Analyzing price level in a booming economy: the case of Azerbaijan

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2009

КОНСОРЦИУМ ЭКОНОМИЧЕСКИХ ИССЛЕДОВАНИЙ И ОБРАЗОВАНИЯ
ECONOMICS EDUCATION AND RESEARCH CONSORTIUM
Working Paper Series

ANALYZING PRICE LEVEL IN A BOOMING ECONOMY: THE CASE OF AZERBAIJAN

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Working paper No11/02E

This project (No R08-1291) was supported by the Economics Education and Research Consortium and funded by GDN

Research area: **Macroeconomics and Finance**

JEL Code: P22, E64, Q33, C51

Abstract: The study analyzes price level in Azerbaijan economy over the period of 2000-2007 by employing a specific approach. The paper concludes that price increases caused by a resource boom differs from the price increases generated by a non-booming economy. Thereby, inflation mainly caused by resource boom has its own specific features in terms of impact on economy and therefore requires specific policy response. Some policy recommendations related to monetary and fiscal policies are suggested for elimination of harmful effects of resource boom and for preventing high price level in Azerbaijani economy.

Keywords: Keywords: Oil boom, Dutch Disease, Price level, Azerbaijan economy, Bound Testing Approach.

Acknowledgments: I am thankful to Diana Weinhold (London School of Economics), my expert within the EERC project, for her valuable comments and useful ideas and especially for her encouragement. I am also grateful to other Economic Education and Research Consortium (EERC) experts including Vladimir Popov (New Economic School, Moscow), Michael Beenstock (Hebrew University, Jerusalem), Gary Krueger (Macalester College), Robert Tchaidze (IMF economist) and Rustam Ibragimov (Harvard University) for their useful remarks. I would like to thank the EERC staff for their provision of opportunity to conduct this research and very useful and friendly scientific environment which I benefited a lot from. I am also indebted to the Catherina Moll, Ferdinand Fetcher (DIW-German Institute for Economic Research), Yadulla Hasanli (Cybernetics Institute, Azerbaijan), Nadir Ramazanov (Central Bank of Azerbaijan), Samir Huseynov (Central European University) and Vasif Abiyev (Qafqaz University, Azerbaijan) for reviewing the paper.

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NON-TECHNICAL SUMMARY

The boom in the oil sector has caused the export revenues to increase over the last several years in the Azerbaijan economy. Huge oil revenues from the expansion of oil export resulted in an expansion in fiscal spending which are mainly oriented to non-tradable sector of the economy in forms of infrastructure and social projects. In parallel with its fiscal policy, the National Bank of Azerbaijan introduced a monetary policy of setting a fixed exchange rate regime to prevent nominal appreciation of the national currency. In the background of these processes the economy has faced with some undesirable tendencies as well as high domestic price level.

Various alternative policy measures can be suggested to prevent high price increases in the Azerbaijani economy. For instance, one possible argument can be that main source of inflation is money growth and therefore policy makers should control it, while others may investigate domestic prices in the context of external shocks and conclude that main reason of domestic inflation is the foreign prices and authorities should focus on this issue. But, in fact pure monetary policy actions are alone not enough for curbing high inflation in Azerbaijan and have only a temporary dampening effect because of high fiscal spending which is specific for many Oil Exporting Countries. Thus, traditional approaches for analyzing and curbing price increases caused by a resource boom are ineffective. Maybe because of these approaches unable sufficiently take effects of boom into account and hence are not so effective in the booming economy.

Since appeared undesirable tendencies (such as the share of the oil sector in the GDP has sharply gone up while the share of the non-oil tradable sector has declined dramatically; the non-tradable sector has remarkably grown; due to increase in the oil revenues and high price increase in the non-tradable sector the real exchange rate of manat has appreciated in recent years which in its turn has undermined the competitiveness of the non-oil tradable sectors) in the Azerbaijani economy can be considered as symptoms of Dutch Disease[1] then the Dutch Disease concept may be considered as a relevant theoretical mechanism for explaining and therefore for curbing the generation of a high price level in Azerbaijan, a resource abundant economy. Because of this concept can provide an explanation of a generation of the high domestic price level.

Hence, it is preferable to take effects of a resource boom into account when one analyze and adjust price increases in a booming economy. For this purpose, this study proposed specific approach which concentrates on the equation that characterizes the real exchange rate including factors of resource boom putting together with the nominal exchange rate path, which is decided upon by the authorities, one would be able to calculate the path for domestic price level implied by the developments in the real exchange rate. Proposed approach assumes a conceptual model which consists of two parts: (a) estimation of real exchange rate including factors of resource boom and then (b) calculation of domestic price level by using calculated real exchange rate (which is derived from the first part and reflects effects of resource boom) and to analyze it together with actual domestic price level.

The study tries to analyze price level in Azerbaijan, a booming economy, by employing above mentioned approach. Firstly real exchange rate equation including factor of resource boom was estimated. Estimation outputs of two alternative methods, Autoregressive Distributed Lag (ARDL) Bound Testing Approach (Pesaran et al., 2001) and Johansen Co-integration Approach (Johansen, 1988; Johansen and Juselius, 1990), were very close to each-other and

[1] Note that according to Corden (1982) and Corden and Nearly (1984) notion of Dutch Disease is an exogenous increase in a resource price or in a resource output results in appreciation of real exchange rate i.e. increase in the relative price of non-tradable goods and a deterioration of manufacturing sector.

indicate that there was statistically significant positive relationship between real oil price and real exchange rate. In other words, impact of resource boom on appreciation of real exchange rate is crucial in Azerbaijani economy[2].

Secondly, a long-run movement of real exchange rate, which reflects effects of resource boom, was calculated by using long-run coefficients of estimated cointegrating equation. Comparison of calculated and actual real exchange rates over the period 2000-2007 indicates that former has been higher since 2004. As movements of calculated real exchange rate reflects effects of resource boom it can be concluded that these effects have had crucial impact on the economy since 2004.

In line with proposed approach, finally, domestic price level reflecting booming effects was calculated. Based on analyzing various aspects of calculated domestic price level together with actual one it can be concluded that effects of oil boom have been crucial in formation of high price level in the Azerbaijani economy especially since 2004. At the same time domestic prices are positively affected by foreign prices while negatively affected by nominal effective exchange rate.

Study also concluded that high price level caused by a resource boom differs from the price level generated by a non-booming (normal) economy. For example, a price increase in non-booming economy is not so dangerous and sometimes it is considered as stimulus for economic growth. However, it is not the case in terms of price increases sourced from the booming economy. The most important cost of such inflation is that it leads to decline in a non-booming tradable sector as predicted by Dutch Disease theory. On the other side high inflation generated by the booming sector negatively affects incomes generated by non-booming sector reducing their purchasing power which imposes substantial social burden (welfare cost) on people employed in the non-booming sector.

Thus, inflation mainly caused by resource boom has its own specific features in terms of impact on economy and therefore requires specific policy response. In this regard ability of the Central Bank in fighting against high inflation is limited in such environment. From the other side, since the main undesirable outcomes, including high price level in the booming economy, are mainly sourced from expanding fiscal expenditures, measures oriented to eliminate these outcomes as well as high price level are subject to fiscal policy. Therefore, monetary policy aiming at ensuring the price stability and fiscal policy with a goal of productive and stable growth should be implemented under condition of efficient coordination and consistent joint action in order to eliminate undesirable effects of oil boom and therefore to prevent high domestic prices level in the Azerbaijani economy.

This study may contribute existing relevant research area by three ways: firstly, there are limited studies, which investigate inflation as a consequence of a resource boom, in CIS countries as well as Azerbaijan; secondly, the study proposes specific approach in order to analyze price increases in a booming economy; and thirdly, policy recommendation suggested by this study may be useful for policymakers in this sense that what kind of actions should be implemented by fiscal and monetary authorities in order to treat negative consequences of resource boom and therefore to curb high domestic price increases.

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[2] Since Autoregressive Distributed Lag (ARDL) Bound Testing Approach has some advantages compared to other cointegration approaches (Pesaran et al., 2001), especially in the case of small number of observations this approach was employed as a main estimation methodology. At the same time in order to check robustness of the results and juxtapose them study also employed Johansen Cointegration Approach (Johansen, 1988; Johansen and Juselius, 1990). Additionally, in order to avoid small sample estimation bias and to make proper inference, study employed two issues: (a) Instead of Pesaran's critical values (Pesaran et al. (2001)) are used Narayan's critical values (Narayan, 2005) in Bound Testing Approach to Co-integration and (b) In the Johansen's Co-integration Test are realized two kinds of corrections for Trace test statistics proposed by Johansen (2002); Reinsel and Anh (1992); and Reimers (1992).

1. INTRODUCTION

The boom in the oil sector has caused the export revenues to increase over the last several years in the Azerbaijan economy. Huge oil revenues from the expansion of oil export resulted in an expansion in fiscal spending which are mainly oriented to non-tradable sector of the economy in forms of infrastructure and social projects. In parallel with its fiscal policy, the National Bank of Azerbaijan introduced a monetary policy of setting a fixed exchange rate regime to prevent nominal appreciation of the national currency. In the background of these processes the economy has faced with some negative outcomes as well as high domestic price level. Undesirable tendencies appeared in the Azerbaijani economy can be considered as symptoms of Dutch Disease: the share of the oil sector in the GDP has sharply gone up while the share of the non-oil tradable sector (agriculture and non-oil manufacturing) has declined dramatically; the non-tradable sector has remarkably grown; at the same time due to increase in the oil revenues and high price increase in the non-tradable sector the real exchange rate of manat has appreciated in recent years sector which in its turn undermined the competitiveness of the non-oil tradable sectors. Note that according to Corden (1982) and Corden and Nearly (1984) notion of Dutch Disease is an exogenous increase in a resource price or in a resource output resulted appreciation in real exchange rate i.e. increase in the relative price of non-tradable goods and a deterioration in manufacturing sector[3].

In this regard, a mechanism of oil revenues management and its efficiency during an oil boom is a very important point. There is a large number of studies related to a management of oil revenues in oil-exporting countries[4] (hereafter OEC), as well as in Commonwealth Independence Countries (hereafter CIS) including Azerbaijan (Sturm et al., 2009; IMF, 2007; Kalyuzhnova and Kaser, 2006; Krause and Lücke, 2005; Koeda and Kramarenko, 2008; Budina et al., 2007; Bagirov, 2006; Wakeman-Linn et al., 2002). Upstream activities in oil sector are controlled by state oil companies, oil revenues accrue directly and completely to the government in most major OEC as well as in Azerbaijan. Certain part of these oil revenues is transferred to government budget for covering capital and current expenditures, while the rest part of these revenues goes to saving funds[5]. However, as Paczyński and Tochitskaya (2008) emphasized, there are some stylized facts regarding the government's treatment of oil revenues in Azerbaijan that are crucial in comparison with other OEC (See: Appendix A for more details): (1) Spending part of oil revenues is quite higher in Azerbaijan than in others; (2) Oil related fiscal revenues are crucial in the formation of overall government revenues; (3) The share of the non-oil deficit in non-oil GDP is quite high; (4) Fiscal policies and pro-cyclical spending are much more

[3] The term Dutch Disease refers to the adverse effects on Dutch manufacturing of the natural gas discoveries of the nineteen sixties, essentially through the subsequent appreciation of the Dutch real exchange rate. Dutch Disease is sometimes interpreted as exclusively resulting from the discovery of new natural resources, which characterized the original Dutch case that gave the disease its name. For example, the Rutherford Dictionary of Economics gives the following definition of Dutch Disease: "The harmful consequences for a national economy of discovering natural resources, especially the decline in traditional industries brought about by the rapid growth and prosperity of a new industry. The successful new industry has high exports, creating a foreign exchange surplus and raising the country's exchange rate with the consequence that other industries of the economy become internationally uncompetitive" (Rutherford, 1992). Buiter and Purvis (1983) distinguish between the case of oil price increases, which have a temporary effect, and the case of oil discoveries, which have permanent effects.

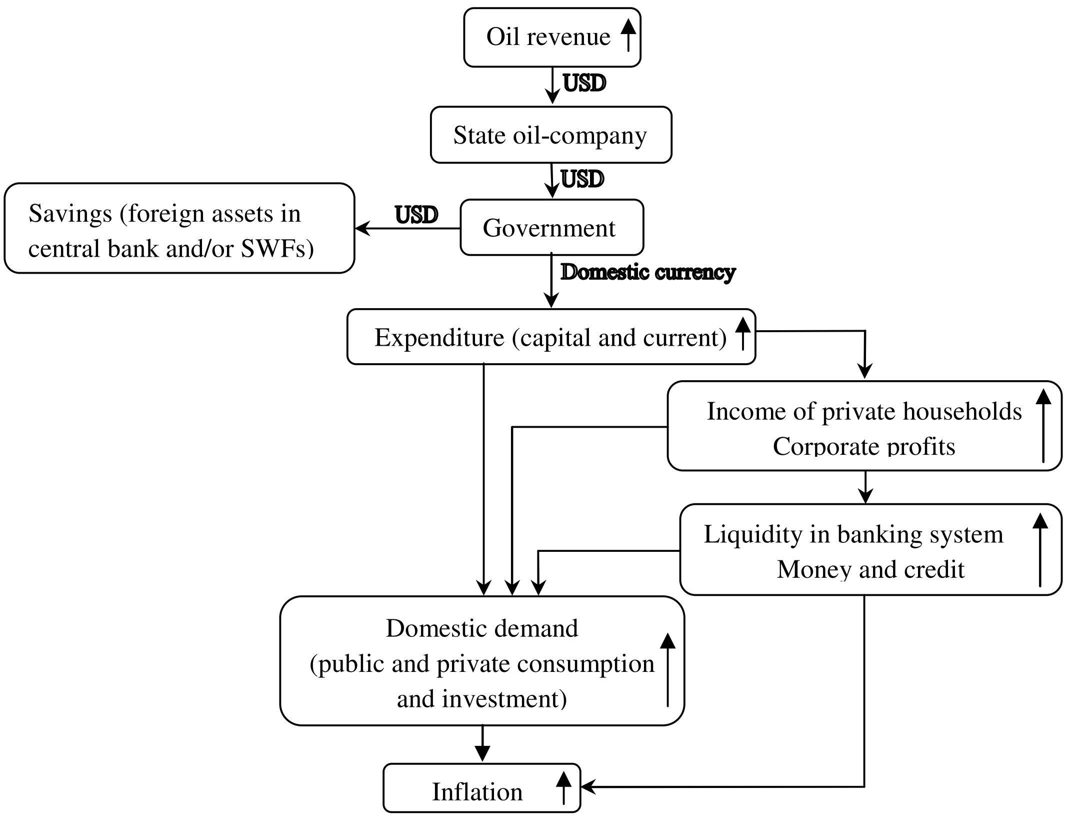
[4] The term "oil-exporting countries" refers to the top ten net oil-exporting countries for which oil and gas account for more than 40% of total exports, i.e. the countries that are most related to global energy markets and at the same time share the feature of being highly dependent on hydrocarbon exports. These countries are: Algeria, Iran, Kuwait, Libya, Nigeria, Norway, Russia, Saudi Arabia, the United Arab Emirates (UAE) and Venezuela.

[5] Note that there is Oil Fund as a saving fund which was established in 1999 in Azerbaijan. It is designed to manage oil and gas related revenues both as a saving mechanism for future generations and for the development of infrastructure in order to achieve growth in non-oil sector.

volatile in Azerbaijan.

Note that fiscal expansion is a key mechanism in many OEC for "injecting" oil revenues into an economy. This expansion increases an inflationary pressure, and monetary policy has been constrained in tackling inflation as a result of prevailing exchange rate regimes which are mostly fixed pegs or tightly managed floats[6] (Sturm et al., 2009; Wakeman-Linn et al., 2002). As Sturm et al (2009) state, a general mechanism of oil revenues management and generation of inflation in this framework is given below Scheme 1.

Scheme 1: Mechanism of oil revenue management in OEC



Source: Author's own construction based on Sturm et al. (2009).

One can reveal that the theoretical mechanism of the generation of inflation in the framework of **Scheme1** is consistent with the Dutch Disease concept. Because as Corden (1984) and Corden and Neary (1982) emphasize the Dutch Disease concept indicates that high revenues from a booming sector cause increased demand for non-tradable goods and therefore a rise in non-tradable prices relative to tradable prices i.e. real appreciation that undermines competitiveness of manufacturing sector. Furthermore, Edwards (1985) states that during a boom, a spending effect is normally mirrored by an increase in the money supply and a rise in inflation.

According to theoretical framework of the Dutch Disease, there are three theoretical reasons why a relative price of non-tradable and therefore an overall price level may rise (Egert et al., 2009; Algozina, 2006). The first reason is related to rise in the non-tradable prices due to labor movement out of this sector. Secondly, higher productivity in the commodity sector pushes up wages in this sector which leads to higher wages in the non-tradable sector and, consequently, to higher non-tradable prices and overall prices. Thirdly, the relative price of non-tradable raises due

[6] With the exception of Norway, which has an inflation targeting framework, all top ten net oil exporters have an external anchor of monetary policy, and most have a strong orientation to the US dollar, i.e. the currency in which oil is priced (Sturm et al., 2009)

to higher profits, wages and related tax revenues of the oil sector are spent on non-tradable goods.

Thus, the Dutch Disease concept may be considered as a relevant theoretical mechanism for explaining the generation of a high price level in Azerbaijan, which is a relatively small and open transition economy providing an interesting case for understanding the price behaviors in such kind of economies.

Objective of the paper is to analyze price level in Azerbaijan, a booming economy.

Various alternative policy measures can be suggested to prevent high price increases in the Azerbaijani economy. For instance, one possible argument can be that main source of price increase is money growth and therefore policy makers should control it, while others may investigate prices in the context of external shocks and conclude that main reason of domestic inflation is the foreign prices and authorities should focus on this issue. In this regard, the current monetary policy measures, to curb high price level in the most of resource dependent countries including Azerbaijan, oriented to increases interest rates and reserve requirements. However, these measures are inefficient due to poorly developed financial markets and dependence of the commercial banks on the foreign borrowing. From the other side, economy faces with high fiscal expansion and due to insufficient independence, the Central Banks have to convert the export revenues of the state budget which in turn leads to high money growth and therefore high inflation. Central Banks try to keep exchange rate stable thus holding fixed exchange rate regime also serves to prevent sharp appreciation of the national currency. However, monetary policy of this design can influence inflation in short term by reducing the appreciation pace, but this effect disappears as a result of purchase of foreign exchange which leads to high domestic price level through high money growth.

Thus, pure monetary policy actions for curbing a high price level in Azerbaijan, experienced resource boom, alone are not enough and have only a temporary dampening effect because of high fiscal spending which is specific for many OEC.

In general, price increases caused by resource boom differ from inflation in a common (non-booming) economy. Therefore, Dutch Disease concept can be considered as a more appropriate framework for explanation and therefore for curbing a high price level in such kind of economies because it may provide an indication of the origin of the price increases. In this regard the suggestions derived from this study may be useful for policymakers in this sense that what kind of actions should be implemented by fiscal and monetary authorities in order to treat negative consequences of resource boom and therefore to curb high domestic price increases.

The study can be divided into two parts. The first part covers estimation issues of real exchange rate equation including factors of resource boom. The second part calculates domestic price level caused by resource boom and then analyzes it in comparison with actual one.

The remainder of this paper proceeds as follows: The Section 2 is devoted to a literature review, while Section 3 describes conceptual framework and strategy of the analysis. Section 4 covers issues of estimation of real exchange rate and Section 5 calculates domestic price level by taking into account factors of resource boom. Concluding remarks are given in Section 6.

2. LITERATURE REVIEW

Since the Dutch Disease concept may be considered as a theoretical framework of the generation of prices in the booming economy as mentioned above, this study should mainly focus on studies that investigate inflation processes related to Dutch Disease[7]. In this regard it would be useful to organize the existing relevant literature by theory covering papers that examine theoretical mechanism linking natural resource abundance to inflation and by evidence reflecting what kind of methodologies are employed and what kinds of conclusions are obtained.

Wijnbergen (1984) theoretically investigated one of major problems, which are specific to the oil-exporting countries - employment and inflation issues by combining Malinvaud-type disequilibrium model with Phillips curve. It is shown that after a transfer, starting from equilibrium, oil-exporting countries end up at the line between repressed inflation and classical unemployment, with the **N** goods market in excess demand mode. **N** goods prices will start to raise over tradable (hereafter **T**) goods prices; wages follow the Consumer Price Index (hereafter **CPI**). Whether the economy slides into repressed inflation or classical unemployment is shown to depend on whether the **CPI** has a large **T** goods component or not. If so, a rise in real wage in terms of **T** goods allows a large drop in the real wage in terms of **N** goods. If the share of **T** goods in consumption is low, however, an increase in the real wage in terms of **T** goods, given the **CPI** indexation, will not allow a large decrease in the real wage in terms of **N** goods, the **N** sector will not absorb all workers shed by the **T** sector, and classical unemployment results.

Edwards (1985) extends traditional Dutch Disease model and explores the monetary consequences of an export boom. Model shows how resource price causes increase in money supply, inflation and appreciation of real exchange rate. Particularly inflation block of this extended Dutch Disease model describes generation of inflation in booming economy.

Lartey (2006) who examines Dutch disease in a small open economy by employing monetary version of two-sector dynamic, stochastic, general equilibrium model with sticky prices in the non-tradable sector and reveals that Dutch disease effects occur under a fixed nominal exchange rate regime during the capital inflow that causing additional pressure on domestic price.

Based on these academic papers and as states Egert (2009) one can describe theoretical mechanism linking natural resource abundance to inflation: (1) resource movement effect can lead to relative price of **N** goods by this way that due to labour movements from **N** sector to **B** sector, supply of **N** goods decrease, which in turn result in increasing price of **N** goods and therefore overall price; (2) spending effect increases additional demand for **N** goods and therefore causes to raise relative price of **N** goods and therefore, overall price increase in economy; (3) higher productivity in **B** sector pushes up wages in this sector which leads to higher wages in the **N** sector and, consequently, to higher **N** prices or consumer price level.

There are number of papers which investigate inflation in resource rich economies. Olin and Olumuyiwa (2000) analyze the major determinants of Iranian inflation for 1990-2000 by applying Vector Error Correction Methodology

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[7] Briefly note that papers investigating theoretical mechanism of Dutch Disease mainly come from Corden and Neary (1982), Corden (1984), Wijnbergen (1984), Buiter and Purvis (1982), Bruno and Sachs (1982), Enders and Herberg (1983), Edwards (1985)which by assuming there are three sectors in an economy (namely the booming (hereafter **B**) and the Lagging (hereafter **L**) sectors which produces tradable goods facing given world price and the Non-tradable (hereafter **N**) sector producing non-tradable goods) shows that boom impacts economy by two effects namely *resource movement effect* and *spending effect* which lead to *direct de-industrialization and indirect de-industrialization* of L sector.

and use variables as money, real income, and exchange rate in the model. They conclude that excess money supply and depreciation of exchange rate have positive impact, while real income has a negative impact on the inflation. The main shortcoming of their research is that the authors did not take into account any variable related to oil revenues. I think that, Iran is an oil-exporting country that is why the oil revenues have a significant effect on their macro-economic environment.

Sadeghi et al. (2007) investigate Iranian inflation depending on exchange rate, excess money supply, oil revenue in the period from 1970 to 2005 years using Auto Regression Distributed Lag (ARDL) Co-integration approach and conclude that the economy suffers from a high inflation rate mainly sourcing from the monetary policy. Because Iran like many other resource rich countries, is vulnerable to the “Dutch Disease”.

By using the Vector Error Correction Model (VECM) Ito (2008) studied the effects of oil price and monetary shocks on the Russian economy as well as inflation covering the quarterly period of 1997-2007. Main findings of his research are that increase in oil prices contributes to inflation over the corresponding periods and monetary shock through interest rate channel immediately affects inflation as predicted by theory.

Arreaza et al. (2003) developed a small scale macroeconomic model for Venezuela consisting of four building blocks: a price equation, an aggregate demand equation (IS curve), an exchange rate equation (UIP) and a policy rule and estimated it by using GMM and OLS over the period of 1989-2001. They concluded that shocks of output, exchange rate and interest rates have a significant effect on inflation.

Odusola and Akinlo (2001) investigated the relationship between income, inflation and exchange rate by using Vector Auto regression (VAR) (official exchange rate, parallel exchange rate, prices, income, money supply, and interest rate) over the period of 1971–1995 in Nigeria and revealed that inflation positively related to the income, money supply and official exchange rate in the short run.

Kamin et al. (1997) in their investigation demonstrated that the level of the real exchange rate was a primary determinant of inflation in Mexico during the 1980s and 1990s.

Siddig (1993) developed Hagen's analytical framework to explain the inflation process in the oil exporting developing countries in the case of Gulf countries over the periods of 1970-1990 by using simple Ordinary Least Squares (OLS) and ARDL approach. He revealed that main determinants of inflation are the import price, exchange rate and money growth which mainly caused by oil revenues.

Ohnsorge and Oomes’ (2005) paper covering on the monthly base 1996 –2004 for Russian economy suggests that monetary aggregates (reflecting foreign currency) and exchange rate co-integrates with prices in long run and these factors are main forces driving inflation fluctuations in short run.

Sosunov and Zamulin (2007) investigated monetary policy in an economy. They used a simple model of monetary policy and calibrated it using parameters relevant for the Russian economy. They showed that tradable consumption grew due to extra export revenue. To prevent the devaluation of the foreign currency, the central bank injected money to the economy by purchasing extra dollars, which could potentially have been spent on imports. After the increase of money supply, the prices of non-tradable tend to grow that in turn causes overall price rising. The authors concluded that in such an economy it is crucial to use international reserve management as a tool to stabilize the economy when a true fiscal stabilization fund is not available. In the case, the international reserve management is used, the monetary authority should respond primarily to inflation, but also to the real exchange rate.

Research history of inflation processes in Azerbaijan is not so long and rich. There are only few papers by Hasanli and Hasanov (2002) and Hasanov (2004) and some reports from NBA and also related international organizations.

However, none of above mentioned papers investigates inflation as a consequence of resource boom. There are only two empirical papers that can be considered relevant to this study: Edwards (1985) and Algozhina (2006). Edwards (1985) tests his extended traditional Dutch Disease model in the case Colombia over the period 1968-1982 and explores the monetary consequences of an export boom. He shows that coffee price causes increase in money supply and therefore inflation.

Algozhina(2006) in her paper investigates inflationary consequence of "Dutch Disease" in Kazakhstan by employing six variables (real GDP, real money supply, exchange rate and real interest rate of government securities and CPI) VAR model with quarterly data from 1996 to 2005. She concluded that there were some symptoms of Dutch Disease in the Kazakhstan and Dutch Disease was a negative condition of the economy causing not only deindustrialization, but also inflation. According to the author, based on the theoretical framework of the Balassa-Samuelson effect, the generation of inflation is inevitable and inflation may increase in the near future as long as the appreciation of the domestic currency continues, and the mining sector continues to be highly productive.

Thus, the reviewed studies support us to conclude that main determinants of inflation are the exchange rate and money growth that are mainly sourced from oil prices (oil revenues) which are specific for booming economy. There are few (Algozhina et al., 2006; Edwards, 1985) studies that investigate inflation as a result of resource boom.

So, this study may contribute existing relevant research area by two ways: On one side there are limited studies, which investigate prices as a consequence of a resource boom, especially in CIS countries, as well as Azerbaijan, on the another side the study is going to utilize specific approach in order to analyze price level in a booming economy.

3. CONCEPTUAL FRAMEWORK AND STRATEGY OF THE ANALYSIS

According to the object of the study the domestic price level will be analyzed as a consequence of a resource boom. As mentioned above traditional approaches for analyzing a price increase caused by a resource boom are ineffective. Maybe because of these approaches unable sufficiently take effects of boom into account and hence are not effective in the booming economy. For example, Money Market Approach assumes that main reason of domestic price increases is excess money supply and by adjusting this supply it is possible to keep domestic prices in the desired level. However, it is so hard or sometimes even impossible to utilize this measure for curbing high price level because of high fiscal spending and conducted monetary policy in the booming economy.

Hence, it is preferable to take effects of a resource boom into account when one analyze and adjust domestic price increases in a booming economy. For this purpose, this study proposed specific approach which concentrates on the equation that characterizes the real exchange rate including factors of resource boom putting together with the nominal exchange rate path, which is decided upon by the authorities, one would be able to calculate the path for domestic price level implied by the developments in the real exchange rate. The idea is that appreciation of exchange rate sourced from resource revenues (or resource price), a key issue of Dutch Disease concept, is specific in booming economy. From another side price level in the economy tends to rise since monetary policy implements fixed exchange rate regime in order to prevent nominal appreciation of national currency by using nominal exchange rate.

Proposed approach assumes a conceptual model which consists of two parts: (a) estimation of real exchange rate including factors of resource boom and then (b) calculation of domestic price level by using calculated real exchange rate (which is derived from the first part and reflects effects of resource boom) and to analyze it together with actual domestic price level.

Such kind of approach allows us to determine the role of effects of resource boom among other determinants such as conducting monetary policy and foreign prices on formation of domestic price level.

In line with above mentioned conceptual model firstly, real exchange rate equation including factor of resource boom will be estimated and then a long-run movement of real exchange rate, which reflects effects of resource boom, was calculated by using long-run coefficients of estimated cointegrating equation. Finally, by using calculated real exchange rate domestic price level reflecting booming effects was calculated.

4. ESTIMATION OF REAL EXCHANGE RATE

Note that all of estimation issues such as real exchange rate equation, the econometric methods, data, and some estimation outputs are given in Hasanov (2010). However, for the sake of convenience for a reader, those sections are introduced in this study again. In order to avoid small sample estimation bias and to make proper inference, I additionally employ two issues in this study which are not exist in Hasanov (2010): (a) Instead of Pesaran's critical values (Pesaran et al., 2001) I employ Narayan's critical values (Narayan, 2005) in Bound Testing Approach to Co-integration and (b) In the Johansen's Co-integration Test I use two kinds of corrections for Trace test statistics proposed by Johansen (2002); Reinsel and Anh (1992); and Reimers (1992).

4.1. Real Exchange Rate Equation

For the estimation of real exchange rate I am going to use behavioral equilibrium exchange rate (BEER) approach (Clark and MacDonald, 1998, 2000). This framework suggests looking for a long-run (co-integrating) relationship between the real exchange rate and its economic fundamentals. The theoretical underpinning of the BEER approach rests on the basic concept of uncovered interest rate parity (UIP):

$$q_t = E_t(q_{t+1}) - (R_t - R_t^*) \tag{1}$$

Where, q_t − is a observed real exchange rate at time t, $E_t(q_{t+1})$ − denotes the expected real exchange rate at time t, R_t and R_t^* − are domestic and foreign real interest rates at time t respectively.

Under the BEER approach the unobservable expectation of real exchange ($E_t(q_{t+1})$) is assumed to be determined solely by a vector of long-run economic fundamentals Z_t (Siregar and Rajan, 2006). It is assumed that Z_t vector mainly consists of three long run fundamentals namely the relative price of non-traded to traded goods (NTT) as a proxy for relative productivity, net foreign assets (NFA) and terms of trade (TOT) [Faruqee, (1995), MacDonald (1997), Stein (1999), Clark and MacDonald, (1998), Clark and MacDonald, (2000)]. Thus, the BEER approach produces the estimates of equilibrium real exchange rate (q_t^{REER}) as a function of the long-run economic fundamentals and the short-run interest rate differentials:

$$q_t^{REER} = f\left(R_t - R_t*, NTT_t, NFA_t, TOT_t\right) \tag{2}$$

As state Korhonen and Juurikkala (2009) one of the privileges of BEER approach is that this approach can take into account country specific features. So, I should make some changes in Equation (2) the based on stylized facts of Azerbaijan economy:

a) Since financial market is weakly developed the interest rate differential can be dropped;

b) The studies such as Koranchelian (2005), Zalduendo (2006), Issa et al. (2006),Oomes and Kalcheva (2007), Korhonen and Juurikkala (2007), Jahan-Parvar and Mohammadi (2008), Mohammadi and Jahan-Parvar (2009) examine relationship between oil price and real exchange rate and reveal that oil prices have a significant impact on the real exchange rates in the oil-exporting countries. Another side some determinants of real exchange rate such as terms of trade, net foreign asset, government spending mainly depend on oil price in the oil-exporting economies. When the oil price raises then terms of trade improves, net foreign assets increases, government expenditure expands and contrary as state Habib and Kalamova (2007). Indeed in the case of Azerbaijan can be observed that there is higher correlation between these above mentioned variables and oil price than real exchange rate. Hence I should exclude terms of trade, net foreign asset from the Equation (2) by including real oil price ($OILP^r$) here;

So, after taking into account above mentioned stylized facts of Azerbaijani economy Equation (2) becomes as following:

$$q_t^{BEER} = f(NTT_t, OILP_t^r) \tag{3}$$

Note that such kind of specification as Equation (3) meets my research objective and is in line with research specifications of Koranchelian (2005), Habib and Kalamova (2007), Korhonen and Juurikkala (2009). On another side as indicates Rautava (2002) given the small number of observations, there is a need to keep the system as small as possible in order to allow for the estimation of parameters.

Since the equilibrium rate is not an officially observable variable, a common empirical approach to estimate the BEER involves two steps. The first step involves estimating the long-run (co-integration) relationship between the prevailing real effective exchange rate (REER) and the economic fundamentals listed in Equation (4):

$$q_t^{REER} = \alpha + \beta_0 ntt_t + \beta_1 oilp_t^r \tag{4}$$

The second step uses the coefficient of these fundamental variables $\left(\hat{\alpha}, \hat{\beta}_0, \hat{\beta}_1\right)$ to compute the behavioral equilibrium exchange rate:

$$\hat{q}_t^{BEER} = \hat{\alpha} + \hat{\beta}_0 NTT_t + \hat{\beta}_1 OILP_t^r \tag{5}$$

4.2. The Econometric Methodology

Since I have small number of observation (only 31 observations) I intend to employ Autoregressive Distributed Lag (ARDL) approach as a main estimation methodology. At the same time in order to check robustness of the results and juxtapose them I am going also to employ Johansen Co-integration Approach in this study. ARDL approach has some advantages compared to other co-integration approaches (Pesaran et al., 2001; Oteng and Frimpong, 2006; Sulayman and Muhammad, 2010): (a) ARDL approach is simple and can be realized by using OLS; (b) There is no endogeneity problem in this method; (c) It is possible to estimate long- and short-run coefficients in one equation simultaneously; (d) It is not needed to Test for Unit Root of variables. In other words, ARDL approach is irrespective whether variables in estimation are I(0) or I(1) or mixture of them; (e) this approach is more effective than others when a study covers small number of observations.

ARDL approach consists of following procedures:

The first stage covers construction of unrestricted Error Correction Model (ECM) as below:

$$\Delta y_t = c_0 + \theta_1 y_{t-1} + \theta_2 x_{t-1} + \sum_{k=1}^{n} \varpi_i \Delta y_{t-k} + \sum_{k=0}^{n} \varphi_i \Delta x_{t-k} + u_t \tag{6}$$

Where, y – is a depended variable; x – stands for explanatory variable; u- is a residuals of model, i.e. white noise errors; c_0 – is a drift coefficients; θ_1 and θ_2- indicate long-run coefficients, while ϖ_i and φ_i- reflect short-run coefficients; Δ - is a difference operator; k – is lag order.

Note that coefficient on y_{t-1}, i.e. θ_1 reflects error correction term.If θ_1 is statistically significant and falls interval of (-1:0) then it can be considered that co-integrating relationship between variables is stable. In other words short run fluctation of variables corrects toward long-run equilibrium level.

It is worth to note that one of the main points in ARDL estmation is to correctly define lag order of the first differenced variables. Becausefinding co-integration relationship between variables is sensitive to lag order (Pesaran et al., 2001, p. 311). Optimal lag order in ARDL is usually defined by minimising of Akaike and Schwarz criteria and at the same time removing serial autocorrelation of the residuals. Note that it is advisable to prefer Schwarz information criterion in the case of small number of observations (Pesaran and Shin, 1997, p.4; Fatai and et al., 2003, p.89).

After constructing proper ECM, the second stage is to test for existence of co-integration between variables. In order to test for co-integration in Bound Testing Approach it is used Wald-Test (or F-Test) on the θ coefficients of Equation (6). Hull hypothesis is that there is no co-integration between variables $(\theta_1 = \theta_2 = 0)$, while alternative hypothesis is that there is co-integration between variables $(\theta_1 \neq \theta_2 \neq 0)$.

Note that F-statistics have non-standard distribution in the case of ARDL. Critical values of F distribution are taken from specific table prepared by Pesaran and Pesaran and are reflected in Pesaran and Pesaran (1997) and also Pesaran et al. (2001). The two sets of critical values provide critical value bounds for all classifications of the regressors into purely I(1), purely I(0) or mutually cointegrated. However, it is worth to note that Narayan (2005) emphasizes that these critical values are generated for sample sizes of 500 and 1000 observations and 20000 and 40000 replications respectively. Narayan (2004b) and Narayan (2005) argues that exiting critical values, because they are based on large sample sizes, cannot be used for small sample sizes. For instance, he compares the critical values generated with 31 observations and the critical values reported in Pesaran et al. (2001) and finds that the upper bound critical value at the 5% significance level for 31 observations with 4 regressors is 4.13 while the corresponding critical value for 1000 observations is 3.49, which is 18.3% lower than the CV for 31 observations. Therefore, I am going to usecritical values which calculated by Narayan for small sample sizes ranging from 30–80 observations and reported in Narayan (2005) for Bound Testing Approach in this study.

If the computed F statistics is higher than the upper bound of the critical values given significance level then the null hypothesis of no cointegration is rejected. If the computed F statistics is smaller than the lower bound of the critical values given significance level then the null hypothesis of no cointegration is accepted. The co-integration test result is inconclusive if computed F statistics falls between upper and lower bands.

If it is found that there is co-integration between variables, then long-run coefficients are estimated as a next step of ARDL approach. Long-run coefficients can be calculated based on estimated Equation (6) by applying Bewley transformation (Bewley, 1979) or manually, by setting $c_0 + \theta_1 y_{t-1} + \theta_2 x_{t-1}$ to zero and solving it for y as following way:

$$y = -\frac{c_0}{\theta_1} - \frac{\theta_2}{\theta_1} x + u \tag{7}$$

As I mentioned above in order to check robustness of the results and juxtapose them I am going also to employ Johansen Co-integration Approach in this study. Johansen (1988) and Johansen and Juselius (1990) full information maximum likelihood of a Vector Error Correction Model, which is as following:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \mu + \varepsilon_t \tag{8}$$

Where, y_t is a (*n x 1*) vector of the *n* variables in interest, $\mu$is a (*n x* 1) vector of constants, Γ represents a (*n x (k*-1)) matrix of short-run coefficients, $\varepsilon_t$denotes a (*n x 1*) vector of white noise residuals, and Π is a (*n x n*) coefficient matrix. If the matrix Π has reduced rank (*0 < r < n*), it can be split into a (*n x r*) matrix of loading coefficients α, and a (*n x r*) matrix of co-integrating vectors β. The former indicates the importance of the co-integration relationships in the individual equations of the system and of the speed of adjustment to disequilibrium, while the latter represents the long-term equilibrium relationship, so that $\Pi = \alpha\beta'$. *K* is number of lags; *t* denotes time and Δ is a difference operator.

Testing for co-integration, using the Johansen's reduced rank regression approach, centers on estimating the matrix Π in an unrestricted form, and then testing whether the restriction implied by the reduced rank of Π can be rejected. In particular, the number of the independent co-integrating vectors depends on the rank of Π which in turn is determined by the number of its characteristic roots that different from zero. The test for nonzero characteristic roots is conducted using Max and Trace [8] tests statistics.

While the ARDL bound testing approach does not require pre-testing order of integration, all variables need to be integrated of order one in order to apply the Johansen Co-integration method. Therefore, before estimating the co-integrated vector-error correction by Johansen's method, the stochastic properties of the data are assessed by means of Unit-Root Tests. I am going to employ Augmented Dickey-Fuller (1981) and Phillips-Perron (1988) unit root tests to assess the time-series properties of the data. The Augmented Dickey-Fuller and Phillips-Perron tests maintain the null hypothesis of non-stationarity of the time series.

4.3. Data

Research covers quarterly data over the period 2000-2007 and includes: real effective exchange rate ($REER$), domestic consumer price index (CPI), and domestic producer price index (PPI), trade-weighted average consumer price index of main trading partners (CPI^F), trade-weighted average producer price indices of main trading partners (PPI^F) and manat-US Dollar bilateral exchange rate and nominal oil price.

Real Effective Exchange Rate is a multilateral consumer price index based on real effective exchange rate of a currency of domestic economy relative to its main trading partners. It is defined in terms of foreign currency per unit of domestic currency, so that an increase in real effective exchange rate means appreciation of domestic currency. Real effective rates are calculated by National Bank of Azerbaijan (NBA) and it can be retrieved from NBA official web-site (www.nba.az).

The Relative Price of Non-Traded to Traded Goods. This variable is used as a proxy for productivity differentials[9].

Productivity differentials are used to capture the Balassa-Samuelson effect[10] that is one of main determinants of real exchange rate. Ideally, direct measurements of productivity in the tradable and non-tradable sectors should be used. However, such kind of data I could not find for Azerbaijan and its main trading partners. So, two kinds of proxies can be used for measuring productivity differentials: The first one is the relative price of non-tradable to tradable; a measurement employed by Macdonald (1997) Clark and MacDonald (1998), Clark and MacDonald (2000), Egert (2007), AlShehabi and Ding (2008), Egert (2009) and other researches. The second one is GDP per capita in PPP terms relative to trading partners, which was used by Chudik and Mongardini (2007). Because of two reasons I use the first proxy: a) The CPI/PPI ratio explicitly differentiates between the tradable and non-tradable sectors, a feature that is lacking in the second measurement; b) In order to calculate GDP per capita in PPP terms relevant variables over the required period and for all trading partner could not be found. Therefore, I decided to use relative price of non-traded to traded goods (NTT) as a proxy for relative productivity and it is defined as below:

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[8] Since Trace tests tend to reject the null hypothesis of no co-integration in small samples, Johansen (2002) shows that as long as the number of parameters per observation, kn/T (with k equal to the number of lags in VAR, n is the number of endogenous variables and T is the length of the sample), is less than 0.20, the Trace test will give robust results. It is useful to take this ratio into account for our co-integration relationships because of we also have small numbers of observations.

[9] Note that to use the relative price of non-traded to traded goods as a proxy for productivity differentials and its definition is in line with the large number of studies, including Macdonald (1997), Clark and MacDonald, (1998), Clark and MacDonald, (2000), Egert (2007), AlShehabi and Ding (2008), Egert (2009).

[10] The Balassa-Samuelson hypothesis postulates that increases in the productivity of the tradable sectors cause non-tradable prices to increase relative to tradable prices, leading to real exchange rate appreciation.

$$NTT = \frac{\left(\frac{CPI}{PPI}\right)}{\left(\frac{CPI^F}{PPI^F}\right)} \tag{9}$$

Trade-weighted average consumer price index of the major trading partners is calculated as below:

$$CPI^F = \sum_{i=1}^{11}\left(CPI^i w^i\right) \tag{10}$$

$CPI^i -$ is a consumer price index of *i*-th trading partner, $w^i -$ is *i*-th trading partner's weight in overall trade volume of Azerbaijan.

Analogically trade-weighted average producer price index of the major trading partners is calculated as below:

$$PPI^F = \sum_{i=1}^{11}\left(PPI^i w^i\right) \tag{11}$$

$PPI^i -$ is a producer price index of *i*-th trading partner.

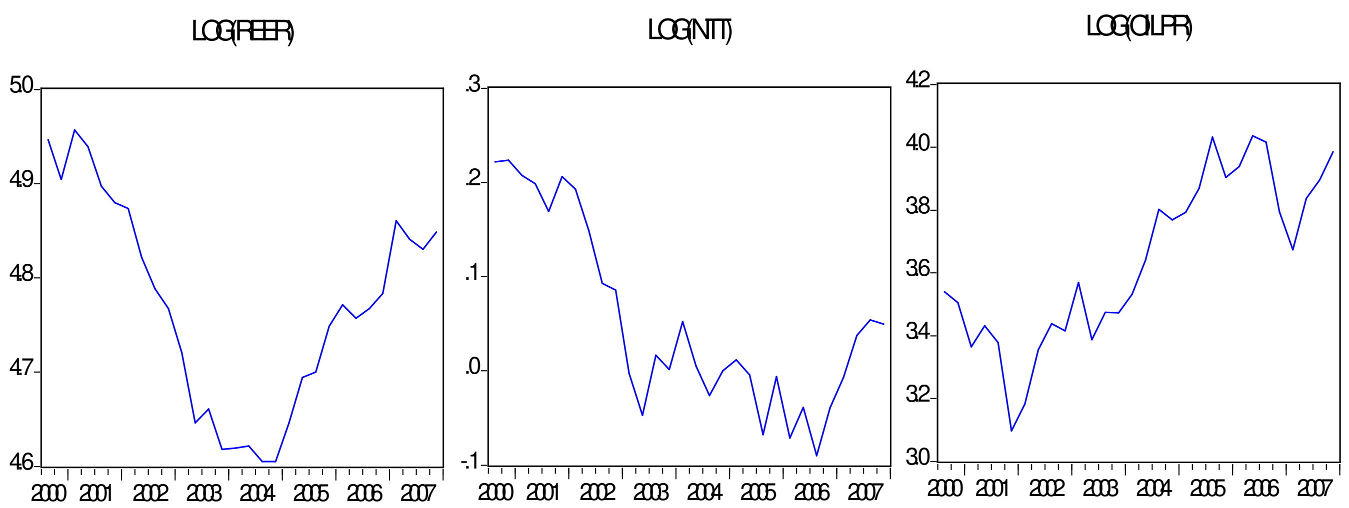
Required data in order to calculate CPI^F and PPI^F is taken from the International Financial Statistics (IFS) and official web page of CBA.

CPI and PPI for Azerbaijan are taken from State Statistical Committee's bulletins on monthly base. Weights of main trading partners in overall trade turnover of Azerbaijan are taken from CBA bulletins.

Real Oil Price ($OILP^R$) is calculated as nominal oil price is multiplied by nominal manat-US Dollar bilateral exchange rate and divided by CPI. As nominal oil price is taken crude oil price of United Kingdom Brent from IFS databases.

The time profile of real effective exchange rate, relative productivity and real oil price in their logarithm expressions are given Figure 1 below:

Figure 1: Time profiles of the variables



4.4. Estimation outputs

In order to know stochastic properties of variables first I perform Unit Root Test by employing Augmented Fickey Fuller and Phillip Perron Tests. Tests outputs are given Table B.1 in the Appendix B and as shown from the test results all three variables are non-stationary in their level and stationary in the first difference. In other words they are I(1). Note that appropriate lag length for variables are selected by Schwarz information criterion.

Equation (6) in my case has following specification:

$$\Delta reer_t = c_0 + c_1 dum07Q1 + \theta_1 reer_{t-1} + \theta_2 oilp^r{}_{t-i} + \theta_3 ntt_{t-1} + \sum_{i=1}^{n} \varpi_i \Delta reer_{t-i} + \sum_{i=0}^{n} \varphi_i \Delta oilp^r{}_{t-i} + \sum_{i=0}^{n} \beta_i \Delta ntt_{t-i} + u_t \quad (12)$$

Where, dum07Q1 – is a dummy variable which take one for the first quarter of 2007 and zero otherwise. This dummy is used for capturing sharp appreciation of real effective exchange rate in the first quarter of 2007 which may be tightly related to huge inflow of oil revenues and incresing in administrative price and therefore in CPI [11]. Also note that small letters indicate logarithmic expressions of variables in the estimations.

As the first step of ARDL approach, I estimate Equation (12) with maximum lag of the first differenced right-hand side variables and seven lags are maximum. Then I seek optimum lag for the first differenced right-hand side variables by minimizing value of Akaike and Schwarz criteria and at the same time by testing serial autocorrelation of residuals of Equation (12) in each lag order . According to to Schwarz criterion one lag is optimal while Akakike criterion indicates two lag. As mentioned in the Methodological section it is advisable to prefer Schwarz information ctiretion in case of small number of observations and therefore, I choose one lag as optimal order.

As a next step I perform Bound Test for checking existence of cointegration between level lagged variables of Equation (12) [12]. Since calculated F-statistics, **10.42** is higher than the **7.607**, upper bound of critical value[13] at the 1% significance level I can conclude that there is co-integration between real effective exchange rate, real oil price and relative productivity.

After getting co-integration between variables next step is to estimate long-run coefficients. Long-run coefficients is derived from Final ECM specification. Final ECM specification and long-run relationship between variables are given Equation (13) and Equation (14) respectively

$$\Delta reer_t = 0,41 - 0,20 reer_{t-1} + 0,15 oilp^r{}_{t-1} + 0,39 ntt_{t-1} + 0,29 \Delta ntt_t - 0,15 \Delta ntt_{t-1} - 0,14 \Delta oilp^r{}_{t-1} + 0,06 dum07Q1_t \quad (13)$$

Final ECM specification is satisfactory in terms of some test characteristics as shown Table B.2 in the Appendix B[14].

$$reer = 2,02 + 0,75\, oilp^r + 1,95\, ntt \quad (14)$$

---

[11]An administrative price was increased 40% at the January of 2007 relative to previous month and it caused high inflation rate and therefore, high appreciation of real effective exchange rate.

[12]Note that we found co-integration between variables also when we estimate equation (12) with two lags.

[13]In the case of 31 observations, unrestricted intercept and no trend and k=2[Narayan (2005), page 1988]

[14]In order to save space other test results (such as residuals tests, coefficients tests, misspecification tests and etc.) are not given in the paper and can be obtained from author under request.

Now in order to check robustness of the results and juxtapose them I employ Johansen Co-integration Approach. First I look for optimum lag length relying on Lag Order Selection Criteria. The most of these criteria indicate that two lags are appropriate.

Thereby, I estimate VAR model with two lags, three endogenous variables, namely real effective exchange rate, real oil price and relative productivity and exogenous variables such as constant and dummy variables namely dum07Q1. Note that this VAR model is satisfactory in terms of stability test, residuals serial autocorrelation, and normality and heteroskedasticity tests (Detailed information can be obtained from author).

Then I perform Co-integration Test based on this VAR and as shown from the Table C.1 in Appendix C both Trace and Max-Eigen Tests indicate existence of one co-integration relation between variables in four of Co-integration Test Specifications. Since there are four competing versions I should choose more relevant one among them. I estimate VECM in each of these four specifications and compare them with their properties. The results are given Table C.2 in Appendix C. As shown from the Table C.2 fourth specification, i.e. “Intercept and trend in CE–no trend in VAR” is not relevant one due to trend coefficient is not statistically significant. The first specification also is not appropriate because of weak exogeneity test of real oil price is not satisfactory here. Thus, I should choose relevant one among the second and the third specifications. One can prefer rather the third specification than second in terms of R-squared, Sum squared of residuals, Log Likelihood and highly significance of weak exogeneity Test. Thus, at the final I consider that the third specification is the most relevant one. So, long-run relationship between real effective exchange rate, real oil price and relative productivity derived from Johansen co-integration approach in given Equation (15)

$$reer = 2{,}00 + 0{,}74\, oilp^{r} + 2{,}10\, ntt \qquad (15)$$

Note that this long-run equation is satisfactory in terms of autocorrelation, normality and heteroskedasticity tests of residuals (See: Table C.2 in Appendix C).

By using long-run coefficients of variables in Equation (15) I construct error correction term. ECM based on Johansen approach is as below:

$$\begin{aligned}\Delta reer_t = -0{,}15\, ecm_{t-1} + 0{,}21\,\Delta reer_{t-2} + 0{,}25\,\Delta ntt_t - \\ - 0{,}14\,\Delta oilp^{r}_{t-1} + 0{,}08\,\Delta oilp^{r}_{t-2} + 0{,}05\, dum\,07Q1_t\end{aligned} \qquad (16)$$

Since coefficient of error correction term is statistically significant and with negative sign I can conclude that there is stabile long-run relationship between variables (See: Table C.2, in Appendix C). Based on these error correction terms I can calculate half-life speed (HLS) of adjustments towards long-run equilibrium (i.e. how many quarter would need manat’s real effective exchange rate to restore half of its equilibrium) and it is revealed that half-life speed of adjustments approximately takes 3-4 quarters in the case of Azerbaijani real effective exchange rate.

4.5. Interpretations of the Estimation Results

Long-run coefficients derived from ARDL and Johansen approaches are very close to each-other as shown from Equation (14) Equation (15) respectively. According to these equations **one percent** increase (decrease) in the real oil price leads to approximately **0.7 percent** appreciation (depreciation) of the real effective exchange rate of manat.

It is worth to note that the finding is in consistent with findings in case of other OEC. For example, Cashin (2002) for 22 commodity exporting countries, Koranchelian (2005) for Algeria, Zalduendo (2006) for Venesuela, Issa et al. (2006) for Canada, Habib and Kalamova (2007) for Norway, Saudi Arabia and Russia, Oomes and Kalcheva (2007) for Russia, Jahan-Parvar and Mohammadi (2008) and Mohammadi and Jahan-Parvar (2009) for 14 oil-exporting countries, Korhonen and Juurikkala (2009) for 9 OPEC countries.

This finding, existence of a cointegration between real oil prices and real exchange rates, indicates that impact of booming effects on appreciation of real exchange rate is crucial in Azerbaijani economy.

One percent rise (decrease) in relative productivity causes approximately **2 percent appreciations** (depreciations) in real effective exchange rate of manat. This finding is also in line with findings of other studies. For example, statistically significant and positive impact of relative productivity on real exchange rate also found by Halpern and Wyplosz (1997) for Transition countries of Eastern Europe and Former USSR; Egert and Lommatzsch (2004) for Transition countries of Eastern Europe; Egert (2005) for Bulgaria, Croatia, Romania, Russia, Ukraine, Turkey; Koranchelian (2005) for Algeria; Egert et al. (2007) for Central and Eastern European economies; Habib and Kalamova (2007) for Russia; Zalduendo (2006) for Venesuela; Oomes and Kalcheva (2007) for Russia; and Korhonen and Juurikkala (2009) for 9 OPEC countries. However, one should be careful when interpret relative productivity in case of Azerbaijan. The point is that as Balassa-Samuelson Hypothesis states that an increase in a relative price of non-tradable sourced from productivity increase in tradable sector (i.e. in manufacturing and agriculture) is not case for Azerbaijani economy. If one look at the productivity growth in non-oil tradable sector (manufacturing and agriculture) it can be observed that there has been downward trend here and on another side there has been high Unit Labor Cost growth in non-oil tradable and non-tradable sectors, especially since 2004 (See: Figure D.1 in Appendix D). Therefore, increasing in relative price of non-tradable can be explained by rather spending effect of oil revenues in non-tradable sector as budget expenditures than Balassa-Samuelson Effect. Indeed main part of oil revenues in form of government expenditure is oriented to non-tradable sector of economy and this excess demand creates price increase in this sector (See: Figure D.2 in Appendix D). Thereby one can conclude that increasing in relative price of non-tradable, one of the main determinants of appreciation of real effective exchange rate mostly associates with high effects of oil boom, than Balassa-Samuelson Effect.

Study also reveals that according to coefficients of error correction terms derived from Johansen and ARDL approaches 15-20 percent of short-run disequilibrium can be corrected toward long-run equilibrium path within a quarter and half-life speed of adjustment approximately takes 3-4 quarters in the case of Azerbaijani real effective exchange rate.

As shown from the Equation (14) and Equation (15), the ARDL and Johansen co-integration approaches almost yield the same results. Equation (17) reflects averaged long run coefficients of Equation (14) and Equation (15):

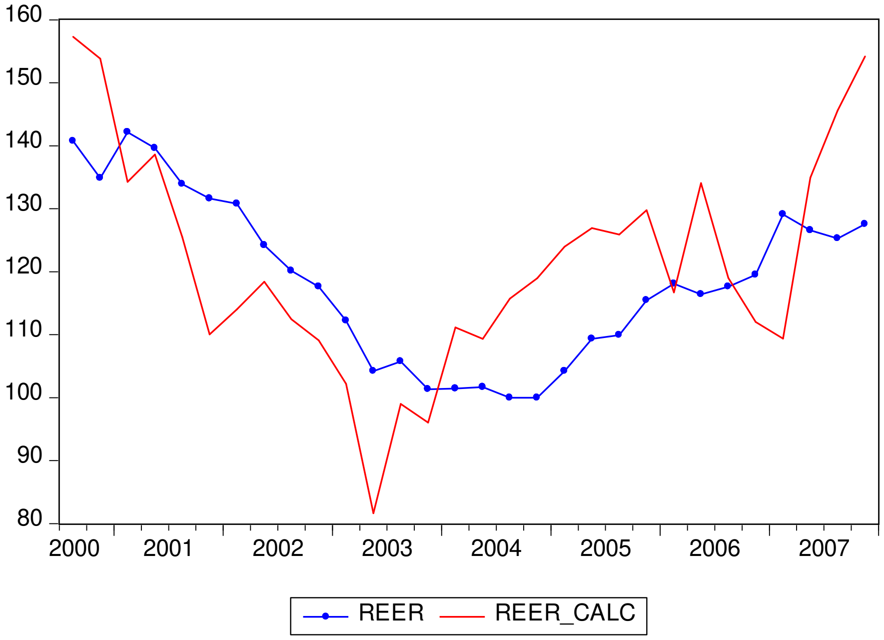
$$reer = 2{,}01 + 0{,}75\, oilp + 2{,}03\, ntt \tag{17}$$

Equation (17) in terms of levels of variables can be written as below:

$$REER = 7.46 \cdot OILP^{R\,0.75} \cdot NTT^{2.03} \tag{18}$$

Long-run paths of actual and calculated real effective exchange rate based on Equation (18) are illustrated in Figure 11.

Figure 2: Actual and calculated levels of real effective exchange rate



Source: Author's own construction based on CBA data and own calculation.

As shown from the Figure 2, calculated real effective exchange rate (REER_CALC) has been higher than actual (REER) since 2004[15]. Since calculated real exchange rate reflects effects of resource boom it can be concluded that since 2004 these effects have had crucial impact on the economy. It is worth to note that this finding is consistent with conclusions of the author's another study, namely "Dutch Disease and Azerbaijan economy".

5. CALCULATION OF DOMESTIC PRICE LEVEL

Usually, real effective exchange rate can be calculated as below:

$$REER_t = NEER_t * \frac{CPI_t}{CPI_t^F} \tag{19}$$

Where, $REER_t$ - is a real exchange rate and its increase means appreciation of national currency as defined above; $NEER_t$ - stands for nominal effective exchange rate and its increase also means appreciation of national currency; CPI_t - is a domestic consumer price index and CPI_t^F - is a trade-weighted average consumer price index of the major trading partners.

Note that trade-weighted average consumer price index of the major trading partners is calculated as below:

$$CPI_t^F = \sum_{i=1}^{11} \left(CPI_t^i * w^i \right) \tag{20}$$

[15] As shown from Figure 11 the calculated real effective exchange rate was lower than actual in the period end of 2006 and beginning of 2007. We assume that this case is sourced mainly from two reasons: 1) There was observed sharp downward in oil price since the third quarter of 2006 and it caused decline in calculated real effective exchange rate (See: Appendix D, Figure D.4) There was high price level since the end of 2006 and especially in first quarter of 2007 in the economy and it in its turn leaded to sharp appreciation of actual effective exchange rate (See: Appendix D, Figure D.5).

Here, $CPI_t^i -$ is a consumer price index of *i*-th trade partner, $w^i -$ is *i*-th trade partner's weight in overall trade volume of Azerbaijan.

If I re-write Equation (19) for CPI_t then I get:

$$CPI_t = \frac{REER_t * CPI_t^F}{NEER_t} \tag{21}$$

In order to take effects of resource boom into account in the generation of domestic prices calculated real exchange rate (RER_CALC) is used instead of actual ($REER_t$) in the calculation as below:

$$CPI\_CALC_t = \frac{REER\_CALC_t * CPI_t^F}{NEER_t} \tag{22}$$

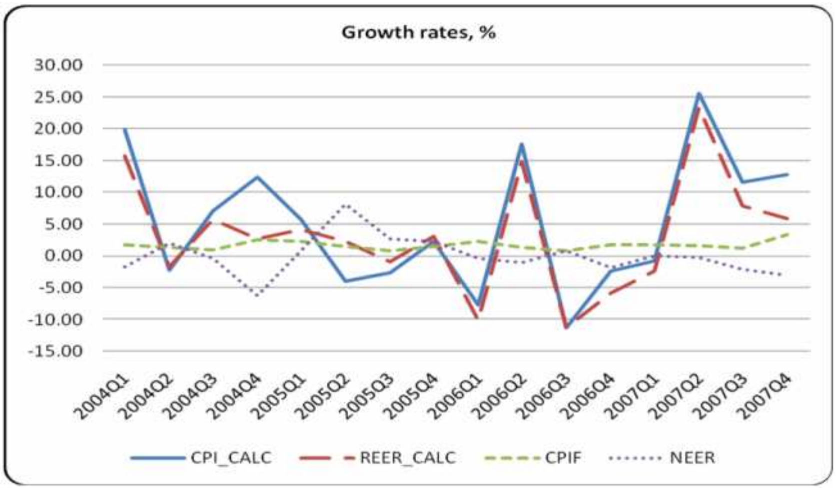
As shown from Equation (22), calculated CPI (CPI_CALC) generates under impacts of tree kinds of factors such as resource boom, foreign prices, and monetary policy. Foreign price has positive impact on domestic price because of Azerbaijan is small open economy. In this regard foreign price can be considered as a proxy for foreign factors. The Central National Bank of Azerbaijan implements rather fixed than flexible exchange rate regimen to prevent appreciation of national currency by using bilateral exchange rate as operational target and nominal effective exchange rate as intermediate target. Hence one can consider nominal effective exchange rate as a proxy for monetary policy. Estimated real effective exchange rate reflects impacts of factors of resource boom on domestic price level.

Thus, such kind of approach (calculation) allows us to take effects of resource boom into account in formation of domestic prices which is in line with our research objective.

It would be interesting to analyze some aspects of calculated CPI and its determinants and to reveal that which factor has much more contribution on it.

The dynamics of growth rates of calculated CPI and its determinants are depicted Figure 12:

Figure 3: Growth rates of calculated CPI and its determinants



Source: Author's own construction based on CBA data and own calculation.

Figure 3 shows that growth rate of calculated CPI has been followed by growth rate of calculated REER (which reflect impacts of booming effects on price level) rather than foreign price and growth rates of the first two variables have depicted almost the same trajectory since the end of 2005. Based on this it can be assumed that change in calculated CPI is mainly sourced from change in calculated REER than foreign prices. From the other side one can come conclude that there is inverse relationship between calculated CPI and NEER based on visual inspection of the Figure 3. Correlation matrix of the variables over the period 2004Q1-2007Q4 confirms this assumption again:

Table 1: Correlation matrix of variables

	CALCULATED INFLATION	FOREIGN INFLATION	NEER growth rate	REER_CALC growth rate
CALCULATED INFLATION	1.000000			
FOREIGN INFLATION	0.236050	1.000000		
NEER growth rate	-0.479349	-0.461380	1.000000	
REER_CALCgrowth rate	**0.942352**	0.030773	-0.165193	1.000000

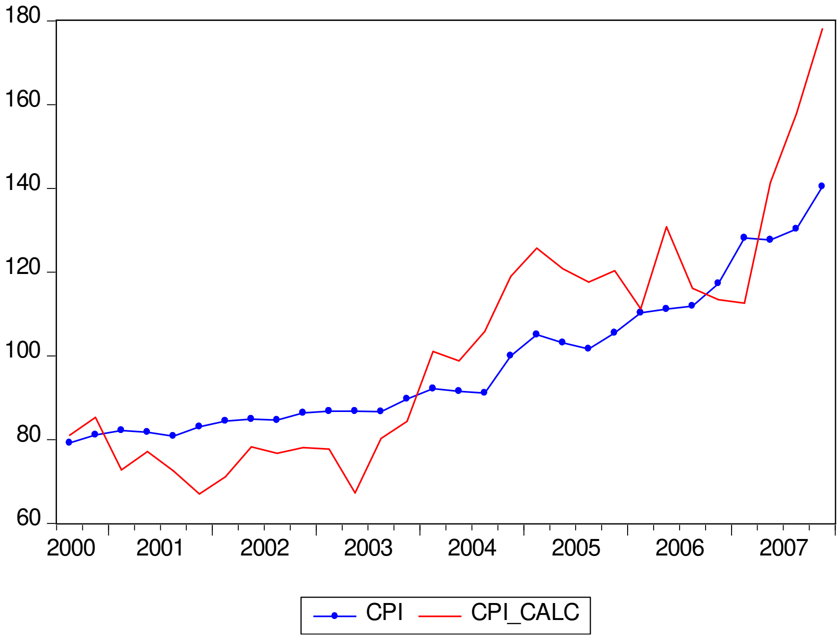
Source: Author's own construction based on CBA data and own calculation.

Table 1 indicates that there is high positive correlation between calculated CPI and calculated REER. Furthermore, foreign price has positive impact on domestic price, while nominal effective exchange rate has negative.

Thus, based on Figure 3 and Table 1 it can be concluded that calculated REER which reflects booming effects was driving factor of high domestic price level in the country during the period of 2004 – 2007. Moreover, foreign price as a proxy for small open economy has positive impact on domestic prices while nominal effective exchange rate as a proxy of monetary policy has negative.

Figure 4 illustrates time profiles of actual and calculated CPI over the research period as below.

Figure 4: Actual and calculated levels of CPI



Source: Author's own construction based on CBA data and own calculation.

As shown from the Figure 4, in general calculated CPI (CPI_CALC) which mainly originated under the effects of resource boom has been higher than actual CPI since 2004[16].

Based on Figure 2-4, it can be assumed that periods of oil boom and high domestic price level are coincide. These facts indicate that effects of oil boom have been crucial in formation of high price level in the Azerbaijani economy especially since 2004.

Inflation caused by a resource boom differs from the inflation generated by a non-booming (normal) economy. Thereby, inflation mainly caused by resource boom has its own specific features in terms of impact on economy and therefore requires specific policy response. For example, a price increase in non-booming economy is not so dangerous and sometimes it is considered as stimulus for economic growth. However, it is not the case in terms of price increases sourced from the booming economy. The most important cost of such inflation is that it leads to decline in a non-booming tradable sector as predicted by Dutch Disease theory[17]. Welfare costs of inflation increases with the level of price increase. In this regard high inflation generated by the booming sector negatively affects incomes generated by non-booming sector reducing their purchasing power which imposes substantial social burden on people employed in the non-booming sector.

Various alternative policy measures can be suggested to prevent high price increases in the booming economy. For instance, one possible argument can be that main source of inflation is money growth and therefore policy makers should control it, while others may investigate domestic prices in the context of external shocks and conclude that main reason of domestic inflation is the foreign prices and authorities should focus on this issue. In this regard, the current monetary policy measures, to curb high price level in the most resource dependent countries, oriented to increase interest rates and reserve requirement. However, these measures are inefficient due to poorly developed financial markets and dependence of the commercial banks on the foreign borrowing. From the other side, economy faces with high fiscal expansion and, due to insufficient independence, the Central Bank has to convert the export revenues of the state budget which in turn leads to high money growth and therefore high inflation. The Central Bank tries to keep exchange rate stable thus holding fixed exchange rate regime also serves to prevent sharp appreciation of the national currency. However, monetary policy of this design can influence inflation in short term by reducing the appreciation pace, but this effect disappears as a result of purchase of foreign exchange which leads to high inflation through high money growth.

In such environment ability of the Central Bank in fighting against high inflation is limited, but this organization with a goal of price stability has to implement relevant measures in curbing high price increases. From the other side, since the main undesirable outcomes, including high price level in the booming economy, are mainly sourced from expanding fiscal expenditures and the measures oriented to elimination of these outcomes are subjects of fiscal policy.

[16] There are some exceptions here. These exceptions are observed in the first and fourth quarter of 2006 and first quarter of 2007 that may be due to increase in administrative price. Administrative price was increased 3.6% and 40.9% in first quarters of 2006 and 2007 respectively.

[17] This process may happen by two alternative ways: Increasing price in non-tradable sector due to excess demand caused by fiscal expansion leads to raise cost of goods and services in non-oil tradable sector. labour and capital resources in non-oil tradable sector tend to movement toward non-tradable sector because of high rate of return as stated "Resource Movement effect". In this circumstance non-oil tradable sector has two choices: a) In order to prevent capital and labour movement producers in non-oil tradable sector can increase wages and rate of return for capital. But in this case due to increase in cost of production the price of non-oil tradable goods will go up and since price of non-oil tradable goods adjusted by the world market increased price in non-oil tradable sector results losing in competitiveness and therefore production of this sector will decrease. b) Movement of labour and capital from non-oil tradable to non-tradable sector results deterioration in non-oil tradable sector.

Consequently efficient coordination and consistent joint action of fiscal and monetary policies are essential. In this context fiscal policy, aimed at productive and stable growth, and monetary policy, with a goal of price stability, should be implemented under efficient coordination and consistent joint action for eliminating undesirable effects of oil boom and therefore curbing high price level.

6. CONCLUSIONS AND POLICY SUGGESTIONS

The study tries to investigate price level in Azerbaijan, the booming economy by employing specific approach over the period of 2000-2007. Analyses show that effects of oil boom have been crucial in generating high domestic price level in the economy since 2004. At the same time domestic prices are positively impacted by foreign prices while negatively affected by nominal effective exchange.

Moreover, it is found that the nature of inflation caused by resource boom differs from inflation originated in non-booming economy. Therefore, in such environment ability of the Central Bank in fighting against high inflation is limited, but this organization with a goal of price stability has to implement relevant measures in curbing high price increases. From the other side, since the main undesirable outcomes, including high price level in the booming economy are mainly sourced from expanding fiscal expenditures and the measures oriented to elimination of these outcomes are subjects of fiscal policy.

Proceeding from the above-mentioned framework, some recommendations can be made which may be useful for policy makers in preventing economy from high price level:

Monetary policy implementation

Instead of the currently implemented measures as changes in refinancing rate and changes of the reserve requirements, it would be suggested that the Central Bank should pay more attention especially on the two issues:

- Development of financial market;
- Strengthening independence of the Central Bank.

If financial market is developed then traditional instruments, especially open market operation will be effective in terms of attaining price stability. Another disadvantage caused by the insufficient independence of Central Bank is the fact that it has to convert any amount of foreign currency into national currency that is required by the Government, which in turn leads to high inflation.

Fiscal policy implementation

Since there is high domestic price level in the presence of relative deterioration in non-booming tradable (manufacture and agriculture) sector and development in non-tradable sector, caused by oil boom, fiscal policy recommendations proposed by the paper mainly oriented to development of non-booming tradable sector and comprises following:

- Reduction of high fiscal expenditures which are mainly oriented to non-tradable sector;
- Efficient use of oil revenues in a favor of non-oil tradable sector development;

- Establishment and support of domestic non-oil industries;
- Attracting foreign direct investments into non-oil tradable sector, especially export oriented branches;
- Promotions (tax concessions, subsidies, soft line credits and etc.) to non-oil industry and agriculture, especially to the export oriented and import substituting and also strategic branches;
- Elimination of institutional constraints, improvement of relevant legislation with a view of developing non-oil tradable sector;
- Development of education and investment in human capital.

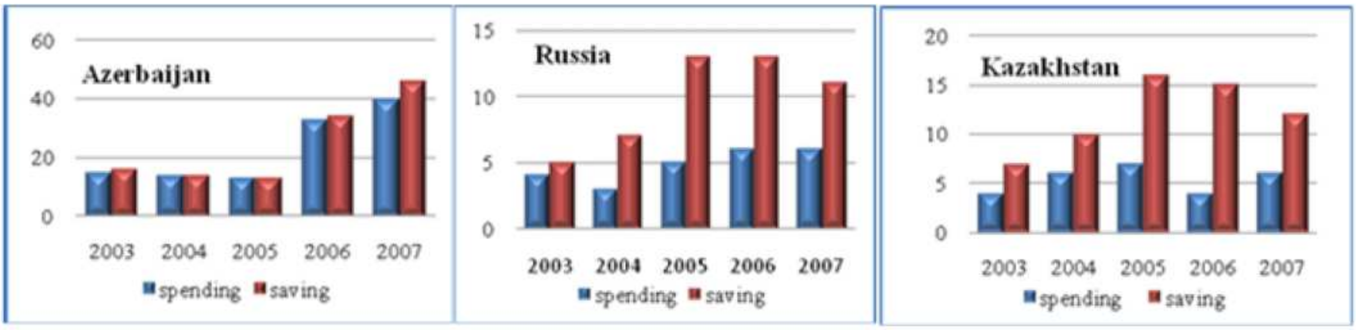
Above mentioned fiscal measures are essential in the development of non-booming tradable sector and therefore in an increase of aggregate supply which is important for preventing high price level in a booming economy.

Thus, monetary policy aimed at protection of the price stability and fiscal policy with a goal of productive and stable growth should be implemented under condition of efficient coordination and consistent joint action in order to eliminate undesirable effects of oil boom and therefore to prevent high domestic prices in the Azerbaijani economy.

Appendix A: Stylized facts in the management oil revenues in the Azerbaijan Republic[18]

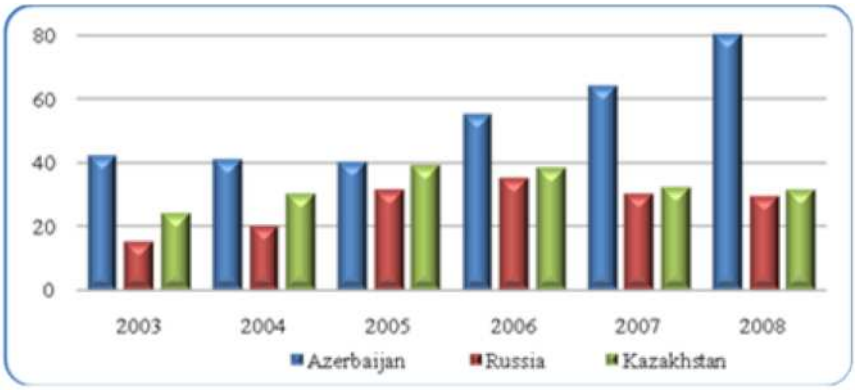
a) Spending part of oil revenues is rather higher in Azerbaijan than others.

Figure A.1 Spending and saving out of oil and gas revenues (as percent of non-oil GDP)



b) Oil related fiscal revenues are crucial in general government revenues

Figure A.2 Oil revenues as a share of government revenues



c) The share of non-oil deficit in non-oil GDP is quite high.

Figure A.3 Non-oil deficits as a share of non-oil GDP (total GDP in Russia)

d) Azerbaijan-much higher volatility of fiscal policies and pro-cyclical spending patterns.

Table A.1 Indicators of non-oil deficit volatility (2003-2007)

	Azerbaijan	Kazakhstan	Russia
Standard deviation of non-oil deficit	12.6	1.3	0.9
Correlation: real growth rates of expenditure and oil revenues	0.97	-0.13	0.34

[18] All figures and table in Appendix A are taken from Paczyński and Tochitskaya (2008)

Appendix B: Estimation Outputs of ARDL Approach[19]

Table B.1: ADF and PP Unit Root Test Results

Variables	Test Method	İn the level			İn the first difference		
		Constant	Trend	Actual value	Constant	Trend	Actual value
LOG(REER)	*ADF*	Yes	Yes	-0.264032	No	No	-4.800968***
	PP	Yes	Yes	-0.416001	No	No	-5.038039***
LOG($OILP^r$)	*ADF*	Yes	Yes	-2.398926	No	No	-5.549716***
	PP	Yes	Yes	-2.398926	No	No	-5.601480***
LOG(NTT)	*ADF*	No	No	-2.041835	No	No	-6.571813***
	PP	No	No	-2.018383	No	No	-6.720613***
Note that *, ** and *** asateriks above actual values indicate statistical significance of actual value at the 10%, 5% and 1% significance levels respectively. Number of observations are 31. Seven lags were used in ADF test automatically and appropriate lag length is selected by Schwarz criterion							

Table B.2: Final ECM Specification with legged level variables

Dependent Variable: DLOG(REER); Method: Least Squares;				
Independent Variables	Coefficient	Std. Error	t-Statistic	Prob.
LOG(REER(-1))	-0.201001	0.052328	-3.841163	0.0008
LOG(NTT(-1))	0.389387	0.099174	3.926307	0.0007
LOG($OILP^r$(-1))	0.147203	0.026386	5.578826	0.0000
C	0.405052	0.221021	1.832639	0.0798
DLOG(NTT)	0.288799	0.081645	3.537239	0.0018
DLOG(NTT(-1))	-0.146740	0.080938	-1.813003	0.0829
DLOG($OILP^r$(-1))	-0.144408	0.036001	-4.011182	0.0005
DUM07Q1	0.056480	0.022799	2.477245	0.0210
R-squared	0.756533	Mean dependent var		-0.003850
Adjusted R-squared	0.682435	S.D. dependent var		0.034770
S.E. of regression	0.019594	Akaike info criterion		-4.809577
Sum squared resid	0.008830	Schwarz criterion		-4.439516
Log likelihood	82.54844	Hannan-Quinn criter.		-4.688946
F-statistic	10.20983	Durbin-Watson stat		2.010402
Prob(F-statistic)	0.000009			

Appendix C. Estimation Outputs of Johansen Approach[20]

Table C.1: VAR Co-integration Test Output

Series: LOG(REER_T_04) LOG(NTT) LOG($OILP^r$) Exogenous series: DUM07Q1; Lags interval: 1 to 2					
Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	1	1	2
Max-Eig	1	1	1	1	2
*Critical values based on MacKinnon-Haug-Michelis (1999)					

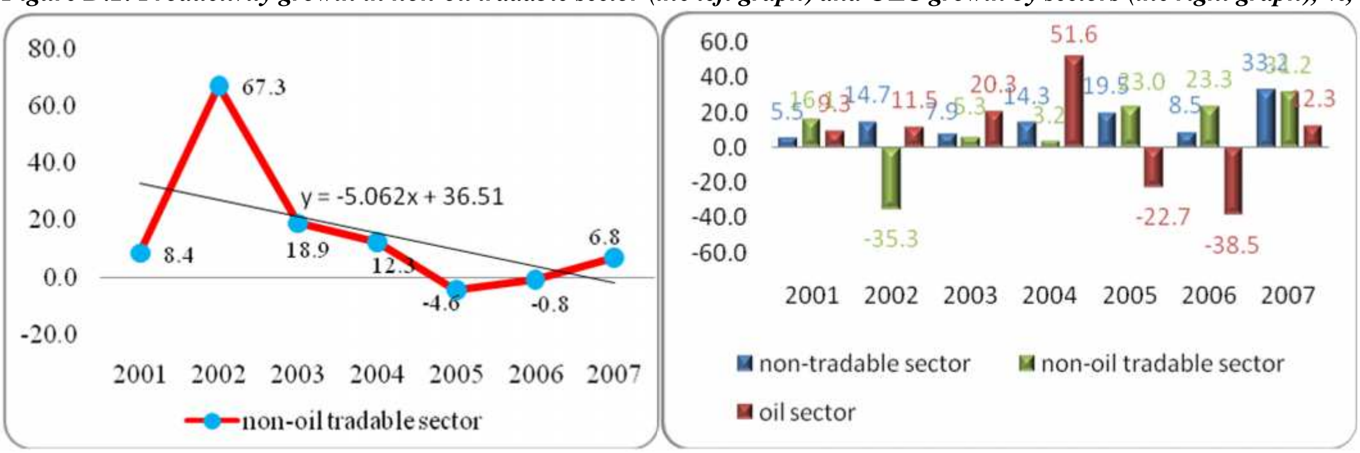
[19] All tables in Appendix B are taken from Hasanov (2010)
[20] All tables in Appendix C are taken from Hasanov (2010)

Table C.2: REER Co-integration Equations Specifications and Residuals Tests and Weak Exogeneity Tests

	Co-integration Equations Specifications			
	No intercept or trend in CE or VAR	Intercept (no trend) in CE–no intercept in VAR	Intercept (no trend) in CE and VAR	Intercept and trend in CE–no trend in VAR
reer	1.00000	1.00000	1.00000	1.00000
ntt	2.90963	2.22077	2.10013	2.15554
t-statistics:	[-9.68844]	[-6.05912]	[-5.99229]	[-4.20601]
$oilp^{r}$	1.26224	0.81671	0.73959	-1.27059
t-statistics:	[-138.025]	[-4.83501]	[-4.57890]	[-5.16496]
C		1.67033	-1.99530	-0.43342
t-statistics:		[-2.66689]		
@trend				-0.00995
t-statistics:				[1.64232]
ECM coefficient	-0.07534	-0.11437	-0.12334	-0.09191
t-statistics:	[-2.77808]	[-3.01422]	[-2.72339]	[-2.70577]
Statistical Properties				
R-squared	0.68279	0.69632	0.69818	0.69719
Sum squared residuals	0.01150	0.01101	0.01095	0.01098
Log Likelihood	78.44756	79.12283	79.21806	79.16756
Akaike AIC	-4.54500	-4.58857	-4.53020	-4.52694
SchwarzSC	-4.17494	-4.21851	-4.11388	-4.11062
Residuals Tests				
LM Test	OK	OK	OK	OK
Jarque-Bera	12.09927	3.71554	3.48120	2.07476
Prob.	0.05980	0.71510	0.74650	0.91270
White Heterosk. Test (Chi-sq)	93.19313	99.58763	95.95743	95.48142
Prob.	0.36790	0.22960	0.31420	0.32630
Weak Exogeneity Test				
$\alpha_{reer} = 0$	7.569794	8.58729	7.32987	6.12715
Prob.	0.00594	0.00339	0.00678	0.01331
$\alpha_{ntt} = 0$	0.79858	1.33686	1.77627	0.26029
Prob.	0.37152	0.24759	0.18261	0.60992
$\alpha_{oilp^{r}} = 0$	6.82660	2.90925	1.21983	2.68776
Prob.	0.00900	0.08807	0.26940	0.10112

Appendix D: Graphic Illustrations[21]

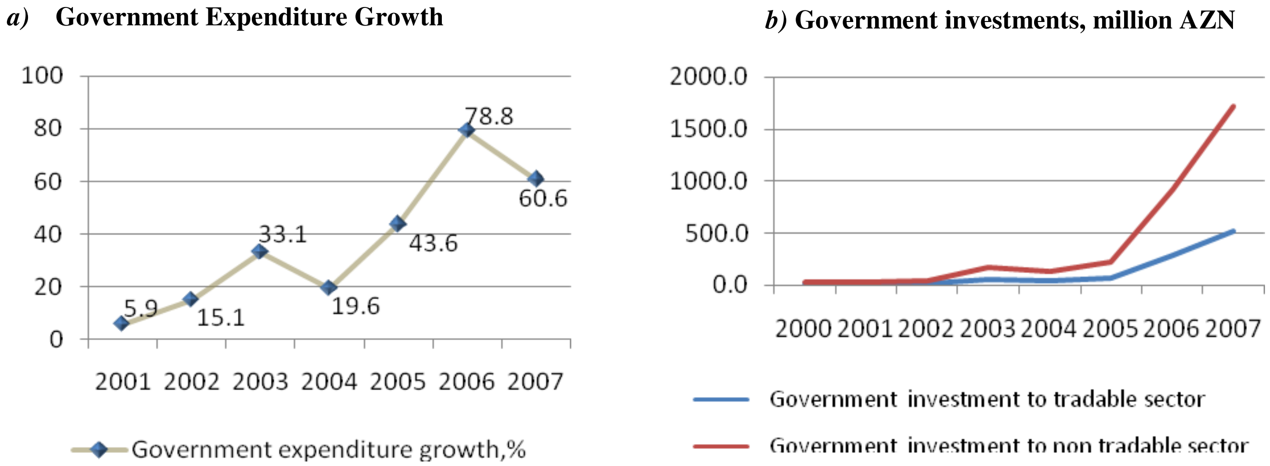
Figure D.1: Productivity growth in non-oil tradable sector (the left graph) and ULC growth by sectors (the right graph), %,



[21] Figures D.1-D.4 in Appendix D are taken from Hasanov (2010)

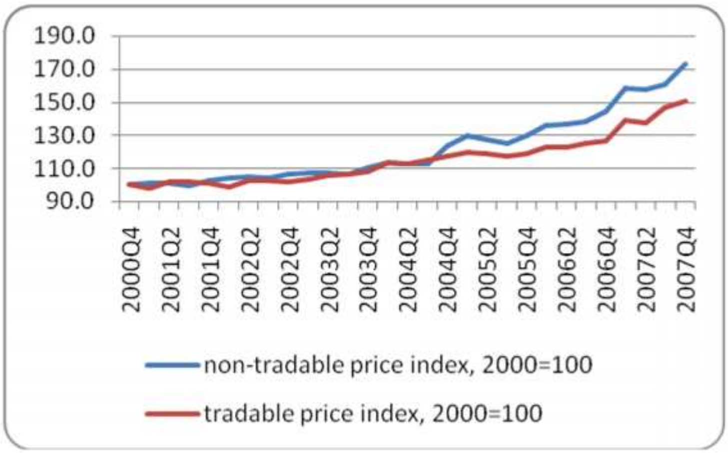
Source: Author's own calculation based on SSCAR data.

Figure D.2: Government expenditures and government investments to non-oil tradable and non-tradable sectors



Source: Author's own calculation based on SSCAR data.

Figure D.3: Tradable and non-tradable prices

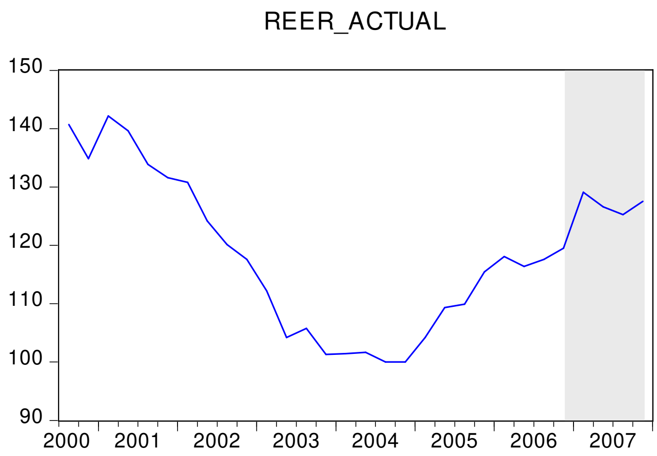


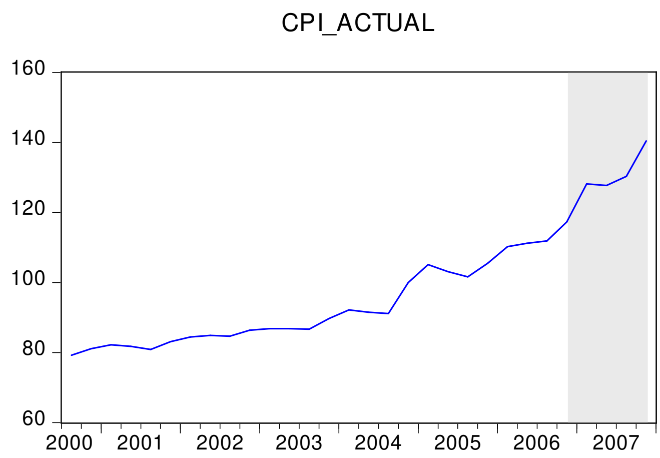
Source: Author's own calculation based on SSCAR data.

Figure D.4: Estimated real effective exchange rate and real oil price

Source: Author's own calculation based on estimation and IFS data.

Figure D.5: Actual real effective exchange rate and actual consumer price index





Source: Author's own calculation based on NBA data.

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