



USING THE FOREIGN TRADE ELASTICITIES IN POLICY OF DEMAND OF IMPORTS OF AGRICULTURAL PRODUCTS IN IRAQ

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Abstract

Foreign trade elasticities are considered to be crucial for both economic forecasting and international policy analysis. The value of trade elasticities has remained the subject of diverse opinion in most international economic policy debates. Therefore, this paper uses import substitution model framework to estimate the price and income elasticities of imports demand on agricultural products in Iraq for the period 1980 – 2018. We use Autoregressive Distributed Lag model (ARDL) to study the long run relationship between variables of the study. The results of the unit root test based on ADF and PP provide justification for the use of ARDL bound test. The co-integration results show that there is a long run relationship between import demand of agricultural products and the chosen explanatory variables, thus all the variables move together in the long run. The estimated long run coefficients show that the price and income elasticities of import demand of agricultural products in Iraq were about 0.01 and 0.45 respectively during the period covered. This implies that the long run import demand of agricultural products in Iraq has been price-and income-inelastic since the sizes of the coefficients of real GDP and relative agricultural prices were less than unity and among the explanatory variables studied, real GDP was the main determinant of import demand of agricultural products in Iraq. Furthermore, the long run coefficient of domestic prices which is also regarded as the cross price elasticity of import demand of agricultural products with respect to local products was about 0.046 and statistically insignificant, thus there is evidence of imperfect substitution between import agricultural products and domestically products. The results from the short run of the model suggest that about 52% of the disequilibrium between the long run and short run import demand on agricultural products is corrected each year.

Key words: Foreign trade elasticities, co-integration, ARDL, Import demand.

Introduction

Foreign trade is one of the most important components of aggregate economic activities and also one of the major driving forces of economic growth in every economy. It is also known that foreign trade provides impetus by making inputs available for domestic production particularly in developing economies. While foreign trade enlarges market frontiers for domestic output and brings about foreign exchange to the country through exports, it also expands the production possibility frontiers and increases the utility of consumers by broadening the consumption basket through imports, thus improving their welfare (Chimobi and Ogonna. 2008).

However, the extent to which a country benefits from foreign trade is a function of a number of factors, most prominent of which is the trade policy regime

prevalent in the economy which could be protective or liberalized (Babatunde and Egwaikhide.2010). It is instructive to point out here that Iraq as a country has experimented with a mix of the two trade policy regimes. Over the past decades, most developing countries, Iraq one of them, have been faced with severe problems of external imbalance stemming from a persistently growing current account deficit. This deficit is widely believed to be linked with the huge deficits in merchandise trade in agricultural sector, and Iraq particularly faced severe economic embargo. Despite the fact that a good number of studies have attempted the estimates of income and price elasticities of agricultural imports and other related issues across countries of the world, there appears to be dearth of empirical studies in this area based on Iraqi agricultural data (Abu-Lila. 2014).

This study, therefore intends to make a modest contribution to the literatures by using the most recent

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method of ARDL in obtaining the estimates of the income and price elasticities of agricultural imports using Iraqi data. Other variables other than income and price will be adequately incorporated and analyzed. Most interesting of these variables is the Dinar/dollar exchange rate given its much discussed influence in agricultural trade.

Material and Methods

Theoretical Framework

The basic model consists of 8 equations for quantities and prices of tradable goods between the state and global market.

$$IM = f(Y, PI, PD) \quad (1)$$

Where:

IM = agricultural imports.

Y = gross domestic product (GDP).

PI & DI = relative prices of agricultural imports to local agricultural products prices.

According to equation 1 we put the following model (11):

$$IMP = \beta_0 + \beta_1 GDP + \beta_2 RLP + \beta_3 OPN + \beta_4 EXR + \beta_5 CPI + u \quad (2)$$

Where:

IMP = agricultural imports

GDP = gross domestic product

RLP = relative agricultural prices.

OPN = degree of economic openness (agricultural exports + agricultural imports)/gross domestic product.

EXR = exchange rate .

CPI = consumer price index (domestic prices).

u = error term.

$\beta_1 - \beta_5$ = estimated coefficients.

By adopting specification of double logarithmic model, the model will become:

$$\ln IMP = \beta_0 + \beta_1 \ln GDP + \beta_2 \ln RLP + \beta_3 \ln OPN + \beta_4 \ln EXR + \beta_5 \ln CPI + u \quad (3)$$

Even the model is double logarithmic model (equation 3) this implies all the estimated coefficients ($\beta_1 - \beta_5$) will represent elasticities.

A priori specification of them should be:

$\beta_1 > 0, \beta_2 < 0, \beta_3 > 0, \beta_4 < 0, \beta_5 > 0$.

Estimation Technique

The data used are annualized secondary time series obtained from the (COS) Central Organization Statistics over the period 1980-2018.

Co-integration test is carried out using the Autoregressive Distributed Lag (ARDL) approach. This procedure is adopted because it has better small sample properties than alternative methods. Another advantage of ARDL is that unrestricted ECM seems to take satisfactory lags that captures the data generating process in a general-to-specific framework of specification (4). Unlike other co-integration techniques, the ARDL model provides an alternative test for examining a long-run relationship regardless of whether the underlying variables are purely I(0) or I(1), even fractionally integrated (Kirchgassner and Wolters. 2007). Moreover, traditional co-integration method may also suffer from the problems of endogeneity while the ARDL method can distinguish between dependent and explanatory variables (Pesaran, Shin, and. Smith. 2001). Thus, estimates obtained from the ARDL method of co-integration analysis are unbiased and efficient, since they avoid the problems that may arise in the presence of serial correlation. appropriate modification of the orders of ARDL model is sufficient to simultaneously correct for residual serial correlation and problem of endogenous variables (Serge and Yue. 2010).

The ARDL procedure consists of estimating an unrestricted error correction model with the following generic form:

$$\Delta LIMP_t = \alpha + \sum \beta_i \Delta LIMP_{t-i} + \sum \delta_j \Delta LR GDP_{t-j} + \sum \lambda_k \Delta LRLP_{t-k} + \sum \phi_l \Delta LOPB_{t-l} + \sum \gamma_m \Delta LEXR_{t-m} + \sum \theta_n \Delta LCPI_{t-n} + \eta_1 LIMP_{t-1} + \eta_2 LR GDP_{t-1} + \eta_3 LRLP_{t-1} + \eta_4 LOPN_{t-1} + \eta_5 LEXR_{t-1} + \eta_6 LCPI_{t-1} + \mu t \quad (4)$$

Results and Discussion

Unit Root Testing

To determine the order of integration of the chosen variables, the Augmented Dickey-Fuller (ADF) and Philip-Perron (PP) unit root tests. The tests were performed assuming intercept and no trend in both ADF and PP unit root specifications. The results are reported in table 1.

Table 1: Results of unit root test of ADF & PP.

| Order of integration | PP | Order of integration | ADF | Variable |
|----------------------|-----------|----------------------|-----------|----------|
| I(1) | -6.2212** | I(1) | -6.0130** | LIMP |
| I(1) | -5.8181** | I(1) | -5.0010** | LRGDP |
| I(1) | -5.9100** | I(1) | -7.2733** | LRLP |
| I(1) | -5.0700** | I(1) | -4.4434** | LOPN |
| I(1) | -6.1215** | I(1) | -7.4055** | LEXR |
| I(0) | -9.3212** | I(0) | -2.9999* | LCPI |

**(*) implies significant at 1%, (5%) level. Source: Authors' Computation by using e-views 10.

Table 2: ARDL Bound Testing Results (with Intercept and Trend)

| 1% Critical Value | | 5% Critical Value | | F-Statistic |
|-------------------|------------------|-------------------|------------------|-------------|
| Lower bound I(0) | Upper bound I(1) | Upper bound I(1) | Lower bound I(0) | |
| 3.29 | 4.87 | 3.57 | 2.11 | 21.3114** |

** implies significant at both 1% and 5%.

Source: Authors' Computation by using e-views 10.

Table 3: Johansen Co-integration.

| Critical Value 5% | Max-Eigen | Critical Value 5% | Trace test | H1 | Ho |
|-------------------|-----------|-------------------|------------|---------|------------|
| 32.70177 | 88.22141* | 88.61231 | 301.5050* | $r > 0$ | $r = 0$ |
| 23.55213 | 61.23198* | 70.63101 | 161.2000* | $r > 1$ | $r \leq 1$ |
| 22.31231 | 45.73509* | 43.35412 | 117.8511* | $r > 2$ | $r \leq 2$ |
| 20.50237 | 27.12001* | 22.70551 | 42.22202* | $r > 3$ | $r \leq 3$ |
| 11.25017 | 10.29877 | 13.59210 | 9.80311 | $r > 4$ | $r \leq 4$ |
| 1.771446 | 1.320205 | 2.311002 | 0.55392 | $r > 5$ | $r \leq 5$ |

* implies rejection of the null hypothesis (Ho) at 5% significant. Both the trace test and Max-Eigen test indicate 4 co-integrating equations. Source: Authors' Computation by using e-views 10.

The results in table 1 show that within the framework of both ADF and PP unit root testing, all variables are I(1) except LCPI which is I(0).

This implies that the use of ARDL for co-integration is justified.

Co-integration Test

The lag selection test was carried out according to AIC and SIC. Although it is known that SIC is preferred to AIC when dealing with small sample, but the diversity between AIC and SIC is settled with the Final Prediction Error (FPE) which is at lag 4. The ARDL results reported in table 2.

The ARDL bound test results indicate evidence of co-integration among the variables of interest. This is confirmed by value of the F-statistic for the joint significance of the lagged level variables in equation 4 which is greater than the upper bound critical values at both 1% and 5% levels of significance (Tennakeen, 2010). Therefore, following the ARDL bound testing approach to co-integration, we conclude that a long run relationship exist between LIMP and the chosen explanatory variables. Furthermore, table 3 presents the Johansen co-integration tests as a compliment to the ARDL bound test (Uz, 2010). The null hypothesis underlying this test is that $r = 0$, against the general alternatives that $r > 0, 1, 2, 3, 4$, and 5. The null hypothesis of no co-integration among the variables of interest is rejected at 5% level of significance since the values of both trace statistic and Max-Eigen statistic do not lead to the rejection of the null hypothesis of $r \leq 4$. Thus, there

is evidence of a long run relationship among the chosen variables.

Estimated Long run Coefficients

We present in table 4 the estimates of equation 3 including the estimated first-order autoregressive coefficient of the error term using OLS. Although all the variables conform to a priori expectation, only the variables LGDP and LOPN are statistically significant at 1%, others such as LRLP, LEXR, and LCPI are statistically insignificant at a (10%) level of significance. The estimated long run coefficients show that a (1%) increase in gross domestic product (LGDP) will bring a rise in agricultural imports by about (0.45) in the long run while a (1%) increase in relative agricultural prices (LRLP) will lead to about (0.01) decline in agricultural imports in the long run. These results imply that the Iraqi agricultural import demand is price and income-inelastic and elasticities of imports are (0.01) and (0.45) respectively which are less than unity. Also, a unit increase in the degree of openness (LOPN) will lead to about (0.19) unit rise in agricultural imports and a unit increase in Iraqi dinar/dollar exchange rate (LEXR) will bring about (0.00012) decreases in agricultural imports. Furthermore, a (1%) increase in the price of domestically agricultural products (LCPI) will lead to (0.0041) increase in agricultural imports. This implies that the domestically agricultural products are not perfect substitutes for foreign agricultural products since the coefficient of LCPI which is the cross elasticity of import demand on agricultural products with respect to domestic agricultural products is far less than unit. In passing, it should be noted that among the variables studied, income which is proxied by gross domestic product (LGDP) is the main determinant of import demand of agricultural products in Iraq during the periods covered by the study. The coefficient of determination is about (0.91) which implies that about (91) of total variations in agricultural

Table 4: Estimated Long run Coefficients Results.

| Probability | t-Statistic | Std. Error | Coefficient | Variable |
|-------------|-------------|------------|-------------|----------|
| 0.0000 | 4.887011 | 3.01555 | 12.65107** | C |
| 0.0010 | 2.118879 | 0.102023 | 0.454759** | LGDP |
| 0.7556 | -0.190070 | 0.93721 | -0.010400 | LRLP |
| 0.0067 | 2.621320 | 0.115523 | 0.195500** | LOPN |
| 0.9634 | -0.004179 | 0.028177 | -0.000120 | LEXR |
| 0.3997 | 0.660340 | 0.007787 | 0.004130 | LCPI |
| 0.0000 | 9.72541 | 0.03999 | 0.855289 | AR(1) |

$R^2 = 0.917$, $R^2 \text{ Adjusted} = 0.899$, $F = 139.3120$, *prob. (F-statistic) = 0.000000*, $D-W = 1.503321$. Breusch-Godfrey Serial Correlation Test: $F\text{-statistic} = 1.031161$, *prob. F (2,25) = 0.2717*. ** implies significant at 1% level, *5% level. Source: Authors' Computation by using e-views 10.

import demand were accounted for by variations in the explanatory variables. The F-statistic value (139.3120) shows that the overall model is statistically significant at (1%) since the p-value is less than (%1). This implies that though not all the explanatory variables are individually statistically significant, they jointly explain variations in the dependent variable (LIMP). Furthermore, the value of D-W and that of Breusch-Godfrey Serial Correlation LM Test show that our model is not plagued by autocorrelation of any order (10).

Estimated Short run Dynamics

Table 5 present the short run results of the Iraq's agricultural import demand function as a parsimonious ECM version of ARDL model. The model was arrived at from an over-parameterized model through general to specific method(11). Specifically from the ECM expressed in equation 5, the coefficients $\hat{\alpha}_i$, $\hat{\alpha}_j$, $\hat{\alpha}_k$, $\hat{\alpha}_{l\hat{m}}$, and $\hat{\alpha}_n$ capture any immediate short term or contemporaneous effect that the explanatory variables have on LIMP. The coefficient $\hat{\alpha}_i$ in equation 3 reflects the long run equilibrium effect of LGDP, LRLP, LOPN, LEXR, and LCPI on LIMP while the absolute value of $\hat{\alpha}$ explains how quickly the equilibrium is restored in the event of shock. Table 5 provides us the proportion of disequilibrium error that is accumulated in the previous period, which is corrected in the current period. The p-

Table 5: Error Correction Model.

| Prob. | t-Statistic | Std. Error | Coefficient | Variable |
|--------|-------------|------------|-------------|--------------|
| 0.0000 | 5.260422 | 0.013019 | 0.505409 | C |
| 0.0000 | 6.007661 | 0.121621 | 1.669082 | D(LIMP(-1)) |
| 0.0000 | 6.998074 | 0.195323 | 1.004023 | D(LIMP(-2)) |
| 0.2007 | 0.904021- | 0.039957 | -0.100030 | D(LRLP(-1)) |
| 0.0009 | 5.763560- | 0.045111 | -0.567820 | D(LRLP(-2)) |
| 0.0000 | 6.560108 | 0.192055 | 1.341100 | D(LRGDP(-1)) |
| 0.0000 | 7.664188 | 0.128540 | 1.199878 | D(LRGDP(-2)) |
| 0.0000 | 7.882019 | 0.175830 | 1.009811 | D(LRGDP(-3)) |
| 0.0000 | 6.568110 | 0.111603 | 1.211009 | D(LOPN(-1)) |
| 0.0000 | 4.678060 | 0.109847 | 1.101751 | D(LOPN(-2)) |
| 0.0022 | 2.708240- | 0.037781 | 0.019562- | D(LEXR(-1)) |
| 0.0017 | 2.712367- | 0.010327 | 0.203022- | D(LEXR(-2)) |
| 0.0050 | 2.777999 | 0.008889 | 0.013579 | D(LCP(-1)) |
| 0.0049 | 2.890505 | 0.018680 | 0.001157 | D(LCP(-2)) |
| 0.0000 | 3.991867 | 0.182771 | 0.520019- | ECM(-1) |

$R^2 = 0.900812$, Mean dependent var. = 0.083100, Adjusted $R^2 = 0.861943$, S.D. dependent var.=0.478691, S.E. =0.108270, Akaike info. criterion = -1.001043, Sum squared resid. = 0.203240, Schwarz criterion = -0.294687, Log likelihood = 53.112622, Hannan-Quinn criter. = -1.676421, F-statistic = 9.113426, Durbin-Watson test = 2.123499, Prob (F-statistic) = 0.000092. Breusch-Godfrey Serial Correlation LM Test: F-statistic = 5.911620, prob. F (2, 10)= 0.0821. Obs*R² = 14.66870, Prob. Chi-square (2)= 0.0955. Source: Authors' Computation by using e-views 10.

value of the error correction term coefficient in table 5 shows that it is statistically significant at (%1) level with the expected negative sign, thus suggesting that imports (LIMP) adjust to the explanatory variables. The coefficient of ECM(-1) is (-0.520013) in the short run model, implying that the deviation from the long term equilibrium is corrected by about (%52) each year. Furthermore, a stability test was conducted using cumulative sum and the cumulative sum of squares. The results show that the model is dynamically stable since the fitted CUSUM and CUSUMQ happen. Also, the Breusch-Godfrey Serial Correlation LM Test shows the absence of autocorrelation in the model(Vojnovic and Unevaska. 2007).

Conclusion

1. This paper estimated the foreign trade elasticities (price and income and cross section) of agricultural imports in Iraq for the period 1980 – 2018, via using Autoregressive Distributed Lag model (ARDL) proposed which was complimented with Johansen co-integration to study the long run relationship between variables of interest.
2. The results of the unit root test based on ADF and PP indicate that the variables under study follow I(1) process except the domestic prices of agricultural products (LCPI) which is I(0). This shows that the variables under study were either I(1) or I(0), implying that the use of ARDL is justified for co-integration analysis.
3. The co-integration results show that there is a long run relationship between import demand on agricultural products (LIMP) and the chosen explanatory variables which imply that all the variables move together in the long run.
4. The long run coefficient of agricultural domestic prices which is regarded as the cross-price elasticity of agricultural import demand with respect to domestic products was about (0.0041), thus there is evidence of imperfect substitution between foreign agricultural products and agricultural domestic products, and that explain from consuming of some consumer of domestic products and prefer them rather than foreign products even there low price especially in some vegetable crops, citrus, dates and red meet, then we estimated the short run dynamics of the model and the results suggest that about (52%) of disequilibrium between the long term and short term of agricultural import demand is corrected each year.
5. We conclude that the use of currency devaluation (via using floating exchange rate) as an import

substitution tool (to reduce imports and increase exports) is not validated and also, the use of higher taxes and interest rates as a tool of expenditures witching policies should be expected to have limited impact on Iraq's agricultural trade balance.

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