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The Central Bank of the Republic of Azerbaijan

November 2011

J-Curve Dynamics and the Marshall-Lerner Condition: Evidence from Azerbaijan

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ABSTRACT

Is there a J-curve for Azerbaijan? In answering this question, we are estimating a bilateral trade model for Azerbaijan vis-à-vis its major trading partner – Europe. The Johansen approach to cointegration and error correction modeling is employed. We analyze the total bilateral trade turnover and specifically the trade in the non-oil sector. Our results prove that a real depreciation of the Azerbaijani Manat will cause a temporary decline in the balance of trade in the short-run, but an improvement in the long-run. The outcome holds both for the total and for the non-oil trade models. Robustness tests with export and imports prices show that the volume effect is the underlying driver for the trade balance improvement in the case of total trade but not for the non-oil sector, in which the price effect seems to be dictating the short-run dynamics. Overall, results of this study suggest a fulfillment of the Marshall-Lerner condition criteria both for the total and for the non-oil sectors, indicate the existence of the J-curve patterns in both scenarios, and the presence of a dominating volume effect in the case of total trade.

Keywords: Marshall-Lerner condition; J-curve; Johansen Cointegration; Error Correction Modeling

JEL Classification: F31, F40

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The opinions expressed in this paper do not necessarily reflect the viewpoint of the Central Bank of Azerbaijan and belong solely to the author.

1. Introduction

Standard economic theory suggests that a real devaluation of the domestic currency can potentially improve the trade balance. A change in the exchange rates has two effects on the flow of trade – price effect and volume effect. The price effect implies that currency depreciation will cause imports to be more expensive and exports to appear cheaper in the short-run. The balance of trade may deteriorate in the short run due to the time required for the exports and imports to adjust their production volumes in response to the new exchange rate. There are at least five different reasons why the volume effect needs time to engage: recognition lag, decision lag, delivery lag, replacement lag, and production lag (Junz, Rhomberg 1973). Krueger (1983) has claimed that there are certain goods which have already been purchased or ordered at the time of the devaluation, and the short run is dominated by the completion of old contractual obligations.

Eventually, as the scale of trade begins to respond to the depreciation, it is believed that the volume or the so-called "quantity effect" of currency devaluation will reverse the trade balance movement and eventually improve it. Dornbusch and Krugman (1976) argued that there would be a perverse negative response of the trade balance to currency depreciation, followed by a larger export elasticity that would improve the balance in the long run. The phenomenon of the domination of the volume effect over the price effect in the long run is the Marshall-Lerner condition. If plotted over time, the trade response graph yields a J-resembling line, thus the J-curve terminology. The "J-curve phenomenon" first appeared in Magee (1973).

Conventionally, the J-curve has been estimated using ordinary time-series econometrics. In particular, the Johansen approach to cointegration and the error correction modeling (ECM) have been widely used. Gupta-Kapoor and Ramakrishnan (1999) estimated the J-curve for Japan employing the Johansen-Juselius method. Bahmani-Oskooee an Alse (1994) studied the relationship between the trade balances and the real effective exchange rate (REER) for many countries using the error correction methodology. Halicioulu (2008) examined the Turkish J-curve with the Pesaran's autoregressive-distributed lag model (ARDL). The Engel-Granger approach has also been used by various researchers. The majority of studies have employed aggregated data. Beginning with Rose and Yellen (1989), however, there has been a rise in disaggregated, or bilateral, estimation. Some of the more recent J-curve studies include Aurora et al. (2003), Onafowora (2003), Hacker and Hatemi (2004), Narayan (2004), Moura and Da Silva (2005), Bahmani-Oskooee *et al*. (2006), Narayan (2006). For a thorough literature review, consult Bahmani-Oskooee and Ratha (2004) who provide a very extensive analysis on the J-curve literature from 37 articles for the 1973-2003 period.

The main motivation for undertaking this research study is that no empirical work on the Azerbaijani J-curve has been done before. The case of Azerbaijan is particularly interesting because the country experienced a sudden and unprecedented export-driven economic and credit boom in the mid-late 2000s when the nation was expanding at record-breaking double-digit rates. Between 2006 and 2009, the real Gross Domestic Product of Azerbaijan almost tripled (Figure 1). The growth was largely driven by the exportation of oil and related mineral products, the money from which started to flow after 2004 when the Baku-Tbilisi-Ceyhan oil pipeline began to operate in full capacity.

While the national current account has benefited greatly from the explosion in total exports, the country's non-oil segment has performed quite poorly. It's widely believed that Azerbaijan is suffering from the so-called "Resource Curse" or the well-known Dutch decease common to almost every resource exporting nation. Non-oil exports, although showing some signs of exuberance in the late 2009, have been growing at dismal rates for the past half-decade. In the meantime, the volume of imported goods to Azerbaijan has been quite steady (Figure 2). The oil component in Azerbaijan's total volume of imports is very small, which leads to total imports being basically equal to non-oil imports. This creates a situation where the non-oil trade balance (non-oil exports minus non-oil imports) in the country has been steadily deteriorating, creating a non-healthy economic environment of long-run non-sustainability (Figure 3).

It's interesting to note that the trade balance has been worsening even despite the fact that the real bilateral exchange rate between Azerbaijan and the Eurozone has been rising (depreciating) slightly (Figure 4). Azerbaijan's main export units are, of course, oil and gas. Because the domestic non-oil sector is vastly ineffective and not competitive, the country is forced to import essentially everything but oil and gas. Azerbaijan does, however, import some minor amounts in mineral-related goods, but the non-oil element in imports is marginally small. Among the non-oil imported goods are some essential units which are demanded by the local population. Regardless of the behavior of the exchange rate, some necessary goods simply must be imported, probably due to a very price inelastic demand with respect to certain industries. For this very reason it is possible for the bilateral exchange rate vis-à-vis the Eurozone to be depreciating, while the trade balance has been worsening.

In effect, this paper is attempting to hit two rabbits with one shot. First, we want to examine if the J-curve estimation can shed light on the decade old question of industrial diversification in Azerbaijan. Should a currency devaluation robustly energize non-oil exportation, then monetary policy makers would have a real case on their table for considering letting the Manat lose temporarily some of its value. In an attempt to provide a short-run boost to non-oil production and thus exportation, the negatives that are typically associated with depreciation in a developing country would be overweighed by the prospects of long-run industrial diversification and build-up of a technologically intensive comparative advantage in the non-oil sector.

On the other hand, if we manage to prove that the Marshall-Lerner condition systematically holds for Azerbaijan, then currency devaluation would have a significant positive effect on the trade balance in the long-run. In other words, depreciation of the Manat could contribute to the solution of the non-oil trade imbalance depicted in Figure 3. All in all, this paper should carry policy-relevant significance as it endeavors to provide real, scientific groundwork on which national policy-makers can construct their strategies with regards to current account management, industrial diversification, and exchange rate determination.

To achieve our dual goal, we believe that using the VAR and VECM methodology is the most suitable path for us, since a short-run analysis is required to trace the evolution of growth in the non-oil sector, and a long-run equation is needed to establish the fulfillment (or rejection) of the ML condition. We will also perform robustness checks by including export and import prices into our model, as described in more detail in the following sections.

The focus of this paper is to study the trade dynamics between Azerbaijan and the Eurozone (Euro-17), Azerbaijan's major trading partner. The Eurozone accounts to more than 50% of Azerbaijan's overall trade turnover. We are using monthly data, obtained from various reliable sources such as the Central Bank of Azerbaijan, Eurostat, and the International Trade Center. Our data set is for the 2006:01-2009:12 time interval, structured in a monthly format. The variables that will be used in various stages of our analysis are the following: trade balance with respect to Euro-17 (X/IM), real bilateral exchange rate vis-à-vis the Eurozone (RFX), domestic aggregate demand (Y_{az}), foreign aggregate demand (Y_{eur}), ratio of export and import prices (P_x/P_{im}).

The models examined in this paper are about functions of demand, domestic and foreign. Based on the approaches from literature, economic reason, and availability of data, real Gross Domestic Product (Y_{az}) has been taken as a proxy for domestic – Azerbaijani – demand. Foreign demand is approximated by the Industrial Production Index (IPI) of the Eurozone (Y_{eur}) (Figure 5). Given the nature of the trading partner, which is a composite of 15+ countries, a weighted and indexed proxy is required for demand approximation. Several literature examples have suggested using the IPI for bilateral estimation with a complex partner (Gupta-

Kapoor and Ramakrishnan, 1999). Values for the Eurozone's IPI were taken from Eurostat, have been reindexed and assigned 100 for January 2006.

The exchange rate in this study will be presented as the real bilateral exchange rate between Azerbaijan and Euro-17s. Formulated this way, an increase in RFX represents a real depreciation of the currency, since more Manats can now be exchanged for the same amount of the Euros. RFX has been indexed similarly to the IPI series and was taken from the internal statistical database of the Central Bank of Azerbaijan.

With the purpose of checking our models for robustness, i.e. for identifying the underlying price and/or volume effects behind the responses of trade to exchange rate innovations, we will also include the export and imports prices into our analysis (Figure 6). As usual, the export and import prices are bilateral with respect to the Eurozone. Since the start of our timeframe in 2006, the two series have been largely congruent. However, in the final 18 months we can detect a clear divergence as the prices of imports becoming considerably higher. One possible explanation for this phenomenon is that Azerbaijani exporters to the Eurozone, faced with the brutality of the aftermath of the Financial Crisis, were forced to lower their asking prices dramatically in response to falling demand for their products. The relative attractiveness of imported goods from Europe has not altered the Azerbaijani population's preference for European goods, as Euro exporters were able to restore their prices to their pre-crisis levels quicker than their Azerbaijani counterparts. In short, the differential in relative consumer preferences and perhaps supply-side comparative advantage can explain the growing divergence in export and imports prices for this particular case.

The remainder of the paper is organized as follows. Section 2 presents the model and econometric methodology. Section 3 reports two sets of empirical results of our analysis of the total and non-oil trade sectors. Section 4 discusses the inferences and implications derived from our findings. Finally, Section 5 concludes.

2. Methodology

The trade balance model employed in this study is estimated by the following long-run reduced form equation:

$$\ln(TB_t) = \alpha_0 + \beta_x(RFX_t) + \beta_{az}(\ln(Y_{az})) + \beta_{eur}(\ln(Y_{eur})) + \varepsilon_t \qquad (1)$$

where, ln is the natural logarithm, TB is a form of the national trade balance, RFX is the real bilateral exchange rate, Y_{eur} is the Industrial Production Index of the Eurozone, Y_{az} is the real GDP of Azerbaijan, and ε_t is the error term.

For simplicity, we proxy the Azerbaijani trade balance with the ratio of exports to imports (X/IM), so that the trade balance and the exchange rate variables would be moving in the same direction. In other words, an increase in RFX would constitute a currency devaluation and should, according to the Marshall-Lerner theory, positively affect the trade balance in the long run. Therefore, it is *a priori* expected that the sign for the β_x coefficient would be positive. Furthermore, some focus will also be placed on the signs of β_{az} and β_{eur}, since those will determine the elasticities of export and import demand.

As a brief theoretical note, a partial derivative of the balance of trade with respect to the exchange rate would show a direct impact of the depreciation. However, a one-time movement in the exchange rate will affect not only the trade balance, exports, or imports, but also the future exchange rate, which in turn will carry an additional effect on the trade aggregates, etc. It is important to account for these feedback effects if we want to estimate the trade balance model correctly. Therefore, an econometric method of vector auto regressions (VAR), not a conventional OLS, should be employed. A VAR model and an impulse response function would take the feedback effects into account.

In the preliminary stage, a set of unit-root tests must be carried out to ensure that at least two of the in our models have unit roots. Should a variable have a unit root in the level form, stationary is obtained usually by first-differencing. Such variable is said to non-stationary in the level form, causing the traditional Ordinary Least Squares framework to suffer from the spurious regression problem. Cointegration of the equation in (1) can be established if the variables are individually non-stationary, or at least two or more of them are. See Hansen and Juselius (1995:1) for a thorough description of the cointegration procedure.

Then, a VAR in the level form will be estimated. The VAR system in this paper will take the following form:

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \cdots + A_n Z_{t-n} + BX_t + \varepsilon_t \qquad (2)$$

where, Z is a vector of n non-stationary variables, X – vector of deterministic variables; ε – vector of innovations.

The preliminary VARs are required to determine the correct number of lags in the model, to ensure that there is no autocorrelation in the error terms, and that the residuals follow the pattern of a normal distribution. With the right number of lags, a Johansen cointegration test can then be performed to determine the number of cointegrating equations. A vector error correction model (VECM) is then estimated with the previously obtained optimal number of lags. This will give us the long-run cointegrated forms for the trade balance equation. Finally, an impulse response function of the trade balance will capture the short-run dynamics, i.e. J-curve phenomenon.

For this paper, the following VECM specification will be used (Hamilton, 1994):

$$\Delta Z_t = \mu_t + \sum_i \gamma_i \Delta Z_{t-i} + \prod X_{t-1} + u_t \qquad (3)$$

where, Z_t is a vector of endogenous variables, μ_t – deterministic component, γ_j – matrix of coefficients, $\prod = \alpha\beta'$, where α is the parameter of speed adjustment, and β' is the vector of cointegration, u_t – matrix of residuals.

3. Results

On each variable used in this paper the Augmented Dickey Fuller (ADF) unit root test was performed[2]. The Akaike Info Criterion was chosen for lag selection. The results of the test are presented in Table 1. Based on the results, it is clear that we will always have at least two I(1) variables in our equation set-ups, since only Ln(X/IM) and RFX are stationary in levels. Therefore, the Johansen approach to cointegration is applicable.

a. Total Trade

We build our first model by analyzing the total trade balance (including the oil sector) of Azerbaijan with the Eurozone. We will use the ratio of imports to exports (IM/X) and, correspondingly, the real bilateral exchange rate. Domestic and foreign demands stay at default. The Johansen cointegration test is performed and indicates a presence of 1 cointegrating equation. Selection of deterministic elements is the following: intercept but no trend for the cointegrating equation, and no intercept for the VAR. The VEC is built with 3 lags. The long-run equation for total trade is presented in (4). The short-run results from ECM are reported in Table 2.

[2] Consult Dickey and Fuller (1979), Phillips and Perron (1988), and Kwiatkowski, Phillips, Schmidt, and Shin (1992) for the proper demonstration of various unit root testing procedures.

$$\ln(\frac{X_t}{IM_t}) = -83.09 + 0.52(RFX_t) + 2.95(\ln(Y_{az})) + 2.30(\ln(Y_{eur})) + \varepsilon_t \quad (4)$$

[6.43] [-4.06] [-3.64] [0.66]

Where in parentheses are the t-statistics. Coefficients for RFX, $Y_{az,}$ and the constant are statistically significant.

The principle target of our interest, the coefficient on the exchange rate, is positive and significant. Thus, the proof of the Marshall-Lerner condition is straightforward: a depreciation of the Manat would improve the Azerbaijani total trade balance in the long run. A 1 unit increase in RFX (which due to indexation amounts to about 1%) would cause a 0.52% positive response in the trade balance. The coefficient for Y_{im} is positive but not significant. This suggests that imports from the Eurozone to Azerbaijan are largely demand driven. Meanwhile, a positive sign for Y_{az} indicates that Azerbaijani exports are not sensitive to the demand in their European partner states, but are instead correlated with Azerbaijan's own GDP. All the signs except the Y_{az} coefficient are what we would have predicted based on logic and economic theory.

The short-run dynamics of the effect that an innovation in RFX has on the trade balance is reported in Figure 7. Note that one standard deviation of RFX is equal to 2.93%. We can observe a clear J-resembling curve, which portrays a deterioration of the trade balance in the short run and its eventual improvement in the long run. The trade balance reaches its lowest point of by the third month, after which it begins to steadily move upwards. Approximately after 12 months, the short run ends and the trade balance stabilizes at its long-run level, which is higher than pre-devaluation. The figure is consistent with the conventional belief that the short-run adjustments should last for one year (Krugman, 1991:451).

The J-curve manages to capture the response of the balance of trade to the combination of the price and volume effects. However, the two effects must be decomposed in order to identify the *correct* reason for the trade balance improvement in the medium-long run. Either the export-import price ratio decreases and later returns to its pre-depreciation level, or the volume of exports grows as the price ratio stabilizes at its new below-zero equilibrium. In order to reveal the motor behind the J-curve dynamics, a new set of VEC models is built, now with an additional variable – P_x/P_{im}, which is the ratio of the export prices to import prices between Azerbaijan and the Eurozone. Thus, the new model with the trade prices takes the following theoretical format.

$$\ln(\frac{X_t}{IM_t}) = \alpha_0 + \beta_x(RFX_t) + +\beta_{az}(\ln(Y_{az})) + \beta_{eur}(\ln(Y_{eur})) + \beta_p(\ln(\frac{P_x}{P_{im}})) + \varepsilon_t \quad (5)$$

There is no *a priori* sign expectation for the price coefficient, but one expects the short run movement of the price ratio to be directed downwards. An IRF of the price ratio's response to the exchange rate innovations, taken from the new VECM in (5), will shed light on the price-volume effect interplay. Figure 8 reports this result. We can see that a 2.93% depreciation in RFX causes the price ratio to drop and to remain in its new below-zero equilibrium in the long run. In other words, the effect of a falling price ratio causes the trade balance to deteriorate in the short run (as evidenced in Figure 7), suggesting the working of the price effect. But in the long run, when prices remain stable, the balance of trade continues to improve anyway, in evidence for an underlying volume effect being the key driver behind the trade balance improvement. Balance of trade behavior which is governed by the price effect in the short run and by the volume effect in the long run is in compliance with a "textbook" definition of a J-curve (Meade, 1988).

b. Non-Oil Trade

Similarly to what we have performed in Section 3.a on total trade, we will now rebuild our baseline model by introducing the non-oil balance of trade instead of the total trade balance. We achieve this by creating a ratio of non-oil exports to total imports. As noted earlier in Section 1, total imports are essentially equivalent to non-oil imports, because Azerbaijan doesn't import many mineral resources. In effect, the ratio of $X_{non\text{-}oil}$ to IM should be a feasible proxy for the non-oil trade balance. This model modification will allow us to find out if a currency devaluation could improve specifically the non-oil sector, in accordance with Azerbaijan's strategy of industrial diversification. The new long-run cointegrating equation for the non-oil balance of trade is presented in (6).

$$\ln\left(\frac{X_{non-oil}}{IM_t}\right) = -34.82 + 0.97(RFX_t) - 0.04(\ln(Y_{az})) - 14.15(\ln(Y_{eur})) + \varepsilon_t \qquad (6)$$

$$[0.03] \qquad [-7.42] \qquad [0.03] \qquad [2.95]$$

where in parentheses are the t-statistics. Coefficients for RFX and Y_{eur} are statistically significant.

The exchange rate coefficient of 0.97 is once again positive and significant. We conclude that the non-oil sector of the Azerbaijani economy positively responds to a currency depreciation in the long run. The Marshall-Lerner condition, therefore, holds for the non-oil trade balance as well. Note that the non-oil long-run exchange rate elasticity (0.97) is higher than in the case of total trade (0.53). We explain this that being smaller in size, the non-oil segment of the economy is more mobile and should be reacting to exchange rate fluctuations in a more flexible manner. The coefficient for Y_{az} is negative, which is the correct sign theory-wise, but it's statistically insignificant. The Y_{eur} coefficient, on the other hand, is negative and significant, which is a surprising phenomenon considering that theory would predict non-oil trade balance to be demand driven; for the case of Azerbaijan, better economic performance in the Eurozone in fact negatively affects non-oil exportation.

Having established the long-run equation for the non-oil sector, we will now study the short-run behavior via an IRF of equation (6). Figure 9 shows that the non-oil balance of trade, although in an unstable manner, declines in the short-run following a 2.93% devaluation in RFX. The lowest point is reached in month 5, after which the trade balance starts to improve, reaching the long-run equilibrium relatively late, about 18 months after the policy intervention. Note than the path towards the long-run is longer in the non-oil sector than in the total trade scenario, and that the non-oil sector is much more volatile in its short-run dynamics.

Finally, in order to identify if the improvement in the balance of trade is governed by the price or by the volume effect, we are including the ratio of export and import prices to our non-oil trade balance model. Figure 10 portrays the short-run response of P_x/P_{im} to a 2.93% depreciation in the RFX. The ratio of prices, much in the same way as in the analysis of total trade, diminishes in the short run. The ratio, however, begins to gradually return to its pre-devaluation level after approximately 12 months. By the end of the second year, the ratio completes the adjustment and actually enters the surplus zone. In light of these findings, we cannot claim that the non-oil trade balance improvement is driven by the volume effect, since the price ratio seems to be the key explanatory factor of the TB dynamics in the medium-long run. Considering that the price differentials are in hundredths of a percent, we can speculate that the movement of prices is too minor to be seriously affecting non-oil exports and imports. Still, despite the certainty with which both the M-L condition and the J-curve effect were obtained in the total trade model, we cannot be completely confident in the short-run results of the non-oil scenario.

4. Discussion

On average, between 2006 and 209, the monthly non-oil exports of Azerbaijan to the Eurozone have amounted to AZN 2.2 million[3]. Results of section 3.b suggest that the non-oil trade balance is positively responsive to exchange rate devaluations, even if considering the negating factor of the strong price effect. This long-run maneuvering requires that domestic non-oil producers are able to adjust their manufacturing volumes fairly quickly, and are also expecting to sell them successfully abroad. Such flexibility is possible if at least one factor is present: the exported products are technologically non-intensive enough, and producers are able to adjust production numbers quickly and without much trouble.

Over the 2006-2009 timeframe. The largest non-oil-related export industries in Azerbaijan are plants and vegetables, semi-precious metals, ready food products, and animal and plant oils[4]. Most, if not all, of these product types should have an elastic-enough supply side in the short-medium run to allow for a quick start of the volume readjustment. In other words, shifting production volumes of foods and plants would be easier than of, say, air conditioners and automobiles. In general, this paper has proposed a bilateral analysis on an aggregated basis. It's desirable that future studies on the J-curve of Azerbaijan would consider industry-level data and examine the elasticities of specific industries in the non-oil sector of the economy with respect to exchange rate innovations. This will not only contribute to the overall pool of literature on the subject, but also provide valuable policy-relevant answers to issues of industrial diversification and non-oil sector development in Azerbaijan.

One of the conventional assumptions of the J-curve theory is that the balance of trade is equal to zero at the time of the devaluation. Should a deficit or surplus exist, however, as is often the case with the majority of countries, the analysis gets more complicated. In particular, it is more difficult to deduce concrete policy-relevant alternatives for action. In principle, the intention to depreciate the currency in order to improve the current account has logic if the nation carries a significant trade deficit. Azerbaijan has been enjoying a trade surplus in the past years, when considering total exports, mainly because oil exportation has been enormous in scale. However, the non-oil component, which currently stands at around 5% of the total value of exports, does not balance out the imports. Azerbaijan's non-oil trade deficit is substantial and has been growing, as evidenced in Figure 3. Application of this paper's analysis to the balance of trade which is already in deficit creates a basic econometric problem and complicates economic interpretation.

Furthermore, there is a potential contemporaneous currency effect vis-à-vis the American dollar, in which the country's oil exports are traded. Depending on how the exchange rate fluctuations are managed, the domestic Manat is typically converted to the Euro via the third currency – the American Dollar. A bilateral AZN/EUR depreciation could therefore potentially devalue the Manat with respect to the Dollar, implying an additional influence on the foreign trade prices and volumes, which could or could not reinforce the J-curve dynamics. We are oblivious to how exactly the interplay between the exchange rates would play out. In short, in order to reflect Azerbaijan's exchange rate regime it is desirable that future studies on Azerbaijan's J-curve would consider an analysis with a pool of several currencies, *in addition* to the strictly bilateral approach presented in this paper.

5. Conclusion

This study has attempted to estimate the J-curve phenomenon for Azerbaijan through a bilateral analysis of the country's total and non-oil trade balances vis-à-vis the Eurozone. The

[3] Based on the internal database of the Central Bank of the Republic of Azerbaijan.
[4] Data was taken from the International Trade Center and from the internal database of the Central Bank of Azerbaijan

Johansen cointegration approach has been employed to measure the long-run responses of the balance of trade to currency depreciation, and impulse response functions were built to analyze the short-run trade dynamics. Results from the analysis of total trade have indicated that a real devaluation of the Manat carries a significant positive effect on the balance of trade in the long run. We also confirm the presence of a J-curve effect in the short-run; trade balance deteriorates in the short run and recovers after approximately twelve months. A robustness test with prices of exports and imports shows that the trade balance improvement in the medium-long run is governed by the dominating volume effect. In the case of the non-oil sector, a real depreciation of the currency also positively and significantly affects the non-oil balance of trade in the long run. In the short run, the J-curve is also present, although it is more unstable. However, due to a stronger price effect in the non-oil sector analysis, evidence on the short-run performance of the non-oil balance of trade is inconclusive.

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Appendix

Figure 1
Real Gross Domestic Product of Azerbaijan

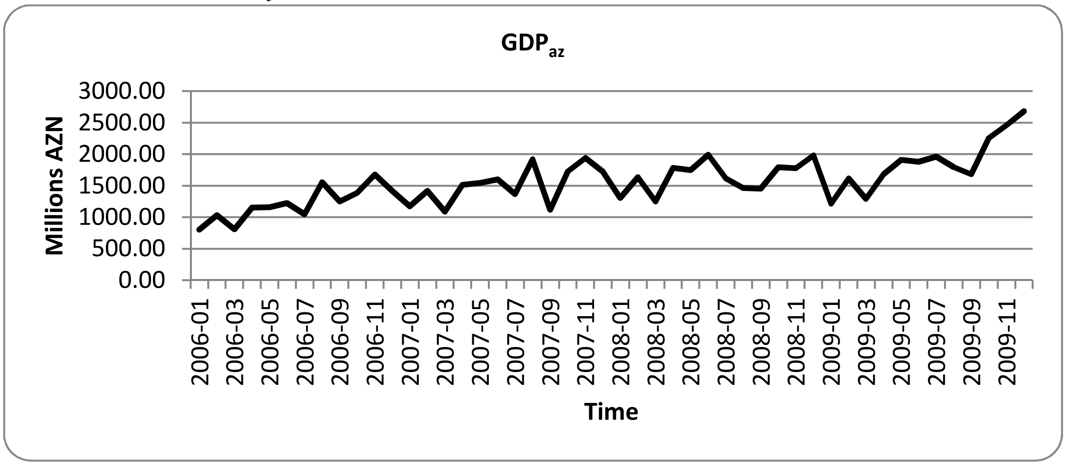

Figure 2
Azerbaijan's Imports from the Eurozone

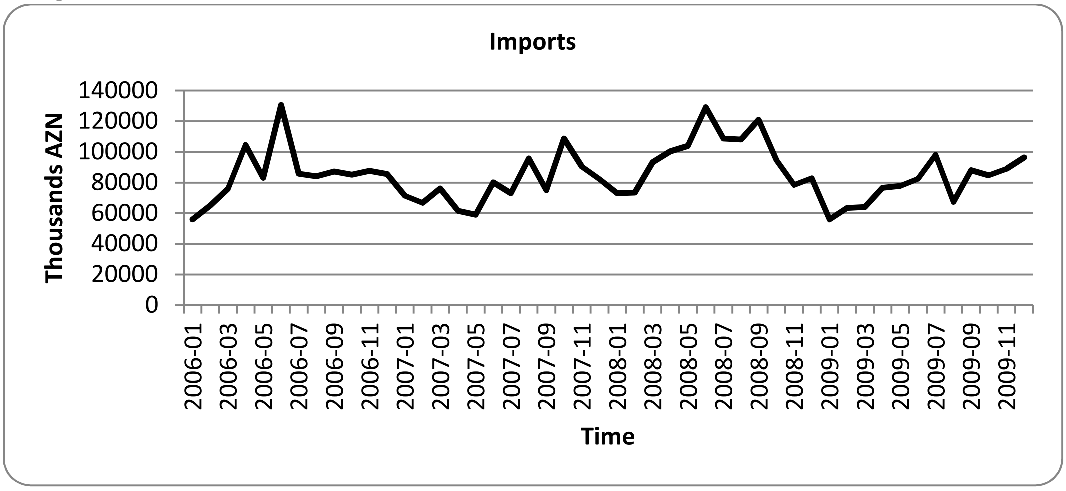

Figure 3
Azerbaijan's Non-Oil Sector

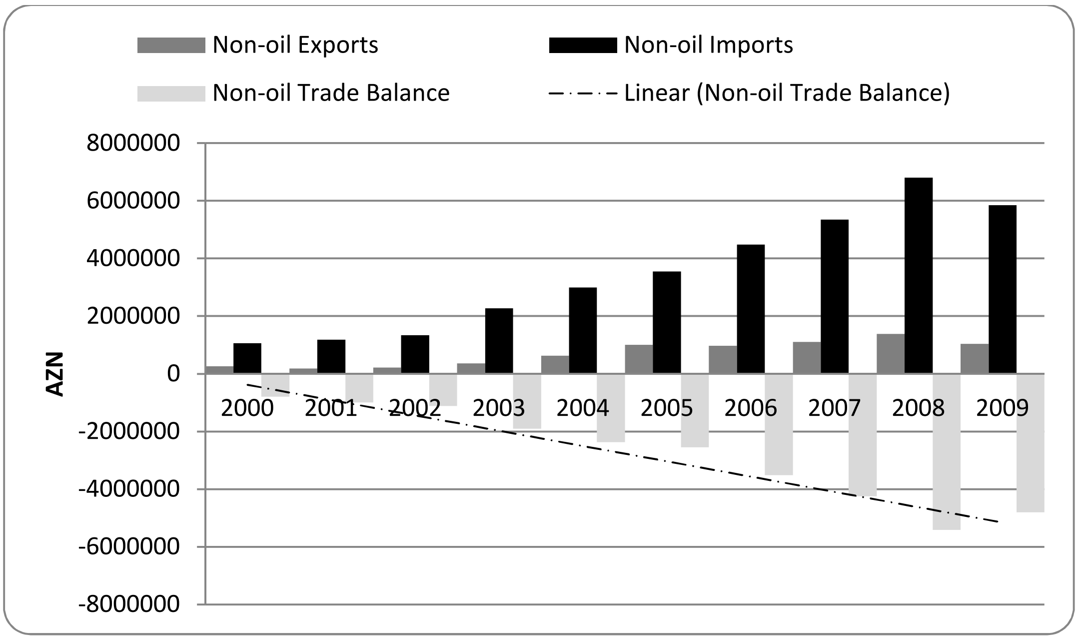

Figure 4
Relationship between Azerbaijan's real bilateral exchange rate with the Eurozone and non-oil trade balance

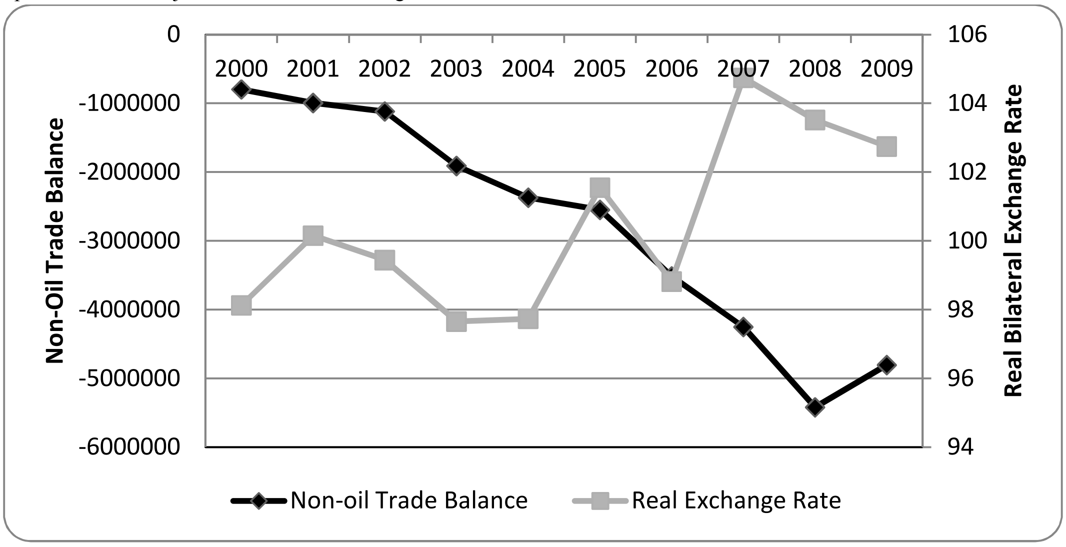

Figure 5
Industrial Production Index of the Eurozone

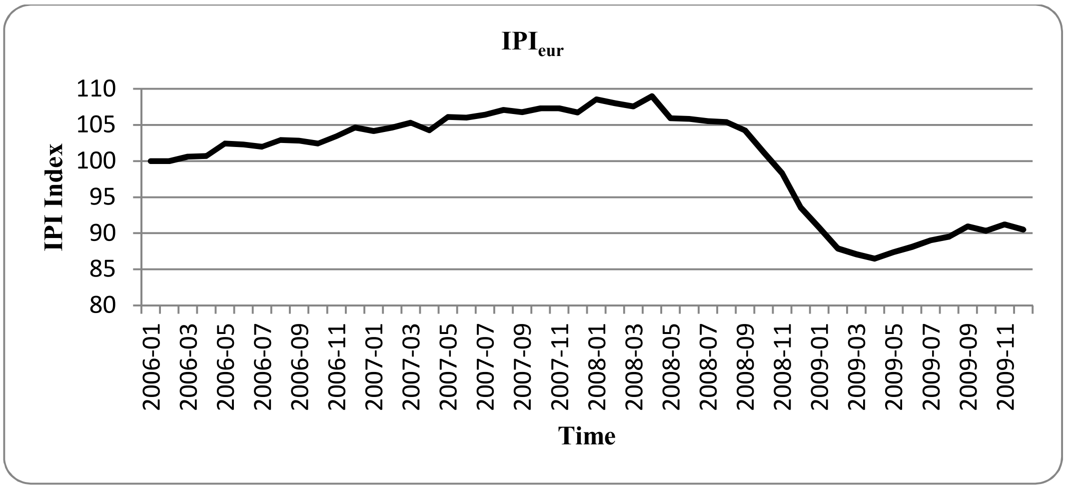

Figure 6
Export and Import Price Behavior in Azerbaijan

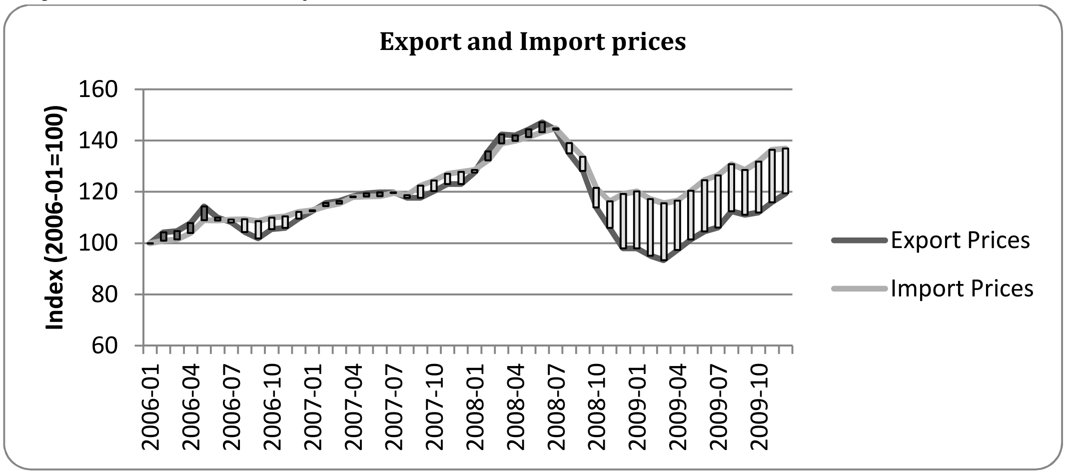

Figure 7
Response of Azerbaijan's total trade balance to a 2.93% depreciation in the real bilateral exchange rate

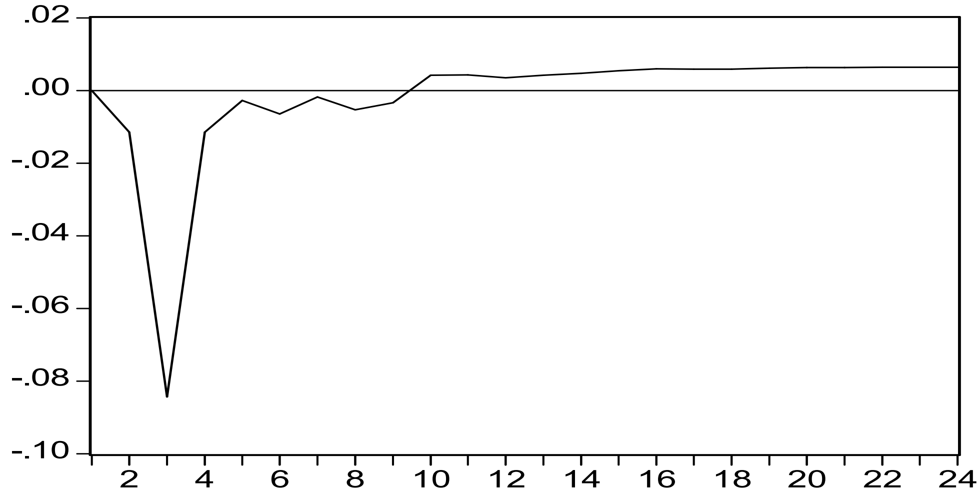

Figure 8
Response of the import and export price ratio to a 2.93% appreciation in the real bilateral exchange rate

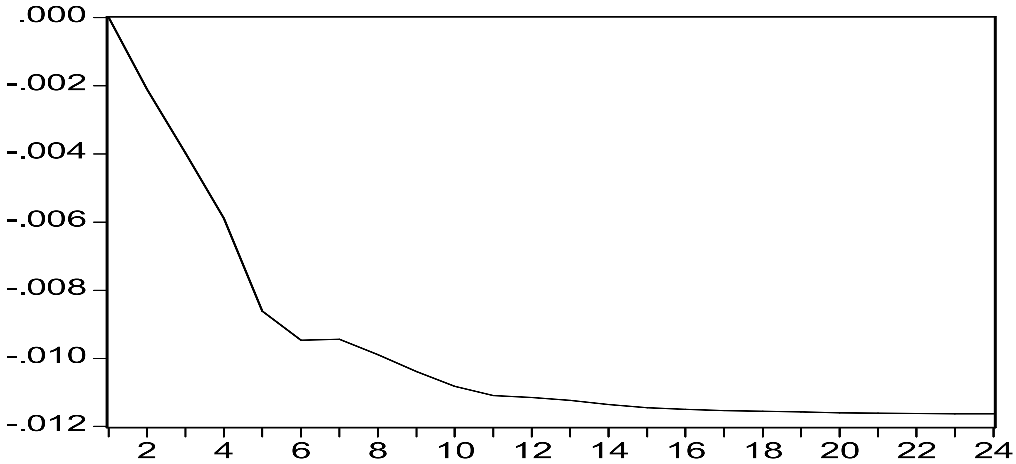

Figure 9
Response of Azerbaijan's non-oil trade balance to a 2.93% depreciation in the real bilateral exchange rate

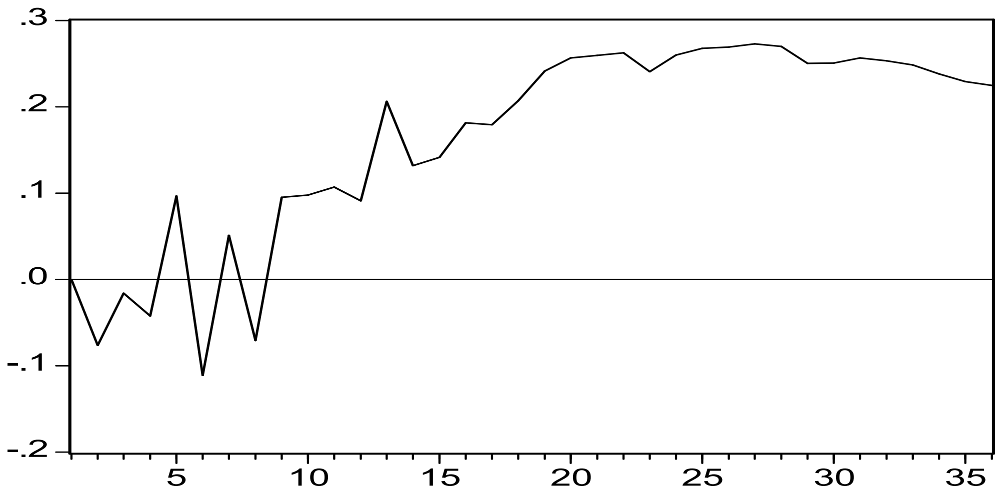

Figure 10
Response of the non-oil export and import price ratio to a 2.93% depreciation in the real bilateral exchange rate

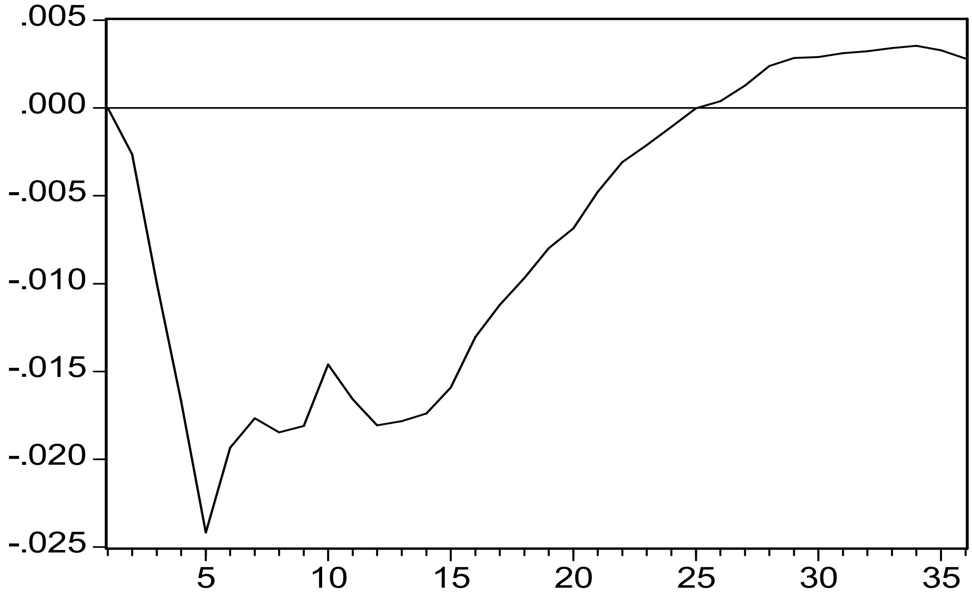

Table 1
ADF Unit Root test results (P-values)

	Ln(X/IM)	*Ln($X_{non-oil}$/IM)*	*RFX*	*Ln(Y_{az})*	*Ln(Y_{eur})*	*Ln(P_x/P_{im})*
Level	0.0079	0.1030*	0.0000	0.4359*	0.3161*	0.4879*
First Difference	0.0000	0.0000	0.0000	0.0000	0.0008	0.0003
Conclusion	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(1)**	**I(1)**

*- Can't reject the null hypothesis of unit root process at the 5% significance level

Table 2
Short-run ECM results from VAR_{total}

D(RFX(-1))	0.035251
	(0.03549)
	[0.99326]
D(RFX(-2))	0.010098
	(0.02703)
	[0.37359]
D(RFX(-3))	0.037850
	(0.02222)
	[1.70312]
R-squared	0.371620
Adj. R-squared	0.128376
Sum sq. resids	4.042114
S.E. equation	0.361097
F-statistic	1.527766
Log likelihood	-9.910016
Akaike AIC	1.041364
Schwarz SC	1.568511
Mean dependent	0.010806
S.D. dependent	0.386775

Note: In parentheses () - standard errors, and [] - t-statistics