IS THE J-CURVE EFFECT OBSERVABLE IN TURKISH AGRICULTURAL SECTOR?

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ABSTRACT

This paper investigates whether or not the J-curve hypothesis holds in Turkish agricultural sector. The analysis is conducted using the model the most commonly employed in j-curve literature. Based on the data covering the period from 1986: I to 1998: III, our results indicate that, following devaluation, agricultural trade balance initially improves, then worsens, and then improves again. This pattern shows that J-curve effect does not exist in Turkish agricultural sector. Another important finding is that devaluation worsens the trade balance of the sector in the long run, a result contradicting with the earlier findings for the Turkish economy as a whole.

KEYWORDS: j-curve, trade balance, exchange rate, agricultural sector

INTRODUCTION

The pattern of the response of the trade balance to devaluation has been hypothesized to take J-shape. The J-curve hypothesis predicts that the trade balance, as a result of devaluation, will first worsen and then after the passage of sometime it will start to improve. This pattern is mainly caused by the lagged response to the devaluation of the real flows. At the time of devaluation, the quantities of exports and imports have been usually predetermined by the previously made contracts in force. Volumes, therefore, respond to exchange rate changes only when new contracts are made, whose effects are realized sometime after the devaluation.

The J-curve hypothesis has been empirically investigated in several studies using different models and different econometric techniques. Most of these studies are at aggregate level and their findings are decidedly mixed. Noland [15], Lal & Lowinger [12], and Hacker and Abdulnasser [10] can be cited as examples of those studies that have found J-curve effect. Rose and Yellen [17], Bahmani-Oskooee [3], and Bahmani-Oskooee & Ratha [6] include studies that haven't found evidence supporting the J-curve hypothesis. A more detailed review of the relevant studies can be found in Bahmani-Oskooee & Ratha [5].

There are also some, but few, studies investigating the J-curve effect in the agricultural sector. Among them is Carter & Pick [8] who studies the J-curve effect in the US agricultural sector by assuming a 10% depreciation of the dollar and finds that the first segment of the J-curve (deterioration part) exists for the US agricultural trade balance. Another such study is by Doroodian et al. [9] who examines the J-curve hypothesis for both US agricultural and manufacturing sectors and finds J-curve effect in agricultural sector but not in manufacturing.

Regarding the J-curve effect in the Turkish data, there are only a few studies and all of them are at the aggregate level, not on the sectoral basis. In their country-based studies, Bahmani-Oskooee & Malixi [4] does not find evidence of J-curve effect for Turkey and Rose [16] finds that the real exchange rate has no effect on Turkish trade balance. Another such study is by Brada et al. [7] who examines the responsiveness of the trade balance of Turkey in two sub-periods and finds that only in the sub-period during which trade liberalizing-economic reforms took place the trade balance was responsive to exchange rate changes. Akbostanci [1] investigates the existence of the J-curve in the Turkish data and does not find short-run worsening in the trade balance but finds long-run improvement.

In this paper we investigate the J-curve effect in Turkish agricultural sector by examining how agricultural sector responds to changes in exchange rate. This will provide us with a better understanding of impact of exchange rate changes on agricultural trade balance and thus policies aimed at this sector can be more properly designed. The analysis is conducted using the model employed by Bahmani-Oskooee [2] for the period from 1986-I to 1998-III.

The rest of the paper is organized as follows; the following section describes the model and data, the next section presents the empirical results obtained, and the last section contains the conclusion.

MATERIALS AND METHODS

In this paper we use the model employed by Bahmani-Oskooee [2]. He obtains his trade balance model by extending Krueger's [11] multiplier-based model by imposing a lag structure on the exchange rate and including world income, world money and domestic money as the additional determinants of the trade balance. Upon these extensions, he specifies the trade balance as follows;

$$TB_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 YW_t + \alpha_3 M_t + \alpha_4 MW_t + \sum_{i=0}^{n} \beta_i (E/P)_{t-i} + u_t \qquad (1)$$

where TB is the trade balance defined as the excess of real exports over real imports, Y is the real domestic income, YW is the real world income, M is the real domestic high-powered money, MW is the real world high-powered money, E is the nominal exchange rate defined as number of units of domestic currency per dollar, P is the domestic price level and u is the disturbance term. Since the exchange rate has lagged values, to avoid multicollinearity problem, Almon lag structure is imposed where it is assumed that distributed lag coefficients lie on a polynomial curve of a certain degree without any constraints.

With respect to the signs of the coefficients in equation (1), the coefficient of the domestic income is expected to be negative because a rise in domestic income will lead to an increase in imports, thus causing deterioration in trade balance. Magee [13], however, has argued that domestic income could lead to an improvement in trade balance if domestic production of importables rises faster than consumption, which will shrink the volume of imports. As for the domestic money, it is expected to have a negative sign because an increase in money will be perceived as an increase in net wealth, thus spending, which includes imports, will increase, leading to a worsening in trade balance. Miles [14], however, has argued that this negative effect may not hold due to three reasons: a) money may occupy a small fraction in total wealth b) money may not be perceived as net wealth c) increases in wealth may

not generate significant increases in expenditure. World income and world money coefficients are expected to have signs opposite of their domestic counterparts.

All the data are quarterly covering the period from 1986: I to 1998: III. The values of all variables are indexed based on quarterly average of 1995. Data for export and import values are obtained from State Institute of Statistics. Data for the remaining variables except for the real domestic income are compiled from International Financial Statistics (IFS) of IMF (CD-ROM). Data on GDP for Turkey is obtained from Turkish Central Bank. For 1986, however, data was available only at yearly basis. We have converted the yearly value into quarterly values using quarterly industrial production index as weights. The source for this index is also Turkish Central Bank. In constructing the world income and world money variables, those countries whose share in the total trade of Turkey exceeds 1% are included. We have come up with 26 such countries. However, because of unavailability of data on some variables for some of these countries, the number of countries included in the study has gone down to 14. Real world income is measured as the sum of weighted average of indexed real GDPs of these countries, weights being the share of each country in the total trade of Turkey. The share of each country in Turkey's total trade out of these fourteen countries in order of importance is Germany: 0.238, Italy: 0.128, UK: 0.118, US: 0.111, France: 0.109, Spain: 0.067, Netherlands: 0.048, Switzerland: 0.037, Belgium: 0.035, Israel: 0.025, Japan: 0.025, South Korea: 0.023, Sweden: 0.018, Austria: 0.018. Real world money is also constructed similarly as the sum of weighted average of indexed real high-powered moneys. We take the real GDP of Turkey as the domestic real income. As for the real domestic money, real high-powered money of Turkey is used. Real exchange rate (E/P) is computed from nominal exchange rate between Turkish lira and US dollar and CPI of Turkey.

RESULTS

In order to be able to estimate equation (1), we first need to determine the lag length for the exchange rate. For this purpose we have used sequential F-test. Based on this criterion, the appropriate lag length has been found to be of 9 quarters. Since Almon lag structure is imposed on the exchange rate, next thing we need to do is to determine the degree of the polynomial. Again based on the sequential F-test, the results indicate that the appropriate degree of polynomial is 2. After determining appropriate lag length and the degree of polynomial, we have estimated equation (1). During the estimation we have encountered serial correlation problem. To eliminate it, we have considered the model as AR(1) process. Estimation results are shown in Table 1.

Table 1. Estimation Results of Trade Balance of Turkish Agricultural Sector

Exchange rate, current	5.04 (1.98)
Lag 1	1.59 (1.04)
Lag 2	-1.02 (-0.97)
Lag 3	-2.8 (-2.58)
Lag 4	-3.73 (-3.05)
Lag 5	-3.84 (-3.10)
Lag 6	-3.11 (-2.81)
Lag 7	-1.55 (-1.54)
Lag 8	0.85 (0.63)
Lag 9	4.09 (1.81)
Sum of Lags	-4.47
Intercept	6597 (2.30)
Domestic income, Y	-4.5 (-0.41)
World Income, YW	-75.1 (-2.08)
Domestic Money, M	-4.79 (-1.02)
World Money, MW	25.7 (2.04)
Diagnostic Tests	
Adjusted R-squared	0.75
D.W. Statistic	1.90
ARCH test	[0.71]
Normality (Jarque-Bera)	[0.47]
Serial Correlation	[0.86]

Note: Values in parenthesis and square brackets are t-ratios and probabilities, respectively.

As is well established in the literature, initially negative signs followed by positive ones on the coefficients of the exchange rate will indicate the existence of the J-curve. The results in Table 1 show that coefficients of exchange rate are initially positive, then negative, and then positive again, which implies that trade balance first improves, then worsens, and then improves again. This behavior indicates that J-curve effect does not exist in Turkish agricultural sector. As explained in the literature review part, Carter & Pick [8] and Doroodian et al. [9] have found the existence of J-curve effect in US agriculture. This means that Turkish agricultural sector responds to exchange rate changes differently from US agriculture.

Note also that the sum of coefficients of the exchange rate variable is negative, which means that devaluation worsens the trade balance of Turkish agricultural sector in

the long run. This is a reflection of the fact that Marshall-Lerner condition, the sum of the elasticities of export demand and import demand being greater than one in absolute value, does not hold in this sector. Such a result contradicts with the findings for Turkish economy as a whole by Brada et al. [7] and Akbostanci [1].

Regarding the coefficients of the variables other than the exchange rate in the model, money both at domestic and world level as well as domestic income have the expected signs but world income has a sign opposite of our expectations. As for the significance of these coefficients, both world income and world money are significant at 5% level but neither domestic income nor domestic money is significant.

Diagnostic test results are also given in Table 1. These results show that the estimation of equation (1) passes the usual assumptions of normality, no heteroscadaticity, and no serial correlation.

DISCUSSION

The response over time of the trade balance to the exchange rate devaluation has been hypothesized to take J-shape. According to the J-curve hypothesis, as a result of devaluation, the trade balance will first worsen and then after the passage of sometime it will start to improve. In this paper we have tested this hypothesis in Turkish agricultural sector. Our empirical results indicate that agricultural trade balance initially improves, then worsens, and then improves again. This pattern implies that J-curve does not exist in Turkish agricultural sector. Another important finding in our study is that devaluation worsens the trade balance of the sector in the long run. This result contradicts with the earlier findings for the Turkish economy as a whole.

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