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Master Thesis

Do oil income shocks lead to an inflated government sector amongst oil exporters in the long run?

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Table of Contents

Summary

In this paper we present our research question *"Do oil income shocks lead to an inflated public sector amongst oil exporters in the long-run?"*. Oil revenues has played an important role for some oil exporting countries. Developing countries highly dependent on its oil production, often run a procyclical fiscal policy. This fact could be explained through several channels, some of them being highly varying tax bases, political distortion, and credit restraints. Some countries create special fiscal institutions which manages, oil funds, fiscal rules, or fiscal legislations. These institutions are created to avoid the problem of oil revenue dependence.

A brief discussion of research topics

Our research question is:

"Do oil income shocks lead to an inflated public sector amongst oil exporters in the long-run?"

We will look at the relationship between oil revenues and the public sector. At first, we will discuss the oil price development and the importance of oil revenues. Second, we will look at the Fiscal process and oil income shock.

Oil price development and the importance of oil revenues

Throughout the last decade there has been large fluctuations in the oil price, and the demand for oil. As shown in figure 1 the oil price fell in both 2008 and 2014. From the figure, we see that we have "boom" periods between 2003 and 2008, and 2009 and 2013, and downturns from 2008 to 2010 and, 2014 to 2015. From figure 2 we see that the world GDP to somewhat degree follows the oil price (or the other way around). We also see that world GDP declined in 2009 and 2014, the same as the oil price. This could be explained by the fact that global growth developments, and the oil price were correlated the last decade (Villafuerte & Lopez-Murphy, 2010). Hence, the oil price has been of great importance to many countries, especially oil exporting countries. Oil revenue has been a critical source of fiscal revenue for many countries the last decade. Villafuerte & Lopez-Murphy (2010) states that for at least 31 oil producing countries, oil revenues accounted for more than 25 percent of total fiscal revenue between 2005 and 2008.
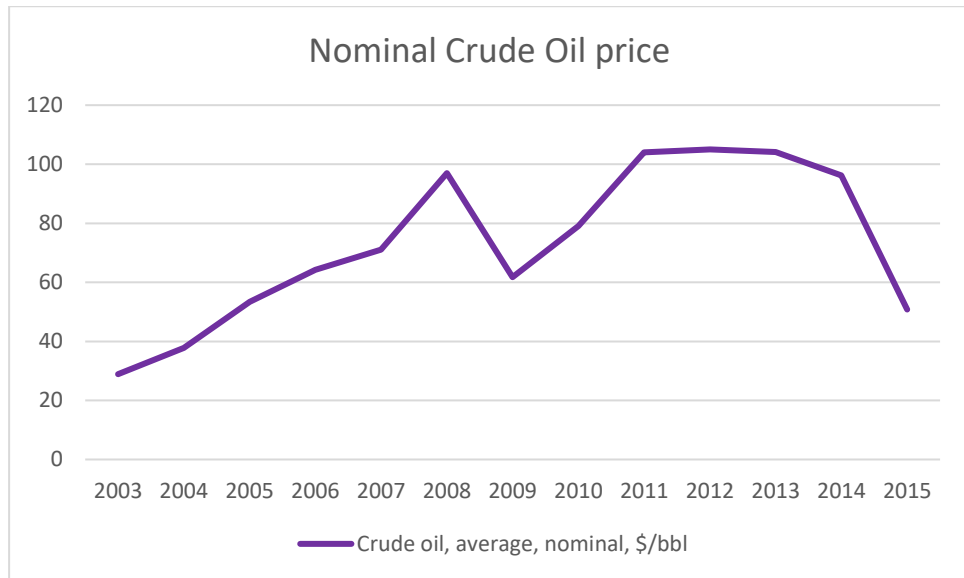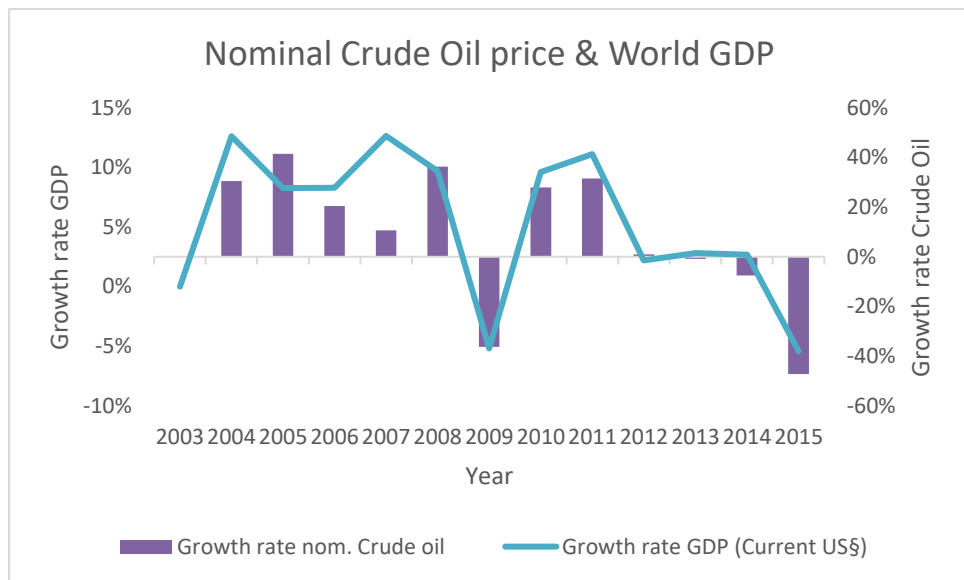
Figure 1: Nominal Crude Oil. Source: World Bank.

Figure 2:Growth rate nom. Crude oil, and GDP. Source: World Bank.

The Fiscal process and oil income shocks

Oil producing countries benefit from oil price booms, like those mentioned in the previous section. The effect of oil price booms on the external and fiscal balance has been different among the oil producers. Oil producers that are/have been dependent on the oil revenue in a fiscal context faces implications because of the volatile nature of the oil price. But, external and fiscal balances have improved in many oil producing countries. Implications arise when oil revenue dependent countries expect the rise in oil prices to be long lasting, and use the resources from

a windfall without saving. As seen in figure 1, during the last decade two major falls in the oil price has occurred. Oil revenue dependent countries tend to spend a lot of its oil revenue making the economy dependent on the oil price, which also causes great deficits during downturns in the oil market. These developments have caused a lot of attention on how oil producing countries should manage their fiscal policies. Fiscal policies, and the role of special fiscal institutions (SFIs) in terms of changing oil market conditions matters when dealing with windfalls from oil revenue shocks. There is important to find out how different countries have responded in terms of fiscal policies to the different oil revenue shocks and the favourable oil price outlook. The role of SFI's has been central in some countries, where most of the SFI's has been created to protect the economy from the changing oil market conditions. The non-renewable nature of the oil, and the volatile oil price causes implications for oil producing countries. Additionally, the SFI's helps to manage fiscal revenues arising from the oil price booms, and in some countries, from the increased output of oil. The motivations for SFIs has been different among countries. Countries use SFIs as oil funds, fiscal rules and fiscal responsibility legislation. The mentioned SFIs differs from country to country. (Ossowski, Villafuerte, Medas, & Thomas, 2008)

A government's response to an oil price boom depends on different factors, such as country specific factors. Government responses vary across countries, depending on the level of development, institutional capacity, level of oil, macroeconomic situation in country, fiscal dependence on oil revenue, fiscal deficits, public and government debt, and the level of liquidity. (Ossowski, Villafuerte, Medas, & Thomas, 2008)

Ossowski, Villafuerte, Medas, & Thomas (2008) report that insitutional capacity, which consists of "collection of laws, organizations, and behaviours that define the way fiscal policy is determined, managed and governed" (Ossowski, Villafuerte, Medas, & Thomas, 2008) is positively correlated (coefficient of 0,8) with a country's level of income. In other words, countries that have spending pressures tend to be those where the quality of spending is highly affected by the weakness of its institutions. The quality of government institutions and public financial management matters, and is highly important when it comes to the effectivness of public spending. Therefore, the ability to use additional resources

arising from oil price booms effectively, could be varying across countries. Oil producers that experience rapid increaces in public spending during oil price booms lacks effectiveness when it comes to public spending. Hence, country specific factors such as institutional capacity and government effectivness matters a lot for the efficiency and sustainability of public spending.

A brief discussion of related literature

Ossowski, Villafuerte, Medas, & Thomas (2008) examines the fiscal responses of oil producing countries to the oil boom through 2005, where they also looks at the role of SFIs. The authors argue that many oil producing countries has established SFIs to enhance fiscal management. Countries with large oil resources benefit from its oil revenues during booms. But the volatile and uncertain nature of the oil price and the exhaustive nature oil in itself constitutes a problem for the oil producers. Hence many oil producing countries have found it difficult to smooth out gornment expenditures and make it independent from the volatility of the oil revenue. To secure the country's economy from the volatile nature of its oil revenue, oil producing countries estabblish SFIs. In an empirical analysis, Ossowski, Villafuerte, Medas, & Thomas (2008) finds that:

"SFIs have not had a discernible impact on the fiscal position, as measured by the ratio of the non-oil primary balance to non-oil GDP, which tend to be more dependent on the short term volatility of oil revenue" (Ossowski, Villafuerte, Medas, & Thomas, 2008)

Further on, controlling for institutional quality, they find that higher institutional quality is associated with lower non-oil deficits. Hence, they argue that higher institutional quality suggests higher non-oil primary balances, where the main contributors for the higher non-oil primary balance are government stability, law and order, and bureaucratic quality. Further on they find that:

"SFIs did not have a significant impact on expenditure growth nor helped constrain the expenditure response to changes in oil revenue" (Ossowski, Villafuerte, Medas, & Thomas, 2008)

They find that during the boom, SFIs strengthened the response of spending to a rising oil income, however in a longer sample, they find that this relationship is insignificant. Further on their data show that expenditures reacted more strongly to changing oil revenues. After introducing a corruption index, the coefficient of the SFI variable becomes close to zero, and insignificant. But the coefficient for corruption is significant and suggesting that countries with higher levels of corruption have higher correlations between expenditures and oil revenue.

Countries with a weak instisutional infrastrucure often experiences correuption, where some powerful groups uses the countries resources in their favor. These groups can use the fiscal process to access the countries capital stock. When faced with a windfall, from for example a boom in oil prices, government expeditures perversly increases and reduces growth, as discussed by Ossowski, Villafuerte, Medas, & Thomas (2008). Tornell & Lane (1999) analyze an economy that has multiple powerful groups and has a weak legal-political institutional infrastrucure. The authors present some emprical evidence that suggests oil producers with divided societies and weak institutional structures dissipate the resources gained from booms in the oil market, with no gain in welafare or growth and they often suffer from chronically low groth. They use evidence from the 1974 shock that permanently raised the oil price, until 1986, where it declined. They use Nigeria, Venezuela and Mexico as examples and show that government spending increased more than the increase in GDP during the windfall. Further on they show that, the countries had very low groth performance despite the increased oil revenues. As argued by the authors, the windfall causes a fiscal process where the resourcess from the windfall gets redistributed, through for example government spending, but this redistribution generates approximately no growth. The authors label this the "voracity effect" (Tornell & Lane, 1999).

Standard Keynesian models suggests that fiscal policy should be countercyclical, meaning that the government should lower taxes and increase government spending during bad times to help the economy out of a recession. Neoclassical models suggests a acyclical fiscal policy, which means that fiscal policy should not follow business cycles, but stay neutral to reduce distortions (Talvi & Vègh, 2005).

Talvi & Vègh (2005) show that fiscal policy in the G7countries seems to be acyclical, while the fiscal policy in the developing countries appears to be procyclical. The standard explanation for procyclical fiscal behavior in developing countries is that during bad times, developing countries gets restricted or limited access from the international credit markets making them unable to borrow when needed most. But Talvi & Vègh (2005) does not rationalize the procyclic behaviour through restrictions to the international credit market. The authors explains the procyclical behaviour through a fiscal policy model that incorporates political distortion (Talvi & Vègh, 2005).

"Given this political distortion, a government that faces large (and perfectly anticipated) fluctuations in the tax base will choose to lower (increase) taxes and increase (lower) government spending in good times (bad times)." (Talvi & Vègh, 2005)

This is to a somewhat degree linked to the "voracity effect", where government spending increases in the aftermath of a windfall. The difference is that Talvi & Vègh (2005) argue that political distortion in itself isnt a sufficient explanation, because political distortion is not limited to developing countries. They argue that fluctuations in the tax base could be the cause. When the fluctuations in the tax base are small, the budget surplus will deviate little from its average value. This puts little political pressure on spending, because it gets unimportant. When the fluctuations in the tax base are large, large budget surpluses are generated during good times, which increases political pressures on spending, and forces a procyclical fiscal policy. Hence, the larger the fluctuations in the tax base, the more porcyclic the fiscal policy. The reason for this is that the budget surpluses necessary for full tax smoothing, becomes more costly in good times relative to bad times, which inforces procyclic fiscal behaviour. The authours argue that the procyclic fiscal behaviour also occurs because the governments inability to save during good times, which forces them to borrow less during bad times. Hence, the authors shift the cause from external financial constraints to domestic fiscal decisions (Talvi & Vègh, 2005).

Kaminsky (2010) looks at the links between fiscal policy and terms of trade fluctuations. The author finds evidence that fiscal policy is countercyclical in

OECD countries, and procyclical in developing countries. Further she finds that fiscal policy is acyclical with terms of trade cycles for OECD and low-income countries, meaning that fiscal policy does not follow booms and busts in commodity prices that causes trade cycles. For upper-middle-income countries she finds evidence that fiscal policy is countercyclical in terms of trade cycles, but the degree of countercyclicality declines during episodes of terms of trade booms, and capital flow bonanzas. Further on she comments that "flexibel exchange rate regimes seem to contribute to a more countercyclical fiscal policy" (Kaminsky, 2010). For lower-middle-income countries the opposite is shown, where the evidence suggests that fiscal policy responds in a procyclical manner to terms of trade fluctuations. These results are similar to the findings by Talvi & Vègh (2005) and Tornell & Lane (1999).

An outline of research plan

"Do oil income shocks lead to an inflated government sector amongst oil exporters in the long run?" To answer this question, we use an empirical strategy consisting of panel data regression. The data set is panel data, covering 264 countries and the period 1967-2016. The period is not structured, and we expect the time frame to shorten after structuring it. The same goes for the number of countries.

We focus on the effect of oil rents on government expenditures, or more generally the fiscal exposure to oil income shocks. We plan to use the following linear regression model (which most likely will encounter some modifications in the future):

(1) $\Delta y_{it} = \alpha + \beta_1 \Delta y_{it-1} + \beta_2 OilR_{it} + \gamma_1 EOI_{it} + \gamma_2 SWF_i + \delta_1 EX_{it} + \delta_2 Oilp_t + \theta_1 XM_{it} + \varepsilon_{it}$

Subscripts *i* and *t* represents, respectively, the country and time. Δ represents the first difference. Δy_{it} represents the percentage point change in government expenditure divided by GDP. The rest of the variables goes as follows:

- $OilR_{it}$ represents the oil rents
- EOI_{it} represents the correlation between employment in industry and the oil price.
- SWF_i is a time specific variable varying across countries representing the dummy for a sovereign wealth fund.
- EX_{it} represents the dummy for the exchange rate regime.

- $Oilp_t$ represents the oil price which is time varying not country varying.
- XM_{it} is a dummy variable representing whether the country is a oil exporter or an importer.

Equation (1) is used for different income groups. We separate the countries into low income (LI) countries, lower middle income (LMI) countries, upper middle income (UMI) countries or a high income (HI) countries. Secondly, we separate between oil exporters and non-oil exporters.

We want to see the effect of oil rents on government expenditure as a fraction of GDP, over the long term. A country's oil sector varies among countries. The size of the oil sector varies, and the impact from a shock in oil revenues on the different sectors inside the country varies. Therefore, the importance of an oil sector varies among countries. We want to focus on the countries where oil has played an important role. To control for the varying importance of oil, we include variables such as employment in industry and oil rents. We draw lines and separate between oil producing countries, focusing on the amount of oil produced. The idea is to separate between the countries who are highly dependent on the oil sector and its revenues, and those who are not. The first method we use is oil rents as explained earlier. Oil rents measures the difference between the value of crude oil production and total costs of production. The value of crude oil production is measured at world prices. The second method is to use the correlation coefficient between the oil price and employment in industry, on oil producers. The correlation coefficient does not explain a causal relationship. Therefore, we assume that the oil price has a larger impact on employment in industry rather than the other way around. Hence, a higher correlation coefficient means a closer covariation between the oil price and employment in industry.

As mentioned earlier SFIs has become more and more normal to prevent the economy from becoming highly dependent on oil revenues. We control for SFIs by using dummy variables. Countries with a sovereign wealth fund gets 1 and countries without gets 0. Our plan is to control for other types of SFIs, such as fiscal rules and fiscal responsibility legislations if the availability of data is in our favour. Exchange regimes has been proved to influence the fiscal process. We limit our regimes to a fixed exchange regime and a flexible exchange regime (Kaminsky, 2010), where we use dummy variables to control for it. 0 if the country uses a fixed exchange regime and 1 if it uses a flexible exchange rate

regime. Another reason for controlling for the type of the exchange rate regime is that a floating exchange rate regime could weaken the impact of oil price changes on revenue for different reasons. One reason is that the regime would dampen any impact on the output. Another reason could be that in response to a fall in oil export prices, a depreciation would have an increasing effect on the revenue (Spatafora & Samake, 2012).

An alternative model we consider using is an *error correction model*, where we focus on the rate at which changes in y (government expenditure/GDP) returns to equilibrium after changes in x (Oil rents).

A description of the data

Oil Rents: $Oil\ rents = revenues - costs$

The difference between the value of crude oil production at world prices and the total costs of the production. This indicator measures the oil rents as a share of GDP of a given country.
Source: "The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium" (World Bank, 2011).

Employment in Industry: *This is defined as persons of working age who are participating in any activity to produce goods or provide services for pay or profit. The industry sector consists of manufacturing, mining and quarrying, construction, and public utilities.*
Source: International Labour Organization, ILOSTAT database. Data retrieved in March 2017.

Government Expenditures: *The government spends money towards the supply of goods and services that are not covered by the private sector, but are essential for the nation's welfare.*
Source:

GDP: *The total value of everything produced by all individuals and companies in the country plus any product taxes and minus any subsidies not included in the value of the products.*

Source: World Bank national accounts data, and OECD National Accounts data files.

Crude Oil Price: *The oil price is the most important value on the international commodity markets. Crude oil prices measure the spot price of several barrels of oil.*

Source: World Bank

GDP per capita:

GDP Per capita is a measure of country's GDP by person.

$$GDP\ Per\ Capita = \frac{GDP}{Population}$$

Source: World Bank

Sovereign Wealth Fund: *SWF are state-owned investment funds that consists of pools of revenues derived from a country's reserves, set aside for investment purposes to benefit the economy of the country and citizens. The Sovereign Wealth Centre defines a SWF to be an investment fund that has all the four following characteristics:*

- *Owned directly by a national/state government*
- *Has no explicit current pension or regular state liabilities*
- *Managed on a way that seeks to increase Capital of the Fund*
- *Invests in a diverse set of financial assets classes in pursuit of commercial return*

  Source: Sovereign Wealth Centre

Population: *The total number of citizens and settlers in a country.*

Source: World Bank

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