THE EFFECT OF A NEGATIVE OIL PRICE SHOCK ON AN OIL-EXPORING COUNTRY: EVIDENCE FROM AZERBAIJAN

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ABSTRACT

THE EFFECT OF A NEGATIVE OIL PRICE SHOCK ON AN OIL-EXPORTING COUNTRY: EVIDENCE FROM AZERBAIJAN

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Anadolu University, Graduate School of Social Sciences, August,2019

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This thesis investigates the effect of a negative oil price shock on the domestic macroeconomic variables of Azerbaijan. The study covers the period from 2006:1 to 2018:8, which includes the recent oil price slump of 2014-2016. We estimate the structural vector auto regression model with Cholesky decomposition analysis and block-exogeneity restriction. We find that a negative oil price shock causes a currency devaluation, deterioration in trade balance, high inflation and recession. Furthermore, a currency devaluation shock generates a similar effect on domestic macroeconomic variables. Accordingly, devaluation deteriorates trade balance, increases inflation, and shrinks economic activity. In other words, these two shocks have a stagflationary effect on Azerbaijan's economy. These findings suggest that a negative oil price shock influences domestic macroeconomic variables via a currency devaluation. Moreover, an oil price shock and a currency devaluation shock explain a sizable portion of the variations in domestic macroeconomic variables. Our findings reveal that the Azerbaijani economy is highly sensitive to fluctuations in oil prices due to its high dependency on oil revenue. As a result, the government should implement policies targeted at decreasing this dependency.

Keywords: oil price, exchange rate, oil-exporting country, SVAR model, Azerbaijan economy, devaluation

ÖZET

NEGATİF PETROL FİYATI ŞOKUNUN PETROL İHRAC EDEN ÜLKE UZERİNDE ETKİSİ: AZERBAYCAN ÖRNEĞİ

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Anadolu Üniversitesi, Sosyal Bilimler Enstitüsü, Ağustos, 2019

Danışman: Doç. Dr. Zekeriya YILDIRIM

Bu tez negatif petrol fiyatı şokunun Azerbaycan ekonomisi üzerindeki etkisini incelemektedir. Çalışmada 2006:1-2018:8 dönemi ele alınmaktadır. İncelenen dönem yakın zamandaki sert petrol fiyat düşüşlerini kapsamaktadır. Bu doğrultuda, yapısal vektör otoregresyon (SVAR) modeli tahmin edilmiş, Cholesky ayrıştırma analizi ve block-exogeneity kısıtları kullanılarak yapısal şoklar ayrıştırılmıştır. Tezin bulguları şöyle özetlenebilir: (i) negatif petrol fiyat şoku devalüasyona, yüksek enflasyona, ekonomik aktivitede resesyona ve dış ticaret dengesinde kötüleşmeye yol açar. (ii) devalüasyon şoku benzer etkiler ortaya çıkarmaktadır: ulusal paranın devalüasyonu enflasyonun artmasına, ekonomik aktivitenin daralmasına ve dış ticaret dengesinin bozulmasına neden olur. Başka bir ifadeyle, her iki şok Azerbaycan ekonomisinde stagflasyonist etkiler ortaya çıkarmaktadır. Bu bulgular negatif petrol fiyat şokunun Azerbaycan ekonomisini devalüasyona yol açarak etkilediğini ortaya koymaktadır. Ayrıca, Azerbaycan ekonomisindeki dalgalanmaların önemli bir kısmı devalüasyon ve petrol fiyat şokları tarafından açıklanmaktadır. Elde edilen bulgular, Azerbaycan ekonomisinin petrol fiyatındaki dalgalanmalara aşırı duyarlı olduğunu işaret etmektedir. Bu duyarlılığı azaltmak için petrol gelirlerine aşırı bağımlılığı azaltacak önlemler alınmalıdır.

Anahtar Sözcükler: petrol fiyatı, döviz kuru, petrol ihraç eden ülkeler, SVAR modeli, Azerbaycan ekonomisi, devalüasyon

20/08/2019

STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with "scientific plagiarism detection program" used by Anadolu University, and that "it does not have any plagiarism" whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

Arif ARIFLI

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SYMBOLS AND ABBREVIATIONS

TB	: Trade Balance
GDP	: Gross Domestic Product
AD	: Aggregate Demand
AS	: Aggregate Supply
BOP	: Balance of Payment
MPC	: Marginal Propensity to Consume
GFC	: Global Financial Crisis
M/P	: Real Money Balance
BOT	: Balance of Trade
AIOC	: Azerbaijan International Oil Consortium
IMF	: International Monetary Fund
SVAR	: Structural Vector Autoregression
OECD	: Organization for Economic Cooperation and Development
FDI	: Foreign Direct Investment
SOCAR	: State Oil Company of Azerbaijan Republic
FX	: Foreign Exchange
OPEC	: Organization of Petroleum Exporting Countries
SOFAZ	: State Oil Company of Azerbaijan
CBA	: Central Bank of Azerbaijan
USD	: United States Dollar
GCC	: Gulf Cooperation Council
IRF	: Impulse Response Function
CPI	: Consumer Price Index
AIC	: Akaike information criterion

INTRODUCTION

Oil is the most significant and most globally-traded commodity. It has a high share in international trade as well as being important for production processes. In 2014–2016, global oil prices decreased sharply, from USD (US dollar) 105 to almost USD 30, owing to a high oil supply and a lower oil demand in international markets. During this period, oil-importing countries experienced beneficial effects from lower global oil prices, whereas oil-exporting countries suffered. In a typical oil-exporting country such as Azerbaijan, oil is the major source of government budget that contributes to the country's economic and infrastructure development. Following the reduction in oil prices, Azerbaijan's economy experienced a recession, devaluation of the manat (AZN) high inflation, and a deterioration in the trade balance (TB). AZN devaluation, triggered by lower oil prices, prompted much discussion among policymakers, economists and researchers. The discussions centered on the following questions: "How does a reduction in global oil prices affect Azerbaijan's economy?," "What are the effects of the negative oil price shock on Azerbaijan's domestic macroeconomic variables,?" and "Which channel of the negative oil price shock affects the Azerbaijani economy.?" There is no comprehensive work attempting to answer these questions.[1] Thus, these questions have not yet been answered. This thesis seeks to answer these questions.

From a theoretical perspective, a decline in oil prices influences the economic performance of oil-exporting countries via worsening the fiscal balance and putting pressure on the exchange rate. It worsens the fiscal balance through decreasing oil revenues, which, in turn, causes a decline in budget transfers. This reduces investment and creates a necessity for changes in fiscal policy. Moreover, the exchange rate is assumed to be the main transmission mechanism of a negative oil price shock in oil-exporting countries with a fixed exchange rate regime. A reduction in oil prices decreases oil revenues and foreign exchange reserves. This generates a pressure on the exchange rate and, subsequently, a currency devaluation. The importance of devaluation cannot be ignored, as it may have significant consequences for economic performance. There is no consensus over whether devaluation has expansionary

[1] To the best of our knowledge, there are only two empirical studies (Hajiyev and Rustamov (2019) and Mukhtarov et al. (2019), that examine the effects of oil price shocks on Azerbaijan. However, these studies focus only on the impact of an oil price shock on inflation. Thus, they do not take into account the other macroeconomic indicators, such as the trade balance, GDP, and the exchange rate.

effects. Therefore, theoretically, there are two different approaches to the impact of devaluation. According to the traditional view, devaluation a has positive impact on economic activity. It improves the TB and stimulates domestic production. However, contrary to the traditional view, Diaz-Alejandro (1963), Cooper (1971), and Krugman and Taylor (1974) suggest that devaluation may have an adverse effect on the economic activity of developing countries through an effect on aggregate demand, aggregate supply, and external debt. Overall, a negative oil price shock causes a currency devaluation which leads to substantial fluctuations in macroeconomic indicators.

There are many empirical studies investigating the effects of oil price shocks on the economic performance of oil-exporting countries. However, there is no general consensus regarding the effects of an oil price shock. The relation between oil price and economic activity varies across countries and depends on the structure of the economy. One group of studies [Aliyu (2009); Al-mulali and Che Sab (2010); Alley et al. (2014); Aimer (2016); Lee et al. (2017); and Nasir et al. (2019)] has focused on the effect of a positive oil price shock on the economic activity of oil-exporting countries. Another group of studies [Farzanegan and Markwardt (2009); Moshiri and Banihashem (2012); Mahmoodi (2017); Ali and Harvie (2017); and Koh (2017)] has investigated the impact of a negative oil price shock on oil-exporting countries' economic activity. Their findings suggest that a positive oil price shock is beneficial for oil-exporting countries, whereas a negative oil price shock has adverse impacts on oil-exporting countries' macroeconomic indicators. On the other hand, some empirical studies [Olomola and Adejumo (2006), Olusegun (2008) and Basher et al. (2016)] have found no significant connection between the oil price and the economic activity of oil-exporting countries. Our study is related to this above-mentioned literature. In recent years, Azerbaijan has suffered from lower global oil prices. Nevertheless, there is no detailed empirical work looking at the adverse effect of the negative oil price shock on Azerbaijan. Therefore, this thesis intends to fill this gap in the literature by providing evidence of the effect of the adverse oil price shock on domestic macroeconomic variables in Azerbaijan. Specifically, we focus on the following research questions: "What are the impacts of the oil price reduction on Azerbaijan's exchange rate, the TB, inflation, and economic activity?," and "What is the transmission mechanism of negative oil price shock?." To answer these questions, we estimate a structural vector auto regression (SVAR) model for the period from

2006:1 to 2018:8. We use the Cholesky and block-exogeneity restrictions to identify structural shocks.

We find that the negative oil price shock significantly affected Azerbaijan's domestic variables. It led to devaluation of the domestic currency, deteriorated the TB, increased inflation, and caused economic activity to contract. The reduction in oil prices influenced the Azerbaijani economy through the exchange rate mechanism. In other words, the exchange rate is the main transmission mechanism of the negative oil price shock. Our findings are consistent with Azerbaijan's economic structure. Azerbaijan's economy has a high dependency on oil revenues, and oil is the main source of the country's income.

This thesis is organized as follows. Chapter 1 introduces the theoretical background. Chapter 2 describes the structure of the Azerbaijani economy, and Chapter 3 presents the dataset and the empirical model and discusses the results and robustness checks.

CHAPTER ONE

1. NEGATIVE OIL PRICE SHOCKS AND CURRENCY DEVALUATION: A THEORETICAL FRAMEWORK

The purpose of this chapter is to investigate theoretical links between exchange rate devaluation that is triggered by a negative oil price shock and macroeconomic variables. This chapter is structured as follows: Section 1 introduces the main factors of the oil price formation process, Section 2 explains oil price shocks and what kind of shocks affect oil prices, Section 3 discusses the impact of positive and negative oil price shocks on oil-exporting countries' economic activity, Section 4 introduces devaluation theories, and Section 5 and Section 6 analyze the effects of devaluation on the TB and the inflationary effect of devaluation, respectively.

1.1. The Main Factors of the Oil Price Formation Process

An oil price formation process is driven by some factors, such as short-term and long-term factors (See Table 1.1). Long-term factors consist of supply and demand of crude oil. Fluctuations in supply and demand for crude oil influence oil prices. For instance, a decrease in demand for crude oil causes a decline in the oil prices. On the other hand, there are some short-term determinants, such as inventories (storage of crude oil), and financial markets, which have a significant influence on oil prices in the international markets. Inventories are an important component that moderate the impact of short-term fluctuations in supply and demand and are significant in the short-term price formation process. The costs of storage and the demand risks determine whether it is more efficient either to sell crude oil at present prices or to stock it in inventories. In addition, in the short-run, the influence of financial markets on the crude oil prices is substantial. Their main role is to reduce price risks by donating instruments for buyers and sellers. Accordingly, crude oil futures (contracts that buyers and sellers negotiate at agreed prices but pay for later) are the main part of financial contracts. As with inventories, futures have a significant function in the short-term crude oil

price formation process. Crude oil futures are used against the price risks for sellers and consumers, and they can be used also for investment projects (Lang & Auer, 2019, p. 3-7).

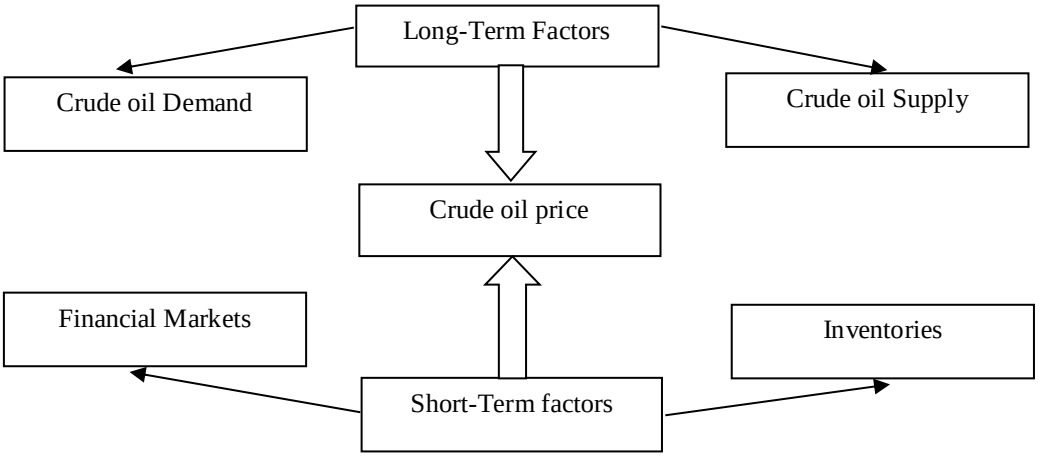

Table 1.1. *Long- and short-run components determining crude oil price* (Lang and Auer, 2019, p. 3)

1.2. Oil Price Shock Definition

Movements in oil prices have been monitored closely by policy makers, professional forecasters, and researchers, as these movements play an important role in determining macroeconomic and financial conditions in both oil-exporting and oil-importing countries. The price of oil is driven by global oil demand and supply, and it impacts the economic activity of both oil-exporting and oil-importing countries (Mahmoodi, 2017, p. 356) The unexpected and sudden change in the price of oil is called an oil price shock. The magnitude of an oil price shock depends on expectations about oil prices and future outcomes (Baumeister & Kilian, 2016, p. 20). On the other hand, the impact of an oil price shock varies across countries, and depends on a country's sectoral growth rate, its institutional structure, and economic performance (Farzanegan & Markwardt, 2009, p. 135).

1.3. What Kind of Shocks Affect Oil Prices?

There are three types of shocks that have a significant effect on oil prices: supply side shocks, demand side shocks, and precautionary demand shocks. The effects of these shocks are introduced below.

i. Supply side shocks

Supply side shocks originate from the oil production process and the current availability of crude oil. These shocks are driven by political circumstances in oil-producing countries, progress in new oil extraction technologies, and the discovery of new potential oil fields. Supply side shocks to the oil price are of two different types: exogenous supply shocks and endogenous supply shocks. Exogenous supply shocks stem from political and geopolitical conditions, whereas endogenous supply shocks relate to the availability of crude oil, technological developments or limitations, or economic situations (Economou, 2016, p. 5-8). The effects of oil supply shocks on global oil prices are represented in Figure 1.1.

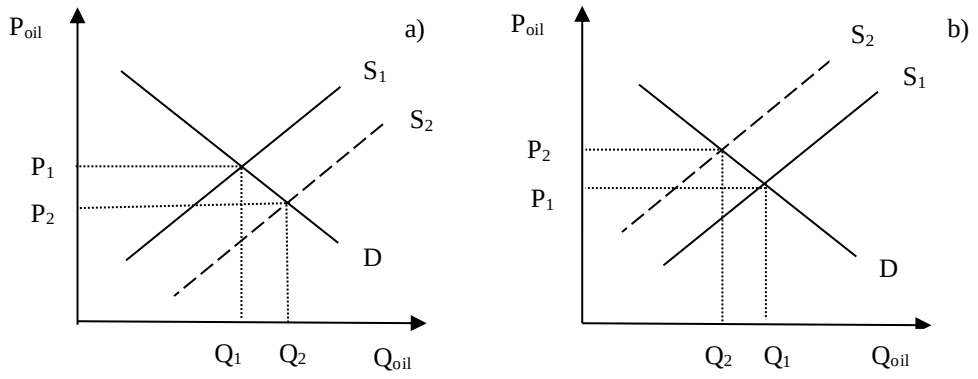

Figure 1.1. *The effects of oil supply shocks on global oil prices* (Peersman and Robays, 2011, p. 1542)

This figure shows that global oil prices decrease from P_1 to P_2, when oil supply increases from S_1 to S_2. Conversely, when the oil supply falls from S_1 to S_2, crude oil prices increase from P_1 to P_2, as shown in Figure 1.1 (b) (Peersman & Robays, 2011, p. 1542).

ii. Demand side shock

Demand side shocks come from changes in demand for crude oil in the international markets. Aggregate demand shocks have an inevitably strong impact on the oil prices (Economou, 2016, p. 7).

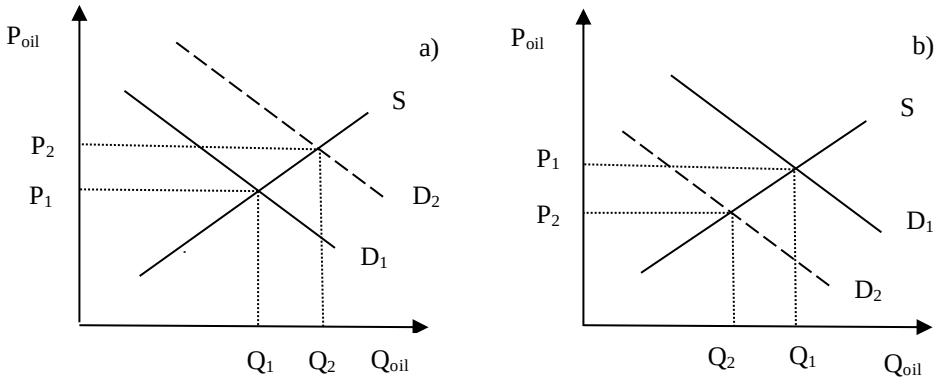

Figure 1.2. *The effects of demand-driven shocks on global oil prices* (Peersman and Robays, 2011, p. 1542)

Figure 1.2 (a) shows the effect of a rise in crude oil demand. When demand for crude oil increases from D_1 to D_2, the oil price rises from P_1 to P_2. Figure 1.2 (b) represents an adverse relationship; when demand for crude oil reduces from D_1 to D_2, the oil price falls from P_1 to P_2 (Peersman & Robays, 2011, p. 1543).

iii. Precautionary demand shock

Precautionary demand shocks (also known as speculative demand shocks) are due to switches about anticipated future shortfalls of oil supply relative to oil demand. These shocks arise mainly from geopolitical reasons and instabilities in oil-producing countries (Anzuini, Pagano, & Pisani, 2015, p. 968)

1.4. The Impact of Positive and Negative Oil Price Shocks On Oil-Exporting Countries' Economic Activity

Movements in the oil price influence oil-exporting countries mainly through their effects on oil revenue. A rise in the oil price improves the TB of oil-exporting countries, resulting in

high oil receipts from oil-importing countries. Meanwhile, a decrease in the oil price may reduce the oil revenues of oil-exporting countries (Rafiq, Sgro, & Apergis, 2016, p. 44).

The effects of oil price shocks on oil-exporting countries depend on the sign of the shocks. Here, we explain the effect of positive and negative oil price shocks on oil-exporting countries' economic activity.

1.4.1. Positive Oil Price Shock

An increase in oil prices affects oil-exporting countries positively. This is because it increases the capital inflow to the country and generates a revenue effect for oil-producing countries. Therefore, a positive oil price shock has an important effect on an oil-exporting country's economic growth, as higher oil prices lead to an increase in output (Allegret, Mignon, & Sallenave, 2014, p. 2). In addition, because of the increased oil inflows to the country, the monetary base of the Central Bank expands. Oil inflows are likely to increase the credit ceiling of the banking system (Khiabani, 2015, p. 60).

Nevertheless, high oil prices may have negative effects on the economic activity of oil-exporting countries. On the one hand, the structure of the economy focuses on the energy sector, and against other tradable sectors, such as the agriculture and manufacturing sectors (Kose & Baimaganbetov, 2015, p. 1058,1059). On the other hand, there may be a negative trade channel. For instance, as oil-importing countries suffer from higher oil prices, their demand for traditional goods and services from oil-exporting countries will decrease (Bjørnland, 2009, p. 235).

1.4.2. Negative Oil Price Shock

A decline in global oil prices affects the economic performance of oil-exporting countries through two channels: fiscal policy and exchange rate pressure channels (see Figure 1.3).

A negative oil price shock complicates the fiscal policy of oil-exporting countries. This is because oil-exporting economies depend highly on oil revenues, and a decline in the oil price leads to lower export revenue from oil-importing countries. As a result of low export revenue, transfers to the budget fall, and this leads to a decrease in public investment. This, in turn, enforces authorities to change fiscal policy to stabilize the fiscal balance (Barnett &

Ossowski, 2002, p. 3). The exchange rate is the main transmission mechanism of the negative oil price shock in an oil-exporting country. To understand the linkage between a negative oil price shock and the exchange rate, the terms of the trade channel should be explained. For oil-exporting countries with a fixed exchange rate regime,[2] a decline in the oil price leads to a deterioration of the TB. When the oil price decreases, revenues from oil exports fall. This causes a decline in a country's foreign exchange (FX) reserves. Declining FX reserves creates exchange rate pressure, and, eventually, the Central Bank devalues its local currency to stabilize its TB (Fratzscher, Schneider, & Robays, 2014, p. 4).

As a result, a negative oil price shock generates devaluationary pressure on the local currencies of oil-exporting countries.

In addition, the USD has a significant impact on the international energy commodity prices, and crude oil is priced in terms of the USD. This relationship can be shown as:

$$P^* = E \times P$$

P* is the price of oil in terms of foreign country, P is the price of oil in terms of the USD, and E is the nominal USD exchange rate. If the USD depreciates (decrease in E), the price of oil will decrease in the foreign countries. Therefore, demand for oil in foreign countries will increase and these countries will purchase more oil relative to the previous period (Yang, Cai, & Hamori, 2017, p. 538).

Overall, a negative oil price shock influences economic activity negatively in an oil-exporting country with a fixed exchange rate system by decreasing oil revenues, FX reserves, and, ultimately, causing a currency devaluation. A currency devaluation, triggered by negative oil price shocks, has substantial effects on macroeconomic performance.

Here, we explain devaluation theories that focus on how a currency devaluation influences economic activity.

[2] If a country adopts either a fixed or a pegged exchange rate regime, the value of its currency will be fixed against the value of another country's local currency.

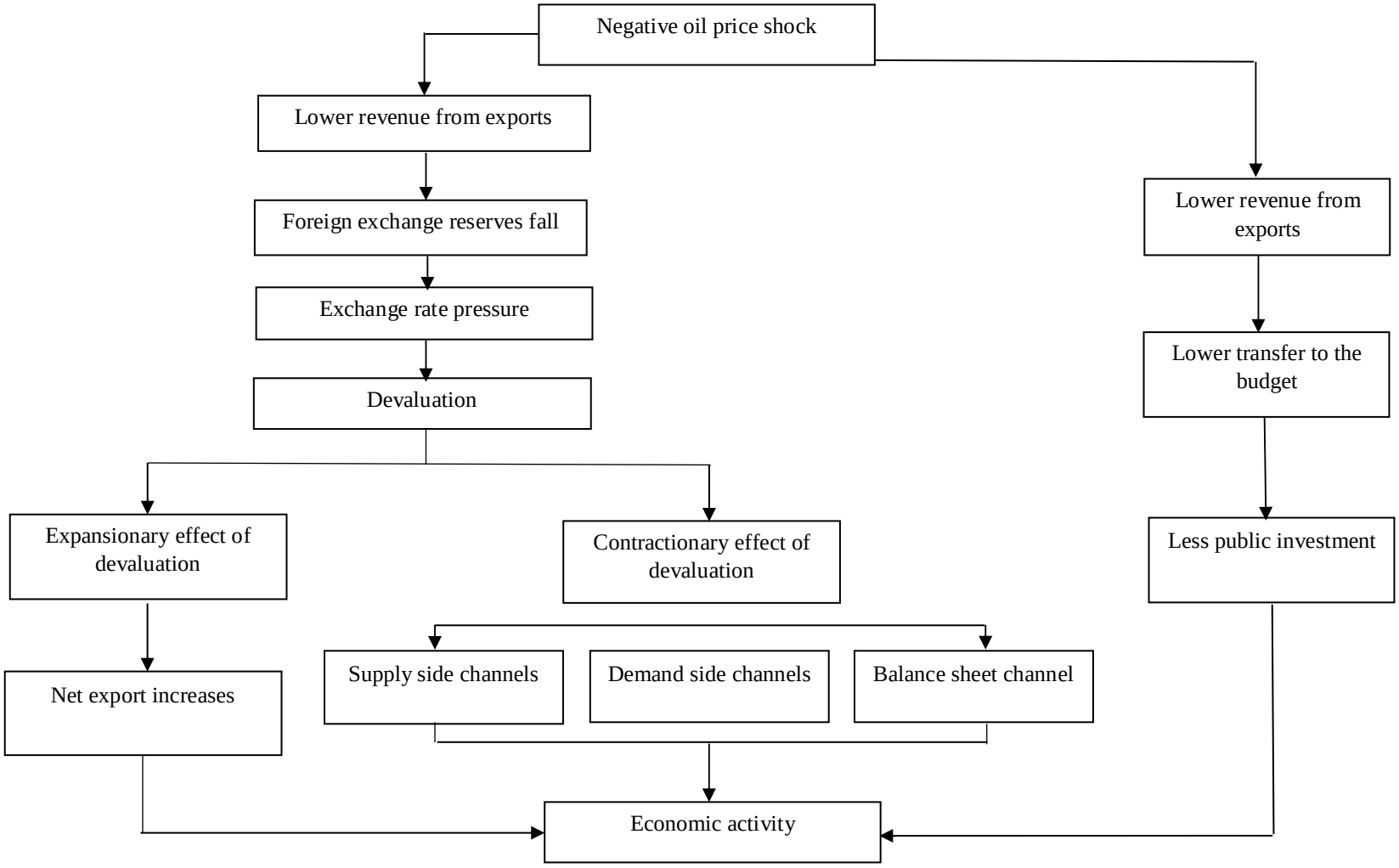

Figure 1.3. *The effect of a negative oil price shock on oil-exporting countries' economic activity* (IMF, September 2016, p. 9)

1.5. Devaluation Theories

Devaluation or depreciation is a decrease in the price of the home country's currency relative to other foreign currencies. Devaluation makes countries exports cheaper and creates a more competitive environment in the global market (Dornbusch & Fischer, 1990, p. 208). On the other hand, devaluation may have a negative effect on economic activity through decreasing output, investment, and consumption. According to the theoretical literature, there are two types of devaluation theories: expansionary devaluation and contractionary devaluation.

1.5.1. Expansionary Devaluation Theory

The expansionary effects of devaluation were suggested by the traditional Mundell–Fleming and orthodox view, and the prevailing outlook was that devaluation has an expansionary effect on economic activity through improving the TB and reducing the balance of payment (BOP) deficit. This view suggests that devaluation forces a country to switch its demand from imported goods to domestically produced products, as the relative price of imported goods is more expensive than before the devaluation. In addition, devaluation expands the export sector by stimulating local industries to produce more tradable goods. So, devaluation affects the economic activity by changing expenditures. This is called expenditure-switching policy, and devaluation is considered as one of the expenditure-switching policies of countries (Acar, 2000, p. 63,64).

Because of these possible effects of devaluation, in developing countries, devaluation is regarded as a stabilization policy of the government. The main purpose of this policy is to reduce the BOP deficit and create a competitive environment for local production (Agénor, 1991, p. 18). In other words, devaluation can improve the TB (See Figure 1.4) only if Marshall–Lerner conditions (elasticity of demand for export and import exceeds unity) are satisfied (Regmi, 2000, p. 21).

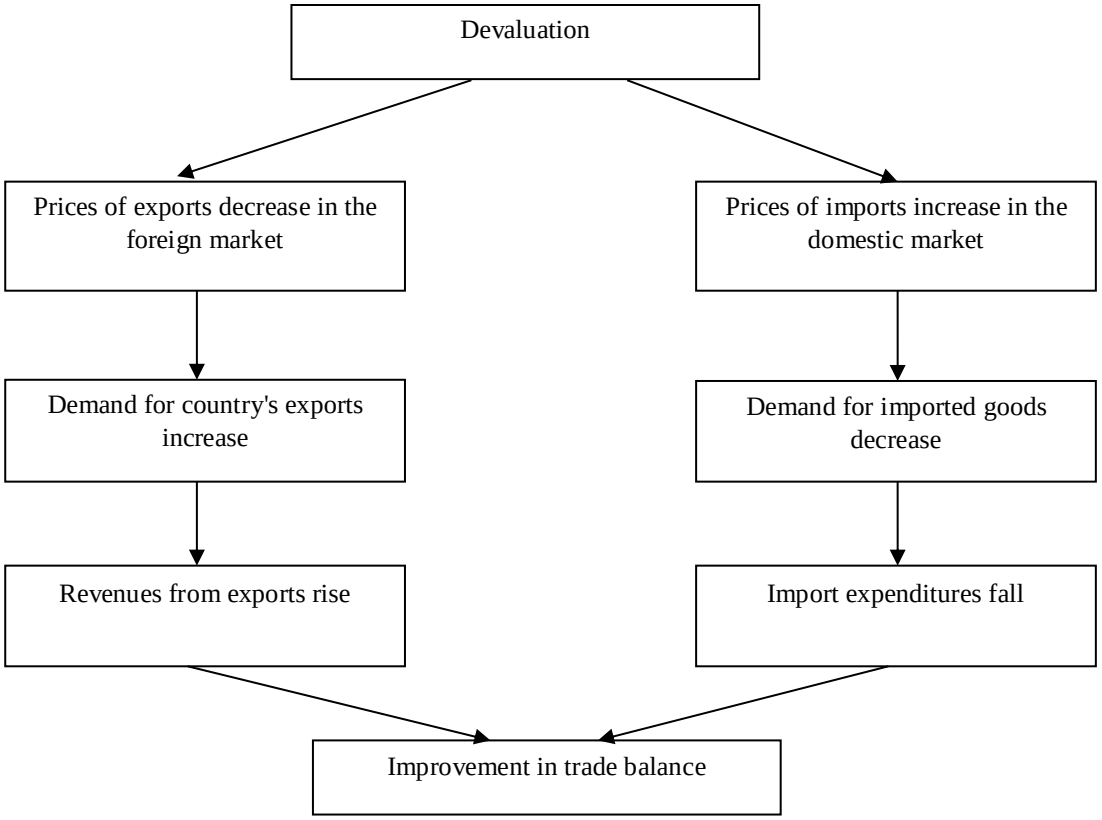

Figure 1.4. *The effect of devaluation on trade balance* (Regmi, 2000, p. 21)

According to the AD-AS model, domestic currency depreciation makes foreign goods more expensive than are domestic goods, which induces the aggregate demand curve to shift upward. An upward shift in aggregate demand expands output (An, Kim, & Ren, 2014, p. 28). Expansionary effects of devaluation are demonstrated in Figure 1.5.

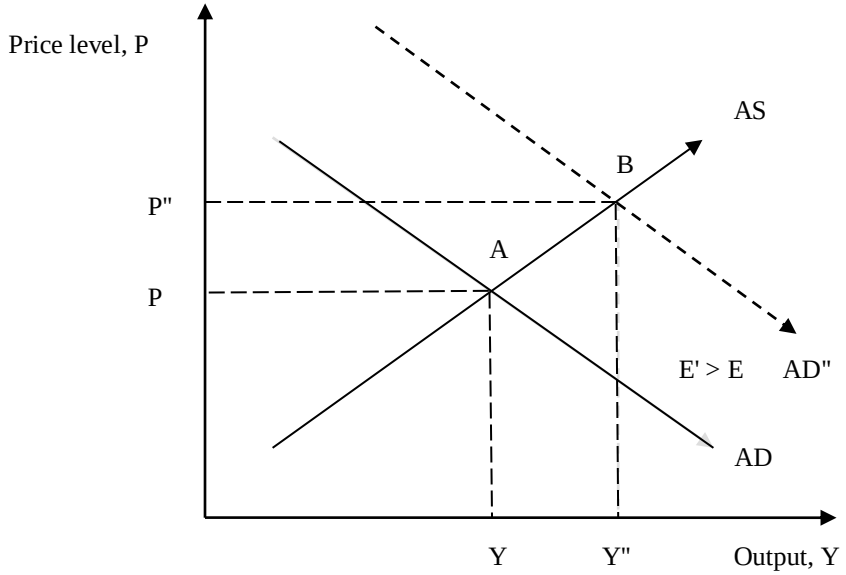

Figure 1.5. *Expansionary effects of devaluation* (Blanchard, 1997, p. 393)

In Figure 1.5, A is an equilibrium point, and government devalues its currency from that point. So, the exchange rate increases from E to E'. Net exports rise because of the cheaper goods, and, as a result, aggregate demand shifts from AD to AD" and output (Y) expands. The equilibrium point shifts from A to B.

Devaluation has a positive effect on output and increases production from Y to Y". However, it also leads to a hike in the price level, from P to P" (Blanchard, 1997, p. 392).

In conclusion, a currency devaluation increases aggregate demand, thus stimulating economic activity; however, it increases inflation.

1.5.2. Contractionary Devaluation Theory

There was no significant discussion about the positive consequences of devaluation on economic growth until the end of the 1970s. The first doubts about the positive effects of devaluation were supported by Diaz-Alejandro (1963), Cooper (1971), and Krugman and Taylor (1974). They asserted that there are some theoretical channels through which devaluation can have an adverse effect on developing countries' economic activity. These

channels are divided into three categories: demand side channels, supply side channels, and balance sheet or external debt channels (see Table 1.2 (Karadam, 2014, p. 9).

Demand-side Channels	
1) Income distribution	**2)** Speculative demand channel
3) Reduction of real income	**4)** Through fiscal effects
5) Decrease in investment	**6)** Real balance channel
Supply-side Channels	
7) Imported input cost	**8)** Indexation of wage
Balance Sheet or External Debt Channel	

Table 1.2. *Channels of Contractionary Devaluation* (Karadam, 2014, p. 9-12)

i. Demand side channels

1. Income distribution

Generally, devaluation can create an income distribution effect. Consumer groups in a society are divided into two categories: wage earners and profit earners. Wage earners have a higher marginal propensity to consume (MPC) relative to profit earners. As the price level increases following devaluation, real wages decrease (Alejandro, 1963, p. 577). Thus, income is redistributed from wage earners to profit earners. When real wages fall, the consumption of wage earners decreases, but profit earners' consumption does not increase significantly, because their MPC is lower. As a result, consumption falls and, thereby, aggregate demand contracts and, ultimately, economic activity shrinks (Bahmani-Oskoee & Miteza, 2003, p. 8).

2. Speculative demand channel

An increase in speculative demand for products is one of the negative effects of devaluation. If devaluation has been expected to increase prices, people will buy more goods and stock them in anticipation of a post-devaluation period. Therefore, government

expenditures fall temporarily. However, in the long-run, there are negative effects, and a currency devaluation leads to a decrease in aggregate demand and overall economic activity (Cooper, 1971, p. 16).

3. Reduction of real income

With the existence of a trade deficit, devaluation decreases real income. Devaluation makes imported goods more expensive, and causes a decline in real income at home while increasing it abroad. Accordingly, a decrease in real income leads to a reduction in consumption. This, in turn, leads to a contraction in aggregate demand, and, as a consequence, economic activity shrinks (Krugman & Taylor, 1976, p. 3).

4.Through fiscal effects

Another negative effect of devaluation is through fiscal effects. Devaluation increases the price of imported goods (because the demand for imported goods is inelastic) in terms of domestic currency, but the quantity of imports remains constant. As the value of trade increases, government increases ad valorem trade taxes. Thus, the income of the private sector falls. As a consequence, there will be a distribution of income from the private sector to the government sector. Subsequently, government expenditures remain unchanged. However, aggregate demand and economic activity decrease due to a decline in private consumption (Choudhary & Chaudhry, 2007, p. 52,53).

5. Decrease in investment

Devaluation depresses new investment plans. As new investments in developing countries depend on imported capital goods, devaluation makes the value of capital goods costly in terms of local currency and decreases the volume of imports. This, in turn, discourages new investment projects, aggregate demand, and finally, causes economic activity to contract (Bahmani-Oskoee & Miteza, 2003, p. 8).

6. Real balance channel

Devaluation decreases the real money balances through increasing the prices of traded goods relative to non-traded goods. This increases the general price level (Howard, 2002, p.

33). When prices increase, real money balances (M/P) decline. A decrease in money supply increases the interest rate (Krugman & Obstfeld, 2008, p. 115,116). An increase in the interest rate decreases consumption and investment, generating a negative effect on aggregate demand, and overall economic activity (Howard, 2002, p. 33).

ii. Supply side channels

Supply-side channels of contractionary devaluation were completed by Van Wijnbergen (1986). Devaluation has a contractionary effect on aggregate supply through imported input costs and indexation of wage channels.

7. Imported input (intermediate goods) cost

Devaluation affects aggregate supply negatively through generating higher costs for intermediate inputs (raw materials, semi-finished goods). Most of the imports of developing countries consist primarily of capital goods and imported inputs. Devaluation raises the domestic currency cost of imported goods and decreases the volume of imported inputs. A decline in imports means that the production process will slow down because of the lack of inputs. This, in turn, leads to higher prices of domestic final products relative to the previous prices of products. Therefore, firms' production tends to decrease, which causes a contraction in output and aggregate supply (Saibene & Sicouri, 2012, p. 195).

8. Indexation of wage

Another supply side channel is related to the wage system. Devaluation increases the prices of traded goods and, ultimately, the general price level, resulting in a decline in real wages. Thus, it is rational to assume that workers will require an increase in their nominal wages to protect their purchasing power. If wages are flexible, their wages will adjust to the new prices. Identically, if a wage indexation mechanism exists, nominal wages will adjust automatically to price changes. As a result of nominal wage increases, the cost of production will rise. This process will cause a reduction in production, resulting in a contraction in output (Acar, 2000, p. 68).

iii. Balance sheet or external debt channel

After the devaluation, some problems occur, especially for the developing countries. The negative effect of devaluation emerges when firms have a substantial share of debts denominated in foreign currency. In other words, government, firms, and banks have assets in terms of domestic currency and have some debts or liabilities denominated by foreign currency. These currency imbalances cause balance sheet problems after the currency depreciation. Therefore, the various actors must make regulations in their budgets or balance sheets to reduce their expenditures. For instance, banks experience a large amount of losses from the devaluation. They decrease credit capacity and even call in loans before the maturity date.[3] This generates a negative effect on firms and leads to a serious decline in economic activity (Berument & Pasaogullari, 2003, p. 406). These imbalances generate two negative outcomes. First, foreign investors lose their confidence, and this leads to fluctuation in the value of domestic currency. Thus, domestic investment declines. Second, it may be challenging for the monetary policy to respond to these changes. Monetary authorities increase the interest rate to stabilize local currency. This also causes a fall in aggregate demand. The balance sheet effect of different sectors is explained in Table 1.3 (Saibene and Sicouri, 2012, p. 197).

Government	Government's reserves versus internal and external debt denominated in foreign currency
Banks	Imbalance between foreign currency reserves and foreign currency liabilities (deposits)
Companies	Firms' reserves versus denominated external and internal debts
Households	Difference between foreign currency reserves versus foreign currency liabilities (mostly mortgages)

Table 1.3. *Balance sheet effect for different sectors* (Saibene & Sicouri, 2012, p. 197)

[3] Maturity date is the last payment date of a loan that has to be paid.

Nowadays, there is adequate empirical and theoretical confirmation that devaluation can have a negative effect on economic activity. The contractionary effects of devaluation on economic activity are represented in Figure 1.6.

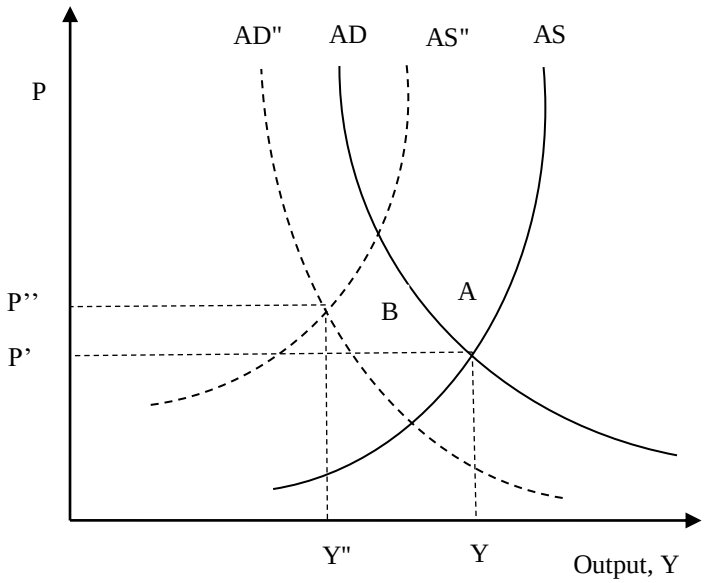

Figure 1.6. *Contractionary effects of devaluation* **(**Williamson**,** 2008**,** p. 542**)**

In this figure, economy is initially in equilibrium at point A. AD and AS represent aggregate demand and supply curve, respectively, P is the price level and Y is output level. Now, suppose that devaluation takes place as a negative shock to domestic total factor productivity. Devaluation raises the price of imported inputs. The elasticity of imported inputs is very low and sensitive to the price changes. Therefore, the prices of imported imports increase, and this also increases nominal wages. As a result, production costs increase. This negative shock shifts the supply curve leftward from AS to AS". As we have mentioned before, currency devaluation affects aggregate demand via six channels: it redistributes income, creates speculative demand for goods, discourages investors, increases trade taxes, decreases real income, and decreases money supply. This, in turn, impacts aggregate demand negatively. Thus, the demand curve shifts to the left, from AD to AD". Correspondingly, as economic activity shrinks and prices increase, this creates a

stagflationary effect. As shown in Figure 1.6, output falls from Y to Y", and the new equilibrium point changes from A to B (Williamson, 2008, p. 540).

1.6. Effects of Devaluation on Trade Balance

According to the analysis of international trade, devaluation has the heaviest influence on the TB. Following a devaluation, the prices of tradable goods increase relative to those of non-tradable goods. Thus, the volume of export rises, imports decline, and the TB improves (Kamin, 1988, p. 13). Theoretically, a devaluation of domestic currency affects the TB in three ways. Firstly, it restrains the volume of imports, as they are more expensive to purchase. Imports are denominated in foreign currency, so government expenditure on imports declines. Secondly, devaluation stimulates exports, and the values of exports are cheaper abroad. And, thirdly, export revenues are in the foreign currency and the country earns a lesser amount of foreign currency for a given quantity of exports (Pandey, 2013, p. 423).

There are three approaches to analysis of the effects of devaluation on the TB: the elasticity approach, the absorption approach, and the monetary approach.

Initial development of the elasticity approach was stated by Alfred Marshall (1923), who suggested that devaluation has either a positive or a negative effect on the TB. Subsequently, the approach was restated by Abba Lerner (1944), and it is now known widely as the Marshall–Lerner condition. According to this approach, the impact of exchange rate changes on the TB depends heavily on the elasticities of exports and imports. If the foreign elasticity of demand for country's exports plus the elasticity of demand for imports exceed unity, there would be an improvement in the TB following the devaluation. If the elasticity of exports and imports is lower than unity, devaluation would worsen the TB of the home country. However, the elasticity of exports and imports is very low in the short-run. Thus, the Marshall–Lerner condition is not satisfied in the short-run. However, in the long-run, devaluation has positive effects on the TB because the TB needs time to adjust to new prices (Begum & Alhelal, 2016, p. 4).

The J-Curve phenomenon is another investigation method of the elasticity approach. This approach is based on the nature of time lags between exchange rate changes and their impact

on the TB. In short, the J-Curve approach investigates the time path effect on a country's trade flows. Thus, there are two different effects on the TB: short-run and long-run effects. The J-Curve approach emphasizes that, initially, the TB worsens before then improving, as is represented in Figure 1.7. (Regmi, 2000, p. 28).

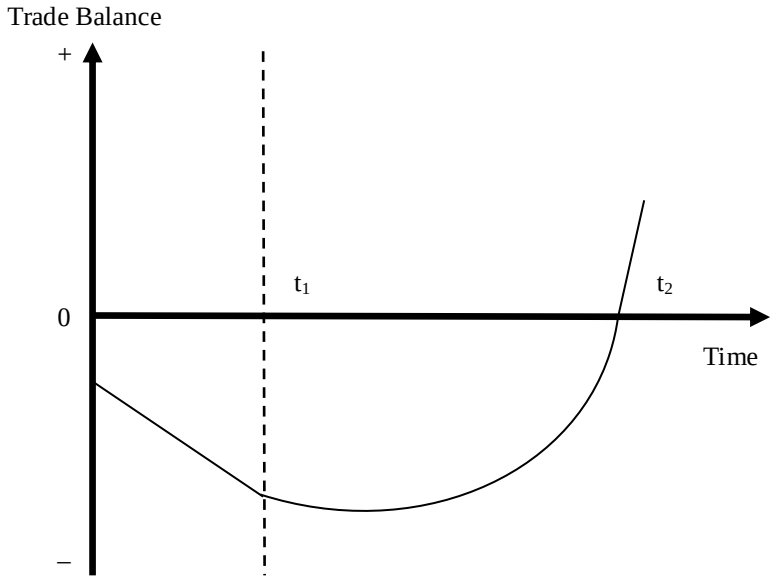

Figure 1.7. *J-Curve effect* (Regmi, 2000, p. 29)

As shown in Figure 1.7, the J-Curve effect generates two distinctions: a negative effect in the short-run and a positive effect in the long-run. Initially, devaluation turns out at point t_1. Following devaluation, the balance of trade curve falls and turns upward to point t_2. After a period of time, the TB continues to improve. According to the empirical investigations of the J-Curve effect, it takes approximately one year or less to advance from point t_1 to t_2 (Regmi, 2000, p. 29).

The absorption approach is a combination of the elasticities approach with Keynesian macroeconomics. It was modeled by Meade (1951), Alexander (1952), and others at the beginning of the 1950s (Ali, Johari, & Alias, 2014, p. 4,5). The main implication of the absorption approach is examining the effects of devaluation on the current account balance by taking into account national income. According to the absorption approach, the impacts

of devaluation on BOP depend on the income level of a country (Bosnjak, Novak, & Kristo, 2018, p. 931). The absorption approach states that, when an economy is below the full employment level, devaluation makes domestic goods more attractive relative to foreign goods, and, thus, income and consumption will increase; however, rise in national income should be greater than is total expenditure to improve balance of trade (IMF, October, 2000, p. 5).

The monetary approach was formally modeled by H. Jonson and J. Frenkel (1976). Both the elasticities approach and the absorption approach disregard employment resources while investigating BOT; however, the monetary approach investigation is based on the existence of full employment. According to the monetary approach, BOP is a monetary phenomenon, and the effects of devaluation on BOP occur only through its impact on real money supply. In other words, a BOP deficit is caused mostly by excessive money supply. Devaluation increases the prices of traded goods and services and, thus, lowers the value of cash balance. This results in a decline in consumption. A decline in consumption results in a reduction in absorption and TB improvement. Consequently, the most important suggestion of the monetary approach is that if monetary authorities increase money supply following devaluation to meet the new demand for money, the effect of the devaluation is assumed to be effective (Ali, Johari, & Alias, 2014, p. 5).

1.7. Inflationary Effect of Devaluation

Immense and sudden devaluations occur usually due to either strong market pressures or a deterioration in BOP. Devaluation offsets overvaluation of the domestic currency and brings the exchange rate back to its previous level. Nevertheless, an exchange rate pass-through to domestic prices is inevitable.[4] On the one hand, devaluation influences a large section of the populace by increasing the prices of tradable goods and services, creates a foreign indebtedness effect for firms and banks, and, therefore, decreases investors' confidence in the short-term. On the other hand, if devaluation causes effective exchange rate adjustment, it expands the current account surplus, and confidence is regained. Thus, the effect of devaluation on the price level is considered as a critical factor. The inflationary effect of

[4] The impact of the exchange rate change on domestic price change is known as exchange rate pass-through.

devaluation changes from country to country and depends on the economic condition of the country (Borensztein & Gregorio, 1999, p. 2-4).

Devaluation of the domestic currency increases the local-currency prices of intermediate, final, and tradable goods. This leads to a general increase in the price level. According to empirical studies, the inflationary effect of devaluation is temporary, and it occurs in the short-run. This causes a temporary increase in the price level that stems from expectations about price changes, and time is required for the inflation rate to return its pre-devaluation level (Kamin, 1988, p. 26,27).

Overall, there is a consensus that devaluation is likely to be inflationary, particularly for small-open economies, through its demand and supply-side effects. The demand-side effect is driven by the expenditure-switching channel whereby devaluation stimulates aggregate demand by expanding net exports. Increase in aggregate demand causes a rise in prices of inputs and nominal wages and, finally, increases inflation. The supply-side effect is related to imported input channel whereby devaluation increases production costs, and, thus, the general price level rises (Yildirim & Ivrendi, 2016, p. 683).

CHAPTER TWO

2. STYLIZED FACTS ON THE DEVALUATION OF AZERBAIJANI MANAT STEMMED FROM A NEGATIVE OIL PRICE SHOCK, AND CONSEQUENCES ON AZERBAIJAN'S ECONOMIC PERFORMANCE

This chapter documents evidence on the stylized facts regarding the effect of lower global oil prices on the Azerbaijani economy. The chapter is divided into 4 sections. Section 1 introduces an overview of Azerbaijan's economy. Section 2 reports on the importance of oil revenues in Azerbaijan's economy. Section 3 describes the great decline in global oil prices and the reasons behind it. Section 4 investigates the relationship between lower oil prices and Azerbaijan's macroeconomic performance.

2.1. Azerbaijan's Economy: Overview

Azerbaijan is a South Caucasian and transcontinental country located between Eastern Europe and Western Asia. The population of Azerbaijan is approximately 10 million. The local currency of Azerbaijan is manat (AZN). AZN was put into circulation on August 1992, and it has been the sole legal circulating medium since January 1994.

After the collapse of the Soviet Union in 1991, the Republic of Azerbaijan regained independence, and the country started to realize its autonomous independent policy in economic and other spheres. The main purpose of this policy is arrangement of the economic system based on the laws of private property, making a change from command to a market economy, and integration into international markets. Azerbaijan's economic development since independence consists of two main periods: economic recession (1992–1995) and economic recovery (after 1996) (OSCE, 2004, p. 1).

Between 1992–1995, Azerbaijan's economy experienced critical macroeconomic difficulties. Real gross domestic product (GDP) decreased by more than 70%, the exchange rate lost its value against other foreign currencies, and the country suffered from depleting international reserves. These imbalances stemmed from three main factors. Firstly, because of the Nagorno–Karabakh war, Azerbaijan lost 20% of its territory and was faced with a large number of refugees. Secondly, Azerbaijan's main trade relationships with Soviet Union countries collapsed. Thirdly, the Central Bank of Azerbaijan (CBA) drove a huge fiscal

deficiency via creating money and causing macroeconomic weakness (IMF, August, 1998, p. 5).

After 1996, Azerbaijan's economic performance started to grow rapidly due to main developments and reforms in the economy. The main reason for the fast economic recovery was associated with the extraction of hydrocarbon resources (crude oil and gas). Since 1994 the ''Contract of the Century'', and 29 ''Production Sharing Agreement'' contracts have been signed, and these contracts have contributed USD 40 billion in foreign direct investment (FDI) in 14 years (Ciarreta & Nasirov, 2015, p. 43). In 1996, the value of AZN appreciated 8% against the USD, the fiscal deficit was financed by oil revenues, and the annual inflation rate decreased to 7%. Improvement in economic activity occurred in 1997, and GDP growth increased from 1.3% in 1996 to 5.8% in 1997 stemming from FDI from the hydrocarbon sector (IMF, August, 1998, p. 5,6).

During 2001–2007 (pre-crisis), Azerbaijan's economy experienced major developments. In 2001, despite a reduction in oil prices, the external current account deficit, and subsequent devaluation of AZN, GDP growth reached 9% (IMF, March, 2002, p. 3,5). Between 2000–2003, real GDP grew by 10%, driven by FDI from the oil and gas sectors. However, inflation accelerated from 1.9% in 2003 to 3.6% in 2003 and reached 6.8% in 2004 due to wage increases in the second half of 2003 (IMF, January, 2005, p. 7,10). Since 2005, great expansion in oil and gas production and large increases in public spending have contributed to remarkable growth in Azerbaijan. During the oil boom years, the annual growth rate has been more than 20%, resulting in higher living standards and a lower poverty rate (IMF, July, 2008, p. 4).

During the 2008 Financial Crisis, Azerbaijan was less affected relative to its neighbors due to the accumulated FX reserves from the oil-boom years. Nevertheless, the crisis reduced access to international markets, decreased FDI, decreased demand for exports, and created fiscal pressure. Although Azerbaijan entered the GFC in a much stronger state than did other countries, the effect of the crisis underlined the importance of economic diversification (The World Bank, December, 2009, p. 27).

After the GFC, economic performance experienced immense growth. Economic growth reached 9.3% during 2009, driven by an impressive expansion in oil production. Inflation

fell sharply and CBA could keep the exchange rate pegged against the USD, which helped to decrease inflation, reduced the dollarization level, and offset the negative effect of banks' and firms' balance sheets (IMF, May, 2010, p. 4).

During 2014–2016, the Azerbaijani economy experienced some difficulties. In this period, sharp decreases in oil prices caused a severe deterioration in Azerbaijan's macroeconomic performance: economic activity shrank, the inflation rate increased, the country's external debt rose, and the TB deteriorated. This indicates clearly that Azerbaijan's economy is highly dependent on oil revenue and sensitive to changes in oil prices.

2.2. The Role of Oil Revenues in Azerbaijan's Economy

Azerbaijan belongs to a group of oil-exporting countries, and its economic growth depends on revenues from oil export. Between 2003–2006, Azerbaijan benefitted from an unprecedented oil boom that it has never received such amount of receipts. Although the oil boom created economic optimism and development, this cannot conceal the reality that the Azerbaijani economy is dependent on oil, and thus, highly vulnerable to oil price fluctuations (Guliyev, 2014, p. 1,2).

Two main oil price slumps highlight the importance of oil revenues in Azerbaijan's economy. First, decreases in oil prices during the GFC led to a decline in oil revenues, thereby generating a recession (IMF, May, 2010, p. 4). Second, the recent oil price decline between 2014–2016 also caused a contraction in economic activity. Azerbaijan lost large-scale oil revenues from the export of oil. Therefore, the revenues of the Azerbaijan International Oil Consortium (AIOC) and the State Oil Company of Azerbaijan Republic (SOCAR) fell. As oil revenues decreased, transfers to the State Oil Fund of the Republic of Azerbaijan (SOFAZ)[5] fell (IMF, September 2016, p. 4,9).

Figure 2.1, Figure 2.2, and Figure 2.3 present a clear picture about the importance of oil receipts in the Azerbaijani economy. For example, Figure 2.1 shows that oil, natural gas, and oil exports were nearly 90% of countries' overall exports in 2015. On the other hand, Figure 2.2 shows the share of the hydrocarbon sector in a country's total GDP. According to this

[5] SOFAZ was established for the purpose of accumulation and management of the receipts from oil and gas exports.

figure, the share of oil and gas sectors in total GDP is historically large (the share is one-third of GDP). Finally, Figure 2.3 shows the transfers of SOFAZ in the total budget. According to this figure, SOFAZ's transfers to the government budget increased sharply in both the GFC (after 2007) and the recent plunge in oil prices (2014). Overall, this evidence indicates clearly that Azerbaijan has an oil-dependent economy and that fluctuations in oil prices have a substantial effect on its macroeconomic performance.

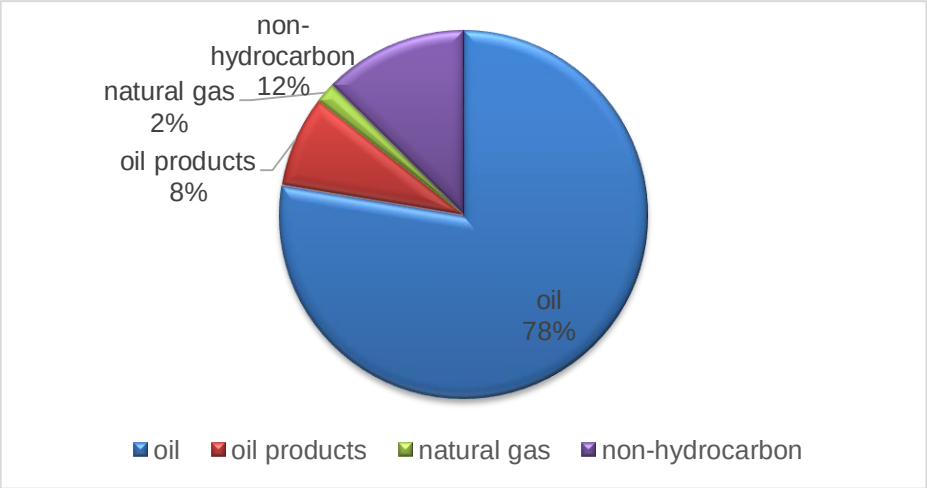

Figure 2.1. *Azerbaijan's main export of commodities during 2015* (IMF)

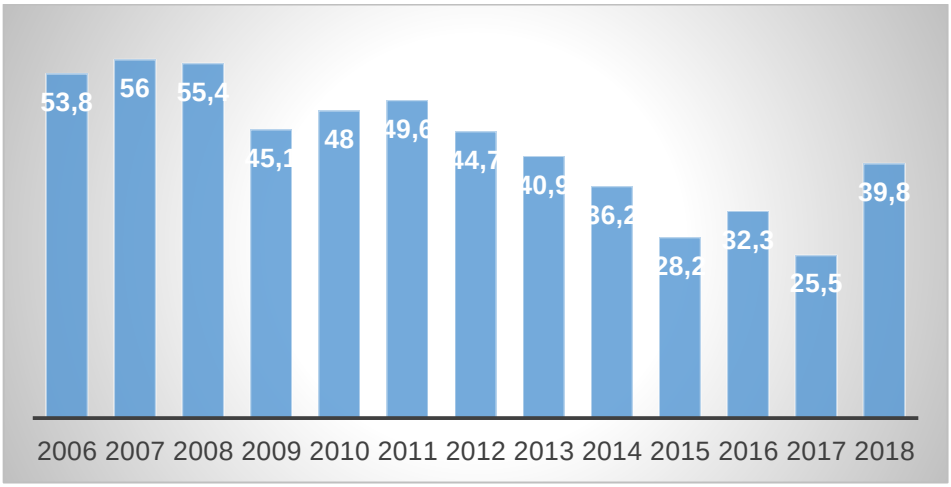

Figure 2.2. *Dynamics of oil and gas sector share in total GDP (%)* (State Statistical Committee of the Republic of Azerbaijan)

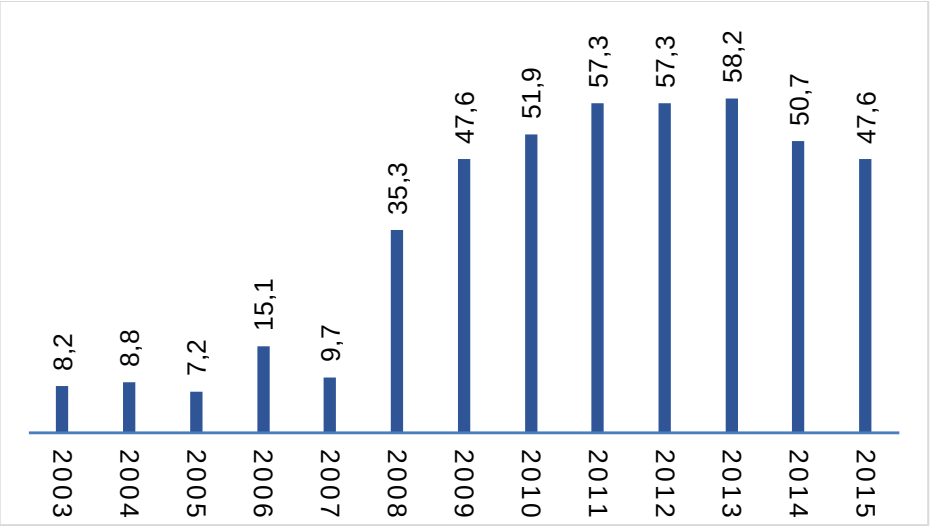

Figure 2.3. *Share of SOFAZ's transfers in total budget revenues (%)*
(http://www.budget.az/main?content=526)

2.3. The Great Decline in Oil Prices and the Reasons Behind It

During 2006–2018, there were two noticeable oil price declines in international markets: the GFC (2008–2009) and recent slump in oil prices during 2014–2016. Figure 2.4 shows developments in global oil prices.

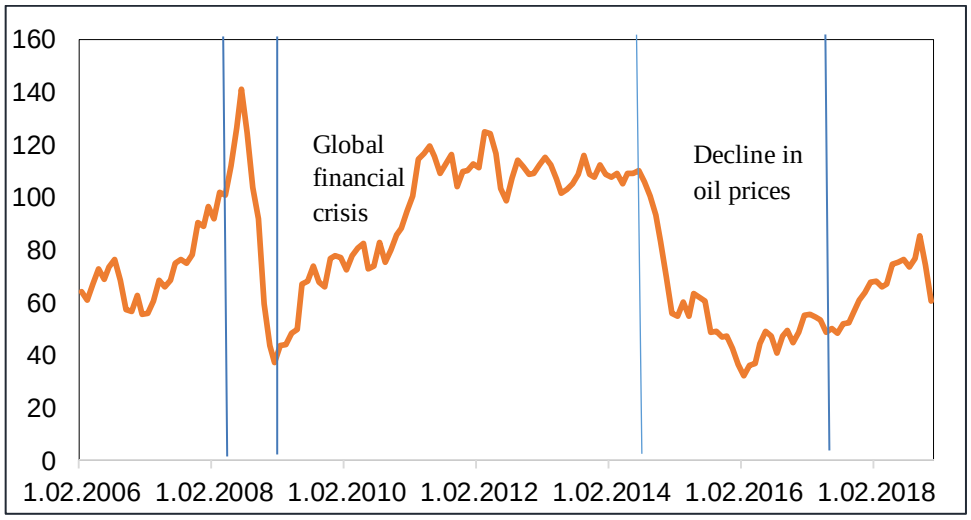

Figure 2.4. *Developments in oil prices since 2014* (DataStream)

Oil prices increased from 2004 to historic highs in the middle of 2008. In July 2008, the crude oil price rose to a record high price of approximately USD 140 per barrel. However, in August 2008, oil prices decreased rapidly to their lowest level of USD 40 as demand from OECD countries decreased unexpectedly and recession emerged from the extrem effect of the financial crisis on the global economy (Sehgal & Pandey, 2015, p. 235).

Between the second half of 2014 and early 2016, oil prices fell by almost 70%. This drop was one of three well-known declines since World War II (The World Bank, April, 2018, p. 2). Oil prices in the global markets were stable at approximately USD 105 per barrel until 2014. Since June 2014, oil prices have declined substantially, leading to policy makers and economists taking comprehensive precautions against substantial fluctuations and inflations. Between June 2014 and December 2014, Brent crude oil prices declined by USD 49, which was 44% of its previous price (USD 105), as shown in Figure 2.4 (Baumeister & Kilian, 2014, p. 131,133).

As shown in Figure 2.4, in January 2016, oil prices declined by approximately USD 29 and have averaged USD 50 since 2015. Low oil prices led to economic stress among oil-producing countries around the world and highlighted the importance of alternative energy production (Bank of Canada, 2017, p. 1).

The recent drop in oil prices stemmed from reasons including demand-driven, supply-driven factors, and appreciation of the USD (The World Bank, March, 2015, p. 8).

1. Demand-driven reasons

Emerging Markets and Developing Economies (EMDEs) experienced a persistent decline in crude oil consumption. Concerns about deteriorating growth prospects strengthened during 2015, and crude oil demand in China, EMDEs, and the US decreased significantly at the beginning of 2016 (The World Bank, April, 2018, p. 5).

2. Supply-driven factors

Although both demand and supply components played an important role in the great oil price decline of 2014, the effects of excess supply seem to have been the main driving factor. These supply driven factors are as follows:

i. Unexpected change in OPEC's policy

In spite of a decline in oil prices since the second half of 2014, most OPEC members were against reducing output and aimed to protect their market share. OPEC's decision in November 2014 was quite unexpected. There was a consensus about not reducing output to match the low demand for its crude oil (ODI, March, 2015, p. 4). Thus, prices fell rapidly, by almost 20%, following OPEC's decision (IMF, July, 2016, p. 20).

ii. An expansion in US shale oil production

An increase in US shale oil production was one of the significant reasons for the oil price crash in the second term of 2014. US shale oil production has intensified widely since 2011, and it is now competitive with that of both Russia and Saudi Arabia. Also, it has power to impact OPEC's decisions. This shale oil extraction reduced US reliance on external energy. Until December 2015, The US did not export its shale oil because of a federal ban for national security reasons. Withdrawal of export restrictions after a year brought the US shale oil into the international market (Alvarez & Nino, 2017, p. 57,58).

iii. Geopolitical considerations

During 2014, there were some supply disturbances in the Middle East, which reduced global oil output. These geopolitical conditions included conflict in Libya, the sanctions against Iran, and disruptions in Iraq (The World Bank, January 2018, p. 52). Nevertheless, while these disruptions took place, shale oil production continued to expand, reaching more than 5 mb/d by the end of 2014, and US shale oil production surpassed the global oil demand (The World Bank, January 2018, p. 52).

3. Appreciation of the USD

The USD appreciated by more than 10% during June 2014 and January 2015. Consistently, great appreciation of the USD increases the price of crude oil in terms of other currencies. This appreciation reduced the global crude oil demand and the prices of crude oil (The World Bank, March, 2015, p. 14).

Overall, these developments in the global oil prices created a recession in oil-exporting countries, including Azerbaijan.

2.4. Lower Oil Prices and Azerbaijan's Macroeconomic Performance

The rapid decline in crude oil prices resulted in economic contractions in Azerbaijan, which is reliant on its fuel exports. As Azerbaijan's economic management mechanism is rooted in high-volume of oil revenues, the economic diversification policies were diminished in the context of the fall of oil prices, and the regulating capacity of oil weakened (CESD, January 2016, p. 3). In the following subsections, we investigate the effect of devaluation, triggered by negative oil price shock on economic activity, the TB, inflation, and external debt, respectively.

2.4.1. Devaluation of AZN Triggered by Negative Oil Price Shock

Figure 2.5 tells the story of two recent AZN devaluations. Following the lower oil prices in the global markets since 2014, Azerbaijan experienced a sharp drop in foreign currency income. In addition, after the second half of 2014, the demand of the population for the USD increased. Therefore, the monetary policy of Azerbaijan faced several challenges. These

challenges were caused by the unsuitable forecasting of recent events, related risks by the CBA, and improper combinations of the CBA's monetary policy to respond to these events. The first reaction of Azerbaijan's economy to negative oil price shocks was at the end of 2014. The pressure on the exchange rate increased, with the result that the CBA lost nearly 28% of its foreign exchange reserves. Finally, in February 2015, the government decided to devalue the local currency by 34% against the USD to avoid reduction of foreign reserves (see Figure 2.5). The CBA set AZN at 1.05 against the USD, as compared to 0.78 in previous years (Mammadov, 2016, p. 6).

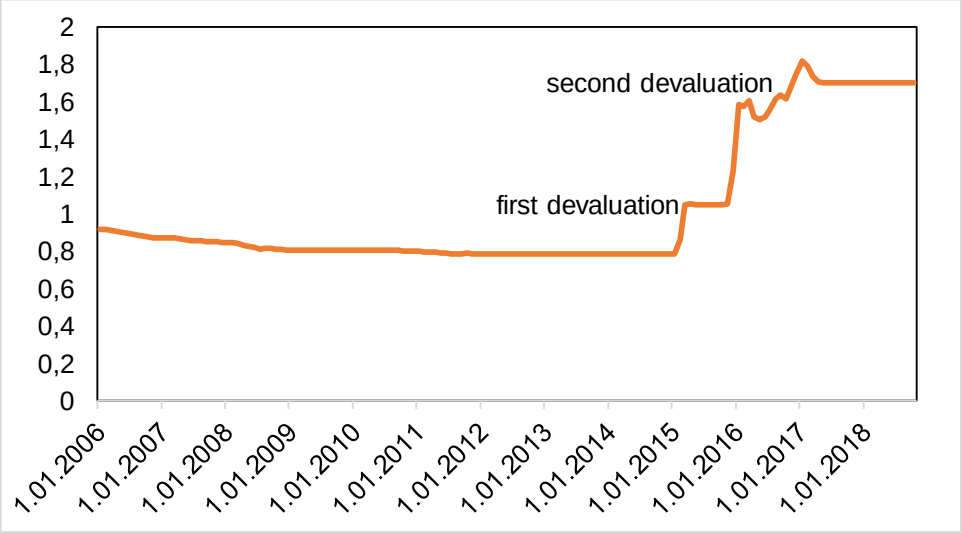

Figure 2.5. *Developments in Azerbaijan's exchange rate following the great plunge in oil prices* (DataStream)

Government planned to implement its monetary and economic policies at USD 90 oil prices. Thus, the average of USD 53 caused economic imbalance. On December 21, 2015 the CBA decided to devalue the national currency by 47.6%, and the USD rate increased from 1.05 AZN to 1.55 AZN (see Figure 2.5). Thus, the CBA could not maintain the fixed exchange rate regime and changed to a managed floating exchange rate regime and adopted dollar-euro basket to manage the exchange rate. Overall, within a year, AZN devalued by nearly 100%. By the end of 2016, the exchange rate of AZN was approximately 1.8 manats to one USD. Devaluation of AZN led to a decline in foreign exchange reserves, and increased

demand for foreign currency. Therefore, in the first term of 2016, half of CBA's foreign reserves depleted to USD 4 billion, and the government closed privately owned exchange offices. In September 2016, the CBA increased the interest rates to 15% to induce people to keep their money in the local currency (BTI, 2018, s. 26,27).

2.4.2. Effect of Devaluation on Azerbaijan's Economic Activity

Azerbaijan's economic activity experienced two major slowdowns over 11 years, as highlighted in Figure 2.6. The first was related to the GFC, which caused a downturn in Azerbaijan's economic activity. The second was due to the recent plunge in global oil prices. When the global oil prices began to decline in the second half of 2014 (see Figure 2.4), revenues from oil exports fell. This caused a sharp decrease in the transfers to the budget and created exchange rate pressure. Thus, Azerbaijan devalued its local currency at the beginning of 2015 (See Figure 2.5). Lower oil prices and the resulting devaluation of the national currency affected aggregate supply and aggregate demand negatively and created balance sheet problems for firms, households, and banks. As a consequence, the volume of credit from banks and public investment both declined. Thus, Azerbaijan's economic activity contracted at the beginning of 2016.

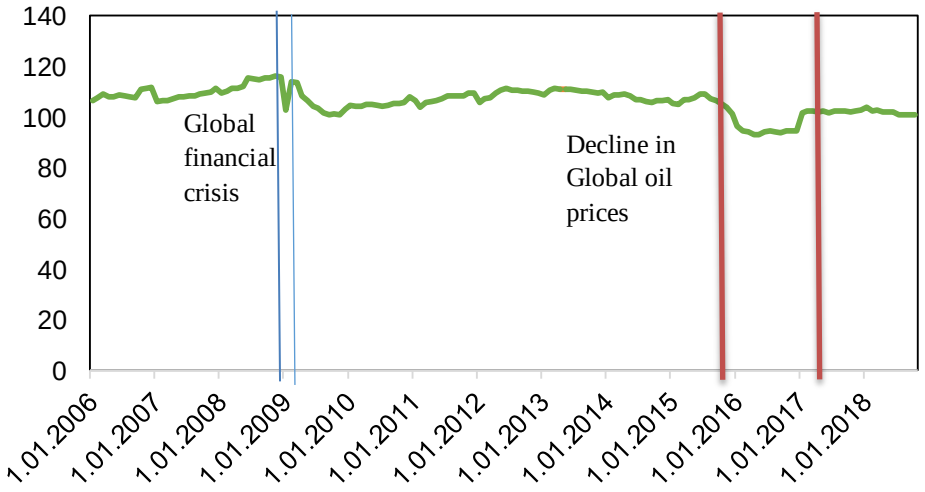

Figure 2.6. *Developments in Azerbaijan's GDP following the devaluation* (DataStream)

2.4.3. Effect of Devaluation on Trade Balance

Azerbaijan is a developing country whose exports consist mainly of crude oil, gas and oil-related products. The country's imports include machinery, vehicles, food products and other capital goods. As we have mentioned before, as a result of lower oil prices in the global fuel markets and subsequent devaluation of the national currency, Azerbaijan's trade balance fell (See Figure 2.7).

In 2015, the country's TB declined noticeably. The main reason why the volume of exports decreased was the great plunge in international oil prices and a slowdown in oil production. The country's volume of oil, oil production, and oil exports diminished by 53.8% compared to 2014. In contrast to exports, the volume of imports increased by 1% relative to 2014 (CESD, August, 2016, p. 5).

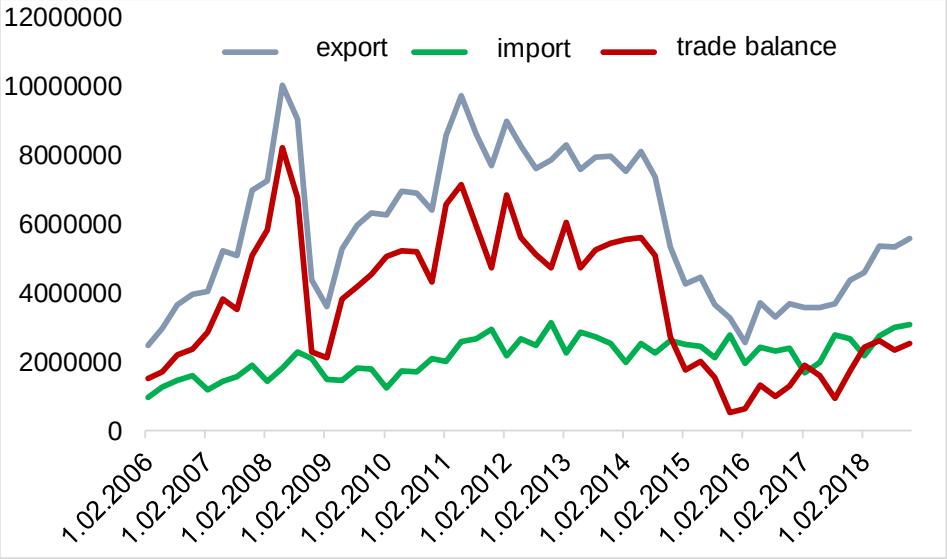

Figure 2.7. *Developments in Azerbaijan's export, import and trade balance following the devaluation* (DataStream)

2.4.4. Effect of Devaluation on Inflation

Figure 2.8 indicates developments in inflation. This figure reveals that Azerbaijan has faced two noticeable high inflationary pressures during the last decade. First, Azerbaijan's

inflation rate increased by more than 20%. The main reason behind this inflationary pressure is the increased price of international commodity prices during the 2008 GFC. However, inflation fell dramatically, to 1.5%, in 2009, driven by a fall in international commodity prices and lower external and domestic demand (IMF, May, 2010, p. 4).

Second, there was a decline in oil prices that reduced the country's receipts and caused the CBA to devalue the local currency. Devaluation of AZN in December 2015 has triggered double digit inflation since the beginning of 2016. After the first devaluation in February, non-tradable inflation (services) remained low, but tradable inflation (food) increased by 5%. However, with the second large devaluation in December, the domestic price level increased sharply, to approximately 17%, at the beginning of 2016 (IHS, November, 2016, p. 9).

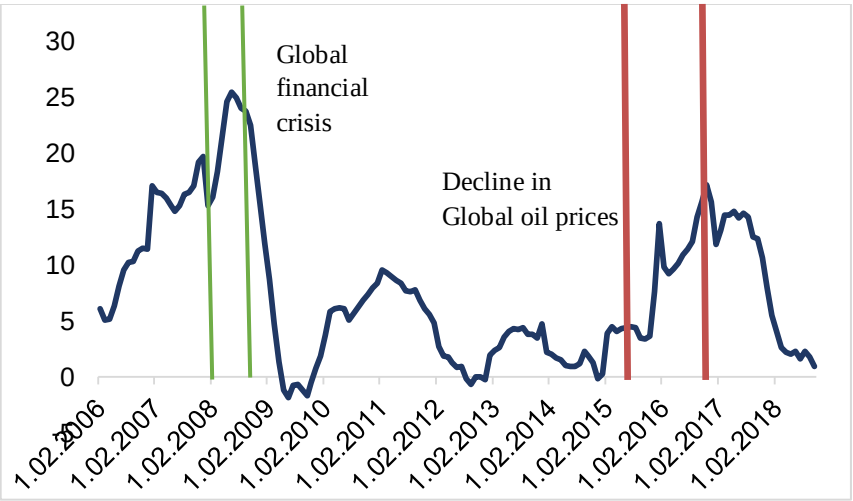

Figure 2.8. *Inflation behavior following the devaluation* (DataStream)

2.4.5. Difficulties in External Debt after Devaluation

Devaluation of the national currency increased Azerbaijan's foreign debt's share in GDP (see Figure 2.9). Foreign debt reached double digits following the second devaluation. There are two main reasons for the increasing share of foreign debt in the country's GDP. The first is devaluation of the national currency. As Azerbaijani GDP is accounted in terms of the local currency, but foreign debt is in foreign currency, mainly USD, devaluation boosted the

share of foreign debt in GDP. The second reason is that, since oil prices fell in the world market, demand for foreign currency has increased.

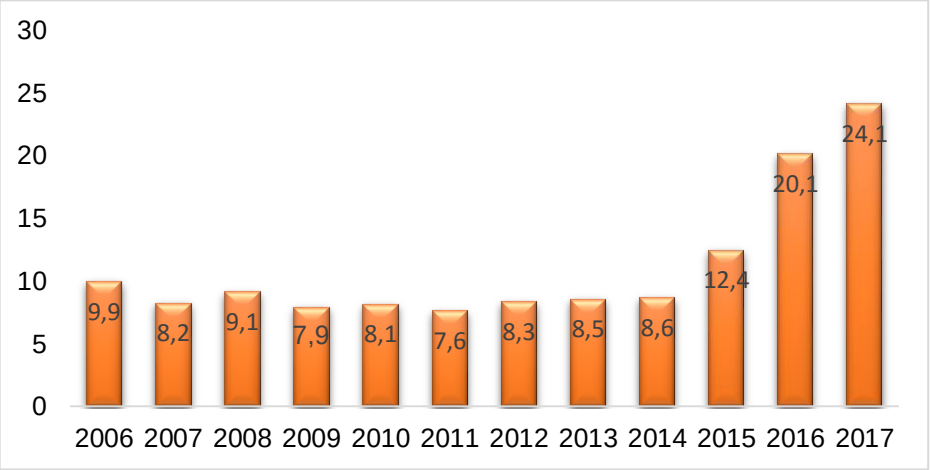

Figure 2.9. *Dynamics of Azerbaijan's external debt (*The Ministry of Finance of Azerbaijan Republic)

CHAPTER THREE

3. EMPIRICAL ANALYSIS FOR AZERBAIJAN

This Chapter is organized as follows: Section 1 introduces the literature reviews; Section 2 presents the empirical analysis, data, and SVAR model; and Section 3 describes our empirical results.

3.1. Literature Review

The effect of oil prices on the macroeconomy has become a crucial area of research in economics since the first oil price shock of 1973. While previous studies, including Hamilton (1983) and Kilian (2009) have shown the importance of oil price fluctuations on the US economy, current studies record the cross-country differences in response to oil price changes. Oil price shocks affect various countries differently, depending on whether the country is an oil-exporter or an oil-importer. Generally, most of the studies in the literature have considered oil-importing countries.[6] However, as our country (Azerbaijan) belongs to the oil-exporting countries, we have taken only oil-exporting economies into consideration in our literature review (see Table 3.1). We categorized the oil-exporting countries into five groups, taking into account the structure of their economy. These groups are OPEC member countries, Africa's oil-exporting countries, Gulf Cooperation Council (GCC) countries, developed oil-exporting countries and various oil-exporting countries.

[6] Tiwari (2013), Ju et al. (2014), Cunado et al. (2015), Gbatu et al. (2017), Hollander et al. (2018), Vu and Nakata (2018), and Ahmed et al. (2019) examined the relationship between oil prices and the macroeconomy of different oil-importing countries.

Table 3.1. *Empirical literature*

Authors/Date	**Country/Countries**	**Sample period**	**Method**	**Findings**
Empirical studies on the impact of oil price shocks on the Azerbaijan				
Mukhtarov et al. (2019)	Azerbaijan	1995-2017	VECM	An increase in oil price and exchange rate rise inflation
Hajiyev and Rustamov (2019)	Azerbaijan	2001-2018	VECM	Negative oil price shock creates inflationary pressure
Empirical studies on the effect of oil price shocks on the OPEC member countries				
Nikbakht (2009)	Algeria, Indonesia, Iran, Kuwait, Nigeria, Saudi Arabia, and Nigeria	2000-2007	Co-integration analysis	Long-run relationship between oil prices and exchange rates
Moshiri and Banihashem (2012)	Algeria, Iran, Kuwait, Nigeria, Saudi Arabia, Venezuela	1970-2009	VAR model	Lower oil prices lead to a stagnation
Monesa and Qazi (2013)	Algeria, Iran, Kuwait, Saudi Arabia, Nigeria and Venezuela	1980-2013	VAR model	The impact of oil price shocks are significant and vary across countries
Ftiti et al. (2016)	United Arab Emirates, Kuwait, Saudi Arabia and Venezuela	2000-2010	The evolutionary co-spectral and cointegration analysis	Oil price shocks have negative effect for both aggregate demand and aggregate supply

Authors/Date	Africa's oil exporting countries	Sample period	Method	Findings
Empirical studies on the effect of oil price shocks on the Africa's oil-exporting countries				
Olomola and Adejumo (2006)	Nigeria	Q: 1970-2003	VAR model	Oil price shocks are not significant
Olusegun (2008)	Nigeria	1970-2005	VAR model	Oil price shocks do not have an important influence
Aliyu (2009)	Nigeria	Q: 1986-2007	Johansen VAR-based cointegration technique	Positive oil price shock stimulates economic growth
Omojolaibi (2013)	Nigeria	Q: 1985-2010	SVAR model	Oil price changes are the main reasons of macroeconomic fluctuations

Authors/Date	Africa's oil exporting countries	Sample period	Method	Findings
Alley et al. (2014)	Nigeria	1981-2012	GMM method	An increase in oil prices is beneficial for Nigeria
Benhabib et al. (2014)	Algeria	M: 2003-2013	VAR model	Cointegration relationship is not found between oil price and exchange rate
Aimer (2016)	Libya	2000-2015	VAR model, co-integration analysis	Positive connection between higher oil prices and Libya's economic growth
Nchor et al. (2016)	Ghana	1980-2014	VAR, VECM models	Positive oil price shocks are stronger than negative oil price shocks

Authors/Date	Africa's oil exporting countries	Sample period	Method	Findings
Rotimi and Ngalawa (2017)	Nigeria, Algeria, Egypt, Libya, Gabon	1980-2015	P-VAR technique	Positive relation between oil price shocks and GDP
Ali and Harvie (2017)	Libya	1970-2007	ARDL model	Negative oil price shock has negative effect on Libya's macroeconomic variables
Akalpler and Nuhu (2018)	Nigeria	1981-2015	VAR method	Oil price has crucial effect on economic growth and exchange rate
Olayungbo (2019)	Nigeria	Q: 1986-2018	Frequency domain causality test	Oil price does not have significant impact on exchange rate and trade balance

Authors/Date	GCC countries	Sample period	Method	Findings
Empirical studies on the effect of oil price shocks on the Gulf Cooperation Council (GCC) countries				
Eltony (2001)	Kuwait	Q: 1984-1998	VAR model, VECM test	Oil price shocks have significant impact on economic variables
Al-mulali and Che Sab (2010)	Qatar	1970-2007	JJ cointegration, VECM tests	An increase in oil prices boosts the real GDP
Nusair (2016)	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates	Vary by country	NARDL model	An increase in oil prices rises the real GDP
Albaity and Mustafa (2018)	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates	M: 2005-2015	Cointegration tests	Oil price shocks affect exchange rate and GDP growth
Nasir et al. (2019)	Bahrain, Kuwait, Saudi Arabia, Oman, Qatar and United Arab Emirates	1980-2016	SVAR model	Positive oil price shock affects GCC members countries beneficially

Authors/Date	Developed oil-exporting countries	Sample period	Method	Findings
Empirical studies on the effect of oil price shocks on the developed oil-exporting countries				
Hou et al. (2016)	Canada	Q: 1980-2011	VAR model	Oil price shocks have a stimulative impact on Canada's economic activity
Donayre and Wilmot (2016)	Canada	1986-2013	TVAR method	Positive oil price shock has stronger impact on output than negative oil price shock
Lorusso and Pieroni (2017)	The UK	M: 1976-2014	SVAR framework	Oil price shocks play a significant role
Lee et al. (2017)	Oil-exporting countries: Canada and UK Oil importing countries: Germany, France, Italy, Japan and US	1994-2015	VAR model	Increased oil prices have beneficial impact on oil-exporting countries

Authors/Date	Countries	Sample period	Method	Findings
Empirical studies on the effect of oil price shocks on the various oil-exporting countries				
Mehrara and Mohaghegh (2011)	Oil-exporting countries	1985-2009	P-VAR approach	Oil shocks remarkably impact output and money supply and not inflationary
Meyer et al. (2016)	Oil-exporting countries	2001-2014	NARDL model	Positive oil price shock increases the food prices in the long-run
Koh (2017)	40 oil-exporting countries	1973-2010	VAR framework	Negative oil price shock decreases output and consumption
Sadeghi (2017)	28 oil-exporting countries	1990-2016	VAR model	Higher oil prices increase non-oil output and government spending
Barkordari and Fattahi (2017)	Iran	Q: 1995-2014	VAR model, decomposition approach	Oil price shocks have positive effect for both inflation and output

Authors/Date	Countries	Sample period	Method	Findings
Farzanegan and Markwardt (2009)	Iran	Q: 1975-2006	VAR model	Positive oil price shock stimulates economic activity, while negative oil price shock has adverse effect on Iranian economy
Yang et al. (2017)	Oil-exporting countries: Brazil, Canada, Mexico and Russia Oil-importing countries: the EU, India, Japan and South Korea	1999-2014	Coherence framework	The adverse relationship between oil price and the exchange rate is verified for the oil-exporting countries
Nyangarika and Tang (2018)	Russia	1991-2016	VAR model	Oil prices have significant impact on Russia's economic activity
Eyden et al. (2019)	17 main OECD countries	1871-2013	FE, LSDV, RC, GMM, FGLS	Oil exporting countries vulnerable to oil price fluctuations

Authors/Date	Countries	Sample period	Method	Findings
Basher et al. (2016)	Oil exporting: Canada, Norway, the UK, Mexico, Russia, Brazil, India Oil importing: Japan, South Korea	Vary by country	VAR model, Markov-switching approach	No systematic evidence found
Sek and Lim (2016)	Ten oil-exporting and ten oil importing countries	M: 1973-2015	SVAR model	Oil price shocks don't have any effect on oil-exporting countries' inflation
Mensah et al. (2017)	The EU, Ghana, India, Nigeria, South Africa and Russia	2000-2007 and 2010-2016	VAR model	Negative relationship between oil price and exchange rate is find mainly during 2010-2016 years
Mahmoodi (2017)	Iran	GTAP data	GTAP model	Negative oil price shock has adverse effect on Iran's economic activity
Alekhina and Yoshino (2018)	Russia	M: 1993-2016	VAR model	Positive oil price shock has favorable impact on Russia's economic activity

There are a few empirical studies (Hajiyev and Rustamov (2019); Mukhtarov et al. (2019)) analyzing the effect of oil price shock on the Azerbaijani economy. They focus mainly on the impact of oil prices on inflation. Their findings suggest that a decline in oil prices leads to high inflation. As a result, the effect of oil price fluctuations on Azerbaijan is not examined extensively in the literature. The current literature leaves unanswered questions, such as "How do changes in oil price affect the value of AZN, GDP, and the TB?" and "What is the main transmission channel of oil price shock?." This thesis aims to answer these questions by examining the impact of a negative oil price shock on macroeconomic indicators, such as the exchange rate, the TB, inflation, and economic activity.

The impact of oil price shocks on the economic growth of OPEC member countries has been investigated by several researchers. Whereas some researchers [Moshiri and Banihashem (2012); Ftiti et al. (2016)] found a negative relationship between oil prices and economic growth, others [Monesa and Qazi (2013)] found mixed results across countries: Venezuela's GDP growth and the inflation rate of Iran respond positively to oil price shocks, but Algeria's GDP growth and Venezuela's inflation rate react adversely. Furthermore, the effects of oil price shocks on the local currencies of OPEC members were analyzed by Nikbakht (2009).[7] He verified the long-run and positive linkage between oil prices and the exchange rates of OPEC member countries. More specifically, he found that oil prices are the main reason for exchange rate fluctuations.

Several studies have been conducted for the African oil-exporting countries. Nigeria is one of the largest oil-exporting countries in Africa. Therefore, most studies have focused predominantly on the macroeconomic impact of oil prices on Nigeria's economy. Some studies [Aliyu (2009); Omojolaibi (2013); Alley (2014)] suggest that oil price shocks are the main driver of macroeconomic fluctuations in Nigeria and that a positive oil price shock stimulates economic activity. In other studies, the effect of oil price shocks has been found not to be significant. Olusegun (2008) found that, although oil price shocks have a revenue effect, they do not have a direct impact on money supply, inflation, and government

[7] Yang et al. (2017) and Mensah et al. (2017) also examined the effects of oil price shocks on the exchange rate for different oil-exporting countries within the multi-country framework. Their results showed that oil prices are the main determining factor of oil-exporting countries' exchange rates and confirmed the adverse relation between oil price and exchange rate. Contrary to this empirical evidence, Haug and Basher (2017) and Basher et al. (2019) found no systematic pattern of either appreciation or depreciation.

spending. Olayungbo (2019) and Olomola and Adejumo (2006) investigated the effect of oil prices on Nigeria's main macroeconomic variables and found an insignificant interrealtionship. Apart from Nigeria, there are some studies about other African oil-exporting countries in different frameworks. Ali and Harvie (2011) conducted empirical research on the effect of oil price shocks on the fiscal policy and main economic variables of Libya. Their results indicated the adverse impact of a negative oil price shock on government budget, non-oil GDP, government spending, gross domestic income, and the exchange rate. Aimer (2016) assessed the relationship between the oil price and Libya's GDP growth and confirmed a positive relationship between higher oil prices and Libya's GDP growth. In contrast, Benhabib et al. (2014) demonstrated a negative relationship between an increase in oil prices and the exchange rate of the Algerian Dinar. Similar research was conducted by Rotimi and Ngalawa (2017) in five oil-exporting countries: Nigeria, Algeria, Egypt, Libya, and Gabon. They also found that positive oil price shocks stimulate economic activity among oil-exporting countries.

The influence of oil prices on the economic activity of the GCC countries[8] (Bahrain, Kuwait, Saudi Arabia, Oman, Qatar, and United Arab Emirates) has been examined by several authors. They used a multi-country framework and their empirical results demonstrated a positive connection between higher oil prices and GDP growth [Albaity and Mustafa (2018); Nusair (2018); Nasir et al. (2019)].

Eltoni (2001) and Al-mulali and Che Sab (2010) conducted research on the effect of oil price fluctuations on Kuwait's macroeconomic variables and the effect of oil shocks on Qatar's GDP, respectively. The authors showed that countries experience high economic growth when there are higher oil prices. However, a rise in oil prices led to higher inflation in Qatar.

There are some studies on the effects of oil price shocks on developed oil-exporting countries such as Canada and the UK. Hou et al. (2016) investigated the impact of oil price shocks and transmission mechanism in Canada. Their empirical findings imply that oil price

[8] The GCC countries is an organization of six oil-exporting countries in whose economic activity oil prices play an important role.

shocks have a beneficial effect on aggregate demand, appreciate the local currency, enhance the terms of trade, and decrease real wages.

A similar investigation was conducted by Lorusso and Pieroni (2017) for the UK economy. The responses of the UK macroeconomy to oil price fluctuations are non-negligible: GDP growth reduces instantly in reaction to a negative oil price shock. In addition, oil shocks cause a rise in UK inflation. Besides the single-country case studies, there are some multi-country studies in the literature.[9]

Some countries, such as Iran and Russia, are not included in the above-mentioned country groups. Mehrara and Mohaghegh (2011) found evidence that oil prices have a direct impact on Iran's output and money supply but have no significant effect on price levels. However, Barkordari and Fattahi (2017) found that the dynamic impact of oil shocks on Iran's output and inflation is negative and positive, respectively. Additionally, the effect of positive and negative oil price shocks on Iran's economic activity were investigated by Farzanegan and Markwardt (2009) and Mahmoodi (2017). These authors found that an increase in oil prices stimulates economic activity. Moreover, a negative oil price shock has an adverse impact on economic activity through decreasing oil revenues and deteriorating the TB.

Nyangarika and Tang (2018) and Alekhina and Yoshino (2018) examined the effect of oil prices on Russian macroeconomic indicators. Their results confirmed that an increase in oil prices have a positive effect on Russia's economic activity: GDP growth increases, CPI decreases, and domestic currency appreciates.

3.2. Empirical Analysis

In this study, we estimate an SVAR model to examine the effects of oil price changes and devaluation on the Azerbaijani economy. Generally, the effect of a negative oil price shock on the macroeconomy of an oil-exporting country is assumed to be contemporaneous. However, the effect of devaluation on economic activity, the TB, and inflation likely involves some time lags. The main advantage of SVAR analysis is that necessary restrictions and required identification issues in the model can be embedded by the economic theory. If

[9] Lee et al. (2017) investigated the correlation between oil price fluctuations and country risks for oil exporting countries (Canada and the UK) and some oil-importing countries. Their empirical results confirmed the beneficial effect of increased oil prices on the country stability of Canada and the UK.

identification is completed, it is possible to investigate the underlying reasons behind structural shocks.

In this section, we introduce our data, explain the empirical model and identify the restrictions. Then, we present our empirical findings and a robustness check.

3.2.1. Data

Figure 3.1 represents our dataset. According to this figure, Azerbaijan's macroeconomic indicators move together with oil prices. In other words, the fluctuations in the country's economy is driven mainly by oil price changes. The recent experience of the Azerbaijan economy supports this argument. Following the great plunge in oil prices during 2014–2016, Azerbaijan's economy has suffered from the adverse effects of lower global oil prices, experiencing, e.g., currency devaluation, high inflation, and contraction in economic activity.

Considering this stylized fact, we analyze how a negative oil price shock affects macroeconomic variables in Azerbaijan. We focus specifically on the exchange rate channel in the transmission of oil price movements to the Azerbaijani economy. In this framework, we have four domestic variables and one exogenous variable. The domestic variables are the exchange rate, the TB, inflation, and GDP. The exogenous variable is oil price. The oil price is included in an empirical model to analyze the effects of a negative oil price shock. To assess the impact of a negative oil price shock on domestic prices, CPI inflation is included to the model. GDP is included to capture the impact on economic activity. The exchange rate is included to examine the impact on local currency. Finally, we include the TB to assess the impact on it. The data are obtained from DataStream. These data are at a monthly frequency and cover the period from January 2006 to October 2018. There are three important reasons for this. First, until 2005, corruption was a major problem in Azerbaijan that jeopardized the country's economic growth. In January 2005, parliament adopted an anti-corruption law to address the problem of corruption. Second, in the years following the opening of the Baku–Tbilisi–Ceyhan crude oil pipeline in May 2005, Azerbaijan's macroeconomic indicators have experienced noticeable growth. Third, the decree "On changing in the Republic of Azerbaijan nominals of banknotes and scale of prices" was signed on February 7, 2005, and, starting

from January 1, 2006, new banknotes were put into circulation.[10] . As the Azerbaijani economy has experienced noticeable development and improvement since 2006, this study does not take into account the data before 2006

Figure 3.1. *Time series of our variables*

[10] One new manat equaled 5000 old manats.

3.2.2. SVAR model and Identification scheme

In this section, we present a structural VAR framework to sort out contemporaneous and causal links among variables. We consider the following SVAR model:

$$AY_t = B(L)Y_{t-1} + \varepsilon_t \tag{0.1}$$

$$Y_t = \left[\ln OP_t, \ln NER_t, TB_t, INF_t, \ln GDP_t\right]$$

Where Y_t represents n×1 vector of our variables; $LnOP_t$ represents the natural logarithm of oil price; $lnNER^{11}{}_t$ represents the natural logarithm of nominal exchange rate; TB_t represents trade balance, which is defined as the natural logarithm of exports divided by the natural logarithm of imports; INF_t represents CPI inflation; and $lnGDP_t$ represents the natural logarithm of GDP. A represents a matrix of contemporaneous coefficients in structural form; B(L) is a matrix polynomial in the lag operator and ε_t is the vector of structural disturbances, which can be represented as $[\varepsilon_t^{OP}, \varepsilon_t^{GDP}, \varepsilon_t^{TB}, \varepsilon_t^{INF}, \varepsilon_t^{NER}]$ that are independent and identically distributed. The ε_t is assumed to be uncorrelated and satisfies $(E(\varepsilon_t) = 0)$, $\varepsilon = E[\varepsilon_t, \varepsilon_{t'}] = I$.

The connection between the structural shocks and reduced-form innovations (residuals) is:

$$\varepsilon_t = Au_t \tag{0.2}$$

To identify structural shocks, we impose two types of restrictions on our SVAR model: Cholesky decomposition and block-exogeneity restrictions.

The Cholesky approach imposes restrictions on structural parameters (coefficients of A matrix), whereas the block-exogeneity assumption imposes restrictions on reduced-form parameters (coefficients of B matrix) and structural parameters.

We begin with Cholesky identification restrictions. The ordering of variables is crucial in this approach, as the Cholesky identification scheme imposes restrictions on the contemporaneous relations between variables, such that the A becomes lower triangular.

We order our variables as follows:

$$\text{oil price} \rightarrow \text{exchange rate} \rightarrow \text{trade balance} \rightarrow \text{inflation} \rightarrow \text{GDP}$$

This ordering is consistent with the following theoretical consideration and the works of Kamin & Rogers (2000), Berument & Pasaogullari (2003), and Mirdala (2014).

[11] The nominal exchange rate is defined as the value of local currency in terms of the USD. An increase (decrease) in the exchange rate implies a currency devaluation (revaluation).

The reason for placing the oil price first is clear: domestic macroeconomic shocks are not expected to influence global oil prices, consistent with the block-exogeneity assumption. The order of our domestic variables depends on the following argument. According to this argument, a negative oil price shock leads to a currency devaluation. This, in turn, has a substantial effect on the TB, inflation, and economic activity.

Overall, with this ordering of variables, the Cholesky scheme imposed the following restrictions on the structural model:

$$\begin{bmatrix} \varepsilon^{OP} \\ \varepsilon^{NER} \\ \varepsilon^{TB} \\ \varepsilon^{INF} \\ \varepsilon^{GDP} \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \end{bmatrix} \begin{bmatrix} u^{OP} \\ u^{NER} \\ u^{TB} \\ u^{INF} \\ u^{GDP} \end{bmatrix}$$

Another restriction to our model is block-exogeneity restriction. Block-exogeneity assumption proposes that the domestic macroeconomic shocks do not influence global oil prices either contemporaneously or with lags. Because Azerbaijan is a small oil-producing country, we do not expect that the Azerbaijani economy would have any significant effect on global oil prices. We have already imposed contemporaneous restrictions by placing the oil price first in the ordering of variables. Consistent with the block-exogeneity assumption, we impose zero restrictions on the lagged coefficients of Azerbaijan's variables in the oil price equation. In particular, by imposing the restrictions, we can differ the lag structure. Whereas the domestic block equations contain the lags of both oil price and domestic variables, the oil equation includes only the lags of oil price. Accordingly, domestic macroeconomic variables are restricted and are not involved in the oil price equation. The block-exogeneity restriction is imposed on the B matrix, as follows:

$$B = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} \end{bmatrix}$$

Before the estimation of the VAR model, we examine the stationarity of the variables by analyzing the results of an Augmented Dickey-Fuller test. The corresponding results are documented in Table 3.4 in Appendix A. The results indicate that all variables have a unit root. Although our variables are not stationary in the level, the VAR in level specification is used to avoid losing information on the long-run relationship between our variables.[12]

Using the lag length Selection criteria, we determine the lag length for the VAR model. The results obtained using the lag length Selection criteria are presented in Appendix Table 3.6. Considering Akaike Information Criterion (AIC) and Final Prediction Error Criterion, we estimate the model with 4 lags for the period from 2006:1 to 2018:8.

Furthermore, we employ the Lagrange Multiplier (LM) test to examine whether the residuals of our reduced form VAR model exhibit serial correlation. Table 3.8 in Appendix B shows the results of the LM test. These results show that there is no serial correlation between the error terms.

3.3. Empirical Results

In this section, we present our empirical findings based on impulse response function analysis and variance decomposition analysis, respectively.

[12] We also examine whether there is cointegration between variables. The test results are presented in Appendix B. According to these results, there is a long-run relationship between the variables. To consider this long-run relationship, we estimate the VAR model with level of variables.

3.3.1. Effects of a negative oil price shock on Azerbaijan's domestic macroeconomic variables

To measure the responses of domestic macroeconomic variables to a negative oil price shock, we perform an impulse response function (IRF) analysis. Figure 3.2 shows a one standard deviation decrease in global oil prices (negative oil price shock). The solid (blue) lines show the IRFs, and the dashed (red) lines represent the 95% confidence intervals for all the estimates.

The results of IRF are illustrated in Figure 3.2. This figure shows clearly that a negative oil price shock has a significant adverse effect on Azerbaijan's macroeconomic variables. A negative shock increases the exchange rate. This effect is statistically and economically significant. In addition, this finding implies that a negative oil price shock causes a devaluation of the Azerbaijani manat. Moreover, an adverse oil price shock reduces the TB within 15 months, and then the effect on the TB disappears. In other word, the shock creates a J-curve effect through causing devaluation. Furthermore, a negative oil price shock leads to an increase in inflation. The impact is weak one year following the shock, but, it then becomes profound. This result suggests that a negative oil price shock has a delayed effect on inflation. Finally, the last graph in Figure 3.2 shows that a negative oil price shock has an adverse effect on Azerbaijan's economic activity. It generates a recession that emerges after the shock and reaches its peak after 10 months. Two years after the shock, the economy enters a recovery period.

To summarize, a negative oil price shock causes a currency devaluation and subsequently generates high inflation and recession. In other words, it has a stagflationary effect on Azerbaijan's economy through the exchange rate channel.

Our findings are compatible with the recent experience of Azerbaijan's economy. During 2014–2016, oil prices decreased sharply, and this had a negative effect on FX reserves and created pressure on Azerbaijan's exchange rate. Devaluation of the national currency deteriorated the TB and increased the price of imported inputs and capital goods. This led to an increase in the general price level. As a result, production contracted and economic activity shrank. So, our empirical model creates similar consequences. Our results are in line with the theoretical arguments. According to the theory, a decrease in global oil prices creates

a currency devaluation in oil exporting countries with a fixed exchange rate regime. Subsequently, it adversely affects economic activity, inflation, and the TB.

Overall, our results are consistent with the related literature. Most of the studies in the literature have documented that a negative oil price shock has adverse effects on domestic variables in oil-exporting countries [Moshiri and Banihashem (2012); Ali and Harvie (2017); Koh (2017)]. Our findings also suggest that a negative oil price shock generates adverse effects on Azerbaijan.

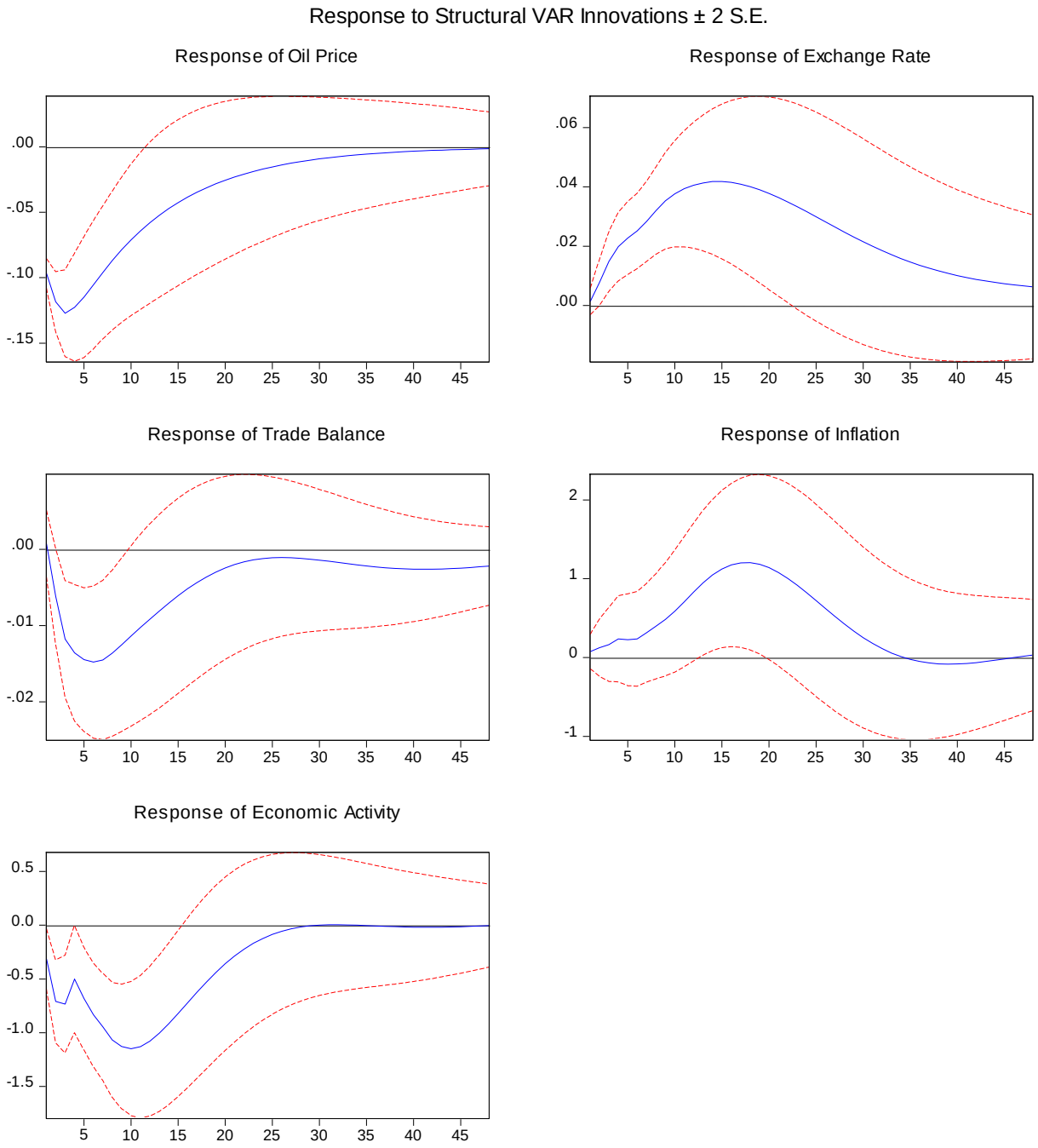

Figure 3.2. *The effect of a negative oil price shock*

3.3.2. Effects of a positive exchange rate shock (devaluation) on trade balance, inflation, and economic activity of Azerbaijan

In the previous section, we analyzed the effect of a negative oil price shock on Azerbaijan's domestic macroeconomic variables. In this section, we investigate whether a negative oil price shock affects Azerbaijani macroeconomic variables through a currency devaluation. To examine this interaction, we exclude the oil price from our SVAR model. The present version of the model has four domestic variables and does not include an external variable. We estimate this model with 4 lags, considering AIC and FPE criteria[13] (see Table 3.7 in Appendix B). In this section, we use this model to examine how a currency devaluation influences macroeconomic indicators. The results of IRF are illustrated in Figure 3.3.

[13] We use the LM test to examine the serial auto correlation for this model. The results are presented in Table 3.9 in Appendix B. The table shows that there is no serial correlation.

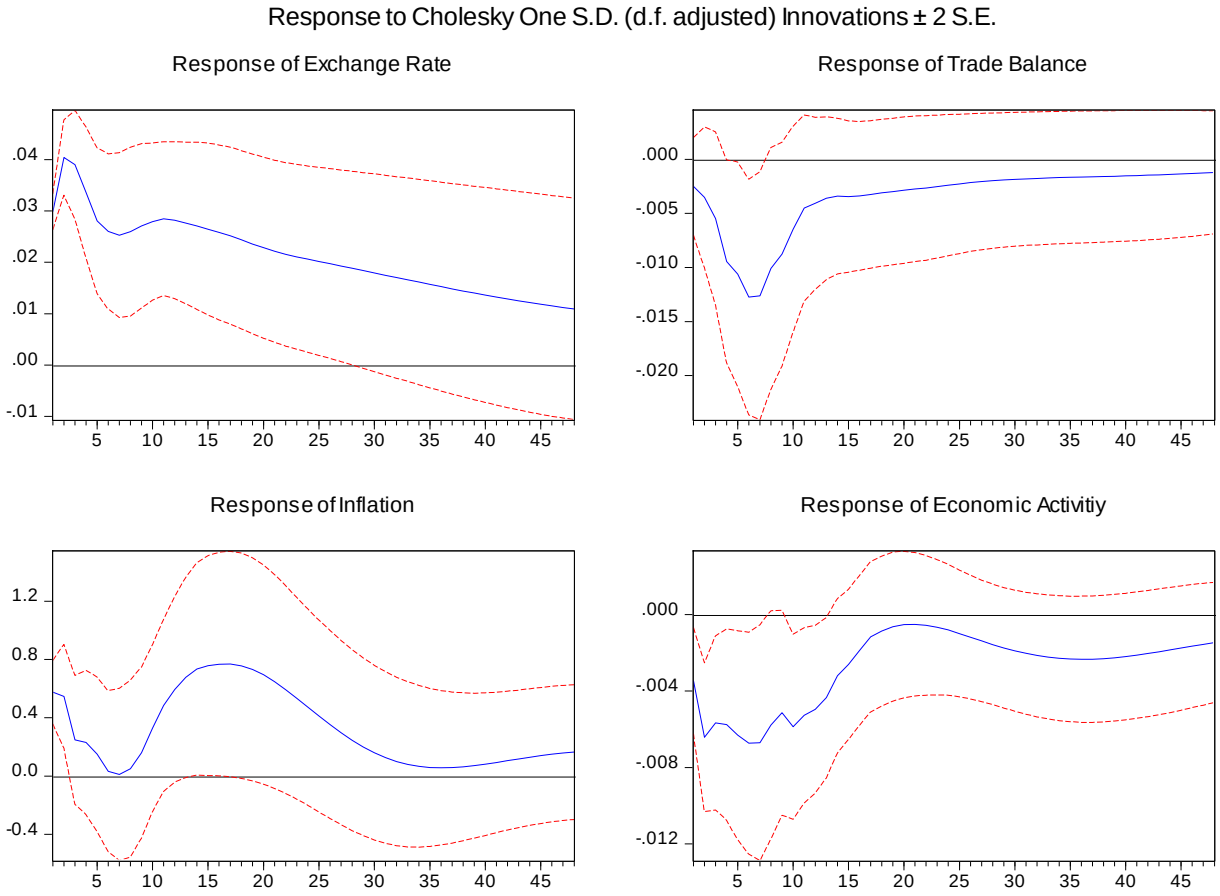

Figure 3.3. *The impact of a positive exchange rate shock (Devaluation)*

The figure shows clearly that a positive exchange rate shock (devaluation) induces adverse effects on Azerbaijan's economy. The effect of devaluation on the TB is negative and statistically significant for the first year. After one year following the shock, devaluation improves the TB. This implies that a J-curve pattern exists in Azerbaijan. Also, devaluation causes a rise in inflation. The impact is mild in the first 10 months, but it then becomes intense. Lastly, as illustrated in Figure 3.3, a positive exchange rate shock (currency devaluation shock) has a contractionary impact on economic activity. The greatest contractionary impact occurs within the first year. Moreover, a currency devaluation creates a recessionary effect like that resulting from a decrease in global oil prices. However, the impact of declining oil prices is more severe than is devaluation.

Our findings are consistent with contractionary devaluation theory. According to this theory, devaluation of the local currency has an adverse impact on the macroeconomy. This reduces the TB, increases inflation, and shrinks economic activity.

Additionally, our results are also consistent with stylized facts (documented in chapter 2). Following the devaluations of AZN on February 2015 and December 2015, Azerbaijani economic activity contracted, the TB deteriorated, and inflation rose.

As a consequence, based on our IRF, which is illustrated in Figure 3.2 and Figure 3.3, it is obvious that devaluation has adverse effects similar to those of a negative oil price shock. As with a negative oil price shock, devaluation reduces the TB, increases inflation, and shrinks economic activity. As a result, we can say that the exchange rate is the main transmission channel of a negative oil price shock. More precisely, a negative oil price shock affects Azerbaijan's economic activity through creating devaluation of the local currency.

3.3.3 Variance decomposition analysis

In the previous section, we used IRFs to analyze the responses of our variables to both a negative oil price shock and a positive exchange rate shock. To specify the relative significance of these shocks, we use variance decomposition analysis. This facilitates identification of how many of the variations in the variables are explained by various shocks over a time period. In the following, we apply variance decomposition analysis to measure the fluctuations in domestic variables caused by a negative oil price shock and a positive exchange rate shock. Table 3.2 represents the variance decomposition analysis for the model, including oil prices. According to this table, oil price shock explains a considerable portion of fluctuations in Azerbaijani domestic macroeconomic variables. It accounts for approximately two third of the variation in the exchange rate. Also, the results reveal that approximately one third of changes in the TB are explained by the oil price shock. In addition, the contribution of the oil price shock to inflation is relatively slight in the short-term. It accounts for 9.5% of the variation in the short-run but, explains 35% of the variations in inflation in the long-run. Finally, oil price shock explains approximately one-half of the variation in economic activity.

Period/Variables	Exchange rate	Trade balance	Inflation	Economic activity
1	0.263378	0.080469	0.327940	3.301509
12	65.15867	33.20027	9.420749	57.10779
24	70.75638	34.61564	33.72426	62.49676
48	68.10545	35.52061	35.21270	61.82901

Table 3.2. *Variance decomposition analysis for a VAR model with an exogenous variable*

Table 3.3 shows the results of variance decomposition analysis based on the model including only domestic variables. In this model, we focus only on the exchange rate shock. These results imply that devaluation explains approximately 11–16% of fluctuations in the TB. Furthermore, inflation is affected by a positive exchange rate shock at a very minimal level. In the 12th month approximately 4.4% of the variation in inflation is explained by exchange rate shock. However, in the fourth year, this contribution increases slightly, to 10.2%. Besides, the exchange rate shock accounts for approximately one fifth of the forecast error variance of economic activity.

Period/Variables	Exchange rate	Trade balance	Inflation	Economic activity
1	100.0000	0.625249	16.327940	2.301509
12	78.17426	11.20027	4.420749	17.10779
24	79.75638	13.61564	8.72426	20.49676
48	82.10545	16.52061	10.21270	22.82901

Table 3.3. *Variance decomposition analysis for a VAR model with domestic variables*

Our results suggest that oil price shock explains an important portion of fluctuations in Azerbaijan's economy. When we exclude the oil price from our model and take into account only the exchange rate shock, we find that the exchange rate shock also explains a significant part of variations in macroeconomic variables, such as inflation, the TB, and economic

activity. As a result, our findings imply that the two shocks, oil price and exchange rate shocks, are important drivers of business cycles in Azerbaijan.

Our results based on the IRF and variance decomposition analyses (documented in Figure 3.2, Figure 3.3, Table 3.2 and Table 3.3) are consistent with the structure of the Azerbaijani economy. On the basis of our results from these analyses, we can deduce that a negative oil price shock has a significant effect on Azerbaijani macroeconomic variables. Accordingly, the Azerbaijani economy is highly vulnerable to changes in oil prices. This is consistent with one of the main characteristic of Azerbaijani economy: high oil revenue dependency. Exports of oil and oil products account for approximately 86% of the country's overall exports (IMF, September, 2016, p. 21 To achieve sustainable growth, save the economy from external shocks, and decrease oil-dependeny, economic diversification and export diversification is needed for Azerbaijan's economy. To achieve economic diversification, the government should either enhance non-oil sectors, such as agriculture and tourism, or create import-substituting businesses.

3.4 Robustness Check

Our main findings suggest that a negative oil price shock causes a currency devaluation and, subsequently, a recession and high inflation, with a deterioration in the TB. Meanwhile, a currency devaluation shock has effects similar to those of the adverse oil price shock, such as a contraction in economic activity, a rise in inflation, and deterioration of the TB. In this section, to check the robustness of our findings, we re-estimate the model using a different lag structure and first differences of variables.

In the baseline model, we use 4 lags considering AIC. Given the monthly nature of the data, one can consider that some residual correlation may still exist. To address this point, we re-estimate the model with 12 lags. Furthermore, the baseline model includes the level of the variables. Our variables are non-stationary at level (See Table 3.4 in Appendix A). To examine whether our results are sensitive to either the level or first-differences, we re-estimate the model using first differences of all variables.

Figure 3.4 and Figure 3.5 in Appendix C indicate the impulse response functions based on the estimation of the VAR model with the first differences of variables. The model with the

first differences provides results similar to those obtained using the baseline model, with one exception (the reaction of the inflation is different). According to this figure (Figure 3.4 in Appendix C), an adverse oil price shock increases the exchange rate, reduces the TB, and shrinks economic activity. Also, a currency devaluation shock (Figure 3.5 in Appendix C) increases inflation, causes a fall in economic activity, and reduces the TB. These results imply that our main findings are not sensitive to the VAR specifications (level or first differences).

Figure 3.6 and Figure 3.7 in Appendix C show the impulse responses based on the estimation of the VAR model with 12 lags. The VAR model with 12 lags provides similar results. The pattern of the responses of the variables to a negative oil price shock and currency depreciation shock is similar to those based on the baseline model. Accordingly, the adverse oil price shock (Figure 3.6 in Appendix C) has a significant effect on domestic macroeconomic variables. Similarly, a currency devaluation shock (Figure 3.7 in Appendix C) has a substantial effect. As a result, we argue that using different lags does not alter our main results. This suggests that our findings are robust to lag structure.

Conclusion

The recent plunge in oil prices during 2014–2016 has brought macroeconomic difficulties for oil-exporting countries. Azerbaijan is one of the oil-exporting countries that have suffered from the consequences of the recent oil price decline. Following the decline, Azerbaijan lost considerable revenues from oil exports. Thus, the local currency was devalued, the trade balance (TB) deteriorated, inflation rose, and economic activity contracted. To the best of our knowledge, there is no comprehensive empirical study examining the spillovers from an oil price shock to Azerbaijan. This study aims to fill this gap in the literature, by offering evidence about such spillovers.

The purpose of this study is to analyze the effects of a negative oil price shock on Azerbaijan's domestic macroeconomic variables, including exchange rate, the TB, inflation, and economic activity. We estimated a structural vector autoregression model to investigate these effects. To identify structural shocks, we used the Cholesky decomposition approach and block-exogeneity restrictions.

Our findings are consistent with the theoretical arguments that a negative oil price shock affects oil-exporting countries mainly through an exchange rate channel. We find that a negative oil price shock led to a recession and high inflation by causing currency devaluation. In other words, it generated stagflationary pressure on the economy. We also find that a currency devaluation shock has similar adverse effects: it causes a fall in economic activity, a deterioration in the TB, and a rise in inflation. The results show clearly that Azerbaijan's domestic macroeconomic variables are affected adversely by a negative oil price shock and a currency devaluation shock. Moreover, oil price shocks and exchange rate shocks explain a significant portion of the fluctuations in Azerbaijani economy. Overall, our findings suggest that macroeconomic performance in Azerbaijan is heavily sensitive to oil price swings, and that lower global oil prices cause macroeconomic challenges for Azerbaijan. This sensitivity comes from weak fundamentals of the Azerbaijani economy, such as high oil dependency and low diversification of the economy. In other words, these characteristics make the Azerbaijani economy more vulnerable to oil price fluctuations

The findings of this study provide comprehensive evidence about the consequences of a negative oil price shock. Our recommendations to policymakers are that the country should implement economic and export diversification strategies to decrease the country's high oil dependency. Government should either enhance non-oil sectors, such as agriculture, mining, and tourism, or create import-substituting businesses to achieve strong and sustainable economic growth.

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Appendix A

Null Hypothesis: LNOP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.417382	0.3691
Test critical values:	1% level	-4.020396	
	5% level	-3.440059	
	10% level	-3.144465	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNNER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 10 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.284200	0.4394
Test critical values:	1% level	-4.024452	
	5% level	-3.442006	
	10% level	-3.145608	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: TB has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.044990	0.1238
Test critical values:	1% level	-4.021254	
	5% level	-3.440471	
	10% level	-3.144707	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.999335	0.1359
Test critical values:	1% level	-4.019975	
	5% level	-3.439857	
	10% level	-3.144346	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.377903	0.3896
Test critical values:	1% level	-4.020396	
	5% level	-3.440059	
	10% level	-3.144465	

*MacKinnon (1996) one-sided p-values.

Table 3.4. *Unit root test results.*

Appendix B

Date: 07/11/19 Time: 10:54
Sample (adjusted): 2006M05 2018M08
Included observations: 148 after adjustments
Trend assumption: Linear deterministic trend
Series: LNOP LNNER TB INF LNGDP
Exogenous series: @TREND
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.245196	99.01082	69.81889	0.0001
At most 1 *	0.211522	57.37891	47.85613	0.0050
At most 2	0.085299	22.20652	29.79707	0.2872
At most 3	0.039408	9.011174	15.49471	0.3643
At most 4	0.020469	3.060787	3.841466	0.0802

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.245196	41.63191	33.87687	0.0049
At most 1 *	0.211522	35.17239	27.58434	0.0044
At most 2	0.085299	13.19534	21.13162	0.4344
At most 3	0.039408	5.950388	14.26460	0.6196
At most 4	0.020469	3.060787	3.841466	0.0802

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3.5. *Cointegration test results*

VAR Lag Order Selection Criteria
Endogenous variables: LNOP LNNER TB INF LNGDP
Exogenous variables: C @TREND
Date: 07/08/19 Time: 16:34
Sample: 2006M01 2018M08
Included observations: 140
*Note: selection calculation does not impose restricted VAR coefficient restrictions

Lag	LogL**	LR	FPE	AIC	SC	HQ
0	-545.8928	NA	0.001934	7.941325	8.151442	8.026711
1	245.3365	1503.336	3.41e-08	-3.004807	-2.269396*	-2.705958*
2	279.1992	61.92037	3.01e-08	-3.131417	-1.870713	-2.619104
3	304.6343	44.69307	3.00e-08	-3.137632	-1.351635	-2.411856
4	**334.1874**	**49.81813**	**2.83e-08***	**-3.202677***	**-0.891386**	**-2.263438**
5	350.0707	25.64015	3.27e-08	-3.072438	-0.235854	-1.919735
6	367.2742	26.54256	3.71e-08	-2.961060	0.400817	-1.594893
7	392.5200	37.14748	3.78e-08	-2.964572	0.922598	-1.384942
8	413.6023	29.51514	4.13e-08	-2.908604	1.503860	-1.115511
9	428.8423	20.24751	4.94e-08	-2.769176	2.168581	-0.762620
10	445.9003	21.44435	5.82e-08	-2.655719	2.807331	-0.435699
11	492.4941	55.24690*	4.56e-08	-2.964202	3.024142	-0.530718
12	513.0972	22.95776	5.25e-08	-2.901389	3.612248	-0.254442

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 3.6. *Lag order selection for VAR model with an exogenous variable*

VAR Lag Order Selection Criteria
Endogenous variables: LNNER TB INF LNGDP
Exogenous variables: C @TREND
Date: 07/08/19 Time: 16:33
Sample: 2006M01 2018M08
Included observations: 140

Lag	LogL	LR	FPE	AIC	SC	HQ
0	97.81003	NA	3.26e-06	-1.283000	-1.114907	-1.214692
1	725.5771	1201.725	5.22e-10	-10.02253	-9.518248*	-9.817605
2	759.8702	63.68729	4.02e-10	-10.28386	-9.443391	-9.942319*
3	774.0923	25.59979	4.13e-10	-10.25846	-9.081805	-9.780304
4	**801.3595**	**47.52283**	**3.53e-10***	**-10.41942***	**-8.906577**	**-9.804647**
5	810.2806	15.03844	3.92e-10	-10.31829	-8.469262	-9.566903
6	820.3280	16.36281	4.30e-10	-10.23326	-8.048037	-9.345249
7	829.8962	15.03581	4.76e-10	-10.14137	-7.619967	-9.116750
8	845.3643	23.42313	4.86e-10	-10.13378	-7.276180	-8.972535
9	853.7257	12.18379	5.50e-10	-10.02465	-6.830870	-8.726795
10	866.5102	17.89825	5.88e-10	-9.978717	-6.448746	-8.544243
11	898.0240	42.31846*	4.83e-10	-10.20034	-6.334184	-8.629251
12	908.8031	13.85890	5.37e-10	-10.12576	-5.923412	-8.418051

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 3.7. *Lag order selection for VAR model with domestic variables*

VAR Residual Serial Correlation LM Tests
Date: 07/22/19 Time: 14:44
Sample: 2006M01 2018M08
Included observations: 148

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	27.87547	25	0.3136	1.120912	(25, 436.1)	0.3140
2	24.08813	25	0.5143	0.964489	(25, 436.1)	0.5146
3	36.11885	25	0.0698	1.465986	(25, 436.1)	0.0700
4	30.04132	25	0.2227	1.210962	(25, 436.1)	0.2231
5	30.25896	25	0.2147	1.220034	(25, 436.1)	0.2150
6	22.01491	25	0.6349	0.879421	(25, 436.1)	0.6352
7	29.80253	25	0.2318	1.201012	(25, 436.1)	0.2321
8	23.66825	25	0.5386	0.947229	(25, 436.1)	0.5389
9	21.29336	25	0.6761	0.849907	(25, 436.1)	0.6764
10	55.62901	25	0.0004	2.308464	(25, 436.1)	0.0784
11	22.11722	25	0.6290	0.883610	(25, 436.1)	0.6293
12	48.01345	25	0.0037	1.975237	(25, 436.1)	0.0037

Table 3.8. *VAR Residual Serial Correlation LM Tests for VAR model with an exogenous variable*

VAR Residual Serial Correlation LM Tests
Date: 07/22/19 Time: 14:50
Sample: 2006M01 2018M08
Included observations: 148

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	Df	Prob.
1	12.31975	16	0.7217	0.768203	(16, 376.4)	0.7218
2	15.45028	16	0.4919	0.967373	(16, 376.4)	0.4921
3	28.52151	16	0.0274	1.816786	(16, 376.4)	0.0274
4	16.35830	16	0.4282	1.025447	(16, 376.4)	0.4284
5	18.69130	16	0.2850	1.175293	(16, 376.4)	0.2851
6	9.559683	16	0.8886	0.593946	(16, 376.4)	0.8886
7	19.18389	16	0.2592	1.207048	(16, 376.4)	0.2594
8	16.80338	16	0.3984	1.053964	(16, 376.4)	0.3986
9	10.75748	16	0.8242	0.669414	(16, 376.4)	0.8243
10	42.68251	16	0.0003	2.770292	(16, 376.4)	0.0003
11	17.30295	16	0.3663	1.086012	(16, 376.4)	0.3664
12	34.85355	16	0.0042	2.238793	(16, 376.4)	0.0042

Table 3.9. *VAR Residual Serial Correlation LM Tests for VAR model with domestic variables*

Appendix C

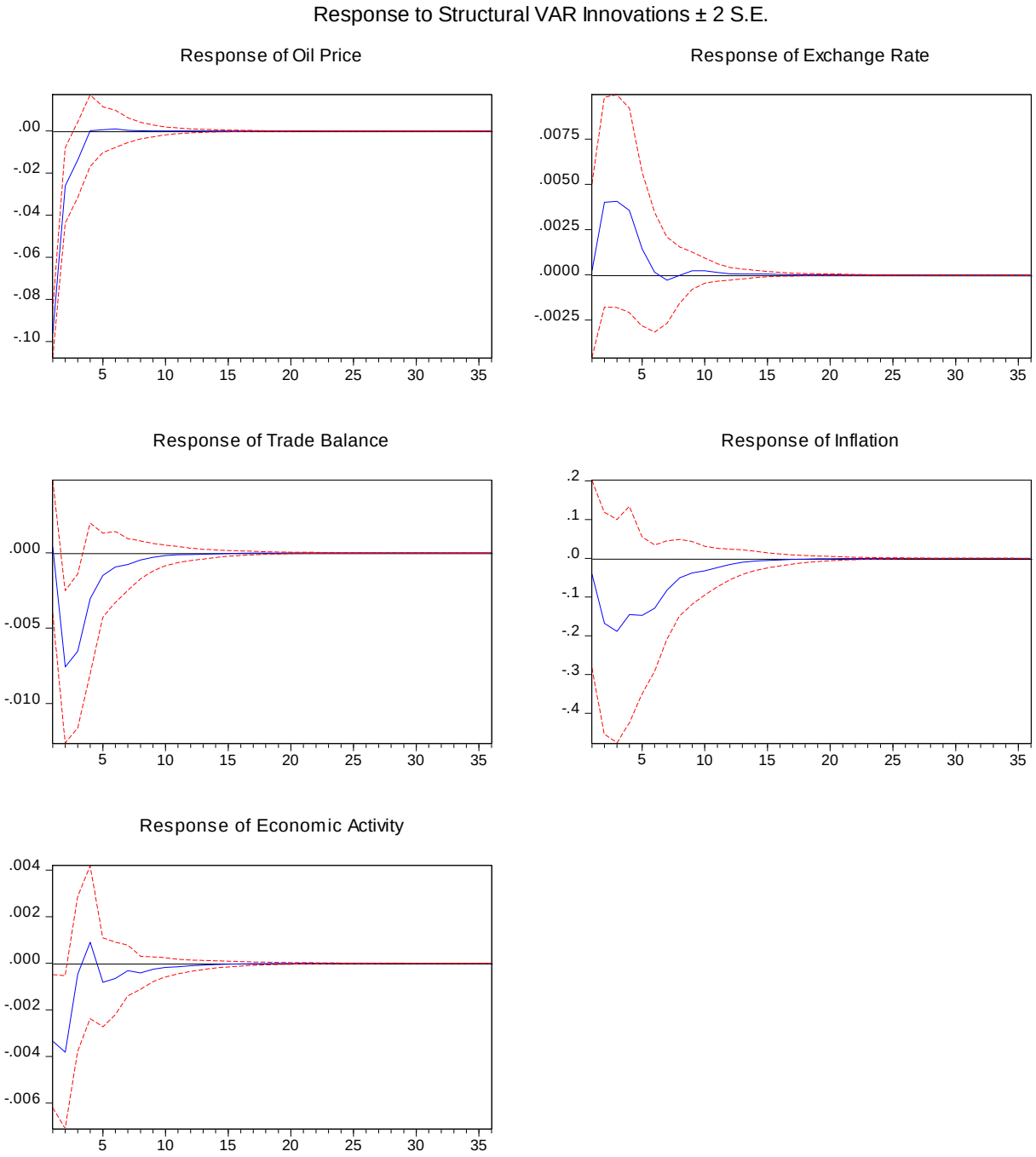

Figure 3.4. *The effect of a negative oil price shock (VAR model with first differences of variables)*

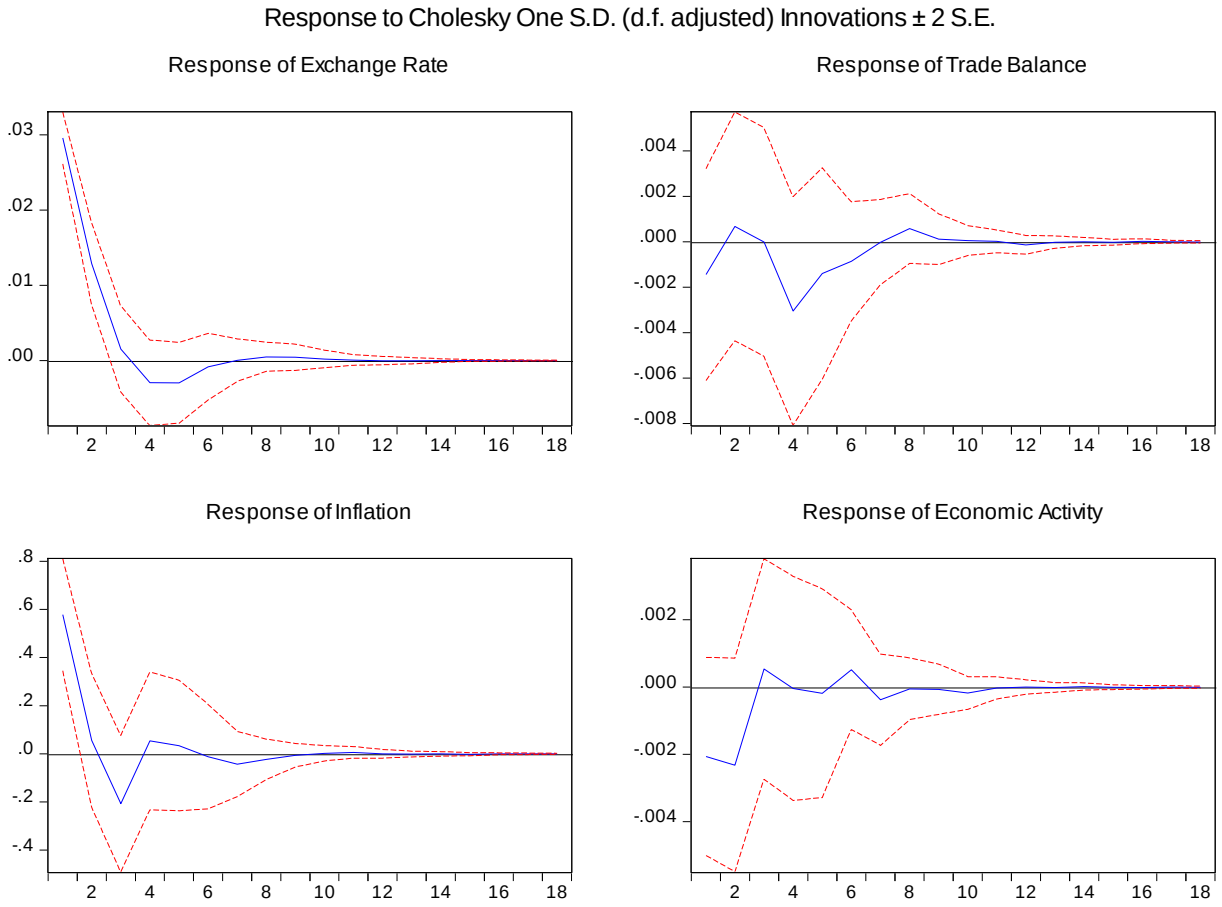

Figure 3.5. *The effect of a positive exchange rate shock (VAR model with first differences of variables)*

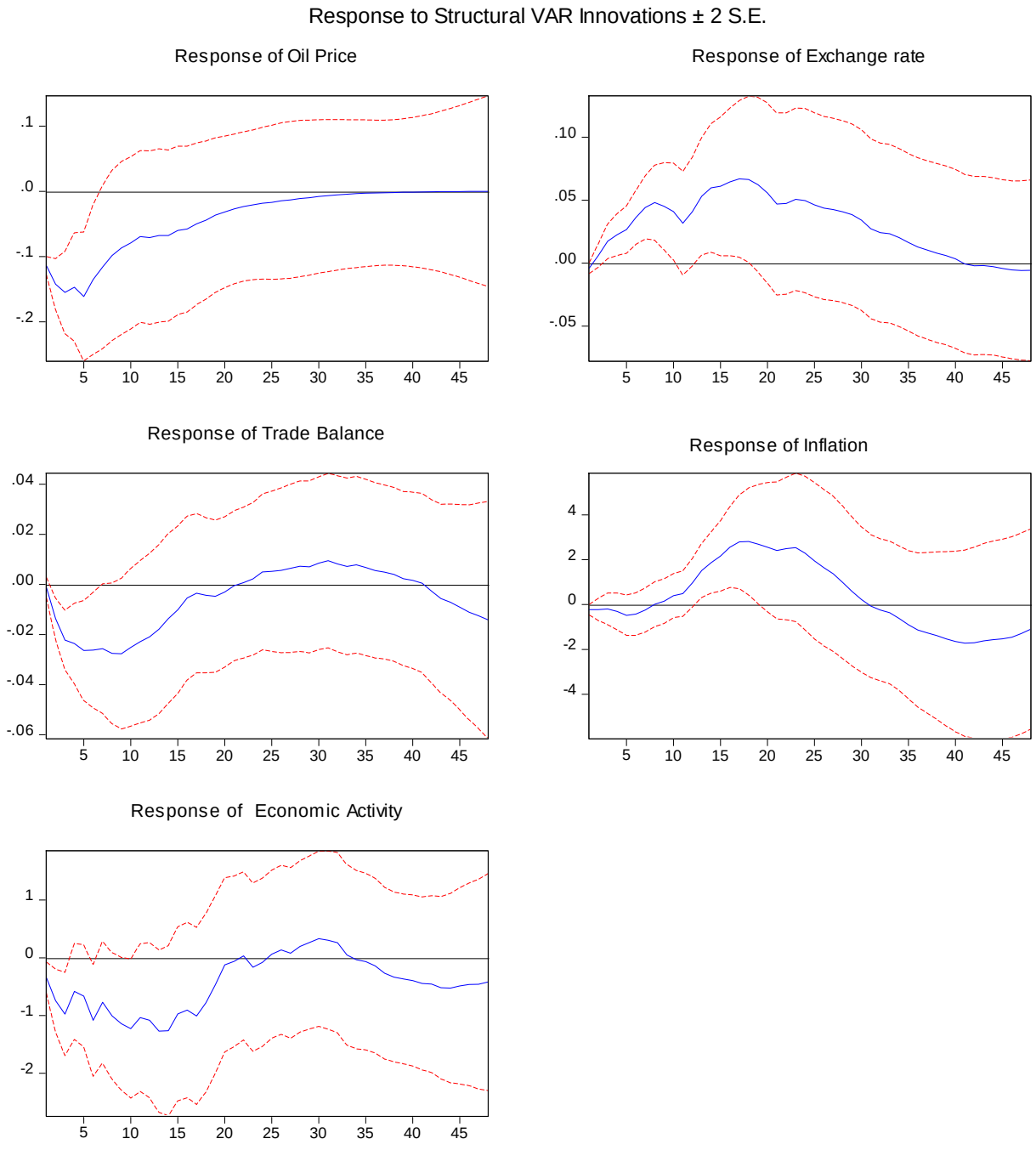

Figure 3.6. *The effect of a negative oil price shock (VAR model with 12 lags)*

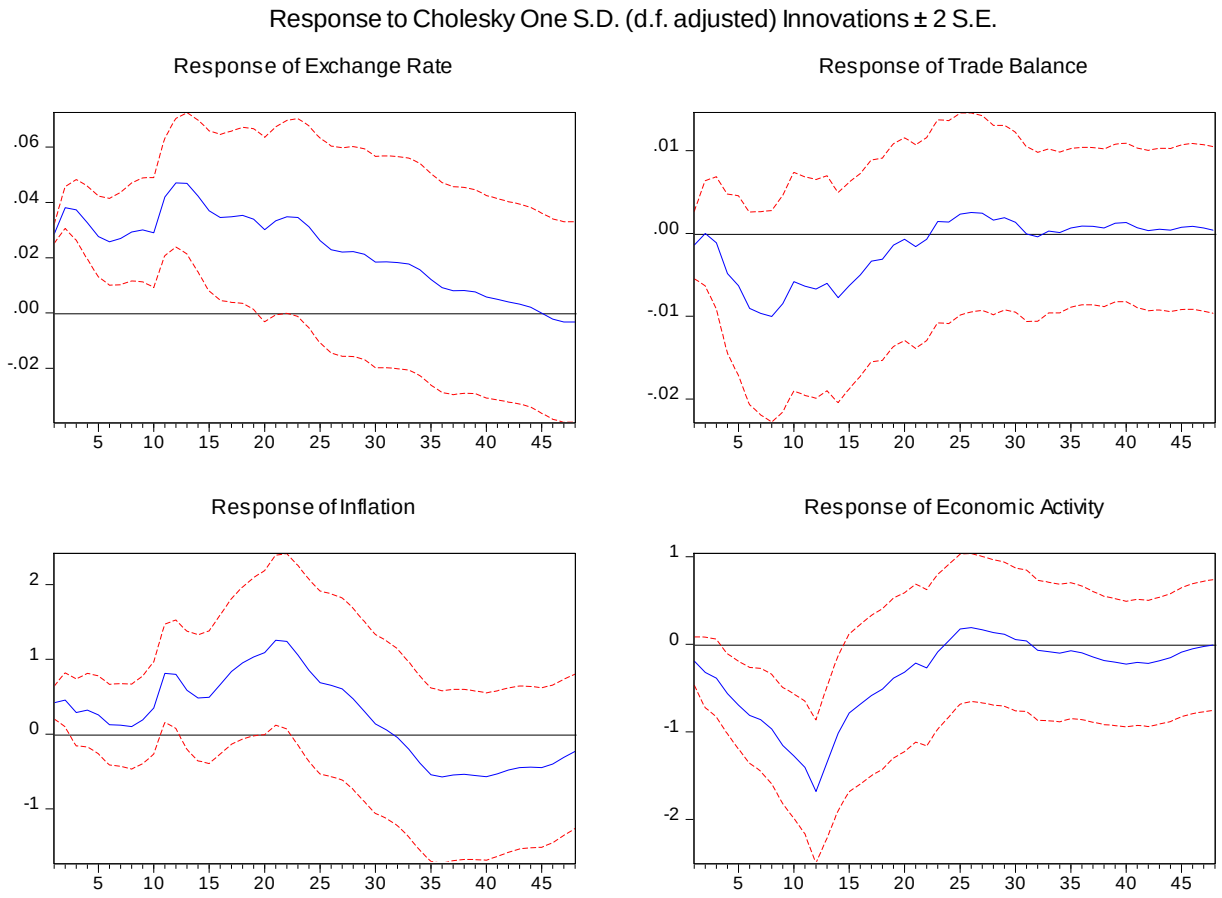

Figure 3.7. *The effect of a positive exchange rate shock (VAR model with 12 lags)*