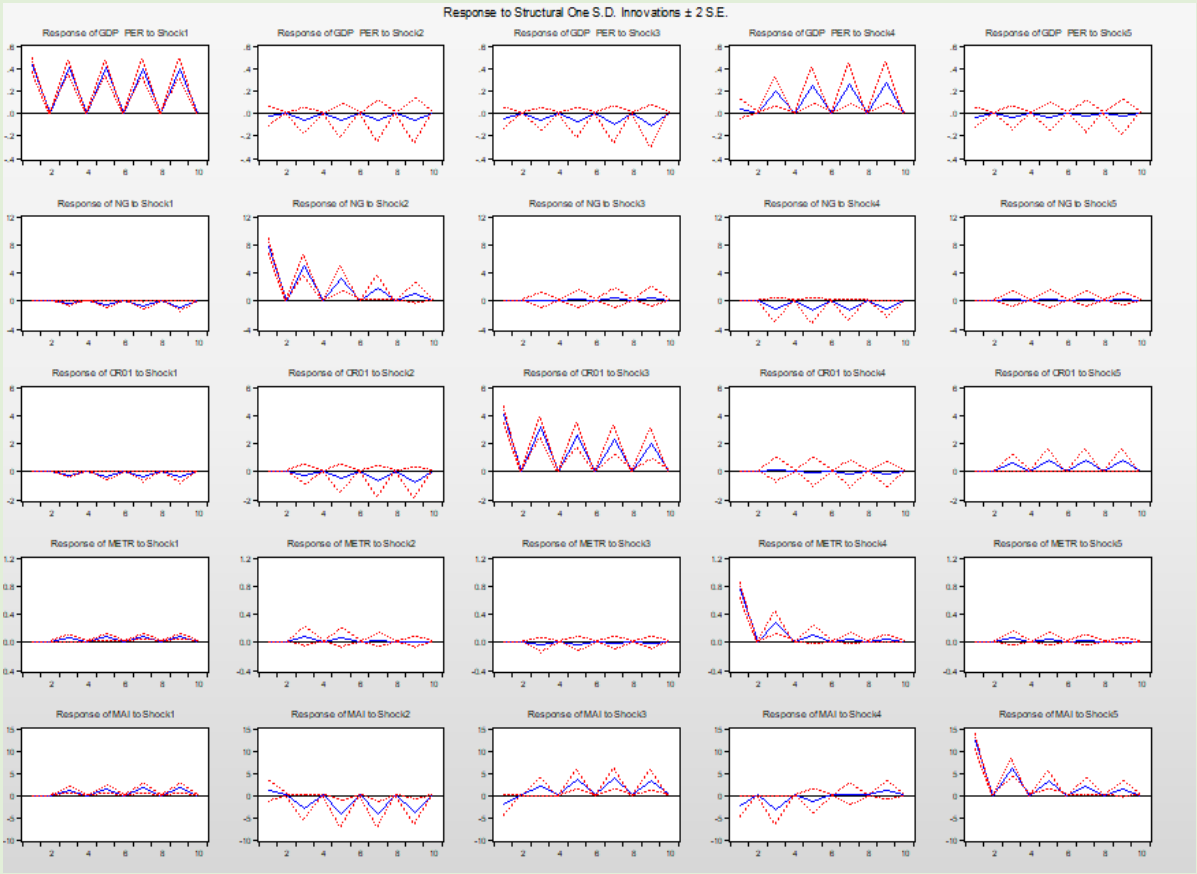

Figure 2: Impulse – Response Functions

Figure 2 shows the permanent or temporary effects (positive – negative) of an internal or external shock on these traded goods and energy usage. It is obvious from the figure that oil and natural gas rent shocks are permanent, and the magnitude of the fluctuations is increasing in the long term. Machinery and transport equipment and manufacture imports have temporary effects on energy usage and fluctuations are only exist in the positive area. The oil rents have negative effects on machinery and transport equipment, but the magnitude of fluctuations is decreasing at the end of 10 periods for manufacture imports.

4. Conclusion

Central Asia serves as a bridge for the EU that links to China, Afghanistan and the Middle East. This region is also an important source for EU's energy imports. Therefore, it is important to determine the effects of imported and exported products among Central Asia and EU on each other. Within this scope, the aim of this study was to find out bilateral foreign trade relations between EU and Central Asian countries. For this reason, the yearly data from 1998 (based on the WTO membership of Kyrgyzstan) to 2017 is analysed using the SVAR method. The data has been downloaded with their annual forms from World Bank development indicators. The membership of Kazakhstan to the World Trade Organization is accepted as a starting point and the period is selected between 1998 and 2016. Uzbekistan, Tajikistan, Turkmenistan and Kyrgyzstan are the members of Central Asia and compared with European Union as an aggregated unity.

After checking for stationary and seasonality of the variables, the SVAR analysis was conducted. According to the results, Central Asia and EU seem to be dependent to each other in terms of trade. In the short term, there is a positive relationship between traded products in Central Asia and EU. Moreover, according to the variance decomposition table, a shift in energy use GDP per unit affects negatively manufactures imports (in the long and short run) and oil rents (in the long run). Lastly, form the analysis it is found that oil and natural gas rent shocks are permanent, and the magnitude of the fluctuations is increasing in the long term. Machinery and transport equipment and manufacture imports have temporary effects on energy usage and fluctuations are only exist in the positive area. The oil rents have negative effects on machinery and transport equipment, but the magnitude of fluctuations is decreasing at the end of 10 periods for manufacture imports.

The five Central Asian countries were part of the Soviet Union until they became independent in December 1991. Since then, these countries have tried to be strong economically. Due to the location and neighbours (three of the four BRICs), the strategic importance of Central Asia is increasing currently. Especially, being a neighbor of China, which is the rising value of world in terms of trade, makes the regional cooperation better. Therefore, understanding the trading behavior of Central Asia countries and finding out its effect is an important issue in terms of trading policies.

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