

Revising Fiscal Policy and Growth in Saudi Arabia

Janelle Mann^{1,*} and Peter Sephton²

¹Department of Economics, University of Manitoba, Canada

²School of Business, Queen's University, Canada

Abstract: This article empirically investigates how private investment and different categories of public expenditure (defense, education, health care, and housing) impact real non-oil GDP in Saudi Arabia. The econometric analysis couples unit root, stationarity, and cointegration analysis with vector error correction models. Impulse response functions are applied to examine the impacts of different shocks to the system. We find that public expenditures on health care and defense have decreased real non-oil GDP while public expenditure on education and housing have very little impact. Interestingly, public expenditures on health crowds-out private investment.

Keywords: Fiscal Policy, Cointegration, Vector Error Correction Model, Impulse Response Function.

1. INTRODUCTION

One of the ways in which to measure the efficacy of a nation's fiscal policies is to examine the sign and magnitude of the impact of public expenditure on GDP (Marattin and Salotti 2014). In this article we employ a variety of methods to investigate the impact of public expenditure on real non-oil GDP in Saudi Arabia between 1971 and 2012. We begin by reporting how aggregated public expenditures impact real non-oil GDP, after which we report that four specific categories of public spending have very different implications for the economy.

Empirical evidence on the impacts of different categories of fiscal spending indicate that defense spending tends to have a negative impact on GDP (Shahbaz, Afza, and Shabbir 2013; Chang, Lee, and Chu 2013; Al-Jarrah 2005) while that on healthcare tends to have a neutral to positive impact on GDP (Ozturk and Topcu 2014; Tang 2012; Mehrara and Musai 2011; Baldacci and others 2004). Education spending has been reported to have a positive impact (Alshahrani and Alsadiq 2014; Hussin, Muhammad, Abu, and Razak 2012; Baldacci and others, 2004) while housing or infrastructure spending appears to have a neutral to positive impact (Alshahrani and Alsadiq 2014; Fedderke and others 2006; Albaladejo and Mamatzakis 2001; Baffes and Shah 1998).

Our empirical analysis provides evidence that public expenditure on defense has a negative impact on real non-oil GDP. Surprisingly, spending on housing and

education does not appear to be directly linked to non-oil economic growth. Unlike previous studies, we report that health spending appears to be negatively related to economic activity. This latter result may be attributed to a crowding-out of private sector investment. The empirical analysis provides three key insights for Saudi Arabian fiscal policy makers: (1) there is a long-run relationship between public expenditure variables and non-oil GDP, (2) policy makers should critically evaluate their methods of allocating government expenditures to health care, and (3) trade enhancing policies have a positive impact on non-oil real GDP.

2. DATA AND ECONOMETRIC ANALYSIS

We employ the natural logarithms of annual data from 1971 through 2012 for a variety of economic series: per capita real non-oil GDP (*NO-PCGDP*), private investment (*PRIVATEI*), oil revenue (*OILREV*), openness to trade (*TRADE*) proxied by the sum of imports and exports, total capital expenditure (*CAPITAL*), total current expenditure (*CURRENT*), defence expenditure (*DEFENCE*), education expenditure (*EDUCATION*), health expenditure (*HEALTH*), and housing and community amenities expenditure (*HOUSING*). All variables were collected from the Annual Statistics report from the Saudi Arabian Monetary Agency (2014). Series were converted into real terms using 1999 as the base year.

The first stage of our analysis is to determine the order of integration for each series. We employed the GLS-ADF unit root test (Elliott, Rothenberg, and Stock 1996) and the efficient fractional DF unit root test (Lobato and Velasco 2007) with critical values simulated following Sephton (2009) to determine whether the series were $I(1)$ or not. If the series are integrated of the same order we will perform a test for

*Address correspondence to this author at the Department of Economics, University of Manitoba, 556 Fletcher Argue Building, Winnipeg, Manitoba, R3T 2N2, Canada; Tel: (204) 474-9275; Fax: (204) 474-9207; E-mail: janelle.mann@umanitoba.ca

cointegration to see if there is at least one long-run attractor to which the system will return when perturbed. We will use the Johansen Trace test (Johansen 1988, 1995) and critical values corrected for the sample size following Doornik (1998).

Our first model investigates the long run relationships between *NO-PCGDP*, *PRIVATEI*, *OILREV*, *TRADE*, *CAPITAL*, and *CURRENT*. This is an attempt to measure, at a relatively high level of aggregation, the impacts of capital and current spending on economic activity. The second model disaggregates fiscal expenditures into four separate categories (*DEFENSE*, *EDUCATION*, *HEALTH*, and *HOUSE*) to capture their different impacts on the temporal evolution of real non-oil GDP.

The third step of the econometric analysis, conditional on a finding of cointegration, is to estimate a vector error correction model (VECM). Impulse response functions with bootstrapped confidence intervals allow us to analyze how different shocks

impact the behaviour of the system both in terms of their immediate impacts, and how the relationships evolve over time. A full understanding of the system is necessary in order to make fiscal policy recommendations with desirable impacts. The dominant role of the public sector in Middle-Eastern countries heightens the level of importance (Abu-Bader and Abu-Qarn 2003).

3. DISCUSSION OF RESULTS

According to results of the GLS-ADF and efficient fractional DF tests each series appears to be non-stationary and $I(1)$, a finding which concurs with Alshanhani and Alsadiq (2014). The Johansen Trace test results suggest that for both the aggregated and disaggregated models, there are four long-run attractors drawing the series together over time. For brevity we did not include these results in a table, but they are available upon request.

The estimated VECM for the aggregated measure of fiscal expenditures model (Model 1) is reported in

Table 1: VECM for Model 1

	$\Delta NO-PCGDP_t$	$\Delta PRIVATEI_t$	$\Delta OILREV_t$	$\Delta TRADE_t$
$\Delta NO-PCGDP_{t-1}$	0.091	0.719	0.188	0.007
$\Delta PRIVATEI_{t-1}$	-0.151**	0.025	0.306	0.059
$\Delta OILREV_{t-1}$	-0.061 [†]	-0.133	0.054	0.069
$\Delta TRADE_{t-1}$	0.185***	0.274	0.883	0.350
$\Delta CAPITAL_{t-1}$	-0.005	0.008	-0.028	0.007
$\Delta CURRENT_{t-1}$	0.080 [†]	0.155	0.222	0.110
EC1 _{t-1}	-0.425***	0.246	-0.417	-0.318
EC2 _{t-1}	0.222***	-0.554..	0.791	0.451 [†]
EC3 _{t-1}	0.110**	-0.141	-0.909**	0.068
EC4 _{t-1}	-0.120	0.587**	0.598	-0.393
	$\Delta CAPITAL_t$	$\Delta CURRENT_t$		
$\Delta NO-PCGDP_{t-1}$	-5.803	2.519***		
$\Delta PRIVATEI_{t-1}$	0.907	0.090		
$\Delta OILREV_{t-1}$	0.049	0.201		
$\Delta TRADE_{t-1}$	2.248	-0.092		
$\Delta CAPITAL_{t-1}$	0.269	-0.006		
$\Delta CURRENT_{t-1}$	0.355	0.087		
EC1 _{t-1}	6.310***	0.608		
EC2 _{t-1}	-1.301	-0.249		
EC3 _{t-1}	-0.056	-0.845..		
EC4 _{t-1}	1.077	0.982..		

NOTE: Dependent variable listed in first row. Significance at $\alpha = 0.10, 0.05$ and 0.01 denoted [†], ** and ***.

Table 2: VECM for Model 2

	$\Delta NO-PCGDP_t$	$\Delta PRIVATE_t$	$\Delta OILREV_t$	$\Delta TRADE_t$
$\Delta NO-PCGDP_{t-1}$	0.079	0.766	-1.421	-0.693
$\Delta PRIVATE_{t-1}$	-0.141	-0.352	0.864	0.221
$\Delta OILREV_{t-1}$	0.027	-0.175	0.362	0.209
$\Delta TRADE_{t-1}$	0.065	0.130	-0.262	-0.149
$\Delta DEFENSE_{t-1}$	-0.068	0.624**	-0.443	-0.116
$\Delta EDUCATION_{t-1}$	0.335**	-0.706	-0.389	0.019
$\Delta HEALTH_{t-1}$	-0.171**	0.218	0.331	0.109
$\Delta HOUSE_{t-1}$	0.022	0.065	0.053	-0.013
EC1 _{t-1}	-0.239***	0.023	0.690*	-0.022
EC2 _{t-1}	0.024	0.121	0.137	0.097
EC3 _{t-1}	-0.004	-0.098	-1.284...	-0.138
EC4 _{t-1}	0.115	0.008	1.307**	0.103
	$\Delta DEFENSE_t$	$\Delta EDUCATION_t$	$\Delta HEALTH_t$	$\Delta HOUSE_t$
$\Delta NO-PCGDP_{t-1}$	-0.047	1.021	1.775	2.372
$\Delta PRIVATE_{t-1}$	-0.195	-0.318	-0.560	-0.914
$\Delta OILREV_{t-1}$	-0.078	-0.194	-0.581	-0.921
$\Delta TRADE_{t-1}$	0.075	0.261	0.980	1.507
$\Delta DEFENSE_{t-1}$	0.409	0.487	0.511	0.399
$\Delta EDUCATION_{t-1}$	-0.634	-0.126	0.462	0.840
$\Delta HEALTH_{t-1}$	0.414	-0.200	-0.409	-0.334
$\Delta HOUSE_{t-1}$	-0.122	-0.075	-0.411	-0.617
EC1 _{t-1}	0.204	-0.100	-0.802	-1.759
EC2 _{t-1}	-0.070	0.137	0.466	0.827
EC3 _{t-1}	-0.314	-0.333	0.058	0.155
EC4 _{t-1}	0.504	0.313	-0.393	-0.615

NOTE: Dependent variable listed in first row. Significance at $\alpha = 0.10, 0.05$ and 0.01 denoted *, ** and ***.

Table 1 while that for the disaggregated specification (Model 2) is in Table 2. The empirical results are quite different. When using aggregate measures of capital and current expenditures, we find that both series help the system to return to balance when it is perturbed. If we attempt to examine how different categories of spending impact the relationships, our measures of fiscal policy have no role in re-establishing equilibrium.

Impulse response functions for real non-oil GDP in response to a one standard deviation shock in other variables are presented in Figures 1 and 2 for Models 1 and 2, respectively. Unlike Joharji and Starr (2010) and Alshahrani and Alsadiq (2014), our results suggest that output weakly responds to shocks to capital expenditures, while it is negatively impacted by a shock to current fiscal spending.

The impulse response functions from Model 2 provide evidence that public expenditures on defense had a negative impact on output, while shocks to spending on education and housing had very little impact. Shocks to health care expenditure had a negative impact on real non-oil GDP, perhaps due to a crowding-out impact on private investment. This can be seen in the impulse response function for private investment in response to a one standard deviation shock in health care expenditures which is presented in Figure 3. This anomalous finding is also documented by Mohammadi, Maleki, and Gashti (2012) for economic co-operation organization countries. This finding is particularly troubling in the case of Saudi Arabia because per capita demand for health care services is forecasted to sharply increase by 2025

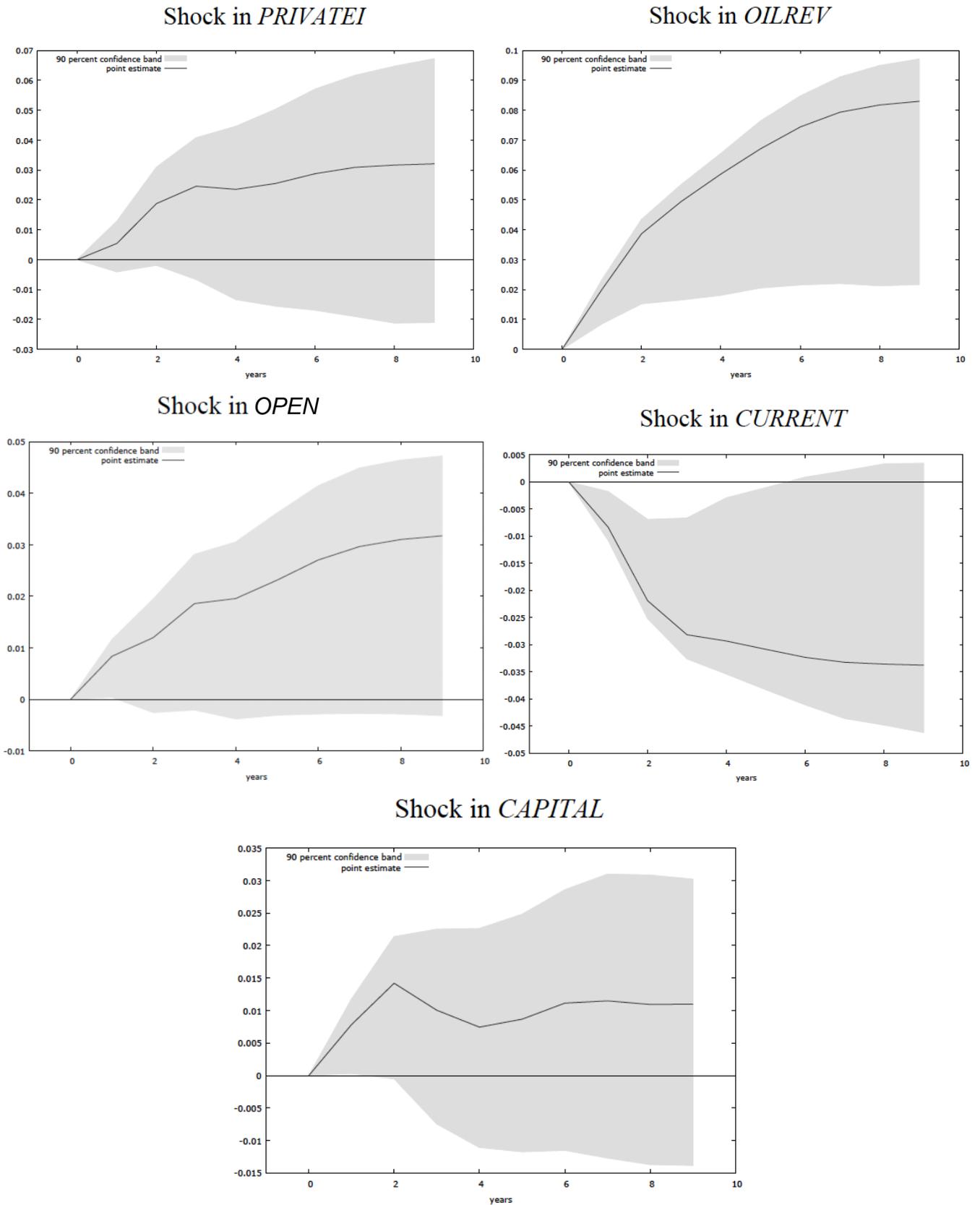
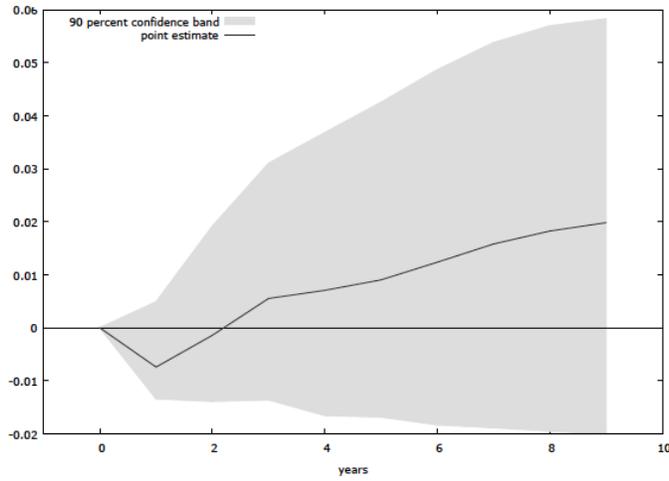


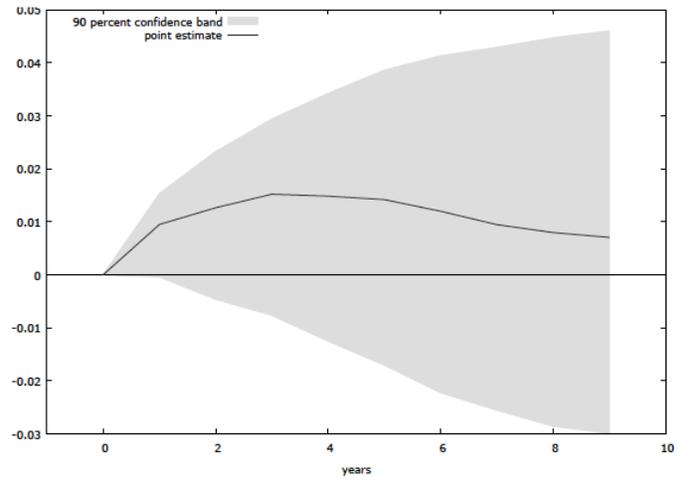
Figure 1: Impulse Response Functions for Per Capita Real Non-Oil GDP for Model 1.

NOTE: Gray shaded area depicts the 90% bootstrap confidence interval.

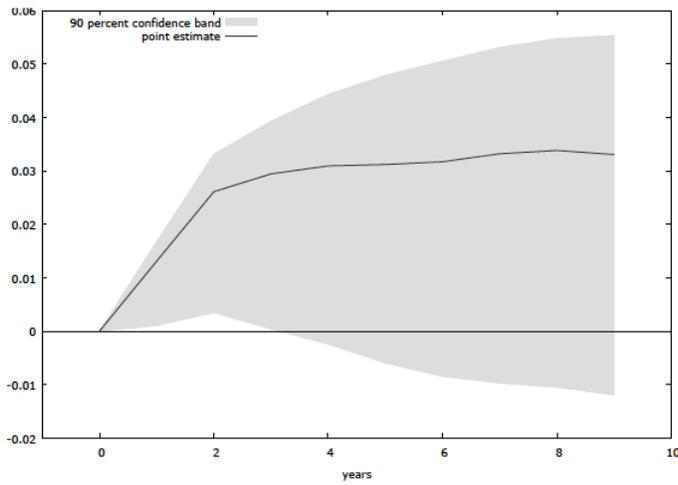
Shock in *PRIVATEI*



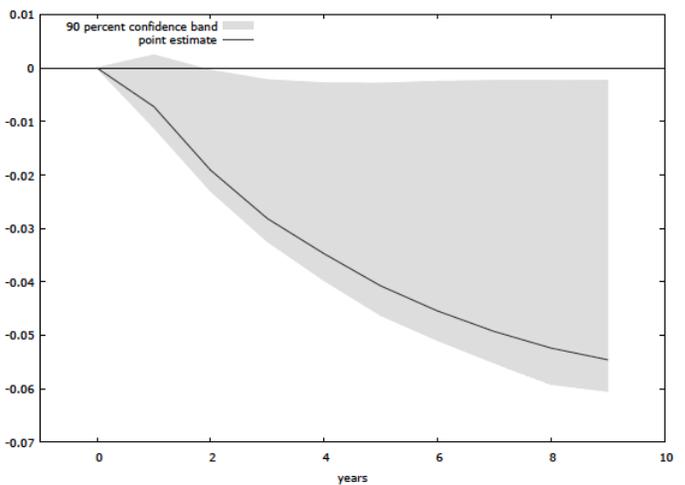
Shock in *OPEN*



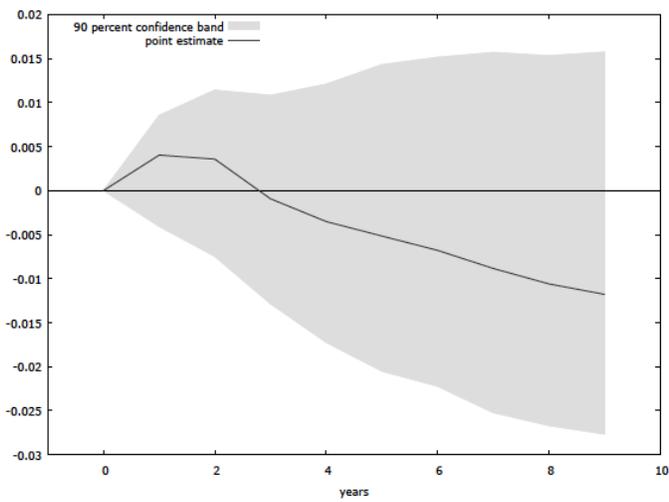
Shock in *OILREV*



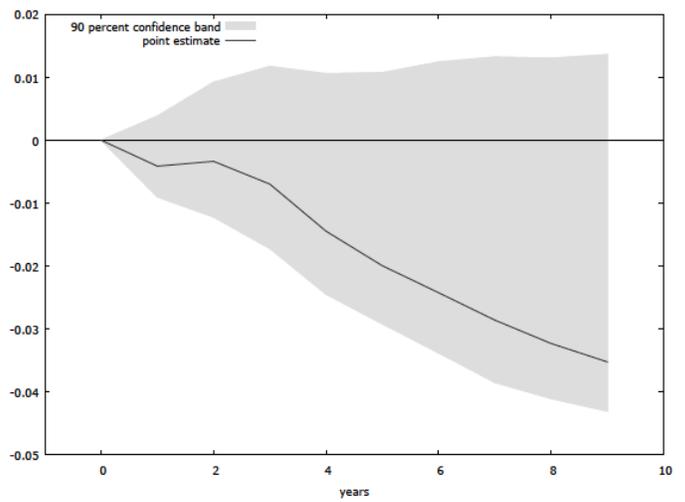
Shock in *DEFENSE*



Shock in *EDUCATION*



Shock in *HEALTH*



(Figure 2). Continued.

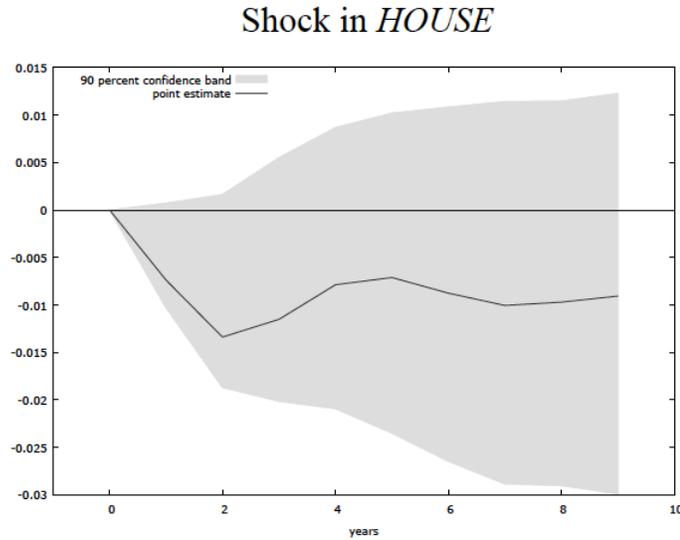


Figure 2: Impulse Response Functions for Per Capita Real Non-Oil GDP for Model 2.

NOTE: Gray shaded area depicts 90% bootstrap confidence interval.

(Watts 2014). Further probing reveals that two of the goals of a ten-year strategic healthcare plan approved by Saudi Arabia in 2009 are to diversify funding and encourage the public sector in the delivery of services (Watts 2014). In order to achieve these goals policy makers should critically evaluate their methods of allocating government expenditures to healthcare in order to avoid the crowding-out of private investment. Within the ten-year strategic healthcare plan the role of the government in the current healthcare model is already being questioned. Policy makers have started to change how they allocate government expenditures. They recently revised their public-private partnership

model and are partially subsidizing loans for local companies building healthcare infrastructure (Watts 2014).

The impulse response functions from Model 2 also provide evidence that government expenditure on housing neither crowds-in nor crowds-out private investment. This result does not provide further insight into the Neoclassical argument for the complementarity nor substitutability of government expenditure and private investment (Wang 2005). The analysis includes periods of government debt build-up, particularly during periods of low oil prices, which resulted in a decrease in banks' lending ability (Wilson 2003). The crowding-out of private investment that is hypothesized by Keynesian economics may have been alleviated by combining expansionary fiscal policy with accommodating monetary policy (Wang 2005; Laopodis 2001).

Shock in *HEALTH*

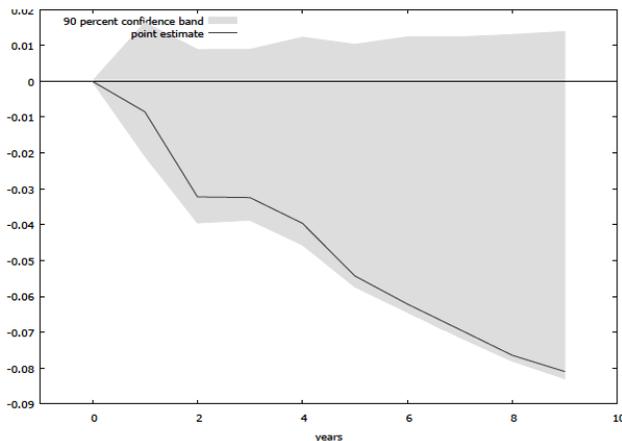


Figure 3: Impulse Response Function for Private Investment for Model 2.

NOTE: Gray shaded area depicts the 90% bootstrap confidence interval.

Both Models 1 and 2 indicate that trade openness had a positive impact on non-oil GDP (assuming that trade volume is a valid proxy for trade openness). The stark difference between the models is the magnitude and the shape of the impact. The impact is smaller for the disaggregated data (Model 2) and plateaus with a gradual and slight decrease after the third year. This inverted-U finding concurs with Shahbaz and others (2013) for Portugal.

4. CONCLUSIONS AND POLICY IMPLICATIONS

This article empirically investigates how different categories of public expenditure (defense, education,

health care, and housing) impact private investment and real non-oil GDP in Saudi Arabia. Due to mixed and inconclusive results from previous empirical studies it is imperative that governments research the relationship in their respective country prior to making fiscal policy decisions. This statement is true for Saudi Arabia because, despite the majority of findings being in-line with previous literature, the empirical findings revealed that government expenditure on health care had a negative impact on real non-oil GDP and crowded-out private investment. It follows that policy makers should critically evaluate their methods of allocating government expenditures to health care, especially due to the increasing per capita demand for health care. Saudi Arabia is currently in the fourth year of a ten-year strategic healthcare plan which makes it important to reinvestigate this finding to reveal whether changes being implemented to promote private investment are effective. Moreover, policy makers should be aware that results from both Models 1 and 2 find openness to trade increased real non-oil GDP. The aggregated model (Model 1) overestimated the increase; never-the-less the evidence suggests that policy makers should be aware that trade enhancing policies increase real non-oil GDP. These are important findings given the recent decline in oil prices and the associated shift in the composition of Saudi Arabia's economic activity. It is difficult not to view this in terms of a transition between the "take-off" and "drive to maturity" stages attributed to Rostow (1960). Trade enhancement can only hasten structural change, and it has the potential to mitigate the deleterious impacts of increased social spending on health care. Managing these competing forces is a Herculean task and it is clear that the authorities are up to the challenge.

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