



## **23<sup>RD</sup> ANNUAL RESEARCH WORKSHOP**

# **OIL PRICES AND THE EXCHANGE RATE: OPTIMAL MONETARY POLICY FOR OIL EXPORTING COUNTRIES\***

**By**

**RAGNAR TORVIK \***

### ***Day 1 Paper SC2***

Presented at REPOA's 23<sup>rd</sup> Annual Research Workshop  
Held at the Ledger Plaza Bahari Beach Hotel, Dar es Salaam, Tanzania;  
April 4<sup>th</sup> – 5<sup>th</sup>, 2018

*This preliminary material / interim, or draft research report is being disseminated to encourage discussion and critical comment amongst the participants of REPOA's Annual Research Workshop. It is not for general distribution.*

*This paper has not undergone REPOA's formal review and editing process. Any views expressed are of the author(s) and do not necessarily represent the views of REPOA or any other organization.*

---

\* This paper is based on a presentation held at the Bank of Algeria seminar in 2016, and also from analysis done by the author for the Ministry of Finance in Norway to discuss policy responses after the oil price shock from 2014 (and onwards).

\* Department of Economics, Norwegian University of Science and Technology, N-7491 Trondheim, Norway. E-mail: ragnar.torvik@ntnu.no

# **OIL PRICES AND THE EXCHANGE RATE: OPTIMAL MONETARY POLICY FOR OIL EXPORTING COUNTRIES**

**By**

**Prof. Ragnar Torvik**

Department of Economics, Norwegian University of Science and Technology, N-7491  
Trondheim, Norway. E-mail: [ragnar.torvik@ntnu.no](mailto:ragnar.torvik@ntnu.no)

# TABLE OF CONTENTS

LIST OF FIGURES .....	4
<b>1.0 INTRODUCTION .....</b>	<b>5</b>
<b>2.0 MACROECONOMIC POLICY IN A TWO SECTOR MODEL .....</b>	<b>6</b>
2.1 Fiscal Policy .....	7
2.2 Monetary Policy .....	10
2.3 Investments and Medium Run Dynamics .....	11
2.4 Supply Side Fiscal Policy .....	13
<b>3.0 A THREE SECTOR MODEL FOR AN OIL EXPORTING COUNTRY .....</b>	<b>15</b>
3.2 A Lower Price of Oil .....	17
3.2 Fiscal Policy Response .....	18
3.3 Monetary Policy Response .....	20
3.4 Temporary versus Permanent Oil Price Shocks and the Robustness of Policy Response .....	22
<b>4.0 CONCLUDING REMARKS .....</b>	<b>24</b>
<i>REFERENCES .....</i>	<i>25</i>

# LIST OF FIGURES

---

Figure 1: The Model..... 7

Figure 2: Fiscal Policy ..... 8

Figure 3: Fiscal Policy + Wage Response ..... 9

Figure 4: Fiscal Policy + Flexible Inflation Targeting ..... 10

Figure 5: Expansionary Monetary Policy ..... 11

Figure 6: Supply Side Fiscal Policy ..... 14

Figure 7: The Three-Sector Model ..... 16

Figure 8: Lower Price of Oil ..... 17

Figure 9: Expansionary Fiscal Policy ..... 18

Figure 10: Expansionary Fiscal Policy + Inflation Targeting..... 20

Figure 11: Lower Oil Price + Inflation Targeting ..... 22

## 1.0 INTRODUCTION

---

In 2014 the oil price went from 115 USD per barrel to below 30 USD per barrel in less than half a year. This oil price shock illustrates both the uncertainty, and the volatility, of oil prices. Such shocks present oil exporters with many policy challenges. In this paper I study some of these challenges, namely those that relates to how monetary policy should respond to oil price shocks. If an oil price shock is temporary, then the question is how monetary policy should smooth out the fluctuations caused by the shock until times are again “normal”. However, if there is some persistence in the shock, then additional challenges present themselves. First, there is need for a structural adjustment making the economy less reliant on oil income, diversifying into other industries that can act as alternative sources of foreign exchange earnings (or saving foreign exchange by replacing imports). Second, the use of fiscal policy to smooth the shock may, in such a case, be problematic since over time the fiscal position is weakened, actually calling for a less expansionary fiscal policy. In this paper, I argue that when this is the case, monetary policy becomes important also when the shock is permanent (or there is a non-negligible possibility that is is). As I show, then monetary policy may be more favorable than fiscal policy response because it sets the economy on a path towards achieving increased diversification and investment in traded sectors, while fiscal policy expansion may contribute to the opposite.

The rest of the paper is organized as follows. In Section 2, a two sector model with a traded and a non-traded sector is presented, and the effects of fiscal and monetary policy is discussed. Section 3 extends this type of model to a three sector model, where the linkages between the oil sector and the rest of the economy not only through the spending effect, but also through the resource movement effect, can be discussed. Concluding remarks are presented in Section 4.

## 2.0 MACROECONOMIC POLICY IN A TWO SECTOR MODEL

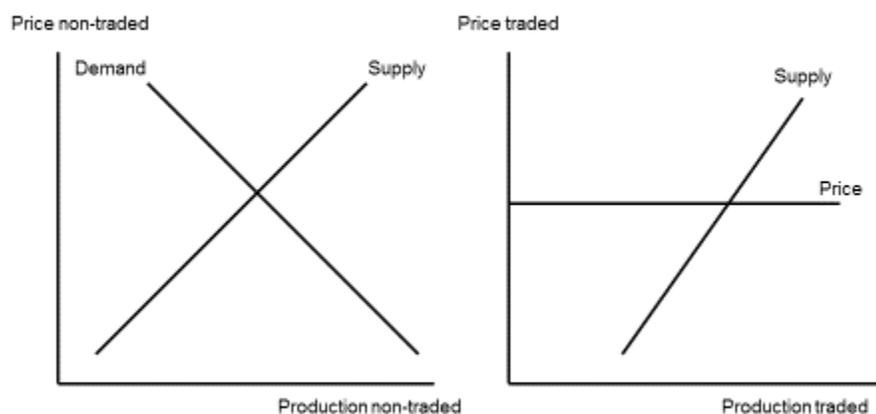
---

Consider a small open economy, which faces given international prices of (traditional) traded goods and of oil, and where oil exports are a substantial source of income. Thus, the structure of the economy is like in Corden and Neary (1982), Corden (1984), van Wijnbergen (1984), Krugman (1987), Sachs and Warner (1995), Obstfeld and Rogoff (1996, Chapter 4), Torvik (2001), and Matsen and Torvik (2005). A difference, however, is that we do not assume full employment, but study stabilization challenges in the short and medium term. In this respect, the structure of the model is similar to Rødseth (2000, Chapter 7), and the model of inflation targeting in Røisland and Torvik (2004).

Thus, allow nominal wages not to adjust so as to achieve full employment in the short run. Figure 1 shows this economy before it is hit by the oil price shock. The left panel represents the non-traded (private and public) sector, while the right panel represents the traded sector. In the left panel the demand for non-traded goods is decreasing in their prices, since a higher price shifts demand towards traded goods and away from non-traded goods. The supply is increasing in the price, as a higher price makes production more profitable (given that wages do not fully adjust to keep the producer real wage unchanged). Since non-traded goods cannot be exported or imported, equilibrium in the market for non-traded goods requires domestic demand to equal domestic supply, which establishes the equilibrium at the intersection of the demand and the supply curve in the left panel of Figure 1.

**Figure 1: The Model**

**Figure 1: The model**



Production in the traditional traded sector, on the other hand, is determined independently of domestic demand for traded goods, as shown in the right panel of Figure 1. Supply is increasing in the price of traded goods, but the price is given at the world market as illustrated with the horizontal price line. Output is determined at the intersection of the supply curve and the price curve in the right panel of Figure 1. Had demand been depicted in the figure, the distance between demand and supply at the world market price would have determined the trade surplus (or deficit), but since this will play no further role in the analysis we do not include it in the figures.

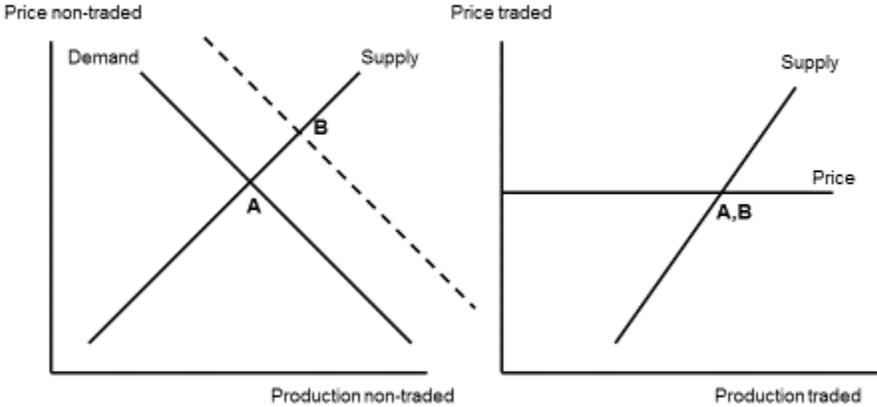
## 2.1 Fiscal Policy

We now look at the effects of macroeconomic policy on the aggregate level of activity, as well as the structural composition of the economy. In this subsection we investigate effects of expansionary fiscal policy, while in the next subsection we turn to the effects of expansionary monetary policy.

The effect of an expansionary fiscal policy is shown in Figure 2. The initial equilibrium is at point A, but with expansionary fiscal policy the demand curve for non-traded goods in the left panel of the figure shifts to the right. This demand curve after the shift is represented by the dotted curve. In the non-traded sector, the new equilibrium at point B implies that the activity level and the price both increases. In the traded sector, neither the supply curve nor the price curve is affected, and thus the activity level, as well as the price, stay unchanged: point A before the fiscal expansion, and point B after the fiscal expansion, are the same. The policy increases aggregate output, and decreases unemployment, through the expansion in the non-traded sector.

**Figure 2: Fiscal Policy**

Figure 2: Fiscal policy

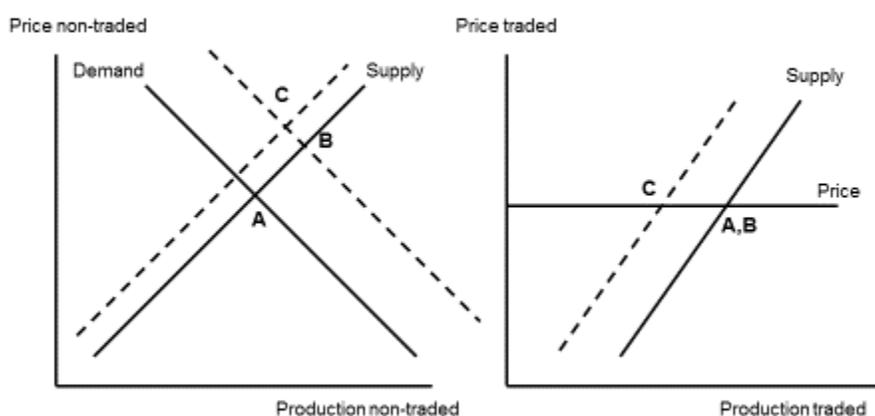


It may be, however, that the wage responds to this new equilibrium. Workers both face higher prices and lower unemployment, which both may generate a higher nominal wage level. In Figure 3, the effects if the nominal wage increases, are shown. A higher nominal wage shifts both supply curves to the left, represented by the dotted curves in the figure. The equilibrium after the increased nominal wages is at point C in both panels of the figure. In the non-traded sector in the left panel the price is pushed further up while the level of activity is somewhat reduced (compared to point B), while in the traded sector, in the panel to the right, the level of activity is lower, as it is now

determined by the intersection of the dotted supply curve and the price curve. While an expansionary policy works expansionary on the non-traded sector, it works contractionary on the traded sector. Most likely, since the non-traded sector is in most countries more labor intensive than the traded sector, the aggregate level of employment is higher, and unemployment lower.

**Figure 3: Fiscal Policy + Wage Response**

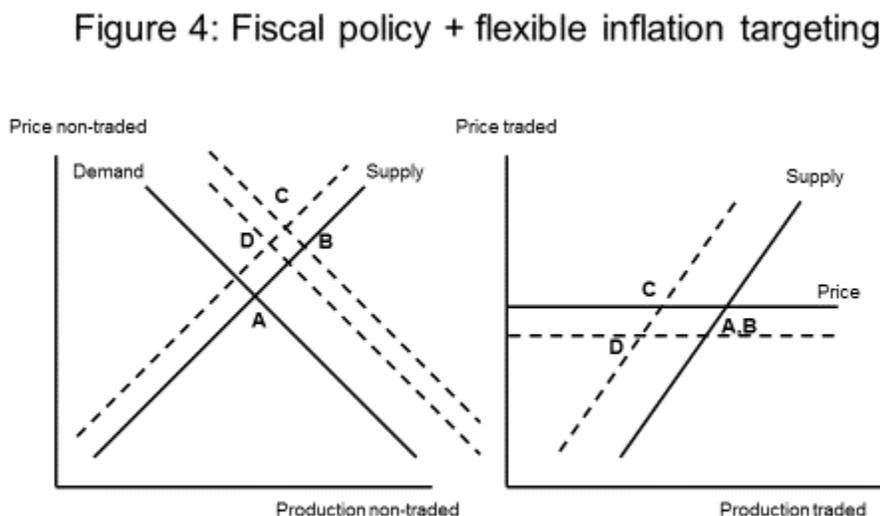
Figure 3: Fiscal policy + wage response



Consider now the case where the economy under consideration sets the interest rate according to flexible inflation targeting, aiming to stabilize prices as well as unemployment. Note that in Figure 3, after the expansionary fiscal policy, unemployment is lower (conditional on that the employment response in the non-traded sector dominates), while prices are higher. Thus, under a flexible inflation target, since both the level of activity and prices have increased, the central bank will respond by increasing the interest rate. The effects are shown in Figure 4. The higher interest rate appreciates the exchange rate, and the price curve for traded goods shifts downwards to the dotted curve in the panel to the right. The level of activity decreases further, from point C to point D. The appreciated exchange rate and the higher interest rate both makes demand for non-traded goods decrease, shifting the demand curve in the left

panel of Figure 4 inwards. The new equilibrium is established at a point such as point D in the figure.

**Figure 4:** Fiscal Policy + Flexible Inflation Targeting



To summarize, an expansionary fiscal policy will most likely increase the level of activity in the economy. We note, however, that the policy has the opposite effect on the activity level in the non-traded and in the traded sector. While an expansionary fiscal policy increases the level of activity and employment in the non-traded sector, the same policy pushes the level of activity and employment down in the traded sector.

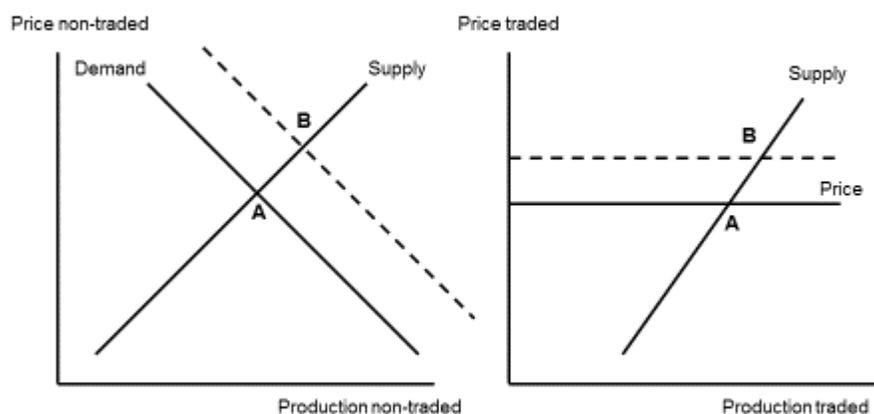
## 2.2 Monetary Policy

The effects of an expansionary monetary policy, by lowering the interest rate, are shown in Figure 5. The lower interest rate depreciates the exchange rate, shifting the price curve in the right panel of Figure 5 up to the dotted curve, and increasing production in the traded sector from point A to point B. The lower interest rate, the higher price of traded goods, and the higher income generated in the traded sector all pull in the direction of increased demand for non-traded goods, shifting the demand curve in the

left panel of Figure 5 to the dotted curve, increasing production and prices from point A to point B.

**Figure 5: Expansionary Monetary Policy**

**Figure 5: Expansionary monetary policy**



Comparing fiscal and monetary policy, an expansionary fiscal policy works contractionary on the traded sector, while an expansionary monetary policy increases the level of activity in the traded sector. The two policy instruments are both able to increase the level of activity, and to decrease the aggregate level of unemployment. But at the same time the two types of policy have very different effects on the structural composition of the economy, in that the first type of policy contracts the traded sector while the second type expands it. Another way to portray this is that while an expansionary fiscal policy appreciates the real exchange rate, i.e. increases the price of non-traded relative to traded goods, an expansionary monetary policy depreciates the real exchange rate. In turn, as we turn to next, this has implications for investment incentives, medium run dynamics, and the diversification of the economy.

## 2.3 Investments and Medium Run Dynamics

So far, we have not discussed the investment responses to the macroeconomic policy. We now extend the analysis to include this, and to investigate the medium run dynamics

of the economy after the different types of macroeconomic policy. By the term medium run dynamics, we mean that we incorporate the effects of investment responses on the capacity of production in the different sectors. It is reasonable to assume that investments are higher in a sector the more profitable they are. If investment goods are a combination of traded and non-traded goods, this implies that a real appreciation makes investments in the non-traded sector more profitable, while a real exchange rate depreciation makes investments in the traded sector more profitable. In addition, investment responses are most likely dependent on how much of the existing production capacity in a sector that is utilized. Thus, a higher level of activity in a sector is also likely to increase investments. Finally, the interest rate is also likely to affect investments, where a lower interest rate makes investment more profitable.

Consider first the expansionary fiscal policy studies above. As regards the effects on investments in the traded sector, there are three reasons from the above analysis that all have the implication that the investment level is likely to be decreased. Firstly, we noted that with an expansionary fiscal policy the real exchange rate appreciates. Secondly, the level of activity in the traded sector falls. And thirdly, the expansionary fiscal policy is likely to be met with an interest rate that is higher than it otherwise would be. Thus, for all three reasons an expansionary fiscal policy decreases investments in the traded sector.

As regards the non-traded sector, the same three effects operate, although with somewhat different signs. The real exchange rate appreciation and the higher level of activity pull in the direction of increased investments, while the higher interest rate pulls in the other direction. In any case, if one is concerned with diversification, that is to increase the relative level of the traded sector in the economy, an expansionary policy most likely contributes to exactly the opposite.

Consider next the expansionary monetary policy. This depreciates the real exchange rate, increases the level of activity in the traded sector, and implies a lower interest rate. Thus, for all three reasons, the investment response in the traded sector is likely to be positive. Not only does an expansionary monetary and fiscal policy have the opposite effect on the level of activity in the traded sector, they also, for three reasons, have the

opposite effect on investments. Again, the effect on investments in the non-traded sector is uncertain, with a real depreciation pulling in the direction of decreased investments, while a higher level of activity and a lower interest rate pulls in the opposite direction.

If diversification is important, then we have seen that an expansionary monetary policy is more likely to contribute to this than an expansionary fiscal policy. In part, of course, this conclusion rests on our interpretation of fiscal policy as affecting the level of demand. An alternative way of fiscal policy to stimulate economic activity, however, is through affecting the supply side of the economy.

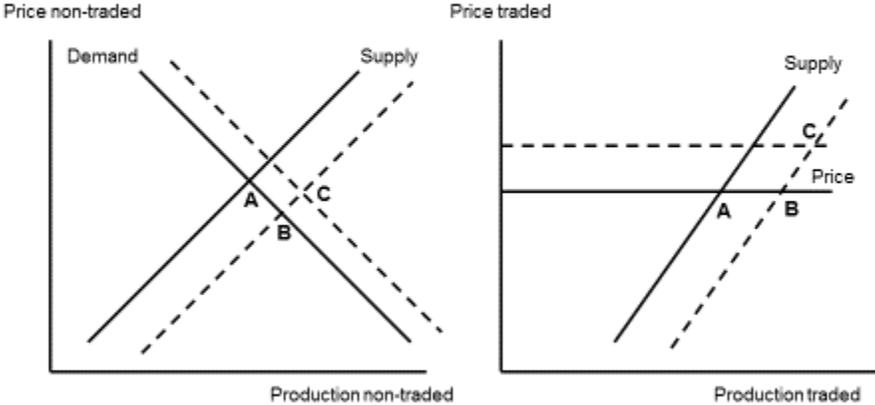
## 2.4 Supply Side Fiscal Policy

Several fiscal policy initiatives are undertaken with the main aim of affecting the supply side of the economy. One example of such a policy shift in many countries recently are decreased taxes on company profits. The aim of such a policy has primarily been to stimulate investments and pull the economy up from the side of supply, rather than to pull the economy up from the side of demand.

Possible effects of such a supply side fiscal policy are shown in Figure 6. Improved investment incentives increase production capacity and shifts the supply curves out to the dotted curves in both the left and the right panel, moving the economy from point A to point B. Production and employment in both sectors increase. It is also possible that this policy, under flexible inflation targeting, will be met with an expansionary monetary policy: in the left panel of Figure 6 it is seen that prices of non-traded goods have come down, and a possible response from the central bank could be to cut the interest rate. In case, the exchange rate depreciates, shifting the price curve in the right panel of the figure up to the dotted curve, and increasing production further from point B to point C. In the non-traded sector, the lower interest rate, the higher prices of traded goods, and the higher income in the traded sector, all imply higher demand for non-traded goods. The demand curve in the left panel of Figure 6 shifts to the right, establishing the new equilibrium at point C.

**Figure 6: Supply Side Fiscal Policy**

**Figure 6: Supply side fiscal policy**



Thus, the conclusion above that an expansionary fiscal policy works against diversification of the economy needs to be qualified. When the fiscal policy expands the economy from the side of demand it reduces diversification, while when it expands the economy from the side of supply it has more favorable effects on diversification.

So far, we have rested our mechanisms on the traditional dichotomy between a non-traded and a traded sector. Such models are useful, but in many oil-exporting countries, they limit the effects of oil prices to the spending effect, aborting the so-called resource movement effect. We now extend the model approach to include the linkages from the oil sector to domestic industries by capturing the resource movement effect.

### 3.0 A THREE SECTOR MODEL FOR AN OIL EXPORTING COUNTRY

---

In two sector models, an implicit assumption is that the effect of the oil sector is to contribute with income, but not affect the factor inputs available for the rest of the economy. In most oil exporting countries, however, a main effect of the oil sector is its backward linkages through demanding inputs from the domestic economy. This implies that a view of the traded sector as a homogenous sector severely limits the understanding of the intersectoral linkages, and may potentially produce not only invalid predictions, but also unsound policy advice. As an example, consider a negative oil price shock. In most oil exporting countries such a shock will result in a depreciation of the currency (to which we will return to below), and thus in a two-sector model as the one analyzed in the previous section, the prediction would be that this is good news for the traded sector, since the depreciation will increase the activity in the sector. This may well be so for the parts of traded sectors that are unrelated to the oil sector. In most oil exporting countries, however, there has been a shift *within* the traded sector, away from producing traditional goods and towards being more closely interlinked with the oil sector. For this part of the traded sector, clearly it is challenging to argue that a lower oil price is good news. If anything, the opposite is the case, since a lower price of oil implies a lower activity in the oil sector and reduced investments in oil extraction and exploration, in turn demanding less inputs from the oil supply industry. In this section we take this critique of the standard two sector approach on board, and extend the approach to a three-sector economy, where the new sector is the oil service industry.

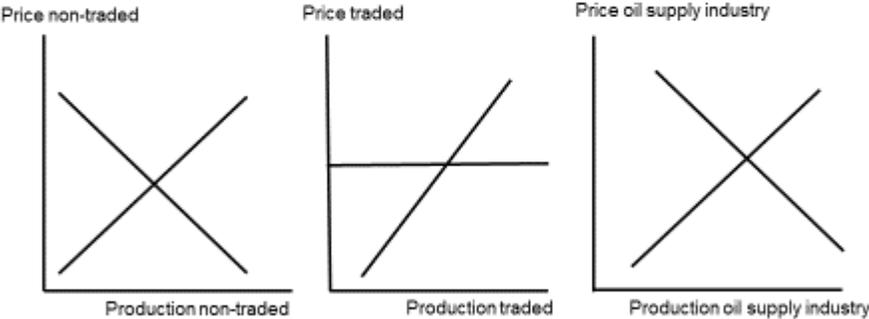
In terms of Corden and Neary (1982) this allows us to capture also the implications of the resource movement effect of oil price shocks, and not only the spending effect. In fact, the resource movement effect, which played a prominent role in the early models of oil and the macro economy, has almost disappeared in the later literature such as van Wijnbergen (1984), Krugman (1987), Sachs and Warner (1995), Torvik (2001), and Matsen and Torvik (2005), who focus exclusively on the spending effect. A difference from the earlier literature which studies the resource movement effect, however, is that

here we look at the short-term implications of the resource movement effect, and not the long-term implications for economic structure, which has been the key topic in the earlier literature. The model presented in this section draws on the model developed in Torvik (2016) (in Norwegian) for the study of the Norwegian economy after the 2014 oil price shock.

The three-sector model is represented in Figure 7. The left and the middle panel reproduces the two-sector model above with the non-traded and the traditional traded sector, respectively. The panel to the right contains the oil supply industry. Here, demand for domestically produced services to the oil sector is decreasing in the price of the services, since this sector competes with alternative suppliers from other countries. The supply from the sector is increasing in the price the sector receives for its services for standard reasons. The price, and the quantity produced by the domestic oil supply industry, is determined by the intersection of the demand with the supply curve in the right panel of Figure 7.

**Figure 7:** The Three-Sector Model

Figure 7: The three sector model

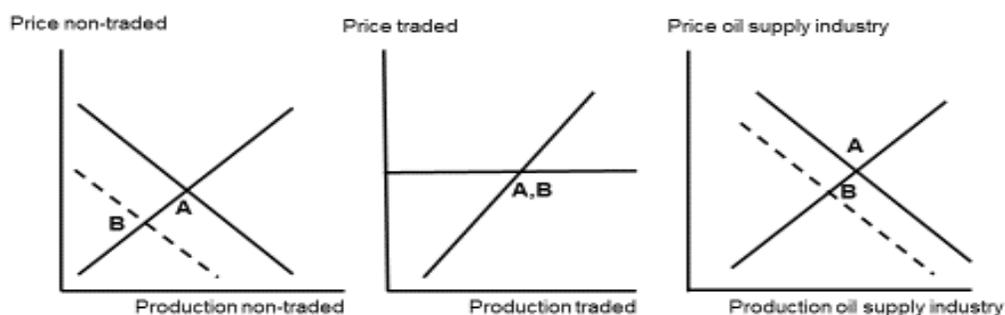


### 3.2 A Lower Price of Oil

Consider now a negative oil price shock. The lower oil price reduces the activity level in oil extraction, and especially the investment level in oil extraction, meaning that for any price there is less demand for goods and services produced by the domestic oil supply industry. In Figure 8, this is represented by the leftward shift in the right panel, moving the price and activity in the oil supply industry from point A to point B. This resource movement effect, i.e. that there is less linkages from oil extraction to demand for domestic labor, has the direct effect of producing a contraction in the oil supply industry. This is not the full story, however. Since incomes and employment is reduced in the oil supply industry, the addition of the resource movement effect also implies that the spending effect becomes magnified compared to what was the case in the two-sector model in Section 2. Thus, the leftward shift in the demand for non-traded goods is stronger than was the case in the two-sector model, producing a stronger contraction in the non-traded sector compared to what was the case in the two-sector model that only contained the spending effect of lower oil prices. The economy moves from point A to point B in the left panel of Figure 8.

**Figure 8:** Lower Price of Oil

**Figure 8:** Lower price of oil

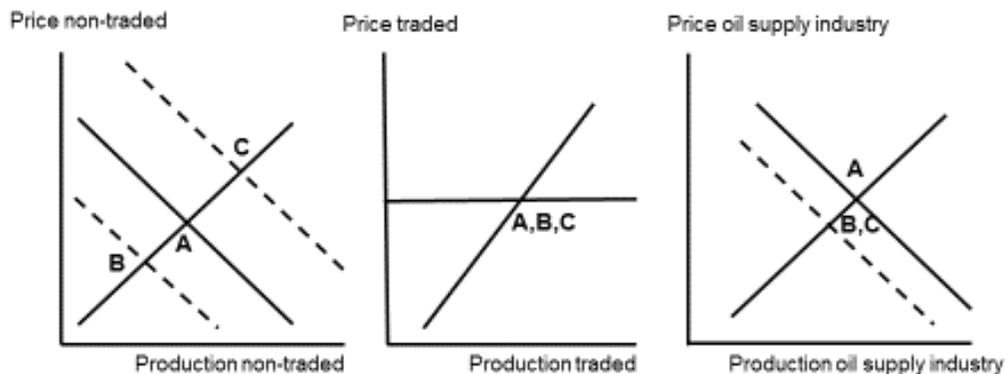


### 3.2 Fiscal Policy Response

Consider now the case where the government aims at combatting the contraction with an expansionary fiscal policy and consider first the case where the fiscal policy is so expansionary that demand for non-traded goods shift back to its initial position. In Figure 9, we are then back at point A in the left panel of the figure. Is this sufficient to avoid aggregate unemployment from increasing? Unfortunately, the answer to this question is no, and the reason is that we still have the contractionary effect of the resource movement effect. In terms of Figure 9, we are still at point B in the middle and in the right panel. Since employment in oil supply industry at point B is still below what it was before the oil price shock, the expansivity of fiscal policy required to avoid unemployment from increasing is stronger. Thus, to be able to combat the increase in unemployment, fiscal policy has to be even more expansionary, moving the demand curve in the non-traded sector to the right, and establishing an equilibrium at a point such as C in the left panel of Figure 9.

**Figure 9:** Expansionary Fiscal Policy

Figure 9: Expansionary fiscal policy

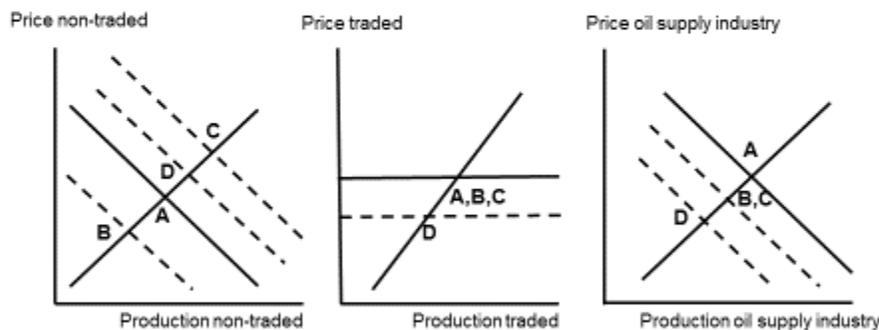


Note, however, that at point C even if employment is back at its original level, the prices of non-traded goods are pushed up. Again, with flexible inflation targeting, this triggers a monetary policy response from the central bank. When the central bank increases the interest rate, the currency appreciates, affecting both the traditional traded sector and the oil supply industry, as seen in Figure 10. In the traded sector, the price curve shifts down to the dotted curve, establishing the equality between the price curve and the supply curve in the middle panel at point D. In the oil supply industry, the appreciation of the currency makes the industry less productive versus its foreign competitors, shifting the demand directed against the domestic oil supply industry leftwards, pushing production down to point D. In the left panel of the figure, the response in the non-traded sector is shown as the movement from point C to point D. The appreciation of the currency, the lower level of activity in both the traded sector and in the oil supply industry, and the higher interest rate, all push demand down.

Note that with flexible inflation targeting, point D has to be to the right of point A in the left panel in Figure 10. To see why this is the case, consider the case where point D in the left panel of Figure 10 was below and to the left of point A. If that were the case, both aggregate prices and aggregate employment would be below target. That, however, cannot be consistent with an optimal monetary policy. The reason for this is that, by reducing the interest rate, prices and employment would both move closer to target. This is clearly favorable and implies that in such a case the interest rate could not have been set at its optimal level in the first place. Thus, the interest rate has to be set sufficiently low that point D in the left panel of Figure 10 is to the right of point A.

**Figure 10: Expansionary Fiscal Policy + Inflation Targeting**

**Figure 10: Expansionary fiscal policy + inflation targeting**



To sum up so far, combatting the oil price shock with expansionary fiscal policy destabilizes both the traded sector and the oil supply industry. A fiscal policy response expands the economy through a larger non-traded sector.

Extending the analysis to include medium run investment dynamics strengthens this picture. The traded sector and the oil supply industry has become less competitive, their level of activity has decreased, and the interest rate is higher. In both sectors, thus, investment levels are likely to decrease. If diversification in the direction of more traded industries, as well as stronger domestic industries that compete with imports, is seen as favorable, then the expansionary fiscal policy contributes to exactly the opposite.

### 3.3 Monetary Policy Response

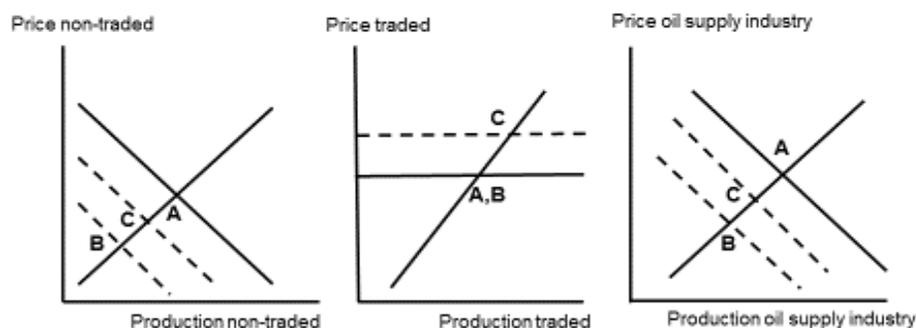
Consider now the case where, instead of a fiscal policy response, the oil price shock is met with a monetary policy response. The effects are shown in Figure 11. Again, after the oil price shock, and without any policy response, we have moved from point A to point B in all three panels. The resource movement effect makes employment and production lower in the oil supply industry. The spending effect, magnified by the lower

employment and income in the oil supply industry through the resource movement effect, shifts demand in the non-traded sector down. The traded sector is not affected, and thus, points A and B for this sector are identical.

Under flexible inflation targeting, the central bank should not sit still. There are two reasons for that. First, aggregate employment has decreased, and, second, prices have decreased. For both reasons, the optimal monetary policy response according to a flexible inflation target is that the interest rate should be lowered. The lower interest rate depreciates the currency, making the oil supply industry more competitive, and shifting the demand curve towards the right in the right panel of Figure 11. The impact effect from A to B is thus partly stabilized, bringing the activity level in the oil supply industry to a level as indicated by point C. In the traded sector, the depreciation of the currency shifts the price curve up, increasing prices and production from point B to point C. Finally, the resource movement effect leading to increased incomes in the oil service sector (from point B to C), the higher prices and income in the traded sector, the depreciation of the currency, and the lower interest rate, all pull in the direction of increased non-traded demand. The demand curve in the left panel of the figure shifts to the right and pushing the level of activity up from point B to point C. Note that, in Figure 11, the monetary policy response can be compatible with a stable aggregate price level, as the prices of non-traded goods have fallen while those of traded goods have increased.

**Figure 11: Lower Oil Price + Inflation Targeting**

Figure 11: Lower oil price + inflation targeting



Including investment responses and medium run dynamics strengthens the effects. The real exchange rate depreciation, the higher activity level in the traded sector, and the lower interest rate all contribute to increased investments, and a better diversified economy, by increasing investments in the traded sector.

### 3.4 Temporary versus Permanent Oil Price Shocks and the Robustness of Policy Response

When an oil price shock hits, there is always the uncertainty if this is a temporary shock, or if the shock also contains permanent elements. Often, supply shocks caused by political turbulence or natural disasters are more likely to be temporary, while shocks caused by new technologies are more likely to have a permanent component. At the time where policy has to react, however, in most cases it is not easy to determine to what extent one faces a temporary, and to what extent one faces a permanent, oil price shock. A policy response that has desired effects if it is a temporary shock, but not if it is a permanent shock, and vice versa, can be characterized as not being robust. A policy that has desired effects in both cases, on the other hand, is a more robust policy response.

If the shock is temporary, a fiscal policy response is relatively more attractive compared to a situation where the shock is permanent. There are, in particular, two reasons a fiscal policy response in terms of an expansionary fiscal policy is unfavorable if the shock is permanent. First, the incomes from the petroleum sector will be smaller than previously anticipated and thus, over time, a *contractionary* fiscal policy response is required. An expansionary fiscal policy response then is the opposite short-term response from what will be required in the medium term. Second, if the oil price shock is permanent a structural transformation of the economy towards alternative traded sector industries is required. A fiscal policy response, as we have seen, kicks off investment incentives in exactly the opposite direction.

A monetary policy response is more robust when the economy faces an oil price shock. In the short run, monetary policy stabilizes the economy by stabilizing traded sectors and oil service industries. Possibly more important, in the medium run a monetary policy response increases investments and capital stocks in traded industries, thus putting the economy on a path in the right direction to what is required in the longer run. For these reasons, an expansionary monetary policy response to an oil price shock is a more robust stabilization tool than an expansionary fiscal policy response.

## 4.0 CONCLUDING REMARKS

---

Petroleum-exporting countries have faced considerable policy challenges due to oil price shocks. In this paper, we discussed the challenges related to stabilization policy, and to investment responses and medium run dynamics. Traditional two sector models imply that while an expansionary fiscal policy contracts the traded sector, and expansionary policy expands the traded sector. Also, adding investment responses and medium-term dynamics, the two policies are likely to have opposite effects, where expansionary fiscal policy contracts traded sector investments while monetary policy response expands them. From a robustness and diversification perspective, much weight should be put on combatting an oil price shock with monetary, rather than fiscal, policy.

Extending the traditional two sector approach to deal with the domestic oil supply industry in a three-sector model strengthens this conclusion. The impact effect of the oil price shock is now stronger, since the oil price not only works through the spending effect, but also through the resource movement effect. The latter adds on to the spending effect, making the initial contraction when the economy is hit by a negative oil price shock larger, and the need for a policy response stronger. Again, if such a shock is met with an expansionary fiscal policy, there is the danger that it puts the economy on a path in a different direction from what is needed over the medium and long term. If the shock is met with a monetary policy response, on the other hand, the economy is put on a path that is more sustainable should the oil price shock turn out not only to be temporary.

## **REFERENCES**

- Corden, W.M. and J.P. Neary (1982). "Booming sector and deindustrialization in a small open economy." *Economic Journal* 92, 825-848.
- Corden, W.M. (1984). "Booming sector and Dutch disease economics: survey and consolidation." *Oxford Economic Papers* 36, 359-380.
- Krugman, P. (1987). "The narrow moving band, the Dutch disease, and the competitive consequences of Mrs. Thatcher: notes on trade in the presence of dynamic scale economies". *Journal of Development Economics* 27, 41-55.
- Matsen, E. and R. Torvik (2005). "Optimal Dutch disease." *Journal of Development Economics* 78, 494-515.
- Obstfeld, M. and K. Rogoff (1996). *Foundations of International Macroeconomics*, MIT Press.
- Rødseth, A. (2000). *Open Economy Macroeconomics*, Cambridge University Press.
- Røisland; Ø. and R. Torvik (2004). "Exchange rate versus inflation targeting: a theory of output fluctuations in traded and nontraded sectors" *Journal of International Trade & Economic Development* 45, 265-285.
- Sachs, J.D. and A.M. Warner (1995). "Natural resource abundance and economic growth." NBER Working Paper No. 5398.
- Torvik, R. (2001). "Learning by doing and the Dutch disease." *European Economic Review* 45, 285-306.
- Torvik R. (2016). "Virkninger av finanspolitikken på aktivitet, omstilling og vekstevne", Working paper 2016/1, Ministry of Finance, Norway.
- van Wijnbergen, Sweder (1984). "The Dutch disease: A disease after all?" *Economic Journal* 94, 41-55.