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THE DEMAND FUNCTION FOR MERCHANDISE EXPORTS: THE CASE OF CROATIA

Abstract

The paper aims to examine demand for merchandise exports from Croatia as a function of relative prices and income of the European Union (EU) member countries. Data sample consists of quarterly time series data over the period 2000 q1 -2019 q1. The paper employed standard tests of cointegration and state space model with time-varying parameters approach to examine the relationship between merchandise exports and its assumed determinants. The results revealed demand function for Croatian merchandise exports highly elastic to changes in income and relative prices. Furthermore, there was sizable increase in demand for merchandise exports from Croatia as a consequence of joining EU. Eventually, the results were discussed in context of balance of payments constraints to growth theory and policy implications were derived.

Keywords: Exports demand, income, relative prices, Kalman filter, Croatia

1.   INTRODUCTION

In 2013 Croatia joined European Union (EU) and now it's on its path towards integration in European Monetary Union (EMU). Empirical literature found merchandise trade between Croatia and other EU member countries as predicted by Heckscher-Ohlin theorem of international trade and Croatia was found as labour abundant country (Bilas and Bošnjak, 2015). Sustainability of international trade flows for Croatia based on theoretical foundation from Husted (1992) has been tested trough different econometric specifications (Bošnjak et al.,2019; Bošnjak, 2019) and results unambiguously pointed weak form of sustainability indicating ineffectiveness of macroeconomic policies in Croatia. Function of import demand for the case of Croatia from Bošnjak et al. (2019a) illustrated convergence of imports prices. Consequently, the function of demand for exports from Croatia is a missing puzzle to make a bigger picture complete. The main aim of this paper is to provide robust estimates of function of demand for exports from Croatia and fill this gap. While bringing the estimates for the Croatian case, the paper follows states space model with time varying parameters and provides more accurate and robust results. The results were further discussed while taking into account relevant empirical findings for the case of Croatia and theoretical assumptions of balance of payments constraint to growth from Thirlwall (1979). The results from this paper might contribute to the ongoing debate in Croatia regarding the potential join of Croatia to EMU.

The rests of this paper is organized as follows: Section 2 briefly summarizes existing literature related to the topic under consideration. Section 3 presents methodology and data description while section 4 research results and discussion. Final section provides highlights of the main findings from the research.

2.   BRIEF LITERATURE OVERVIEW

The function of demand for exports and imports in case of Croatia provided by Mervar (1994) was based on the assumption of imperfect substitutes and illustrated almost the same absolute amount of imports and exports elasticity to change in relative prices. While bringing price and income elasticity of Indian exports Raissi and Tulin (2018) provided extensive literature overview supporting the export demand specification as log-linear function of the real exchange rate and the income variable as the dominant and empirically successful specification due to low requirements for data and its clear interpretation. Lavee et al. (2016) followed panel data approach for the case of Israel and found export elasticity to real exchange rate of less than one. Empirical literature from all over the globe follow different econometric procedure and brings empirical evidence on the level of country (Ibrahim, 2017), Industry (Riyani et al., 2018) or groups of countries (Uysal et al., 2018). Based on dynamic panel data for eleven euro area countries, Bobeica et al. (2016) documented a significant relationship between

fall in domestic demand and increase of exports. Bogdan et al. (2017) examined current account determinants and export performances in regards to exchange rate policies. The first sample included countries with fixed exchange rate regime and countries with hard or soft pegs: Bulgaria, Estonia, Latvia, Lithuania and Croatia. The second sample included the countries with float and intermediate regimes: Poland, Romania, Slovakia, Hungary, the Czech Republic and Slovenia. The countries with float and intermediate regimes were found to outperform countries with fixed exchange rate regime in terms of current account and export during the pre-crisis period. Following constant market share approach Buturac et al. (2019) found export performance of the Croatian manufacturing industry improved after the accession of Croatia to EU. The relationship was found to hold when domestic demand increases but the effects of domestic demand were not symmetric. Gouveia and Santos (2018) studied export dynamics for Greece, Croatia, Bulgaria and Romania over the period 1999–2014. The research results indicated dominant role of foreign demand comparing to the role of depreciation in the real exchange rates. Furthermore, the research results pointed out that price and income elasticities vary depending on estimation procedure.

3.   METHODOLOGY AND DATA DESCRIPTION

The paper follows state space model with time varying parameters (TVP) from Harvey (1991) already implemented for the cases of Croatia to examined sustainability of international trade flows(Bošnjak, 2019) and import demand elasticity (Bošnjak et al, 2019). According to the best knowledge of the authors, a specification of state space model with time varying parameters has not been fitted yet in form of function of demand for exports. The methodology adopted to reveal demand elasticity for merchandise exports from Croatia take the form as provided in equation (1):

$$\ln(X_t) = \alpha_t + \beta_{1,t}\ln(Yeu_t) + \beta_{2,t}\ln(\text{REER}_t) + \beta_{3,t}\text{EU} + \varepsilon_t, \quad \varepsilon_t \sim IIDN(0,\sigma^2) \quad (1)$$

$$\alpha_t = \alpha_{t-1} + v_{0,t}, \ v_{1,t} \sim IIDN(0,\sigma_{v0}^2) \quad (2)$$

$$\beta_{1,t} = \beta_{1,t-1} + v_{1,t}, \ v_{1,t} \sim IIDN(0,\sigma_{v1}^2) \quad (3)$$

$$\beta_{2,t} = \beta_{2,t-1} + v_{2,t}, \ v_{2,t} \sim IIDN(0,\sigma_{v2}^2) \quad (4)$$

$$\beta_{3,t} = \beta_{3,t-1} + v_{3,t}, \ v_{3,t} \sim IIDN(0,\sigma_{v3}^2) \quad (5)$$

Where the measurement equation is given by equation (1) and transition equations are illustrated by equations (2), (3), (4) and (5). Transition equations illustrate that the new state value is modelled as a linear combination of the previous state value and a residual term. The measurement equation presents a relationship between observed variables and unobserved transition variables. Dependent variable $\ln(X_t)$ is observed and presents (natural) logarithmic value of exports (X_t), while explanatory variables present (natural) logarithmic value of GDP of EU countries (Yeu_t) in (natural) logarithmic value of real effective exchange rate (REER_t) in (natural) logarithmic form and dummy variable (EU)

that indicate EU membership of Croatia. The explanatory variables establish the relationship between the observable dependent variable and the unobservable time-varying coefficients. The terms α_t, β_{1t}, β_{2t} and β_{3t} are unobserved time-varying coefficients to be estimated. ε_t and $v_{0,t}$ represent the error term in the measurement and transition equations, respectively. The model in equations (1), (2), (3), (4) and (5) presents a state space form with initial conditions. The estimates of the state space were obtained using the Kalman filter while the estimates of the parameters in the equations were obtained by maximizing the Likelihood-function. Kalman filter is a recursive procedure requiring to set plausible initial values. In this case, the parameters of the model were first estimated by means of OLS and these parameters and fitted values of the state variables obtained from the OLS estimation were specified as initial values. Eventually, following methodology described in this section this paper brings the estimates of demand function for merchandise exports from Croatia. TVP approach is less restrictive and allows the insight into time variation. Therefore, it is expected to illustrate potential changes in of the demand function over the time. However, prior to estimating time varying parameters of demand function for merchandise exports the results of standard unit root tests were provided. Unit root tests considered in this paper include Dickey-Fuller (1979) (ADF test), Phillips–Perron (1988) (PP test), the Generalized Least Squares and Dickey-Fuller test (DF-GLS test) that is developed by Elliot et al. (1996), Kwiatkowski et al. (1992) (KPSS test). Following the unit root test results and co-integrating relationship was tested based on cointegration test from Johansen (1995).

The research data sample consists of quarterly time series data over the period 2000q1 – 2019q1. The data on merchandise exports at constant prices were retrieved from the Croatian Bureau of Statistics. The data on real effective exchange rate against 19 European Monetary Union (EMU) countries and gross domestic product of EU countries at constant prices were retrieved from the Eurostat database. All of the variables under consideration were X-13 ARIMA seasonally adjusted and are transformed to (natural) logarithm allowing the estimated coefficients can be interpreted as elasticity. The observed series are illustrated in Figure A1 in the Appendix and descriptive statistics is provided in Table A1 in the Appendix.

4.   EMPIRICAL RESULTS AND DISCUSSION

Following empirical procedure described in section entitled methodology and data description, unit root tests results were presented in Table 1.

Table 1

Standard unit root tests

Variable and test	Levels		First difference	
	Constant	Constant and trend	Constant	Constant and trend
ADF test	t-stat.			
X	-2.297241	-2.568002	-11.83809	-12.11820
Y	-1.199385	-2.036652	-4.519569	-4.487642
REER	-3.012949	-2.306009	-7.944824	-8.257945
PP test	Adj. t-stat.			
X	-2.668428	-2.646636	-12.22513	-13.27847
Y	-1.242390	-1.865564	-4.619628	-4.585783
REER	-2.964461	-2.348830	-7.977953	-8.254704
DF-GLS	Adj. t-stat.			
X	1.498292	-1.371503	-11.90413	-12.12508
Y	0.005787	-1.998501	-4.143310	-4.418897
REER	-0.339643	-1.203653	-7.990791	-8.264519
KPSS test	LM-stat.			
X	1.156186	0.214515	0.318790	0.101259
Y	0.716875	0.122107	0.097380	0.097380
REER	0.712743	0.259084	0.336910	0.065946

Source: Own estimates

Unit root tests results in Table 1 unambiguously point out that all of the variable under consideration were not stationary at its levels but integrated of order one. Consequently and following Johansen's (1995) cointegration tests existence of cointegrating relationship between variable of interest was tested and results are summarized in Table 2.

Table 2

Johansen's (1995) cointegration tests results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	p-value
None	0.146108	27.26696	29.79707	0.0953
At most 1	0.133335	15.57861	15.49471	0.0486
At most 2	0.065196	4.988984	3.841466	0.0255
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	p-value
None	0.146108	11.68835	21.13162	0.5786
At most 1	0.133335	10.58963	14.26460	0.1760
At most 2	0.065196	4.988984	3.841466	0.0255

Source: Own estimates

Following Johansen's (1995) cointegration tests results in Table 2, there was no cointegrating relationship between variables under consideration. Since

the variables under consideration were integrated of order one but not cointegrated, it was not possible to procced with standard procedure assuming Vector Error Correction Model (VECM). However, state space model with time varying parameters approach does not require stationary variables. Relaxing restriction of parameter constancy since it is reasonable in case of small transition economy that passed different stages of integration toward EU during the time under consideration. Following methodology proposed in section entitled methodology and data description, the estimates for state space model with TVP were obtained and presented in Table 3.

Table 3

Estimation results (state space model with TVP) of demand function for the merchandise exports from Croatia

	Final state	Root MSE	z-statistic	p-value
α (Constant)	-16,41856	7,59439	-2,16193269	0,0306234
$ln(Y)_{EU}$(GDP)	1,412153	0,5203869	2,713659779	0,0066544
$ln(REER)$	1,1814182	0,5995969	1,970354083	0,0487978
EU (EU membership - dummy variable)	0,1303562	0,04889957	2,665794403	0,0076807
Log likelihood: -153.1711	AIC: 324.3422			
Diagnostic tests:				
Ljung- Box Test statistic: 13.891	p-value: 0.3077			
Jarque Bera Test statistic: 6.6142	p-value: 0.03662			
ARCH Test statistic: 16.632	p-value: 0.164			

Source: Own estimates

Results from table 3 show significant constant term, significant effects from change in income of EU significant effects from relative prices as well as the significant effect out of Croatian joining EU. There was a sizable elasticity of demand function for merchandise exports from Croatia regarding the income of EU countries as well as regarding relative prices. Fontagné et al. (2018) pointed out that elasticity of demand for exports to changes in exchange rates was small "typically around one or lower". In case of Croatia the elasticity of demand for exports to changes in exchange rates was higher than one as stated in Table 3. Figure 2 in the Appendix illustrate constant intercept and income elasticity over the time while Figure 3 illustrate slightly increased elasticity of demand for merchandise exports to change in relative prices. Based on results in Table 3, merchandise exports performance from Croatia could be improved with price competitiveness. When possible, exchange rate depreciation is an easiest way to obtain price competitiveness and boost export performance. Bošnjak et al. (2019a) examined import demand elasticity in Croatia and reported inelastic import demand to changes in prices explained as convergence of import prices. Recalling the results from Bošnjak et al. (2019a) and compering to results from Table 3 one can see that merchandise exports from Croatia tends to increase in

line with real depreciation of Croatian currency while imports remained unaffected. Sum of import and export elasticity to changes in real effective exchange rate was higher than unity. Consequently, as a results of real depreciation of Croatian currency merchandise exports can be improved and final effects on current account are expected to be positive. However, Bilas and Bošnjak (2015a) found merchandise exports from Croatia determined by export of raw materials excluding fuel and it is reasonable to believe that Croatia could benefit more out of production in the country comparing to exporting raw materials for production out of the country. Benazic and Kersan-Skabic (2016) provided determinants of exchange rate dynamics, but relatively high level of euroizaion in financial system (Bošnjak, 2018) constraint policy makers in Croatia to depreciate Croatian currency. However, following Bošnjak et al. (2018) an increase of money availability improves current account of Croatia indicating existence of financial constraints to Croatian exporters. Therefore, allowing more access to financial resources for exporters in Croatia might be valuable policy measure. Gouveia and Santos (2018) pointed out non-price factors such as product quality and variety, innovation and quality of institutions as important drivers of exports. Bierut and Kuziemska-Pawlak (2017) pointed out the role non-price competitiveness in export performance of Central and Eastern European countries as well. Mikulić and Lovrinčević (2018) pointed out low level of internationally integration in Croatian economy and therefore, measures towards more of participation in global value chains might be valuable. Following Bošnjak et al. (2019a) income elasticity of import demand in Croatia amounts 1.78 and it is higher comparing to income elasticity of demand for exports in Table 3. Bearing in minds Thirlwall's law (Thirlwall, 1979) income elasticity of demand for imports in Croatia should be decreased and production should be directed towards products that are more attractive at home as well as outside of the country. Conclusively, Croatian economy is a small one and policy makers should put its effort to enable environment suitable for production of high-quality goods.

5.   CONCLUSIONS

There are several conclusions that can be derived out of the research presented in this paper. Firstly, research results from this paper illustrated that Croatian merchandise exports and its determinants are integrated of order one and embody stochastic trend. However, co-integrating relationship was not supported. In this case, state space model with time varying parameters is a well-suited specification to estimate function of demand for exports. Secondly, the demand function for merchandise exports from Croatia is elastic to change in income of EU countries as well as to change in relative prices. Unlike the price elasticity of exports in majority of cases from other countries, the price elasticity of demand for exports from Croatia was higher than unity. Depreciation of Croatian currency could improve export performance and current account of Croatia while holding other variables constant. However, there are some limitations of supporting

merchandise exports from Croatia while boosting price competitiveness. Bearing in minds Croatia is a small and open economy non-price competitiveness arises as more important for well-being in Croatia. To improve non-price competitiveness longer time period might be needed. However, recommendations to policy makers should be to put more effort and improve environment for production of goods with higher quality and decrease and offer more attractive products in country as well as abroad. Consequently, the income elasticity of demand for imports in Croatia should decrease and constraints to growth out of balance of payment for Croatian economy can be relaxed. Identification of specific niche for production is beyond scope of this paper and further research should be directed towards potential specialization in Croatian industry production and its effects.

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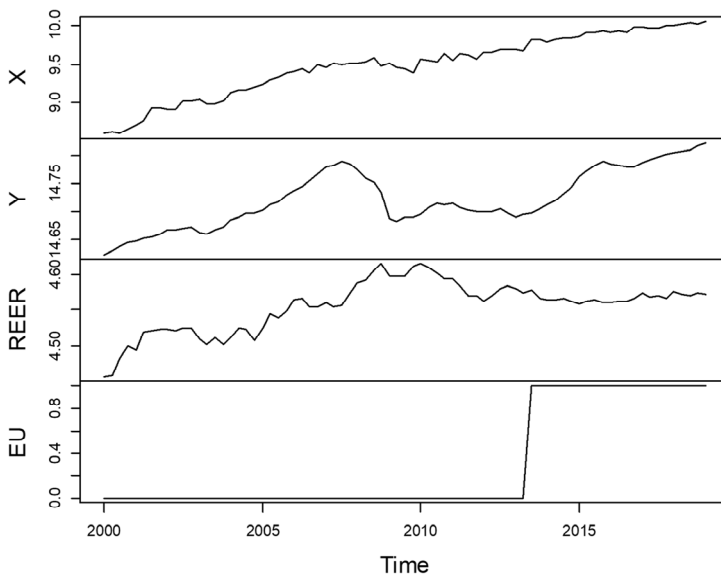
Appendix

EXPORTS_SUPPLY

Figure 1 Development of the variables under consideration

Table A1

Descriptive statistics of the observed variables

	X	Y(EU)	REER
Min.	8.600	14.62	4.458
1st Qu.	9.196	14.69	4.526
Median	9.519	14.71	4.565
Mean	9.482	14.72	4.556
3rd Qu.	9.823	14.77	4.575
Max.	10.050	14.82	4.615
No. Of observations	77	77	77

Source: Own estimates

Smoothed estimates of constant   2000 Q1 / 2019 Q1

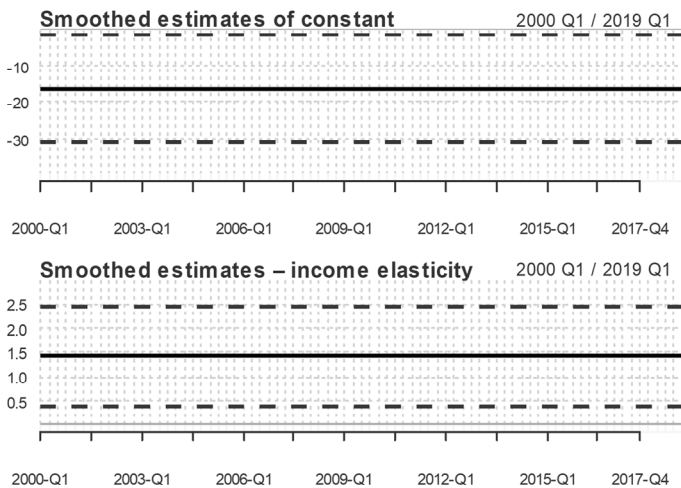**Smoothed estimates – income elasticity**   2000 Q1 / 2019 Q1

Figure 2 Smoothed estimates of constant and income elasticity of exports

Source: Own estimates

Smoothed estimates REER elasticity   2000 Q1 / 2019 Q1

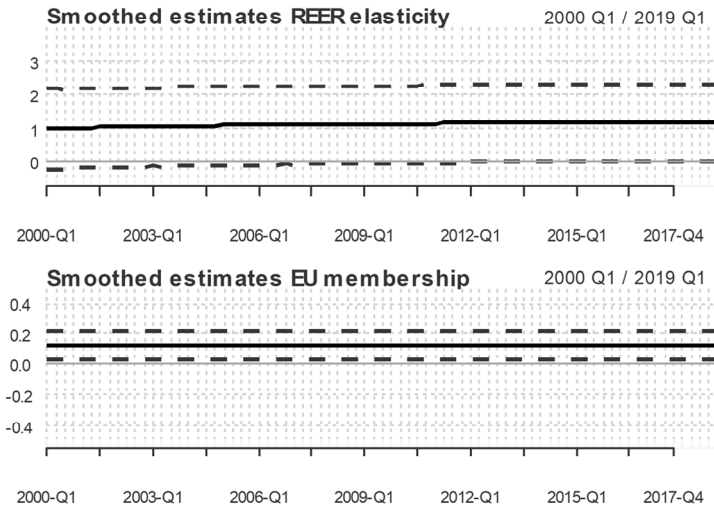**Smoothed estimates EU membership**   2000 Q1 / 2019 Q1

Figure 3 Smoothed estimates of price elasticity and effects of accession to EU

Source: Own estimates

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FUNKCIJA POTRAŽNJE U IZVOZU ROBE: SLUČAJ HRVATSKE

Sažetak

Cilj ovoga rada je ispitati potražnju za izvozom robe iz Hrvatske kao funkciju relativnih cijena i prihoda zemalja članica Europske unije (EU). Uzorak se sastoji od kvartalnih podataka vremenskih serija tijekom razdoblja 2000. 1.kv. - 2019. 1.kv. U radu su korišteni standardni testovi modela kointegracije i državnog prostora s pristupom vremenski promjenjivih parametara kako bi se ispitao odnos između izvoza robe i njegovih pretpostavljenih odrednica. Rezultati su pokazali da je potražnja za hrvatskim izvozom robe vrlo elastična na promjene prihoda i relativnih cijena. Nadalje, došlo je do znatnog porasta potražnje za izvozom robe iz Hrvatske, kao posljedica pridruživanja EU. Dobiveni rezultati raspravljaju se u kontekstu ograničenja platne bilance prema teoriji rasta, kao i implikacije na poslovnu politiku.

***Ključne riječi:** Izvozna potražnja, dohodak, relativne cijene, Kalmanov filtar, Hrvatska.*

***JEL klasifikacija:** C13, C51, F17, F14.*