Examining the Performance of Oman's Economy

Razzak, Weshah

School of Economics and Finance Massey University

8 October 2020

Examining the Performance of Oman's Economy

W A Razzak
School of Economics and Finance
Massey University, New Zealand
2020[1]

Abstract

We examine the economic performance of Oman's economy over the period from 1998 to 2016, where data are readily available. Our focus is on the performance of the non-hydrocarbon sector (NHC sector) relative to the hydrocarbon sector (HC sector), nominal versus real GDP growth, productivity measures, the drivers of growth, and the return to investments. We also compare Oman non-hydrocarbon sector performance to Dubai, which is the closet non-oil economy. We have a number of finding that could help policymakers.

JEL Classification E0, E01, E22, E23, E24
Keywords: Productivity, (un) skilled labor, investments, Oman, Dubai

[1] Honorary Research Fellow, for correspondence use, razzakw@gmail.com and w.razzak@massey.ac.nz.

1. Introduction

The sole interest in Oman stems from that fact that it was the Gulf Cooperation Council (GCC) oil-producing country most adversely affected by the negative oil price shock in 2014. Oman is a relatively small GCC producer of crude. It produces less than one million barrel a day. However, most of the government revenues come from oil income. Figure (1) plots the share of oil revenues in total revenues; the average from 1986 to 2017 is 70 percent. The dip in revenues in 2014 was due to the oil price shock in March 2014. Most interestingly, to finance the budget deficit, the government decided to borrow in the international capital market, at increasing costs, instead of asking the IMF for assistants. Fiscal adjustment and economic recovery have been underway since 2014, incomplete, and there is evidence that it might take more time.

Figure (2) plots the external debt to GDP ratio. The ratio spiked in 2014. Since 2014 and the Omani government has been trying to make fiscal adjustments. Although the IMF Article IV 2019 sounds optimistic, the economic condition remains critical especially with the COVID-19 pandemic that engulfed the world in 2020. Figure (3) plots the primary fiscal balance. It took a significant dip in 2014, and it indicates that expenditures have been stubbornly high.

We have a number of objectives. First, we examine the relationship between the non-hydrocarbon sector (NHC) and the hydrocarbon sector (HC), both for real GDP and real GDP *per person* (i.e., a measure of productivity). The main question is whether Oman can progress without too much reliance on oil, which depends on the progress of the NHC sector. Second, we do a growth accounting to assess the drivers of productivity growth. Third, we compare the NHC's productivity with Dubai's, which is the closest non-hydrocarbon economy. Fourth, we estimate the rate of return to private investments.

Our main findings are that, first, the share of the NHC sector increased from about 40 percent of the total economy over the period from 1998 to 2005, to a nearly 60 percent over the period 2006 to 2016. This is a good progress. It implies that Oman has been increasingly diversifying income away from oil. Second, consistent with the increase in the share of the NHC sector in the economy, real GDP growth in the NHC sector has been notable over the period 1998 to 2006.

It grew at an average of 6.8 percent, while the whole economy's average growth rate was 3.6 percent, and the HC sector grew by less than 1 percent. Third, the NHC sector has been relatively less volatile because domestic prices are usually less volatile compared with oil prices, which is highly likely due to subsidies of locally produced goods and services. All these findings are encouraging signs for the future of Oman. Fourth, there is a general belief among Omanis that the NHC sector is driven by oil income. This is not true; it cannot be confirmed by the data. While *nominal* GDP growth rates across sectors are correlated, the *real* GDP growth in the NHC sector is independent from growth in the HC sector. This nominal-real distinction is important.

Fifth, strong real GDP growth notwithstanding, productivity growth, i.e., real GDP per person, has been negative on average. The average productivity growth rates are -3.27, -6.45, and -0.08 percent for the economy as a whole, the HC sector, and the NHC sector respectively. Sixth, capital productivity growth in the NHC sector has been rising; however, it has been declining in the HC sector and nearly flat in the economy. It means that more investments had taken place over time. Labor productivity and Total Factor Productivity (TFP), in levels and in growth rates, have been disappointing. Labor productivity has been falling. Our estimated marginal productivity of labor has been declining in all sectors. There is a caveat, however, with respect to measurements. Services output is the largest in the NHC sector. It comprises 35 percent. Services output is hard to measure and usually measured with large errors, thus productivity is measured with errors too. Furthermore, because most of the skilled Omanis work in the government, 128 thousand, their output is not measurable. Thus, we have missing productivity.

Seventh, growth accounting reveals that only capital deepening (capital – output ratio growth) and TFP growth in the HC sector could account for some of the growth in real GDP per person. Neither labor nor human capital is significant. Eighth, there is a high positive real GDP growth income and a negative real GDP *per person* growth, i.e., productivity. The increase in GDP is a result of higher oil price, a *positive terms of trade shock*. Productivity is unaffected by the price oil but by investments in R&D, usable knowledge, education and human capital, TFP, and global research efforts, e.g. Kuznets (1960), Romer (1990), Jones (2002), Lucas (2009). Real GDP growth and real GDP *per person* are measures of two different things.

Ninth, comparing Oman's NHC sector's productivity to Dubai's, which is the closest NHC economy, suggests that Dubai's productivity growth has been relatively poor. Dubai's real GDP per capita growth rate over the period from 2007 to 2016 was -1.0 percent; nevertheless, it is higher than Oman's NHC sector. Dubai's economy is dominated by services. Services sector makes up nearly 70 percent of the total economy. Note that the service sector's output such as the output of education, health, defense, administration, and other services, is difficult to measure. Therefore, productivity measures are highly uncertain.

Tenth, for the economy as a whole, real GDP per capita growth is negatively correlated with government expenditures and investments, positively correlated with private investments and the *production* of hydrocarbon (oil and gas). For the NHC sector, private investment is a key driver of productivity growth. Government investments and oil production have no effect on real GDP per person growth rate. Everything else remains unchanged; a 10 percent increase in private investments to GDP ratio increases real GDP per capita growth rate by a quarter of a percentage point.

We estimate that the total private investment in the projects of the Development Plan, which is OR 8.5 billion so far (double the private investments level in 2016 OR 4,300.67 million) would increase real GDP by OR 1,15 million annually. Hydrocarbon production (oil and gas in equivalent millions of barrels of oil) has a very significant impact on real GDP per person growth rate in Oman. Depending on specifications, a 10 percent increase in the growth rate of the production of oil and gas per person increase real GDP growth by 6 percent. However, the effect of oil production on real GDP growth in the NHC sector is insignificant.

Eleventh, Oman main weakness is low productivity. This is true, however, for all GCC countries, and all Arab countries. To be precise, labor productivity is poor because the quality of labor is poor. We do not have adequate measures of labor quality; however, a closer look at the data shows that Oman's labor is largely unskilled. There are 1.8 million unskilled workers in the NHC sector. Among this labor, there are 1.6 million unskilled foreign workers with less than secondary school qualification. Even if we ignore domestic and construction workers, we still have a relatively large unskilled labor in the NHC sector. Occupation wise, there are only

450,485 skilled laborers working in the private sector. They make 22 percent of total employment in the sector. Unskilled expats make about 70 percent of the total number of workers in the private sector. This large number of unskilled labor reduces overall labor productivity in the NHC sector.

Twelve, on the other hand, most of the skilled Omanis workers work in the government. Unfortunately, their productivities (output/inputs) are immeasurable because their output is immeasurable because we do not have a measure of their outputs. Thirteenth, according to the World Bank recent special report on the education outcomes in Oman, there is evidence that primary and secondary school attainments are low and education outcomes are poor (e.g., low level of learning). We extrapolate that these outcomes adversely affect the skill level. Dubai's education outcomes are much higher than Oman. We found that proxies for human capital such as the growth rates of schools and university enrollments have insignificant effect on real GDP per capita growth.

In summary, Oman's NHC sector suffers from an excess supply of unskilled labor, which seems to be the main cause of low productivity. Because of the excess supply of unskilled labor, the NHC goods and services market in Oman is limited to producing unskilled-intensive goods with low returns. Technical progress and investments are the drivers of productivity growth. Investments, domestic and FDI seek returns. If productivity is low, investments remain low. In addition, technical progress requires skilled labor, hence skill-biased technical change. To achieve such changes, the labor market conditions must be corrected.

There are two general types of relevant policies to deal with the problems of excess supply of unskilled labor; fiscal policy and *activist labor market* Policies. Usually, in market economies, fiscal policy influences wages, productivity and employment via changes in the tax rates on individuals and corporations. Tax on labor income could, for example, be used to close the gap between the public and private real wages and induce changes in the distribution of labor and skills across sectors. For example, the introduction of a labor income tax, or increasing the tax rate on labor income in the public sector could motivate the Omani skilled labor to take jobs in

the private sector. Without such tax, the government could effectively motivate skilled Omani labor to move from the public sector to the private sector because people respond to incentives.

The fiscal authority could use the available corporate tax as a policy instrument to affect employment or productivity in the private sector. For example, the fiscal authority could give incentives to businesses to increase the share of Omanis by either lowering business taxes or given them tax credit. It could do the same to increase FDI or R&D, or productivity.

More taxes mean, and to a certain extent, more revenues. Some argue that taxes could reduce or even eliminate the budget deficit, unless the Laffer curve is true, which means taxable income declines with higher tax rates. However, the tax carries with it the usual trade-offs, which must be considered carefully. There is a very large literature on the political economy of taxation. "Taxation and representation" and whether taxes lead to more democracy are typical questions asked in this literature. There is no solid evidence that taxation leads to democracy. There is, however, a concern that taxation could lead to social unrest. The timing matters.

From a macroeconomic viewpoint, the introduction of labor income tax reduces the supply of labor, productivity, and real after-tax wages. Finally, there is the timing of introducing taxes. Taxes should not be increased or introduced when the economy is in a downturn. Oman's economy is on the downturn of the business cycle so increasing taxes is not a good idea. Developed countries do not increase taxes during recessions.

To increase productivity, the labor market skilled-unskilled imbalances must be fixed first. Flexible labor market conditions increase private investments. Private investments require markets with free entry, reasonable regulations, and a suitable business environment. There are two other important markets in addition to the labor market, which affect private savings-investments-productivity growth: the goods and services market, and the money-credit market.

The money-credit market mobilizes and manages domestic savings and promotes private investments. Interest rate liberalization is a key structural financial reform. The theoretical argument under the assumptions of perfect information and competition calls for letting the

market to determine the allocation of credit. With the real interest rate adjusting to its equilibrium level, low-yield investment projects would be eliminated so that the overall efficiency of investment increases. As the real interest rate increases, saving rates and the total supply of credit increase, which induce more investments. Investments increase the steady-state rate of economic growth. It is unclear that the lending rate is market-determined in Oman and how the Central Bank of Oman affects it. The gap between deposit rate and lending rate is very wide.

Over a very long span of time, skills growth motivates more technically advanced capital investments. It also motivates high quality FDI.[i] Finally, domestic investors and domestic businesses *entry to market* face a structural competitiveness issue. Oman is a mercantile economy similar to all GCC countries with a few dominant conglomerates, which have exclusive import licenses. Therefore, entry of new businesses and investors, regardless of their size, is difficult. It is quite clear that this problem requires the intervention of the highest authority in the land.

We have seven sections in this paper. In the next section, we present some stylized facts. Section 3 analyzes productivity, growth accounting. Section 3 analyzes productivity. Section 4 explains why labor productivity is low. Section 5 is a comparison with Dubai. Section 6 provides measures of the rate of return on private investments, and the last section is a conclusion.

The data are from the Omani National Center of Statistics and Information, the Ministry of Finance, and the IMF World Economic Outlook. Dubai's data are from the website of Dubai official statistics. The data are available from 1998-2016. Some data are available in longer time series, but others are shorter. Usually, the GDP and most real variables are difficult to find up to date. GDP is published with a lag of two years.

2. Stylized Facts

The NHC sector is important for the future of Oman's objective to diversify income away from oil. Table (1) lists the average contributions of sub-sectors in the NHC sector in Oman over the

period 1998-2016. Services dominate the NHC; they make up 35 percent of the real economy, followed by manufacturing with 14 percent.

We plot the real (constant base price) GDP growth rates for the economy, the HC and the NHC sectors in Figure (4). The data suggest a number of interesting stylized facts. First, contrary to common beliefs, on average, the real GDP growth rate of the NHC sector is higher (6.8 percent) than that of the HC sector (0.91 percent) and the economy-wide growth rate (3.61 percent). Furthermore, the share of the oil sector in the economy has been declining and the share of the NHC sector increasing. Table (2) reports the averages over the two sub-samples, 1998-2005 and 2006-2016. The size of the NHC sector has increased significantly over time while the HC sector shrunk. Second, growth in the NHC sector has been relatively less volatile than the other two. The coefficient of variation is 0.51 compared with 4.9 for the HC sector and 0.84 for the economy, see table (3). Oil is inherently volatile market. Third, the growth rates equalize at the end of the sample. Fourth, the correlation between the economy-wide and the HC sector real GDP growth rates is high, 0.80. The correlation between the economy-wide and the NHC sector growth rates is much smaller, 0.50. However, most interestingly, the correlation between the HC and the NHC over the sample is -0.10. Negative correlation implies that the HC sector's growth does not induce growth in the NHC sector. Precisely, the two sectors are statistically *independent*. The chi-squared test for independence has a value of zero (P-value equal 1).[ii] Figure (5) is a scatter plot of the two variables. Again, the plot shows that there is no correlation or causation along the 45° line. Table (3) reports descriptive statistics.

2.1 Explaining real growth-stylized facts

The results presented above point out to an important distinction between *nominal* and *real* quantities. Some policymakers in Oman ignore this distinction. They believe that oil drives up the NHC sector. Figure (6) plots the growth rate of *nominal* (current producer price) GDP for the Omani economy, HC and NHC sectors. The picture is consistent with the abovementioned belief and very different from figure (4). The correlation between the growth rate of *nominal* GDP of the economy and that of the HC sector is 0.99; between the HC and NHC sectors is 0.50; and between the economy and the NHC sector is 0.70. These are significantly different rates from

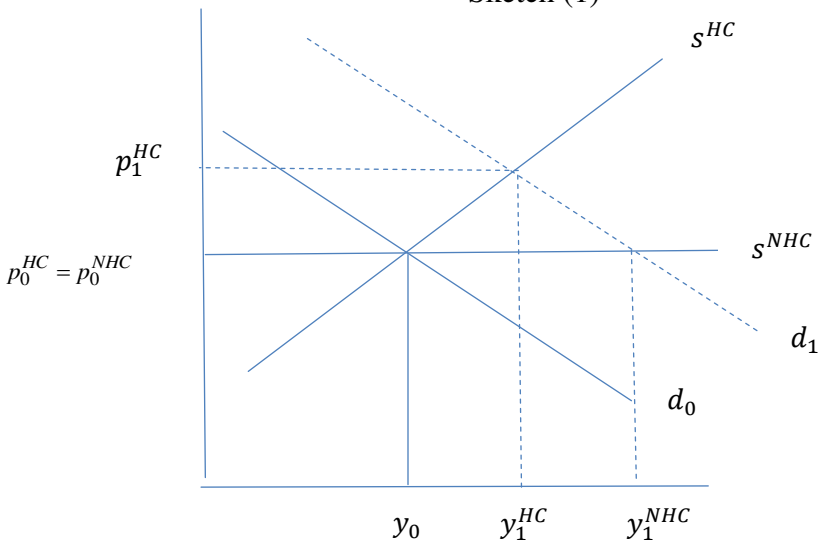
the correlations in real terms, which we reported earlier, -0.10 and 0.50 represent a significant difference. Second, the NHC sector nominal GDP growth has been the least volatile with the coefficients of variation 0.70 compared with 3.7 for the HC sector and 1.7 for the economy. On average over the sample from 1999 to 2016, the NHC sector nominal GDP growth rate was 9.33 percent compared with the growth rate of the whole economy, which is 8.9 percent, and the HC sector, which was 7.8 percent.

Figures (4), (5), and (6) suggest that at least one potential explanation for the relatively better performance of the NHC sector is that the price deflator of the NHC sector is, on average, significantly smaller and less volatile than prices in the oil sector and the whole economy. Table (4) confirms this suggestion. It reports the averages, the standard deviations, and the coefficients of variation for the inflation rate in these three sectors. The NHC sector's price deflator is, on average, the lowest and the least volatile. Domestic prices in the NHC sector, unlike the price of oil, which behaves like as asset prices and subject to volatile shocks, could be stickier. The sickness of domestic prices of goods and services could be a result of subsidies and regulations among other reasons. Price subsidies and other regulations among other reasons could explain price stickiness.

In the case of a demand shock, for example, an upward shift in the demand curve causes a larger change in output and a smaller change in prices. Sketch (1) illustrates the point. Assume that the supply curve s^{NHC} is flatter in the NHC sector with sticky price than the HC sector supply curve s^{HC}. The demand is downward slopping d_0. Output is $y_0$and the prices in the HC and NHC sectors are the same $p_0^{HC}$and p_0^{NHC}respectively. A shift in the demand curve to $d_1$changes the output from $y_0$to $y_1^{NHC} > y_1^{HC}$while the price in the NHC sector remains at $p_0^{NHC}$and the price in HC sector increases to p_1^{HC}. Essentially, NHC sector's output increases by more than the HC sector and the price remains unchanged. In real terms, output in the NHC sector is greater. The same happens if we use output growth and price changes.

More on this point is that the standard deviation of inflation by sectors (except for fisheries) is significantly higher in the HC sectors and the industries where hydrocarbon is an input in the production. Figure (7) plots the statistics.

Sketch (1)



3. Productivity

Examining real GDP per person growth (i.e., productivity growth) paints a significantly different picture for Oman than real GDP growth. Over the same sample from 1999 to 2016, average Oman's real GDP per person growth rate is -3.27 percent. The growth rates for the NHC and HC sectors are -0.08 and -6.45 percent respectively. These negative productivity growth rates, unlike real GDP growth, are the main problem of the Omani economy.[iii]

Figure (8) is a scatter plot of the growth rate of the real GDP per employed person in the economy (e.g., another proxy for productivity growth) and growth rates of the real GDP per employed person in the NHC sector and the HC sector for the period 1999 to 2006. First, most of the scatter dots are in the negative quadrant of the graph. Second, the NHC sector's labor productivity growth has higher correlation coefficient with the economy-wide growth per person, (0.89) compared with (0.12) for the HC sector – scatter plots closeness around the 45° line indicates higher association between sector's productivity and the economy-wide productivity growth. Figure (9) plots the times series data. The NHC sector has a much higher productivity growth throughout the sample.

3.1 Marginal Productivity

We calibrate a constant return to scale Cobb-Douglas production function.[iv] An index for the marginal productivity of labor (i.e., the change in output resulting from increasing labor by one extra unit) is plotted in figure (10). The marginal productivity of labor has been falling everywhere, but its level is higher in the NHC sector than in the HC sector and the economy-wide measure as well. Declining marginal productivity has something to do with the large number of unskilled labor in Oman, which we will examine further in the next sections.

Figure (11) plots the marginal productivity of capital. For the economy-wide, it is generally more volatile and falling. It is falling in the HC sector, but rising in the NHC sector. Thus adding more capital to the production of goods and services in the NHC sector has been driving up productivity. Later, we will examine the effect of private investments on real GDP per person growth rate.

3.2 Total Factor Productivity (TFP)

We measure TFP it by calibrating the same Cobb-Douglas production function described earlier.[v] TFP is a measure of efficiency. The results are consistent with real GDP per person in the sense that the NHC sector's performance is better than the HC and the rest of the economy; although, TFP deteriorated over time in all sectors. Figure (12) plots the level of TFP index.[vi] Figure (13) plots the growth rates of TFP. Table (5) reports average statistics. Average TFP growth rates are negative. The Conference Board also reports negative TFP growth for Oman over a long period.

Both the level and the growth rate of TFP in the NHC sector lie above those of the whole economy and the HC sector. The *average* growth rates for the economy, the HC and NHC sectors are negative as shown in the table above. The NHC sector's TFP growth, although negative, it is higher than TFP growth of the economy. However, it is highly volatile. The volatility in the NHC sector is twice as large as the volatility in the HC sector and nearly three

times larger than the economy-wide TFP growth volatility. The volatility is an indicator of heightened uncertainty.

Next, we examine growth accounting for the association of: capital deepening; labor; human capital; and TFP growth rates with real GDP per person growth in all sectors.

3.3 Growth Accounting

3.3.1 Capital Deepening

Figure (14) plots the effect of capital deepening measured by the growth rate of capital – output ratio and the economy's productivity growth. The 45° line measures the goodness of fit, whereby scatter plots closely around the line from both sides represent good fit. Domestic capital is savings. Investment is the rate of change of capital after accounting for some depreciation of the stock of capital. Investment is a very important determinant of economic growth. However, a significant amount of the capital stock is also imported. Unlike the HC sector, the NHC sector's capital deepening has a significant effect on the overall productivity of the economy. The HC sector's capital deepening (triangles) does not seem to explain the economy-wide productivity growth as much as the NHC sector's. Nonetheless, capital growth seems to explain more of the variations of the real GDP per capita growth in Oman.

3.3.2 Labor

Figure (15) plots the employment growth data. Unlike capital, employment does not explain the variations in the economy's real GDP per person. Most of the scatter plots are far away from the 45° line.

3.3.3 Human Capital[vii]

Figure (16) plots the proxies of human capital growth. Human capital accumulation increases skills and enables the labor force in the process of the absorption and the adoption of global knowledge. This enhances the efficiency of technological diffusion and subsequent economic

growth.[viii] We use primary and secondary school enrollments and college and university enrollments growth rates as proxies for human capital. These data are only available for the whole economy. Sectoral data are unavailable. Primary and secondary enrollment explains more of Oman's productivity growth than college and university enrollment, however, the overall fit is weak for both proxies. The scatter plots are far from the 45° line. These weak associations are consistent with the employment growth data. Labor and skills seem to have very little or no effect on overall productivity growth in Oman. Labor *quality* is the *Achilles Heel* of the Omani economy. We will provide more evidence later in this analysis.

3.3.4 TFP

Finally, we plot TFP growth against the economy-wide productivity growth in figure (17). There is close association between TFP growth in the HC sector in particular and the economy-wide productivity growth with the exception of 2003. TFP, which is generated by global research efforts, is transferred to Oman via, for example, imported capital, global management, accounting practices, and technology. We showed earlier that the marginal productivity of capital has been increasing in the NHC sector. Capital goods are imported into Oman, and with these imported capital goods, Oman gets its share of global growth in knowledge, which eventually drive GDP growth per person.[ix] There must be a significant amount of knowledge transfer through capital imports in the HC sector for as long as the oil industry has been operating in Oman.

4. Why Labor Productivity is low?

Having illustrated that labor productivity and labor productivity growth are relatively low, and that labor does not explain real GDP per capita growth, we need to understand why that is. Table (6) reports the distribution of labor in Oman by skills. It is plainly clear that Oman's labor market is dominated by unskilled labor and that is the main reason for low labor productivity.
First, the number of unskilled workers defined by those who have secondary degree and less is more than 1.8 million workers. This is 90 percent of the total employment in the private sector. Among those, there are 1.6 million unskilled ex-pats. Adding more unskilled labor to the

production of GDP would not increase productivity, or only increase the production of unskilled-intensive goods, but most likely services. Recall that services output is hard to measure.

Second, most of the highly skilled Omanis work in the public sector, about 75 percent of total Omani workers. Skilled Omanis in government do not add to labor productivity since the government is not a producer of goods and services. These figures explain the low productivity statistics satisfactorily.

Third, the larger the share of services, e.g., education, health, administration, and defense, the less certain we are about labor productivity because output of these sectors is difficult to measure.

Fourth, the rate of growth of employment is higher than the rate of growth real GDP; the difference, which is real GDP per person growth is negative. The increase in employment growth is explained by the average low wage rates of the unskilled labor in the private sector. For example, in 2016 the growth rate of real GDP in the NHC sector was 1.8 percent while employment grew at 8.37 percent. Figure (18) plots the data.

5. How far is the NHC sector from Dubai?

Productivity is a relative measure. To assess Oman NHC sector's performance we compare it to Dubai, which is largely a non-hydrocarbon economy. We use Dubai Statistics data from 2006 – 2007 to 2015-2016; some variables have missing observations. Poor data notwithstanding, we compare TFP, labor productivity, capital deepening, human capital accumulation and foreign direct investment (FDI). The data show that although Dubai's productivity growth is negative too, it is still higher than Oman's NHC sector.

We report the sectoral output contributions in Oman NHC sector and Dubai for 2016.[x] Table (7) reports the economic activities in 2016 in both Oman's NHC sector and Dubai. Note that services make up 70 percent of Dubai's economy. Services productivity is hard to measure because output in services is hard to measure. Therefore, we remain cautious about comparing

Oman's sector developments to Dubai. Oman's non-hydrocarbon TFP is smaller than that of Dubai over the period from 2007 to 2015, and declining. It is rather vital to understand why that is. Figure (19) plots the Omani TFP relative to Dubai's (Dubai=100).

5.1 Relative TFP Growth

For Dubai, we computed the share of labor using total compensations to employee / nominal GDP to be 0.38, thus given the constant returns to scale Cobb-Douglas production function, the share of capital is 0.62. The stock of capital is computed using exactly same method we used for Oman earlier. The depreciation rate is fixed at 0.05. Figure (20) plots the growth rate of TFP for Oman's NHC sector and Dubai's. Table (8) reports the averages and the standard deviations. TFP growth is negative on average in both places, which is not surprising; the Conference Board data also shows negative TFP growth for the UAE. However, Oman's NHC sector has a significantly lower and more volatile average growth of TFP than Dubai. Dubai's TFP growth declined significantly in 2009 (the period of the Great Recession that followed the Global Financial Crisis), recovered, and then started to decline mildly 2014. The overall 'assessment' is that both economies run into significant inefficiencies, however, less in Dubai than Oman's NHC sector.

5.2 Relative Labor Productivity

Similarly, Dubai's real GDP per employed person growth rate – labor productivity growth – is also negative on average (-1.0) over the period from 2007, however, it is less negative than Oman's NHC sector (-4.2). Figure (21) illustrates. Relative to Dubai, Oman NHC sectors' labor productivity level has been constantly falling too. Figure (22) plots relative labor productivity. So what are the sources of growth in Dubai? *Not Capital Deepening*, the capital-output ratio growth rate is, on average, lower than Oman's NHC sector. It grew at a negative rate of -1.25 over the period from 2007 to 2015. Figure (23) plots the data.

There are two remaining data pertinent to growth: human capital accumulation and foreign direct investments. Figures (24) and (25) plot the growth rate of primary & secondary school

enrollment and university & college enrollments. These are proxies for human capital. Both enrollment variables are significantly higher in Dubai. Average primary and secondary school enrollment growth rate over the period from 2000 is 5.17 percent. Oman's is 1.86 percent. Average university and college enrollment growth is double that of Oman, 14.5 percent compared with 7 percent in Oman.

Figure (26) plots FDI growth rates for Dubai and Oman. Again, Dubai's FDI growth rate is significantly higher than Oman. The average over the sample is 16.7 for Dubai and 14.1 in Oman. The difference is statistically significant.

Estimation of the contribution to real GDP growth and the rate of return on these investments is hard given the small sample size. Given the significant difference in human capital accumulation and FDI in Dubai, we examine their effects on real GDP growth a little more. Figure (27) is a scatter plot of real GDP growth rate in Dubai along with three variables, the primary and secondary school enrollment growth rate; the university enrollment growth rate, both as proxy for human capital; and the FDI growth rate. There is no correlation. Dubai's real GDP growth is uncorrelated with either human capital or FDI. We plot the same data for Oman in figure (28). Relatively, human capital proxy the school enrollment has higher correlation with real GDP growth, but not FDI. These correlations are generally weak. This is troubling. Razzak and Bentour (2013) provide evidence for the effects of FDI on economic growth in developing countries; see also Bin Jelili (2020).

6. The Rate of Return on Investments

To measure the rate of return on investments, we estimate a simple growth model. The dependent variable is real GDP per capita. The independent variables are private investments – output ratio (or per capita); government investments – output ratio (or per capita); the growth rate of the production of hydrocarbon (oil and gas in millions of oil barrels) per capita; and two proxy measures of human capital. These measures are enrollments in primary & secondary schools – per capita growth rate and college and university enrollments per capita growth rate.

We report the estimated elasticities in table (9). For the whole economy, the fit is very good as shown by $\overline{R}^2$ (0.81). Our estimates have consistent standard errors. Private investments and the production of hydrocarbon growth rates have very significant effect on productivity growth. A 10 percent increase in private investment to GDP ratio raises the growth rate of per capita income by 2.5 to 3 percent. This is quite significant relatively speaking. A 10 percent increase in the growth rate of hydrocarbon production per capita increases real GDP per capita growth by 6 percent. It is not the case for the NHC sector. We showed earlier that there is evidence of independence between growth in the HC and NHC sectors. In this growth model, hydrocarbon per capita growth rate has no significant affect on real GDP per capita growth in the NHC sector. This result confirms the correlations we reported earlier in this paper. We concluded that the oil sector is independent of the NHC sector. Proxies for human capital have negative impact on real GDP per capita growth. Typical growth models have significant positive impact from human capital. This is not the case in Oman.

To interpret our estimated rate of returns on investments, for example, the estimated elasticity be 0.5, GDP is OR 6 and investment is OR 1. The rate of return is 0.5(6/1) is OR 3. Thus, a 100 percent increase in investments from OR 1 to OR 2 increases GDP from OR 6 to OR 9, reflecting the estimated elasticity of ½ percent.

Our results indicate that – *everything else remained unchanged* – a 10 percent increase in private investments – GDP ratio increases real GDP per capita growth by a quarter of a percentage point. Thus the rate of return on private investments is $e \times average\left(Y_t/I_t^p\right)$, where e is the estimated elasticity 0.03. In terms of the levels, for example, average real GDP over the period 1999-2016 was OR 20,612 (million) and average private investments was OR 1,899 (million). Thus, the return is OR 0.33. Assume that investment is doubled from approximately OR 4,300 (million) in 2016 to OR 8,600 (million). This would have increased average real GDP by approximately OR 1.2 Billion from OR 29,067 (million) to OR 30,467 (million).

Important to note that: (1) There is insignificant change in the results if we use private investments per capita and government investments per capita instead of private investments / GDP and government investment / GDP ratio. (2) The results are subject to a small sample bias.

(3) The effect of government investment / GDP on real GDP per capita *growth* is negative. Thus, the return on government investment is negative. Caveats are, first, our model has no dynamics because the sample is small. The effect on growth could take several years. Second, there is a strong positive relationship between government investments / GDP ratio and the *level* of real GDP per capita.[xi]

7. Conclusions

We have examined the performance of the Omani economy, with more attention paid to the NHC sector. Although Oman is a typical rentier economy, whereby oil fuels most activities, the data indicate that the Omani non-hydrocarbon sector is independent of the oil sector. The most serious issue is Oman's low productivity. The main causes of poor productivity are; first, the hydrocarbon reduces work-effort and incentives. When oil prices are high, government revenues are high, thus more government spending. Rent increases as a result. Razzak and Laabas (2016) reported that the estimated average weekly hours worked by person increases when the price of oil drops in the GCC. The explanation is that people smooth out consumption so they work harder – i.e., long hours, to keep income constant.

Second, the labor market in the NHC sector is skewed towards unskilled labor. The labor market is segmented with a wage (and benefits) differential whereby most of the Omani skilled labor work in the public sector while most of the less skilled and unskilled labor is in the private NHC sector producing unskilled-intensive services.

Within the labor market, wages, productivity, and employment are jointly determined. In a typical flexible labor market, firms continue to employ labor if the real wage is less than the marginal productivity of labor. They lay-off labor if the real wage exceeds labor productivity. Moreover, in equilibrium the real wage must be equal to labor productivity. On the supply of labor side, workers accept job offers when the real wage exceeds the reservation wage. The reservation wage depends on the benefits workers receive if they do not work. We do not know what the reservation wages are, but table (6) reports the distribution of skills across the government and the private sectors. We also know that total compensations to employees in the

government sector is OR 3,306,000,000 and the compensations for the private sector is OR 7,031,000,000, therefore, government sector's wage premium is OR 407. This premium is the ratio of the average wage in government sector / average in the private sector. The averages decline as the total number of workers increase. This premium suggests that the Omani people prefer government jobs. In addition, the worker receives more benefits; shorter average weekly hours worked, and job security, etc. Policy must focus on ways to eliminate this premium. One way to eliminate this premium is to reduce the number of unskilled expats in Oman; it would raise the average wage in the private sectors and reduce the public sector wage premium. Workers would be indifferent and equilibrium in the labor market is restored.

Another way to eliminate the wage differential across sectors, i.e., public vs. private, in countries with income tax system is to alter the tax rate across sectors. For example, assume that the wage in the public sector is higher than the private sector for the same job, OR 8 vs. OR 6. Let's suppose that the income tax rate 0.10, therefore the after-tax wages are OR 7.2 and OR 5.4. To make these two wages equal without any change in the wage itself, increase the tax rate in the public sector to 0.32. This will render wages equal at OR 5.4. Therefore, people would be indifferent to working in the public or the private sector.

Policy reforms at both the firms and national level are needed to improve labor productivity in Oman. The main actions are listed in the *Private Sector Growth Assessment* study (World Bank, 2016) and in the proposed *Policy Reform Agenda* prepared by the Macro Fiscal Unit at the Ministry of Finance (2017.) Both documents include reforms in the following key areas: investment climate, labor market, and education. After investing in much needed infrastructure projects, Omanis should allocate resources to investment projects with increasing return to scale.

Increasing productivity is more than a structural issue. For example, Razzak *et al.* (2016) have shown that in advanced economies, factor input growth differentials (capital, labor) could not explain international productivity growth differential. Global research efforts and development (R&D) efforts seem to be a key determinant factor of TFP and can explain (in the long run) 80 percent of the productivity growth differentials. Oman has to increases the quality of its labor force in order to attract more technology (i.e., the skill-biased technical change). Foreign

technical progress requires highly skilled workers in order to come to Oman. Again, policy has to focus on reducing the millions of unskilled foreign workers in Oman, attract more FDI,

There are a couple of crucial areas for future productive development. First, education and the labor market are highly connected. In 2018, more than 23,000 people graduated with university degrees. They all looked for the government to find them jobs. The Five-Year plan also anticipates at least 20,000 jobs to be created annually. Currently, the government only thinks about how to achieve this objective. In fact, there should be "out-of-box" long-run solutions to this extraordinary problem. Not all ideas are welcome, but they should be heard and debated.

Here, we propose a policy idea. We see the problem as an excess supply of labor. There are more job seekers than posted jobs. This is especially true in the public sector. More Omanis want to work in the government. The source of the excess supply is free tertiary education to all. Obviously, everyone likes free education. Some argue that free university is a right that every citizen should have. We argue that education should be free up to the end of high school. University education has a private return, which is higher than public returns. Therefore, it is probably unwise to use public money to provide university education to all people. That been said, public financing of university education depends on the stage of development. Countries, which are in the early stages of development, spend more on university education. There are caveats too. Some talented people have low income, which the state should pay for their university education. Usually, these people undergo asset testing.

However, people have different abilities, i.e., heterogeneity. The fact is that only a small fraction of the 3000 students accepted at the Sultan Qaboos University can pass the entrance competence tests in Math and English, yet they all get accepted, graduate, and be looking for a job four or five years later. Similar issues arise in the vocational training institutions.

Our idea is to link government subsidy to students (i.e., free tuition) and to tertiary institutions to the education's outcomes. In other words, we propose to link subsidy to productivity of both the students and the universities and the vocational training institutions. Students who do not perform a certain Grade Point Average (GPA) should pay for their education. Universities that

cannot place its students in private sector jobs do not receive subsidies. In other words, make the student's education subsidy correlated with the GPA, and taper it to zero as the GPA declines to below 1. Also, make the university's subsidy correlated with its ability to place its graduates in private sector jobs. This policy works on creating incentives to do well and to have better outcomes, higher productivity, and on eliminating excess supply of labor in the public jobs. We believe that this policy can save millions of OR in public spending.

References

Jelili, R. B., Does Foreign Direct Investments Affect Growth in MENA Countries: Semi-Parametric Fixed-Effects Approach, Middle East Development Journal, 2020,

Jones, C. I., (2002), Sources of U.S. Economic Growth in a World of Ideas, American Economic Review, 220-39

Kuznets, S., (1960), Population Change and Aggregate output, in Demographic and Economic Change in Developed Countries, (ed.,) Universities – National Bureau, Columbia University Press, 1960, 324-351

Lucas, R. Jr. (2009), Ideas and Growth," Economica, (76), 1-19

Lucas, R. Jr. (1988), On the Mechanics of Development Planning, Journal of Monetary Economics, XXII, 3-24

Lucas, R. Jr. and B. Moll, (2014), Knowledge Growth and the Allocation of Time, Journal of Political Economy, Vol. 122, no. 1, 1-51

Mankiw, G. N., D. Romer and D. N. Weil, (1992), A Contribution to The Empirics of Economic Growth, Quarterly Journal of Economics, 407-437

Nelson, R. and E. Phelps (1966), Investment in Humans, Technological Diffusion, and Economic Growth," American Economic Review Proceedings, LVI, 69-75

Nickell, S, (2003), Employment and Taxes, *CESIFO* Working Paper No.1109, (December)

Prescott, E. C. (1998), Needed: A Theory of Total Factor Productivity, Federal Reserve Bank of Minneapolis.

Razzak, W. (2018), International Productivity Growth Differentials, Sectoral Analysis and Missing Productivity, RePEC https://mpra.ub.unimuenchen.de/84967/1/MPRA_paper_84967.pdf

Razzak, W A and B. Laabas (2016), Taxes, Natural Resource Endowments, and the Supply of labor: New Evidence, in Handbook of Research on Public Finance in Europe and the MENA Region, IGI Global Research Publishing, USA (eds.) M. Mustafa Erdogdu and Bryan Christiansen, Chapter 23, PP 520-544

Razzak W., B Laabas, and E. M. Bentour, (2016), The Dynamic of Technical Change in Some Developing and Developed Countries, Handbook of Research on Comparative Economic Development Perspectives on Europe and the MENA Region, chapter 9, (eds.) M. Mustafa Erdoğdu, Marmara University, Turkey and Bryan Christiansen, PryMarke LLC, USA

Razzak, W, and M. Bentour, (2013), Do Developing Countries Benefit from Foreign Direct Investments? An Analysis of Some Arab and Asian Countries, Review of Middle East Economics and Finance, Vol.9 Issue 3, 357-388

Romer, P. (1990), Human Capital and Growth, Carnegie-Rochester Conference on Public Policy, Vol. 32, 251-286

Solow, R. (1956), Contribution to the Theory of Economic Growth, Quarterly Journal of Economics, LXX, 1956, 65-94

Solow, R. and F. Y. Wan, (1976), Extraction Costs in the Theory of Exhaustible Resources, The Bell Journal of Economics, 7(2), 359-370.

Stiglitz, J. (1974), Growth with Exhaustible Natural Resources: Efficient and Optimal Growth Paths, Review of Economic Studies, 123-137.

Table (1) – Average Contribution to Real GDP 1998-2016

Sector	Contribution (%)
Agriculture & Fishery	**0.90**
Manufacturing	**13.8**
Mining & Quarrying	0.30
Electricity, Gas, & Water	4.80
Building & Construction	4.20
Services	**34.8**
Wholesale & Retail Trade	7.40
Hotels & Restaurants	0.80
Transport, Storage & Communications	4.10
Financial Intermediation	3.80
Real Estate & Business Activities	4.20
Public Administration & Defense	7.60
Education	3.90
Health	1.60

Source: Ministry of Finance / National Center of Statistics and Information

Table (2) - Average Shares in the Economy

	1998-2005	2006-2016
Hydrocarbon	61.9	44.3
Non hydrocarbon	39.4	57.9

The shares are GDP in constant basic prices in the sectors / economy's real GDP

Table (3) - Descriptive Statistics for the Real Economy
Real GDP Growth Rates

	Average	STD	CV
Economy	3.61	3.02	0.84
Hydrocarbon	0.91	4.51	4.94
Non hydrocarbon	6.80	3.49	0.51

STD is the standard deviation CV is the coefficient of variation

Table (4) - The Price Deflator Inflation Rate 1999-2016

	Average	STD	CV
Economy	5.14	14.83	2.88
Hydrocarbon	6.88	28.78	4.18
Non Hydrocarbon	2.52	4.65	1.84

STD is the standard deviation CV is the coefficient of variation

Table (5) - TFP Growth Descriptive Statistics 1999-2016

	Average	STD	CV
Economy	-2.19	2.61	-1.19
Hydrocarbon	-3.81	3.46	-0.91
Non-Hydrocarbon	-0.83	6.46	-7.78

STD is standard deviation. CV is coefficient of variation

Table (6) - The Distribution of Workers by Skills and Sectors

	Government Sector			Private Sector		
	Expatriate	Omani	Total	Expatriate	Omani	Total
Not stated	236	126	362	23622	-	23,622
Illiterate	6,979	2,196	9,175	30009	6,816	36,825
Read and Write	2,422	9,625	12,047	508852	27,134	535,986
Primary	28	7,851	7,879	162567	22,379	184,946
Preparatory	48	10,086	10,134	649461	51,657	701,118
Secondary	302	37,932	38,234	260034	82,144	342,178
Total Unskilled	**9,779**	**67,690**	**77,469**	**1,610,923**	**190,130**	**1,801,053**
Diploma	5,542	33,807	39,349	50566	19,449	70,015
University	17,291	81,412	98,703	90116	22,602	112,718
Higher Diploma	747	4,560	5,307	4682	62	4,744
Master's Degree	3,026	7,164	10,190	5456	1,485	6,941
Ph.D.	1,003	1,178	2,181	2614	141	2,755
Total Skilled	**27,609**	**128,121**	**155,730**	**153,434**	**43,739**	**197,173**
Grand Total	**37,624**	**195,937**	**233,561**	**1,787,979**	**233,869**	**2,021,848**

NCSI Annual Statistical Bulletin 2017, PP 110 and 111. Not stated are not included in the totals. Caveat: some workers with low-qualification could be considered skilled since skills could be acquired from learning-by-doing.

Table (7) – Sector Contribution to Total Output 2016

	Oman	Dubai
Sector	Contribution %	Contribution %
Agriculture & Fishery	**-**	**0.10**
Agriculture	**0.96**	
Fishery	**0.64**	
Manufacturing	9.13	9.50
Mining & Quarrying	0.39	1.70
Electricity & Water	2.01	-
Electricity, Gas, Steam & AC	-	2.60
Total Industrial Activity	**19.18**	**13.90**
Water& Sewage, Waste		0.10
Building & Construction	7.64	6.20
Services	**41.20**	**70.20**
Wholesale & Retail Trade	7.39	26.9
Hotels & Restaurants	0.92	4.90
Transport, Storage & Communications	6.09	11.5
Financial Intermediation	5.19	11.3
Real Estate & Business Activities	4.22	6.80
Public Administration & Defense	9.26	3.00
Education	4.84	0.70
Health	1.92	1.00

Table (8) - Summary Statistics for TFP Growth

	Average	STD
Dubai	-0.19	2.03
Oman NHC Sector	-4.02	5.15

Table (9) – OLS
Dependent Variable is Real GDP per capita Growth Rate Sample 1999-2016

Economy Wide			NHC Sector	
	Coefficients	P value	Coefficient	P value
$ln(I_t^p/Y_t)$	0.025	0.0000	0.03	0.0040
$ln(I_t^g/Y_t)$	-0.028	0.0000	-0.07	0.0000
$\Delta ln(N_t/wap_t)$	0.60	0.0000	0.00	0.9696
$\Delta ln(E_t^{ps}/wap_t)$	-0.32	0.0000	-0.51	0.2016
$\Delta ln\,(E_t^u/wap_t)$	-0.04	0.0160	-0.18	0.1462
$\Delta ln(wap_t)$		0.0078	-1.16	0.0000
$\bar{R}^2$	0.81		0.35	
σ	0.01		0.03	
DW	2.41		1.32	

$Y_t$is real GDP,wap_t is working age population,I_t^p is private investments,I_t^g is government investments,N_t is total production of oil and gas measured in millions of barrels of oil-equivalent,E_t is enrollments, and the superscripts ps and u refer to primary & secondary and university. All variables are stationary. The standard error of the regression is σ and DW is the Durbin-Watson statistic. We use HAC standard errors and covariance estimation with pre-whitening lag = 2, AIC max-lag=2, Bartlett Kernel with a Newey-West bandwidth 1.85 and 2 lags. The Bandwidth is small because the sample is small; hence, the small sample bias exists. Results do not change if we use I_t^p/wap_t and I_t^g/wap_t as regressors.

Figure (1)
Oil Revenues - Total Revenues (%)

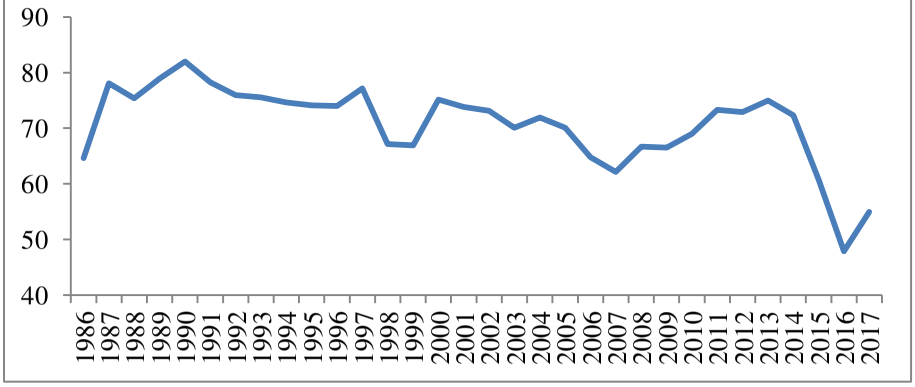


Figure (2)
General government gross debt - GDP

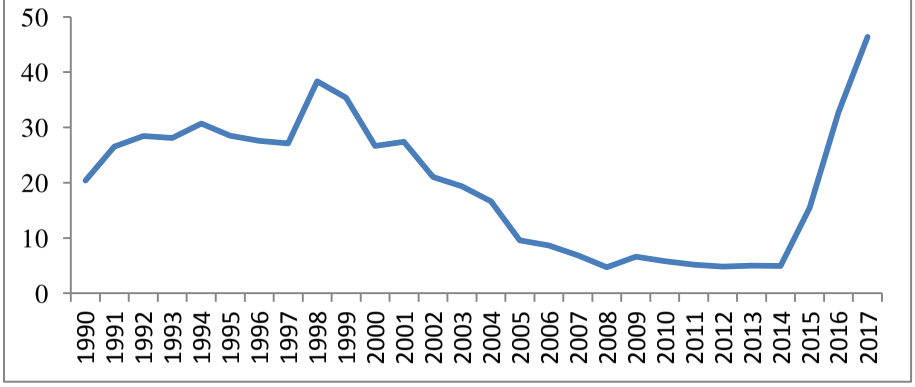


Figure (3)
Primary Fiscal Balance
Revenues- non interest Expenditure

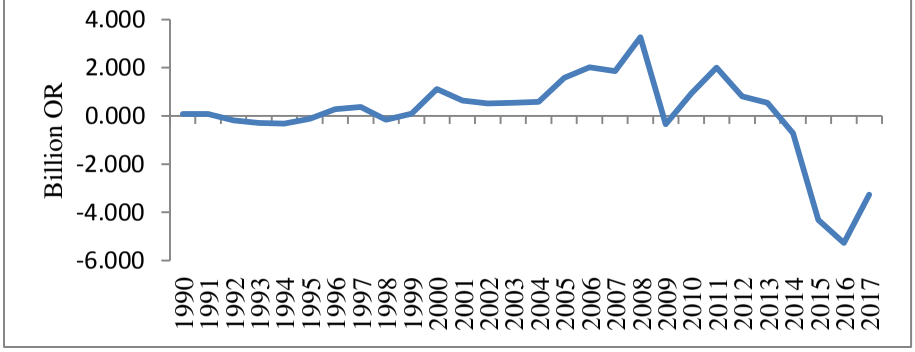


Figure (4)
Real GDP Growth Rates
(Constant Base Prices)

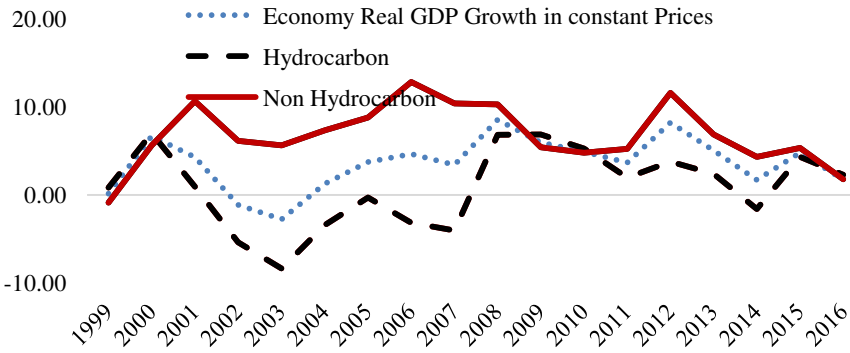


Figure (5)
GDP Growth in Constant Prices

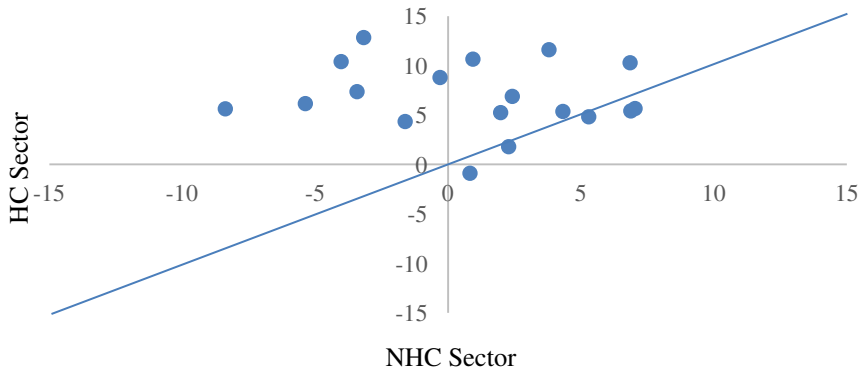


Figure (6)
Nominal GDP Growth Rates (Basic Prices)

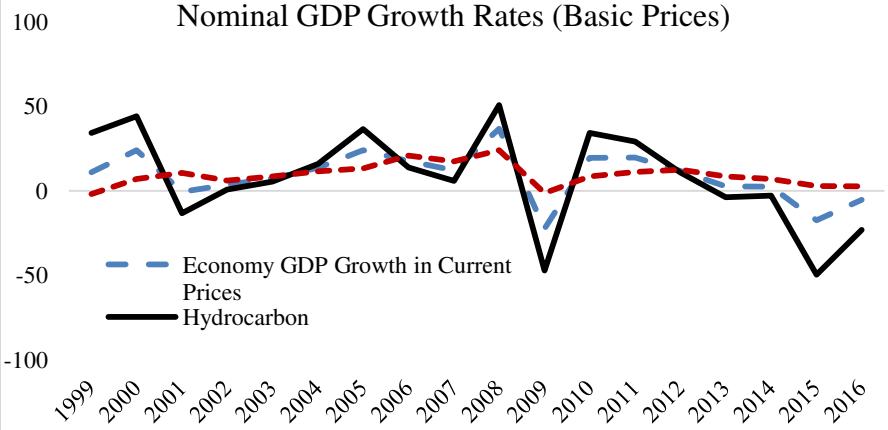


Figure (7)
Standard Deviations Inflation Rates by Sectots
1999-2016

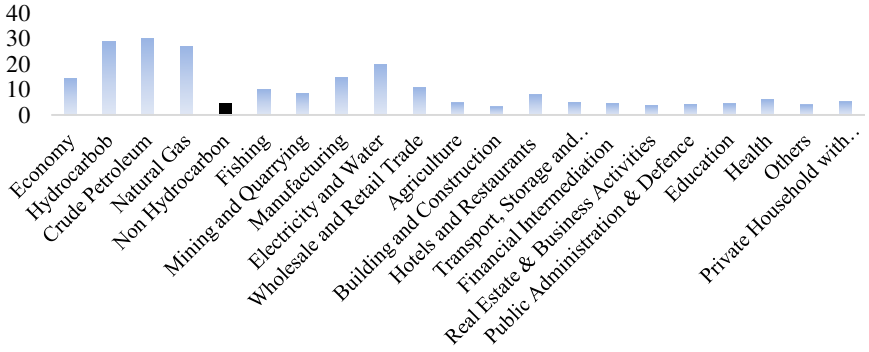


Figure (8)
Labor Productivity Growth

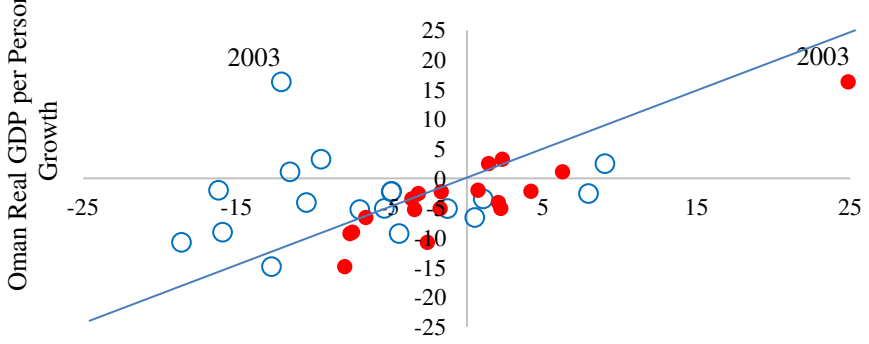


Figure (9)
Labor Productivity Growth

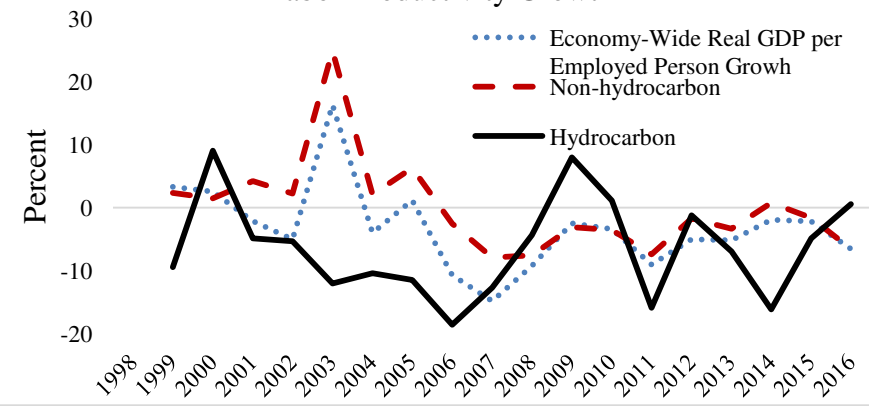


Figure (10)
Marginal Productivity of labor

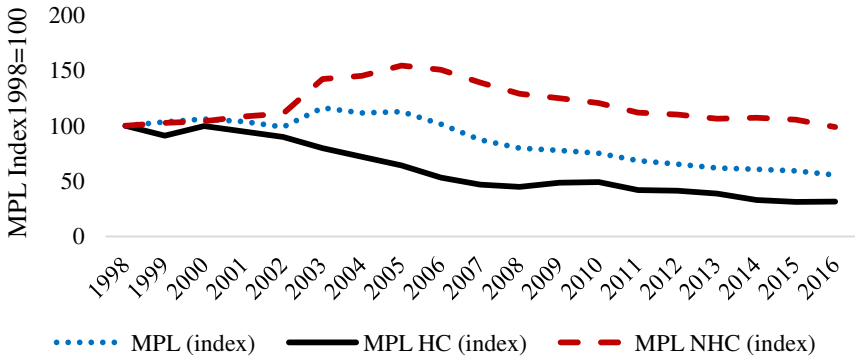


Figure (11)
Marginal Product of Capital

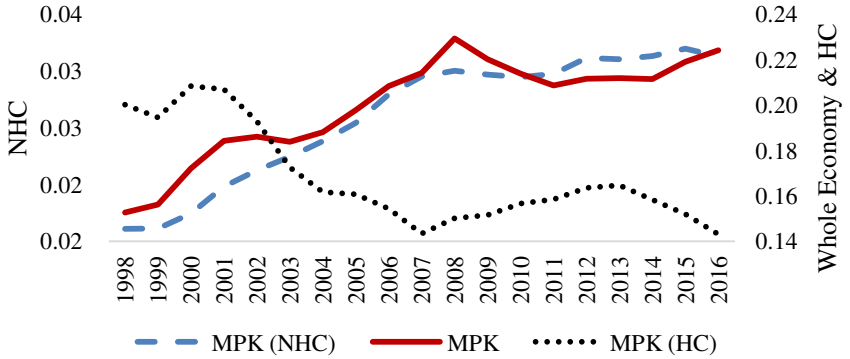
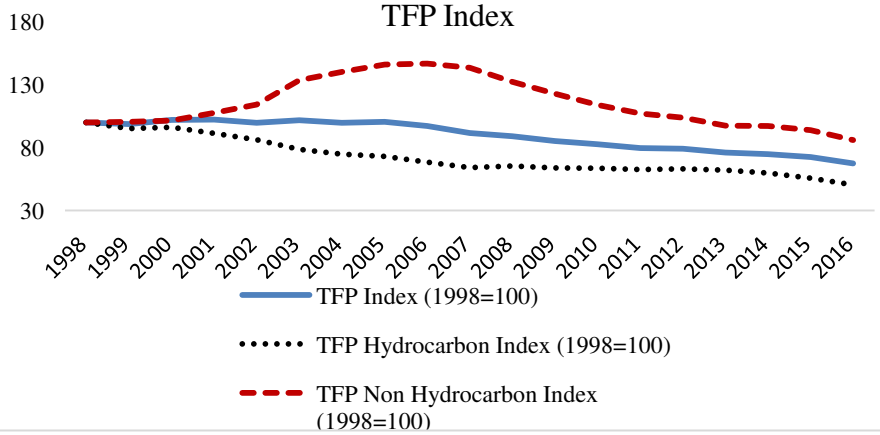


Figure (12)
TFP Index



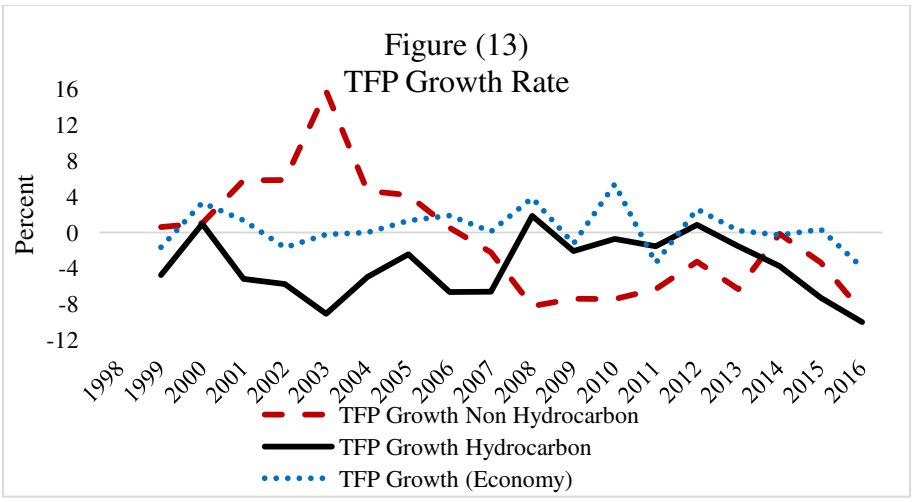


Figure (13)
TFP Growth Rate
Percent
16
12
8
4
0
-4
-8
-12
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
TFP Growth Non Hydrocarbon
TFP Growth Hydrocarbon
TFP Growth (Economy)

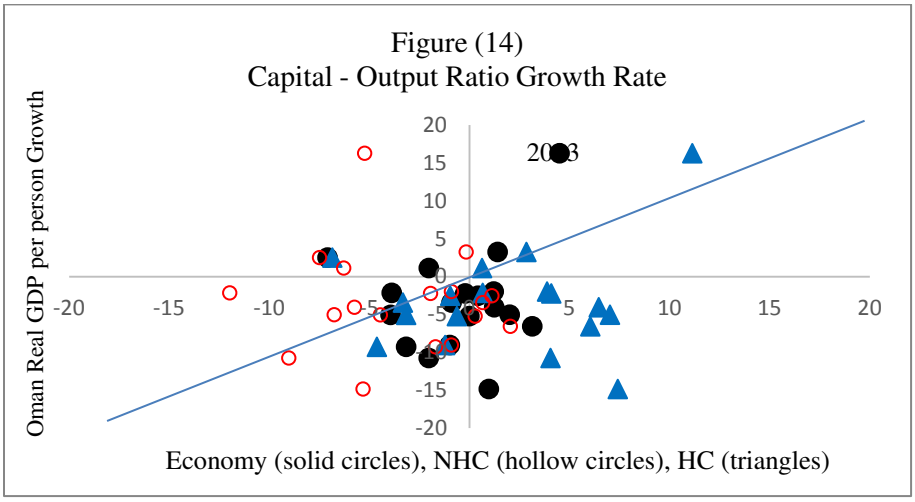


Figure (14)
Capital - Output Ratio Growth Rate
Oman Real GDP per person Growth
2003
Economy (solid circles), NHC (hollow circles), HC (triangles)

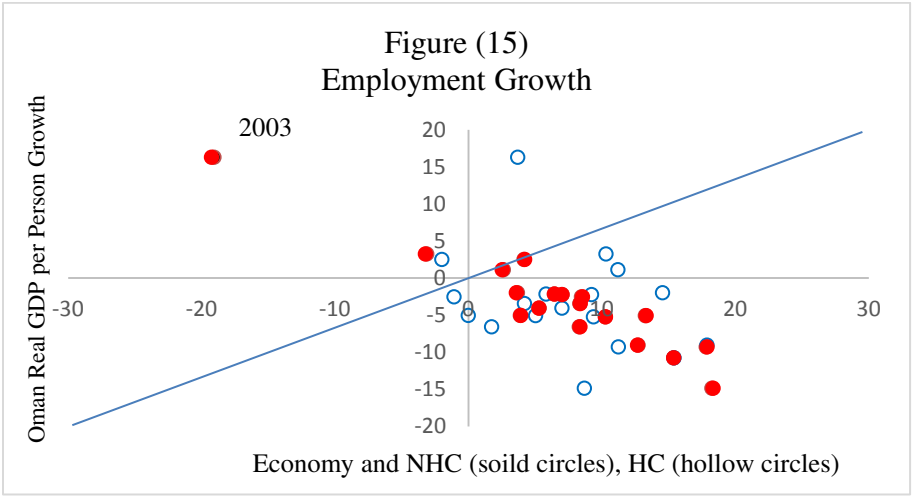


Figure (15)
Employment Growth
Oman Real GDP per Person Growth
2003
Economy and NHC (soild circles), HC (hollow circles)

Figure (16)
Primary & Secondary and University & College Enrolment

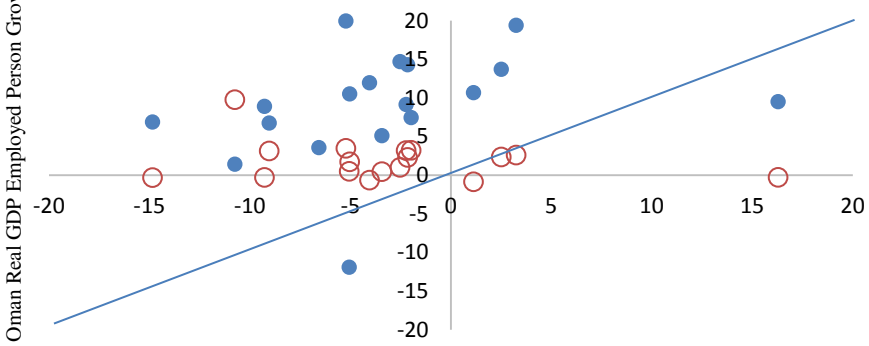


Figure (17)
Total Factor Productivity Growth

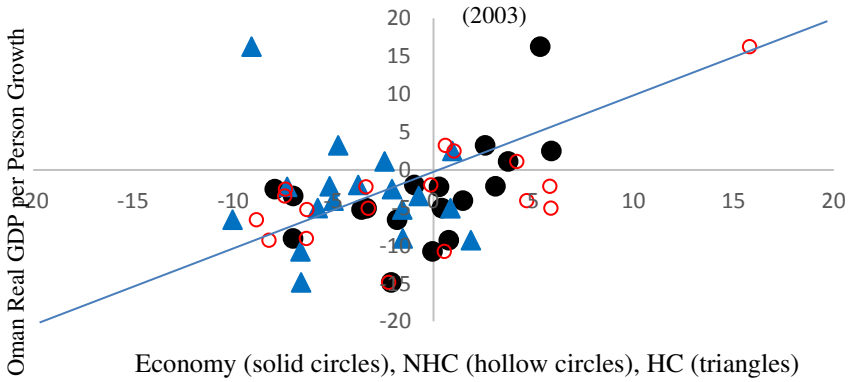


Figure (18)
NHC Sector Real GDP Growth and Employmnet Growth

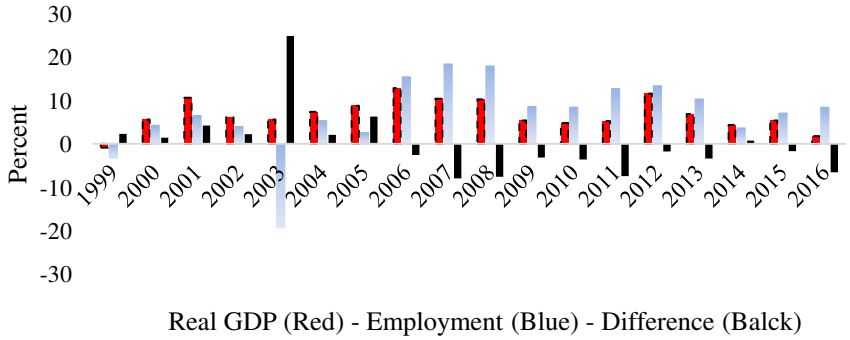


Figure (19)
Oman/Dubai TFP (index 2006=100)

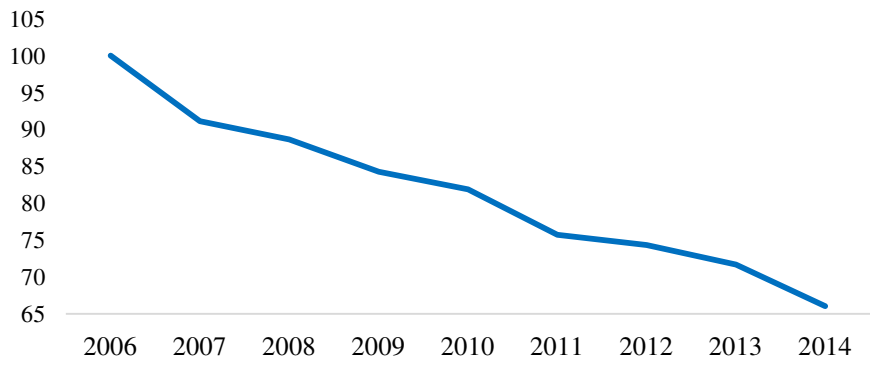


Figure (20)
TFP Growth

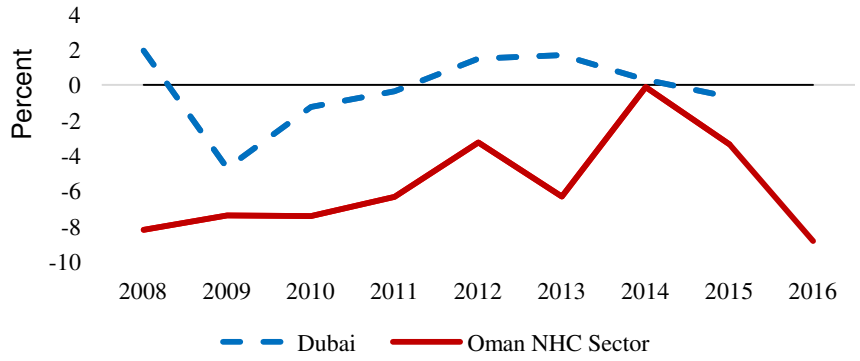


Figure (21)
Real GDP per person Growth Rate

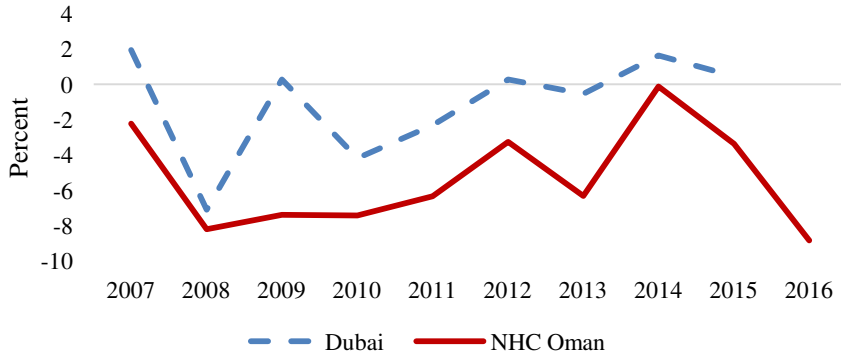


Figure (22)
Oman NHC / Dubai Labor Productivity (Dubai=100)

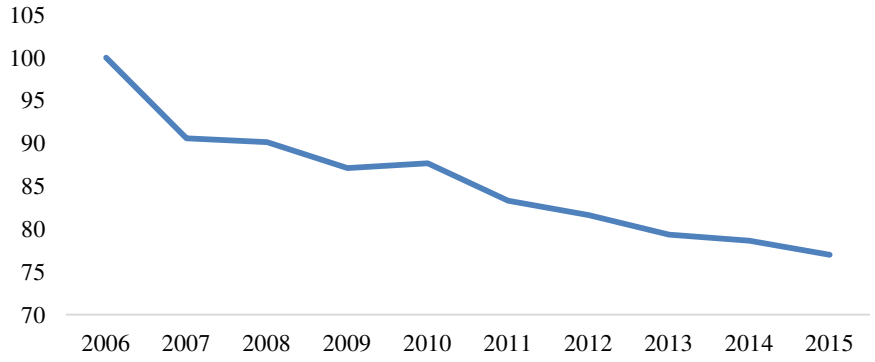


Figure (23)
Capital-output Growth Rate

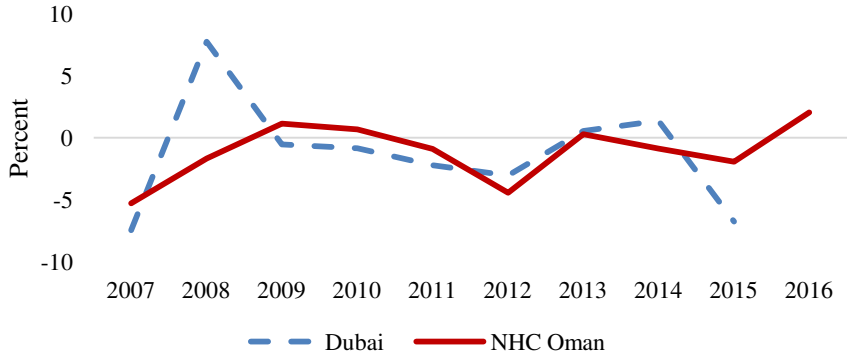


Figure (24)
Primary & Secondary School Enrolment Growth

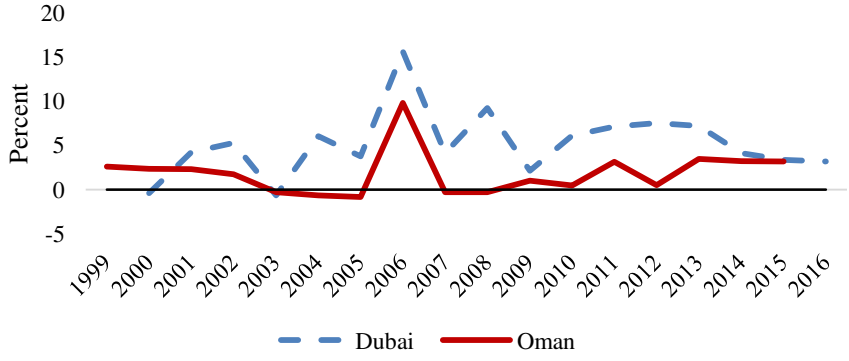


Figure (25)
University & College Enrolment

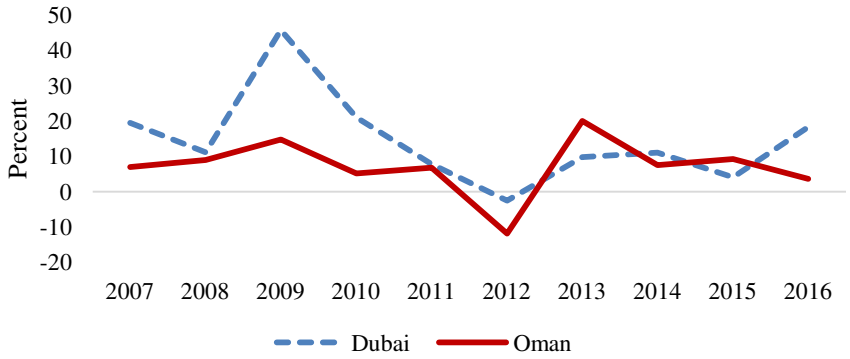


Figure (26)
Foreign Direct Investments

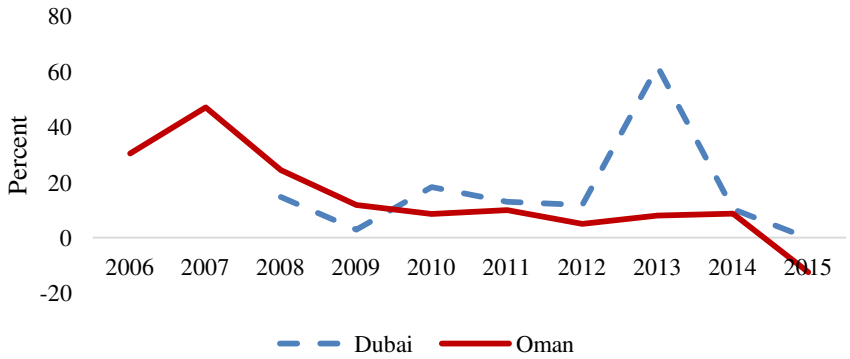
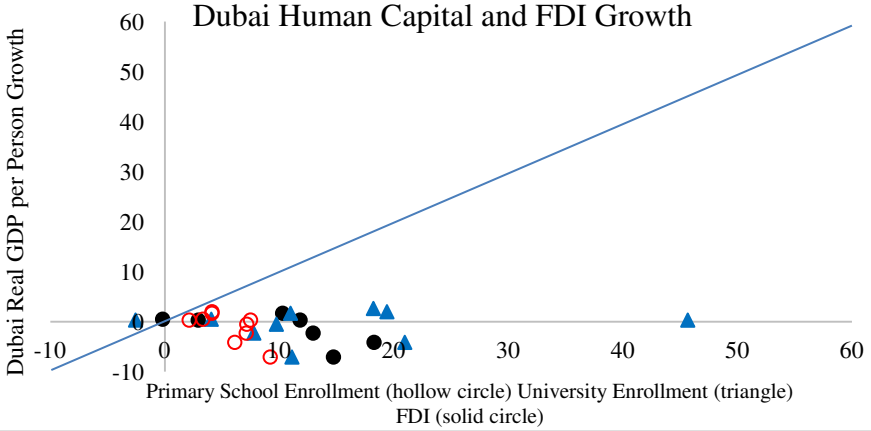
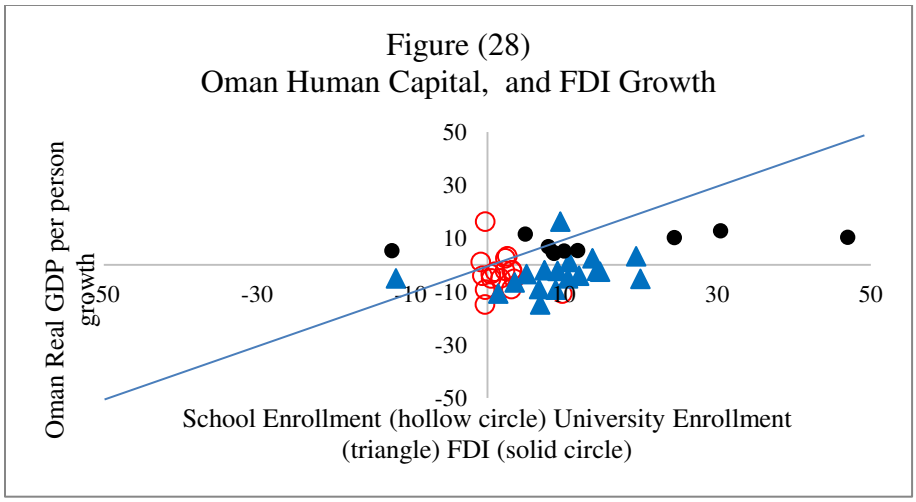


Figure (27)
Dubai Human Capital and FDI Growth





[i] Oman investments law was enacted in 2019.

[ii] The null hypothesis is that there is no association between the NHC and the HC sectors. With 17 degrees of freedom, the Chi-squared test value implies that we cannot reject the hypothesis. We also estimate Granger-Causality type regressions. We found no feedback from the HC GDP and its growth rate. Past information on HC sector, do not explain current NHC GDP.

[iii] The Conference Board statistics might be different but they are negative too.

[iv] The production function is a constant return to scale Cobb-Douglas. $Y = L^{\alpha} N^{\omega} K^{1-\alpha-\omega}$, where Y is real GDP, L is labor measured by employment, N is the flow of hydrocarbon (oil and gas measured in same unites of million barrels), K is capital stock. We assume that hydrocarbon is a relevant input in the production function of every sector in the economy (Solow and Wan 1976 and Stiglitz 1974). The stock of capital is measured by the Perpetual Inventory method $K_t = K_{t=0}(1-\delta) + I_t$, where initial capital stock $K_{t=1998}$ is assumed to be three times real GDP; the average depreciation rate δ is 0.055 taken from Penn World tables 9.0 and investments I_t is gross fixed capital formation. We deflate the stock of capital by the sector's corresponding deflator. The flow of hydrocarbon is N (oil and gas in equivalent barrels). The share of labor α is measured total compensations to employee / nominal GDP for the economy, HC and NHC sectors. The share of hydrocarbon ω is the oil revenues in OR / nominal GDP in the sectors respectively. We do not have data for gross operating surplus to calculate the share of capital and that is the reason for assuming Constant Returns to Scale such that the share of capital is 1 minus the other two shares. The share of labor in total output is 0.29 and oil is 0.25; for the HC sector the shares are 0.05 and 0.59 for labor and oil respectively (capital-intensive sector); and for NHC sector the shares are 0.46 and 0.44 for labor and oil respectively. These shares are averages of the period 1999 to 2016. The marginal productivity of labor is $\partial Y / \partial L = MPL = \alpha L^{\alpha-1} N^{\omega} K^{1-\alpha-\omega} = \alpha Y / L$ and the marginal product of capital is the derivative with respect capital stock.

[v] TFP is a measure of technical progress or efficiency. In Solow (1956) – the neoclassical growth model – it is a residual. Prescott (1998) argues that TFP needs an economic theory. In the original Solow growth model (Solow, 1956), growth depends positively on savings, and negatively on population growth. Technological progress, which drives the growth process, was exogenous. In the recent endogenous growth literature (see, Mankiw *et. al*1992, Romer 1990 and Lucas 1988 among many others) saving accumulation (capital) remains a crucial explanatory variable, however, technical progress, which is knowledge (measured by human capital, research and development, pure research ideas) is the main driver of growth in general. Put simply, growth is about producing and selling *new* goods and services. Both the *variety* and the *quality* of these goods and services are necessary for selling them in competitive markets. The new goods and services imbed workers' skills and new research ideas (see Jones 2002,

Lucas 2009 and Lucas and Moll (20140 for example). For example, most of the value of the newer generations of cellphones compared to the older generations is in the ideas behind their new functions.
Constant growth could, temporarily, continue at a faster rate if research intensity, which creates the new ideas, rises steadily over time. It is possible to think of two constant growth paths. At a balanced growth path is where all variables in the economy grow at constant exponential rates forever. This growth rate is associated with the long-run steady state. Another constant growth path is associated with the transitional dynamics. This path is a function of capital deepening, human capital, labor, and excess ideas.

[vi] TFP is $Y / L^{\alpha} N^{\omega} K^{1-\alpha-\omega}$, where Y is real GDP, L is labor measured by employment, N is flow of hydrocarbon (oil and gas measured in same unites of million barrels), K is capital stock.

[vii] Oman is the only Arab country that is not included in the Barro-Lee data set on average years of schooling because the data are not available, thus the Penn World table does not report human capital index for Oman.

[viii] Nelson and Phelps (1966) is an early contribution to the effect of investments in human capital on growth.

[ix] NCSI Monthly Statistical Bulletin 2018 reports that imports of capital equipment was 20 percent of total imports in 2016.

[x] Only 2016 data are available.

[xi] Wes estimated the same model in *levels* using Fully-Modified OLS (FM-OLS) method. This estimation is restricted by the shortness of the sample. We could not have lags because of the short sample, except for one lag in the cointegration relationship. We use the Newey-West method with no lags to adjust the standard errors.