Fiscal multiplier in Malaysia: Concept, empirical assessment and policy implication

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Abstract

The concept of fiscal multiplier accounts for the impact of discretionary policy on both the short- and long- run output. While having the ability to measure the spill-over impact on growth from any fiscal measure would be critical for formulation of fiscal policy, there are various challenges in measuring the fiscal multiplier. This paper examines the magnitude in which changes in government revenue and expenditure would affect growth, the persistency and asymmetry of these impact. We find that total expenditure and total revenue induce an impact (average for first four quarters) of 0.4 and 0.8 on growth, and these impacts are expected to be persistent up to the 20th quarters. Impact on growth is asymmetric with a positive expenditure shock inducing the most stimulative effect while a positive revenue shock poses the largest drag to growth

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1. Introduction

In 2020, the world faced an unprecedented challenge in the form of a global health and economic crises. While rapid deployments of vaccines have, to a large degree, contained the impact of the pandemic on healthcare systems across the globe, a resurgence in cases and deaths, brought about by the emergence of more virulent SARS-CoV-2 variants (e.g. Delta and Omicron), forced countries to continue implementing movement control measures of varying degrees. While necessary, these measures have resulted in direct negative impact on incomes and livelihoods.[1] In response, governments across the world continue to leverage on various policy levers to provide the much-needed support for vulnerable households and businesses, improving healthcare capacity, fostering recovery in employment and economic activity, and facilitating transformation towards a post-pandemic economy. The latest estimates indicate that extensive fiscal support through larger fiscal spending has resulted in the average global fiscal deficit to widen to -7.9% of GDP in 2021 from -3.6% of GDP in 2019[2]. The extent of fiscal support, coupled with a sharp decline in output and government revenue have pushed the global public debt to 97.8% of GDP in 2021 from 83.6% of GDP in 2019 (IMF, 2021).

Malaysia was also not spared from these challenges as the pandemic resulted in the contraction of GDP by 17.1% in the 2Q of 2020, the worst decline observed since the 4Q of 1998 (Bank Negara Malaysia. 2020). Consequently, Malaysia's GDP in 2020 shrunk by 5.6% and unemployment stood at 4.5%, the highest in 3 decades (Bank Negara Malaysia, 2021). In response to the crisis, 8 stimulus and assistance packages[3] were implemented by the Government, funded via the COVID-19 Fund which was established under the Temporary Measures for Government Financing (Coronavirus Disease 2019 (Covid-19)) Act 2020. With an initial ceiling of RM45 billion,

[1] Estimates suggest a total loss of income suffered was worth up to USD4 trillion (UNCTAD, 2020).
[2] This was driven by the widening of fiscal deficit to 8.8% in advanced economies, 6.6% in emerging market economies and 5.4% in low-income developing countries (IMF, 2021).
[3] The 8 packages refer to the Prihatin Rakyat Economic Stimulus Package (PRIHATIN), PRIHATIN SME Economic Stimulus Package (PRIHATIN SME+), National Economic Recovery Plan (PENJANA), *Perlindungan Ekonomi dan Rakyat Malaysia* (PERMAI), Strategic Programme to Empower the People and Economy (PEMERKASA), Strategic Programme to Empower the People and Economy Plus (PEMERKASA+) and National People's Well-Being and Economic Recovery Package (PEMULIH)

revisions to the statutory debt limit were required to increase the ceiling to RM65 billion and subsequently to RM110 billion.[4] Against the large fiscal stimulus[5] deployed and expectations of continued fiscal support, both globally and domestically, the questions pertaining to the ability of discretionary fiscal policy to support growth, particularly through the fiscal multiplier impact (Dime, Zhuang & Ginting, 2021) are at the forefront.

Fiscal multiplier is defined as the impact of a discretionary change in government spending or taxation policy on the gross domestic product (GDP) of an economy (Spilimbergo et al, 2009). Over the years, emphasis on fiscal multiplier has gained prominence due to its role in formulation of fiscal policy as well as ensuring accuracy in macroeconomic forecasting (Batini et al, 2014). However, its use in policy work has been impeded by the relative complexity in estimating fiscal multiplier due to the lack of consensus on the appropriate methodology to be employed and the limited data availability, especially for emerging market economies (EMEs). Thus, empirical studies on fiscal multipliers have mostly focused on advanced economies, which usually tends to have larger fiscal multipliers than EMEs, meanwhile limited studies available on EMEs have produced mixed and inconclusive results (IMF, 2008; Ilzetzki, 2011; Kraay, 2012; Estevão and Samake, 2013; and Ilzetzki et al, 2013).

Hence, this paper attempts to contribute to the growing literature on fiscal multipliers in developing economies by estimating the fiscal multiplier for Malaysia. The focus of this paper is to examine the magnitude in which changes in government revenue and expenditure would affect growth, while analysing the persistency and potential asymmetry of these impact. This paper exploits government revenue and expenditure data and employ a Structural Vector Autoregression (SVAR) and Nonlinear Auto Regressive Distributed Lag (NARDL) models. This paper also attempts to contribute to the nascent literature on fiscal multipliers for Malaysia by investigating asymmetries that may arise. Existing publication of Malaysia-specific evidence is skewed towards quantifying the impact of fiscal policy on growth, with very few research questions

[4] The statutory debt ceiling limit, under the Loan (Local) Act 1959, was raised from 55% of GDP to 60% of GDP in August 2020 and subsequently increased to 65% of GDP in November 2021 to allow for the additional allocation under the COVID-19 Fund.
[5] An estimated amount of USD16.9 trillion in fiscal measures has been announced to combat the crisis, although it is increasingly difficult to distinguish between measures strictly related to the COVID-19 crisis and measures with a broader goal of supporting the recovery (IMF, 2021).

geared towards analysing the nuances of these impacts their policy implications. With that said, while our current focus does not lie in investigating the impact of other determinants on fiscal multipliers (which comprises a large discourse in literature, as would be discussed in Section 2), extensions to our research question could attempt to explore those in the near future.

2. Literature review: Size and persistence of fiscal multipliers

Empirical literature on fiscal multipliers often distinguishes between the size of fiscal multiplier and its persistence. Size of the fiscal multiplier refers to the magnitude of the impact on growth from a discretionary fiscal shock meanwhile persistence of fiscal multiplier refers to duration it takes for the impact to dissipate from the economy (Mineshima et al, 2014; Batini et al, 2014). Both aspects are crucial in understanding fiscal multipliers (i.e., some fiscal shocks may have smaller multiplier but persist longer in the economy). Literatures on fiscal multipliers that delve into the factors determining the size and persistence of fiscal multipliers suggest that these factors can be divided into 2 categories: (a) structural country characteristics that influences the economy's response to a fiscal shock during normal times; and (b) conjunctural factors caused by cyclicality or policy outcomes (Batini et al, 2014). Beyond these, fiscal multipliers have additionally been observed to vary depending on the types of fiscal instruments deployed (European Commission, 2010; Coenan et al, 2012).

Contributions on structural characteristics found that trade openness is an important feature (Barrell et al, 2012; Ilzetzki et al, 2013; IMF, 2008), where countries with a lower propensity to import tend to have higher fiscal multipliers due to limited import leakages. Similarly, countries with high levels of public debt tends to have lower multipliers as increased deficit spending negatively affects investor confidence, default risks and interest premiums (Kirchner et al, 2010). Countries with flexible exchange rate regimes have lower multipliers because exchange rate can act as a shock absorber and neutralise the effect of a fiscal measure (Born et al, 2012; Ilzetzki et. Al, 2013). Meanwhile, large automatic stabilisers have a counterbalancing effect on a fiscal measure hence causing multiplier to be lower (Dolls et al, 2012). Interestingly, a country with a rigid labour market (i.e. strong labour union) tends to have larger fiscal multiplier as rigid wages amplify the response of output to demand shocks (Gorodnichenko et al, 2012). Along the same strand, an economy with higher

efficiency of the public sector (Batini et al, 2014) and higher government credibility (Avellán et al, 2020) is expected to have a larger fiscal multiplier. Most recently, much of the literature is also focused on understanding the strong negative relationship between the degree of informality and the size of the fiscal multiplier (Lemaire, 2020; Dellas et al., 2017; Pappa et al., 2015) which is potentially explained by a reallocation of private spending towards unofficial goods or the shadow economy in response to a change in public expenditure thus muting the 'official' fiscal multiplier (Colombo et al., 2022). This is further supported by findings from current business cycle models that account for the informal economy -- showing that said sector amplifies the responses of formal output, consumption, and employment to productivity and interest rate shocks (Horvath and Yang, 2022; Leyva and Urrutia, 2020).

Another important and widely studied determinant of fiscal multiplier is the fiscal instruments used by the Government for discretionary fiscal policy. Spending multipliers are generally larger and more persistent than taxation multipliers over the long-term (Anderson et al, 2013; Ianc and Turcu, 2020). Fiscal multipliers are also observed to be larger for consumption spending, while investment spending tends to persist over longer horizons. (Baxter and King 1993; Coenen et al., 2012; IMF, 2014). Crucially as well, fiscal multipliers are also documented to be larger for temporary and one-off measures when compared to permanent measures (Barro and Redlick, 2011; Barrell et al, 2012).

There are also conjunctural factors where fiscal multipliers are observed to be larger and tend to persist longer during a recession than during an economic upcycle (IMF, 2011; Delong and Summers, 2012; Auerbach and Gorodnichenko, 2013). Similarly, fiscal multipliers are larger and persist longer when the degree of monetary accommodation is higher, that is when interest rate is low or near the zero lower bound (Erceg and Lindé, 2010; Woodford, 2011; Coenen et al, 2012).

Table 1: Stylised summary of literature review on fiscal multipliers

Determinants	Authors	Findings
Structural Characteristics		
Exchange rate regime	Born et. al (2012)	Economies with flexible exchange rates tend to have lower multipliers as the increased
	Ilzetzki et. al (2013)	

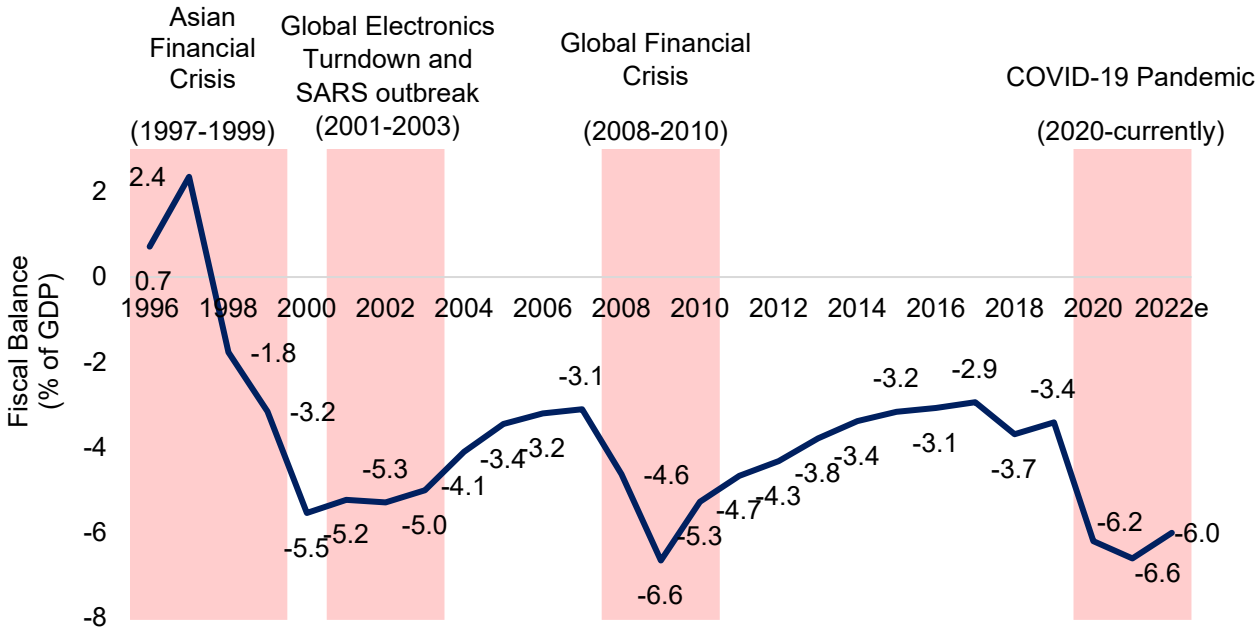
		demand from a fiscal measure is offset by currency appreciation
Trade openness	IMF (2008)	Countries with lower propensity to import tend to have higher fiscal multipliers due to limited import leakages
	Barrell et. al (2012)	
	Ilzetzki et. al (2013)	
Size of the informal sector	Colombo et al. (2022)	A lager informal sector tend to reduce the size of the multiplier. A greater degree of informality raises the relative price of official goods and shifts demand towards the informal sector thus weakening the multiplier (of the formal economy) in response to a fiscal shock.
Labour market rigidity	Cole and Ohanian (2004)	Countries with more rigid labour markets (i.e., with stronger unions, and/or with better labour market regulation) have larger fiscal multipliers because lower-wage flexibility tends to amplify demand shocks on output
	Gorodnichenko et. al (2012)	
The size of automatic stabiliser	Dolls et. al (2012)	Large automatic stabilisers have a counterbalancing effect on fiscal measures causing the multiplier to be low.
Public debt levels	Kirchner et. al (2010)	Countries with high levels of public debt tend to have lower multipliers as increased deficit spending negatively affects confidence, default risks and interest premiums
Institutional Credibility		
Public sector efficiency	Batini et. al (2014)	Efficient public sectors are associated with higher fiscal multipliers through effective tax collection and administration of welfare systems.
Government credibility	Avellan et. al (2020)	Higher government credibility is associated with higher fiscal multipliers through lower corruption and leakages from public investment projects.
Fiscal Instruments		
Expenditure vs taxation measures	Anderson et. al (2013)	Generally, spending multipliers tend to be larger than tax multipliers
Permanent vs temporary measures	Barrell et. al (2012)	Temporary measures tend to have larger multipliers than a permanent change in discretionary spending
Consumption vs investment spending	Barro and Redlick (2013)	Short-term multipliers are observed to be larger for consumption spending, but public investment spending tend to have both a large and persistent cumulative fiscal multiplier
	Barrell et. al (2012)	
Conjunctural Factors		
Business cycle	Delong and Summers (2012)	Fiscal multipliers tend to be larger during a recession than an upcycle
	IMF (2011)	

	Auerbach and Gorodnichenko (2013)	
Monetary policy accommodation	Erceg and Linde (2010)	Fiscal multipliers tend to be larger at zero lower bound, but its persistence is contingent on the size of the fiscal shock

3. The Malaysian context

As in other economies, fiscal policy is primarily intended for the purposes of influencing macroeconomic variables using government revenue (taxation measures) and expenditure. Beyond its intended application for the purposes of macroeconomic stabilisation, it is additionally leveraged on to chart the direction of the economy's development intended to incentivise or disincentivise certain behaviours (e.g. climate policy through taxation) or for outright investments in public provision (e.g. rail network). During periods of economic recession, fiscal policy is deployed to provide immediate macroeconomic stabilisation. For example, during the Asian Financial Crisis (AFC) 1997, Malaysia unveiled a fiscal stimulus package amounting RM7 billion (2.5% of GDP) to support the economy, resulting in the fiscal balance turning negative to -1.8% of GDP in 1998, after 5 years of fiscal surpluses from 1993–1997 (1993-1997 average: 1.3% of GDP). Similarly, in 2001, the Government announced two fiscal stimulus packages amounting at RM3 billion and RM4.3 billion respectively to counter the weaker global demand due to the global electronics downturn and the 9/11 terrorist attacks in the United States. During the Global Financial Crisis in 2009, the Government announced a stimulus package worth RM60 billion, equivalent to 9% of GDP to support and stimulate the economy. Despite the many episodes of economic crisis and the use of fiscal stimulus to support the economy, there is a lack of research that investigates the impact of discretionary fiscal policy on the economy and the extent of its effectiveness. Given the importance of understanding how best fiscal policy can lend support during times of crisis, the COVID-19 pandemic has once again pushed fiscal multipliers to the forefront of policy discourse.

Chart 1: Fiscal deficit (% of GDP)



Source: Ministry of Finance

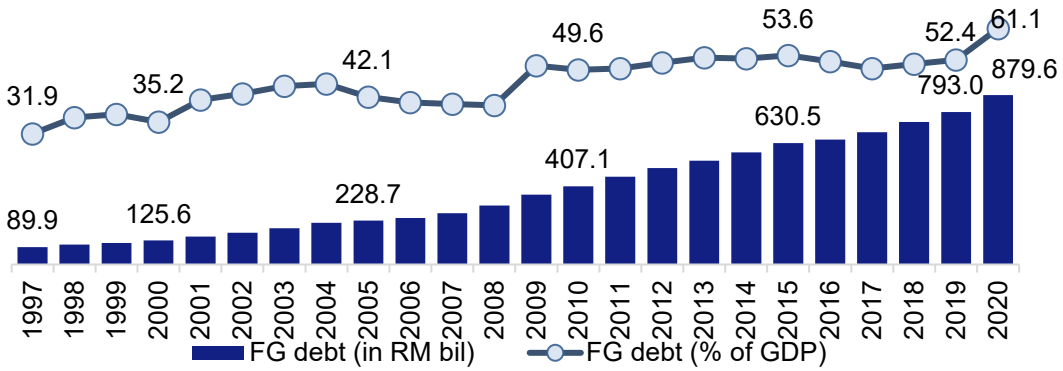
Similar to other countries, Malaysia implemented multiple stimulus packages throughout 2020 and 2021, amounting to RM530 billion (37.4% of 2020 GDP), of which RM80 billion[6] (5.6% of 2020 GDP) was direct fiscal injection through the COVID-19 Fund (Ministry of Finance, 2021). The policy was sequenced into 3 main phases; the first phase focused on limiting the impact of movement controls measures in containing the economic scarring and providing support to vulnerable households and businesses. The second phase placed emphasis on preventing relapse of the first phase through expenditures on healthcare (e.g. improved healthcare capacity and vaccine procurement). The final phase focused on ensuring entrenched recovery and facilitating reforms through investment expenditures on digitalisation and green agenda. To achieve that, fiscal policy had to be time-bound and targeted to maximise its effectiveness. Notable measures include cash transfers (e.g. Bantuan Prihatin Nasional and Bantuan Khas COVID-19), wage subsidy programme (WSP), and the implementation of small scale projects, which comprises a sizeable proportion of the stimulus, as it is likely to provide immediate impact to growth. This approach, while effective in stimulating growth in the short run, alludes to the importance of fully quantifying the impact of different measures on GDP. Over the long run, the impact of

[6] Quoted figure refers to expenditure up until the end of 2021

supply-side measures might have a larger cumulative impact on growth – a hypothesis that fiscal multiplier estimates would be able to substantiate.

While a brief scan into the literature for Malaysia shows that the size of fiscal multiplier varies across the empirical investigation (Ilzetzki, 2011; Rafiq and Zeufack, 2012; Rafiq, 2013; Tang et al., 2013; Tan et al., 2020). The unprecedented size of fiscal stimulus undertaken to combat the economic downturn from the COVID-19 pandemic has significantly altered the fiscal landscape of Malaysia. The debt-to-GDP ratio has edged up by 10 percentage points from 52.4% in 2019 to 62.1% in 2020, and this is on the back of persistent fiscal deficits since the AFC in 1997 when the debt-to-GDP ratio was at 32%. This coupled with declining tax elasticity of the Government, indicated by the lower tax-to-GDP ratio from 15.4% in 2012 to 10.9% in 2020[7], which has further deteriorated the Government's fiscal position and impedes the fiscal space available in the medium-term. This necessitates the discussion on fiscal multipliers to ensure prudent and optimal deployment of resources whilst maintaining sustainable public finance and debt management. In addition, given the changing landscape in global economy as well as fiscal and monetary policy, it is important to assess how these developments in macroeconomic conditions will impact the effectiveness of discretionary fiscal policy as a demand management tool.

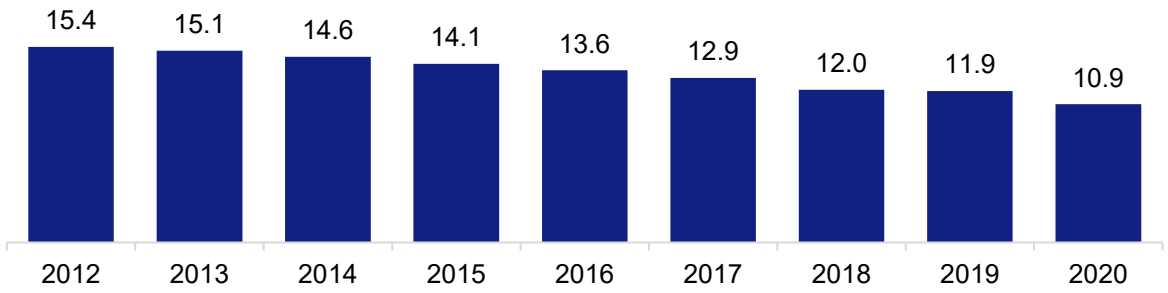
Chart 2: Federal Government debt (in RM billion and % of GDP)



Source: Ministry of Finance

[7] Empirical evidence suggests that countries with a tax-to-GDP ratio of less than 15% tend to grow significantly more slowly than countries beyond this tipping point because it impedes opportunities for productive government spending. (Breuer et al, 2018)

Chart 3: Tax to GDP ratio (%)



Source: Ministry of Finance

Studying the impact of fiscal multiplier on growth for Malaysia would further enrich the literature with important policy implications. First, it would provide policymakers with the tool for judicious decision-making in facing future crises in order to obtain the optimal fiscal policy response to a shock in the economy. Related to that point, understanding fiscal multipliers also facilitate in macroeconomic projections, especially during a crisis (Blanchard and Leigh, 2014). Secondly, it also enables effective fiscal consolidation as authorities can identify the amount of adjustments required to achieve their fiscal as well as macroeconomics targets (Eyraud and Weber, 2013). This is particularly important moving forward as the Government aims to rebuild policy buffers after the crisis and ensures the medium-term sustainability of its fiscal position.

4. Methodology

4.1 SVAR

We shall describe and introduce the empirical methodology in assessing the impact of changes in fiscal policy and deriving the fiscal multiplier. Following the literature, we employed the structural VAR (SVAR) approach that has become the workhorse model for estimating fiscal multipliers and is widely adopted.[8]

Our SVAR specification includes a four-dimensional vector of total expenditure (TE), total revenue (TR), interest rates (IR), and real GDP growth (GDP). Denoting the vector of endogenous variables as $X_{t,}$ the reduced form can be written as

[8] Refer to meta-analyses by Rusnak (2011), Gechert (2015) and Gerchert and Rannenberg (2018) to assess the existing methodological paradigm. Recently, Capek et al. (2020) adopted SVAR and estimated two million fiscal multiplier values for European countries.

$$X_t = A(L, q)_{t-1} + U_t \qquad (1)$$

where $X_t = [GDP_t, TE_t, TR_t, IR_t]$, $A(L, q)$ is a K×K autoregressive lag polynomial matrix and $U_t = [u_t^{GDP}, u_t^{TE}, u_t^{TR}, u_t^{IR}]$ is the corresponding vector of the reduced-form residuals, which in general will have nonzero cross-correlations (Blanchard and Perotti, 2002). Note that, X_t is a closed system of equations whereby variables are assumed to interact endogenously. To obtain the fiscal multiplier, we need to recover the structural uncorrelated shocks, μ_t.

Multiplying Equation (1) with a A_0 yields the structural form of the SVAR model,

$$B(L)X_t = B\mu_t \qquad (2)$$

in which $B(L) = A_0 A(L)$ and $A_0 U_t = B\mu_t$. These are the reduced form errors, U_t and structural disturbances, μ_t . Then, exact restrictions using a recursive identification scheme based on lags were implemented to retrieve the structural shocks in μ_t. Once the structural shocks have been identified, total expenditure and total revenue multipliers can be computed.

As per the literature, the Impulse Response Functions (IRFs) would be generated for shock visualisation, which would then be used for multi-horizon fiscal multiplier estimates. From this analysis, we can compare the relative strengths between different X_t vector and reveal whether the shock of total expenditure and total revenue have transitory or permanent effects, especially on GDP. This shows how output responds to discretionary changes in fiscal policy. Rather than computing one unique value, we compute the fiscal multipliers at each subsequent horizon following a change in total expenditure and total revenue, thus generating the multi-horizon estimates. In this regard, estimates from IRFs would be inputs for the total expenditure and total revenue multipliers, with the value at each horizon determined following the lead by Ramey (2019) as shown below.

Fiscal multiplier = Ratio of the impulse response of output at horizon, *t*, to the initial shock in total expenditure or revenue at horizon, 0, multiplied by the average.

$= \left(\frac{\overline{Y}}{X}\right) \cdot \frac{ly(t)}{lx(0)}$ *where* $\left(\frac{\overline{Y}}{X}\right)$ *is the sample average of GDP to government spending.* $ly(t)$ *denote the value of*

the impulse response of log(GDP) at horizon, j, while $lx(0)$) denote the impulse response of log(government spending or revenue).

Prior to proceeding with the estimation as above, it is essential to determine whether the variables are difference or trend stationary. Therefore, the standard time series econometrics application of unit root and stationary tests, cointegration[9] and the Forecast Error Variance Decompositions (FEVDs) were conducted.[10]

After determining the fiscal multiplier throughout the horizon, we proceed with testing the existence of asymmetries of fiscal policy on the GDP by estimating a NARDL model, which makes it possible to estimate both long-run and short-run asymmetries. The model captures the differing impact to GDP between positive and negative shocks of fiscal policy.

4.2 NARDL

Following Shin et al. (2014), the asymmetric long-run equation can be illustrated as:

$$GDP_t = \alpha_0 + \alpha_1 TE_t^+ + \alpha_2 TE_t^- + \alpha_3 TR_t^+ + \alpha_4 TR_t^- + \alpha_5 IR_t + e_t \quad (3)$$

where GDP, total expenditure, total revenue and interest rates are described above and $\alpha = (\alpha_0,\ \alpha_1,\ \alpha_2, \alpha_3,\ \alpha_4,\ \alpha_5, \alpha_6)$ are long-run parameters to be estimated. In Equation (3), $TE(TR)_t^+$ and $TE(TR)_t^-$ are partial sums of positive and negative changes to the explanatory variables ($TE(TR)_t$) which correspond to:

$$TE(TR)_t^+ = \sum_{i=1}^{t} \Delta TE(TR)_i^+ = \sum_{i=1}^{t} max(\Delta TE(TR)_i, 0) \quad (4)$$

and

$$TE(TR)_t^- = \sum_{i=1}^{t} \Delta TE(TR)_i^- = \sum_{i=1}^{t} min(\Delta TE(TR)_i, 0)$$

[9] A cointegration test was employed to ensure the validity of our VAR estimation and preclude potential biases that could arise if variable were to be cointegrated.
[10] Note that results from the unit root and cointegration tests are reported in Appendix 1.

(5)

Referring to the formulation above, the long-run relation between GDP and increases in total expenditure (total revenue) is $\alpha_1(\alpha_3)$ while $\alpha_2(\alpha_4)$captures the long-run relation between GDP and a reduction in total expenditure (total revenue). By allowing variation between α_1 and α_3, as well as α_2 and α_4, adjustment in GDP following a positive shock in TE (TR) can be a discerned from a negative one.

As shown in Shin et al. (2014), Equation (3) can be framed in a linear ARDL (p, q) model (Pesaran and Shin, 1999; Pesaran et al. 2001) as follows:

$$\begin{aligned}\Delta GDP_t = {} & \alpha_0 + \beta_1 GDP_{t-1} + \beta_2 TE^+_{t-1} + \beta_3 TE^-_{t-1} + \beta_4 TR^+_{t-1} + \beta_5 TR^-_{t-1} \\ & + \beta_6 IR_t \\ & + \sum_{i=1}^{p} \alpha_1 \Delta GDP_{t-i} + \sum_{i=0}^{q} (\theta_i^+ \Delta TE^+_{t-i} + \theta_i^- \Delta TE^-_{t-i}) \\ & + \sum_{i=0}^{r} (\delta_i^+ \Delta TR^+_{t-i} + \delta_i^- \Delta TR^-_{t-i}) + \sum_{i=0}^{s} \alpha_2 \Delta IR_{t-i} + e_t\end{aligned} \tag{6}$$

where *p*, *q*, *r* and *s* represent the lags. In addition, the NARDL model in Equation (6) take account both short- and long-run dynamic adjustments of the variables.[11] The model nests the short-run and long-run symmetry effects simultaneously. For long-run symmetry, the relevant joint null hypothesis is $-\beta_2/\beta_1 = -\beta_3/\beta_1$ while for short-run symmetry the joint null hypothesis is (i) $\theta_i^+ = \theta_i^-$ for all i = 1,…,q or (ii) $\sum_{i=0}^{q} \theta_i^+ = \sum_{i=0}^{q} \theta_i^-$ for total expenditure. In a similar vein for total revenue, the long-run symmetry is $-\beta_4/\beta_1 = -\beta_5/\beta_1$, while for the short-run symmetry the joint null hypothesis is (i) $\delta_i^+ = \delta_i^-$ for all i = 1,…,r or (ii) $\sum_{i=0}^{r} \delta_i^+ = \sum_{i=0}^{r} \delta_i^-$. Both total expenditure and total revenue restrictions can be tested by the standard Wald test. The model is symmetric if the restrictions cannot be rejected and asymmetric if rejected.

Suppose the model is asymmetric, either in the long-run or the short-run, or both, it is detected in Equation (5). The positive and negative cumulative dynamic multiplier

[11] This approach to identify the presence of asymmetries in the response variable was also applied following work by Ibrahim (2015) and Ibrahim and Sukmana (2017).

effects of a unit change in $TE(TR)_t^+$ and $TE(TR)_t^-$, respectively, on GDP_t are obtained as:

$$m_h^+ = \sum_{j=0}^{h} \frac{\partial GDP_{t+j}}{\partial TE(TR)_t^+},\ m_h^- = \sum_{j=0}^{h} \frac{\partial GDP_{t+j}}{\partial TE(TR)_t^-},\ h = 0,\ 1,\ 2\ldots..$$

Note that when $h \to \infty$, $m_h^+ \to \alpha_1(\alpha_3)$ and $m_h^- \to \alpha_2(\alpha_4)$ in Equation (3). The main advantage of computing dynamic multipliers is that it allows the identification of short and long-run asymmetries. We plot the dynamic multipliers[12] to capture the differences in the impact of total expenditure and total revenue on GDP. The results will give additional insight in analysing the magnitude and direction of impact from discretionary fiscal policy for Malaysia.

4.3 Data Description

We define total expenditure as the sum of operating and developing expenditure of the Federal Government of Malaysia. Total revenue constitutes both tax – direct and indirect – and non-tax revenue such as interest and returns on investment, collected by the Federal Government. Both datasets are sourced from the Monthly Highlights and Statistics published by Bank Negara Malaysia. Datasets are converted to real terms expressed in constant 2015 prices using the historical GDP deflator obtained from the World Bank database.

Quarterly data of real GDP in constant 2015 prices on the other hand was sourced from the Quarterly National Accounts published by the Department of Statistics Malaysia.

Interest rates are defined as the weighted average lending rates across commercial banks, published in the Quarterly Bulletin, and the Monthly Highlights and Statistics by Bank Negara Malaysia. Datasets are also converted to their natural logs.

Our main sample spans from the first quarter of 1998 to the second quarter of 2019. To minimise the influence of stressed periods on our estimations, we exclude quarters impacted by notable crises, i.e., the advent of COVID-19 pandemic and the Asian

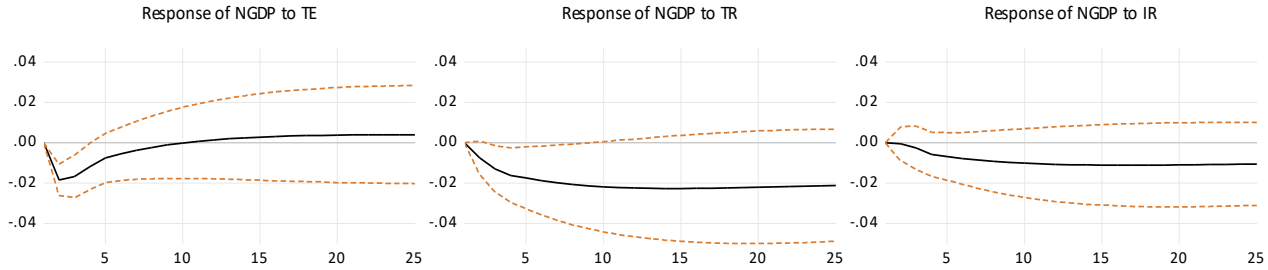
[12] As attached in Appendix II.

Financial Crisis, in the benchmark. As an alternative specification, however, we do consider a sample between the first quarter of 1998 and the second quarter of 2021 as a measure of robustness to investigate whether the overall empirical findings remain stable.

5. Empirical Results

Given a system of four-dimensional variables, we construct up to twelve possible scenarios of Impulse Response Functions (IRFs) for each variable taken separately (discounting their own shocks). This is to provide additional insight into the dynamic response patterns of GDP. Although the test was conducted for all variables in the system, only the results of the responses of GDP to shock innovations originating from total expenditure, total revenue and interest rates are reported here. Visual illustrations of the IRFs up to twenty-five quarters are presented in Figure 1 for the sample period between quarter one of 1998 and quarter two of 2019.

Figure 1: Impulse Response Functions of Four Variables (1998Q1 – 2019Q2)



We then construct the fiscal multipliers based on Ramey (2019). Figures 2 and 3 report the impact of a unit shock in total expenditure and total revenue to GDP across horizons for two samples, the benchmark of quarter one of 1998 to quarter two of 2019, and quarter 1 of 1996 to quarter two of 2021. Note that for both samples, signs of the total revenue and total expenditure multipliers at all horizons are generally as expected - the former negative and the latter positive.

Figure 2: Total Expenditure Multipliers in Different Samples

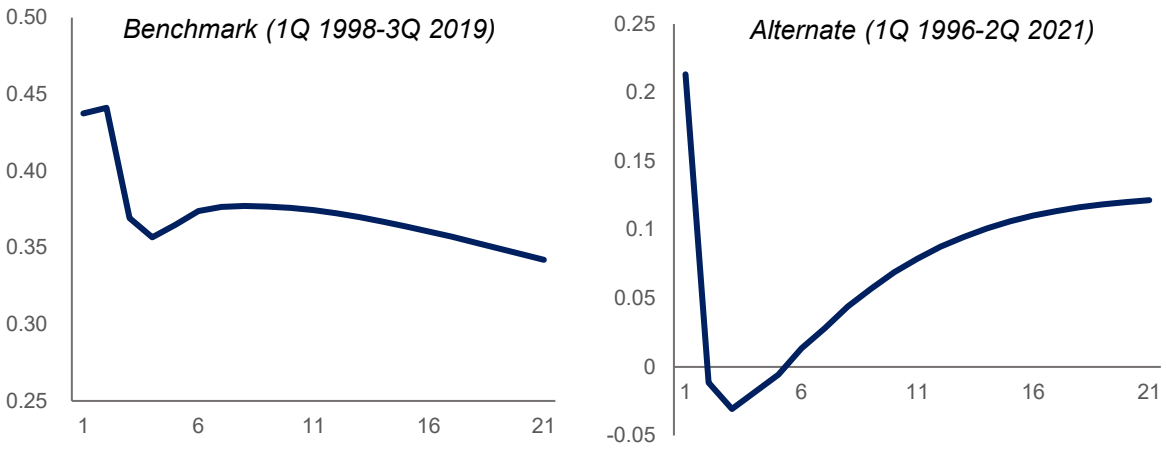
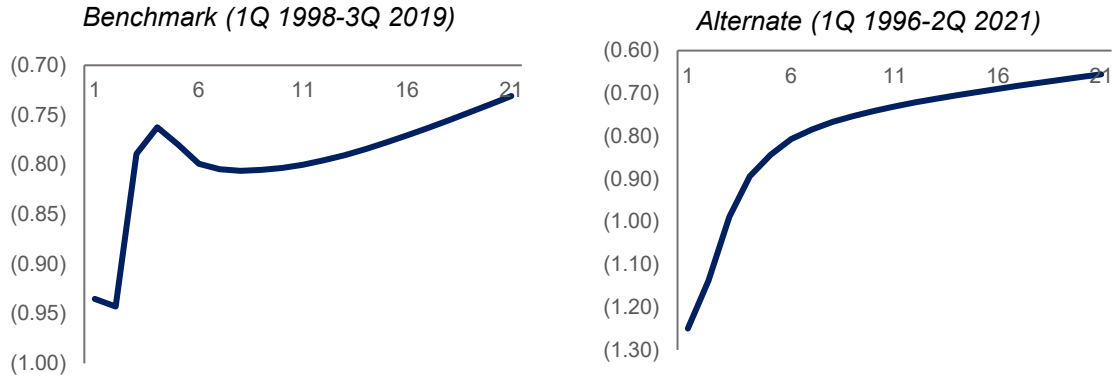


Figure 3: Total Revenue Multipliers in Different Samples



Between the benchmark and augmented sample, total expenditure multipliers are larger in the former albeit less persistent. As shown in Figure 2, the total expenditure multiplier in the main sample peaks at 0.44 in quarter two. The multiplier then declines, but rebounds in quarter four. From quarter six onwards, the multiplier remains in the positive region but slowly decays, reporting an average value of 0.37 across twenty horizons. Under the augmented sample, the total expenditure multiplier peaks at 0.21 in the first quarter and declines significantly after. The multiplier trough crosses the negative threshold at -0.03 in the third quarter, then rebounding sharply and stabilising around the 0.11 value throughout the subsequent horizons.

In Figure 3, we observe the converse such that revenue multipliers under the benchmark sample is smaller than the alternative but similarly persistent. In the main sample, the total revenue multiplier is the largest in the second quarter at -0.94, before declining to -0.74 in the fourth quarter. The multiplier then slightly rebounds to -0.81 and slowly decays throughout the subsequent horizons. The total revenue multiplier

averages to -0.79 across the twenty-one quarters. Under the augmented sample, the revenue multiplier peaks at -1.25 in the first quarter before declining almost exponentially, averaging to -0.79 across the reported horizons.

Table 2: Estimates from Nonlinear ARDL Model

Estimation Period	1998Q1 – 2019Q3	1996Q1- 2021Q2
Short Run Estimates		
D(NGDP(-1))	0.041 (0.643)	-0.096 (0.287)
D(NGDP(-2))	-0.300 (0.000)*	-0.338 (0.000)*
D(NGDP(-3))	-0.207 (0.026)**	-
D(TE_POS)	0.010 (0.342)	-0.012 (0.566)
D(TE_POS(-1))	-0.031 (0.003)**	-0.078 (0.001)**
D(TR_POS)	0.016 (0.603)	-0.009 (0.812)
D(TR_POS(-1))	0.122 (0.000)*	0.095 (0.013)*
D(TR_POS(-2))	-	-0.007 (0.843)
D(TR_POS(-3))	-	-0.076 (0.052)
D(TR_NEG)	-0.014 (0.586)	-0.043 (0.225)
D(TR_NEG(-1))	-	0.101 (0.008)**
D(IR)	0.138 (0.000)**	0.203 (0.000)**
D(IR(-1))	0.084 (0.001)**	0.066 (0.105)
ECT	-0.054 (0.000)**	-0.162 (0.000)**
Long Run Estimates		
C	8.005 (0.000)**	10.427 (0.000)*
TE_POS	0.619(0.223)	0.221 (0.057)*
TE_NEG	0.338 (0.427)	0.396 (0.036)**
TR_POS	-2.636 (0.264)	-0.490 (0.219)
TR_NEG	-2.877 (0.235)	-1.025 (0.041)**
IR	1.305(0.158)	0.659 (0.013)**
Wald based asymmetric effects		
Short-run asymmetries		
TE_{SR}	4.167 (0.041)**	12.566 (0.000)**
TR_{SR}	6.206 (0.012)**	1.716 (0.190)
Long-run asymmetries		
TE_{LR}	1.308 (0.252)	6.498 (0.010)**
TR_{LR}	0.200(0.654)	14.624 (0.000)**

Notes: Asterisk ** and * depict statistically significant at 5% and 10% levels, respectively. Figures in the parentheses represent p-values. JB, LM and CUSUMSQ denote the tests for Jarque-Bera error normality, serial correlation and Cumulative square test for stability respectively. (*) depict significance at 5% level. Figures in the parentheses represents p-values.

The NARDL is based on the assertion that a particular economic variable induces different effects following a positive and negative change. In this regard, the NARDL method divides total expenditure and total revenue into positive and negative components. We test the existence of asymmetries in total revenue and total expenditure via a Wald test and report such results in Table 2. Column 2 suggests that short-run asymmetries exist in the benchmark sample at a 10% significance level. In

the alternative sample, evidence of short-run asymmetries exists at a 20% significance level. Short run estimates in Table 2 report the magnitudes at which GDP asymmetrically responds after one quarter, following either a positive or negative change in total revenue and expenditure. In the short run, an increase of 1 percent in total revenue would result in a 0.12 percent increase in GDP while an increase of 1 percent in total expenditure leads to an almost negligible decline in GDP by 0.03 percent. On the negative side, both revenue and expenditure shock bear insignificant impacts on growth in the short run. Long-run asymmetries also suggest asymmetric responses following either a positive or negative change in total revenue and expenditure. An increase of 1 percent in total expenditure entails a 0.62 percent increase in GDP while an increase of 1 percent in total revenue leads to a decline of 2.64 percent in GDP over the long run. On the other hand, a 1 percent reduction in total expenditure results in a 0.34 percent increase in GDP while a 1 percent reduction in total revenue leads to a 2.88 percent decline in GDP over the long run.

6. Discussion

6.1 SVAR

We first note that our multipliers register values within the range of empirical estimates from other Emerging Market Economies (EMEs).

Table 3: Empirical Studies: One-year multipliers in Selected Emerging Market Economies

Country	Study	Total Government Spending	Total Government Revenue
Indonesia	Tang et al. (2010)	-0.3	0.4
Bulgaria	Muir and Weber (2013)	0.2	0.4
Costa Rica	Estevao and Samake (2013)	0.2	0
Croatia	Simovic and Deskar-Skrbic (2013)	0.8	0.6
China	Wang and Wen (2013)	1.7	0
Romania	Stoian (2012)	0.5	0.9
Saudi Arabia	Espinoza and Senhadji (2011)	0.3	0
Philippines	Ducanes et al. (2006)	0.3	0.0
Thailand	Tang et al. (2010)	-0.4	0.1
South Africa	Jooste (2012)	0.3	0.7
Mexico	OECD (2009)	0.7	0.2
Panel EMEs	Ilzetzki (2011)	0.2	0.3

For total expenditure, a peak multiplier of 0.44 in the benchmark specification is within the -0.3 to 1.7[13] range observed for selected EMEs. Despite being at the lower-middle end of the spectrum, we argue this could be due to the sensitivity of our estimation to composition effects.[14] In some of the case studies, analyses on aggregated values undermine the true impact of expenditure components posited to be growth-inducing, for example, the likes of infrastructure spending and transfers (Coenan et al., 2012; European Commission; 2010). Total expenditure encapsulates not only productive expenditure but also recurring operating expenses, which have limited effects on growth (Ilzetzki et al., 2013). In our dataset, such expenditures include transfers and debt service charges. To the extent that the model identifies variations of these components as exogenous changes, estimates of total expenditure multipliers may be underestimated in effect.

Our revenue multiplier, conversely, registers at the higher end of the EME spectrum of 0 to -0.9)[15], with a reported peak multiplier of -0.94. Empirically, there is no consensus that revenue multipliers are strictly larger than expenditure multipliers despite what theory postulates[16] (Batini, 2014). Studies citing more pronounced revenue multipliers are simply more common in EMEs, with differences in magnitude being twice as large than total spending multipliers (Stoian, 2012; Jooste, 2012; Tang et al., 2013). For findings concluding otherwise, Romer and Romer (2010) suggests that such are common in empirical approaches that rely on auxiliary elasticities to control for the endogenous relationship between revenue and output. Romer and Romer argue that measures of the automatic effects between revenue and output are often inflated, resulting in biases that could undermine the true size of multipliers arising from purely discretionary changes in revenue.

[13] Appendix I
[14] Composition effects refer to the low overall spending multiplier that may result from the counteracting effects of a low government consumption multiplier and a high government investment multiplier or vice versa.
[15] Appendix I
[16] A priori arguments supporting the potency of expenditure measures over revenue in stimulating growth are two-pronged. First, Keynesian wisdom suggests that government stimulus via changes in aggregate demand unequivocally impacts growth. From a standard utility-maximising perspective, however, the impact of a tax change on the re-optimisation of work and leisure has ambiguous effects on the movement of labour supply, thus, output, as it is contingent on the relative strengths of income and substitution effects.

Against advanced economies, our estimated expenditure is at the lower end of the spectrum ranging between 0.24 and 2.7 while our revenue multiplier is considered sizeable within the range of -0.1 to -1.1.

Table 4: One-year multipliers in Selected Advanced Economies

Country	Study	Total Government Spending	Total Government Revenue
USA	Martens and Ravn (2013)	1.8	0.6
Germany	Gerchert (2011)	1.2	1.1
Great Britain	Cloyne (2013)	1.1	0.6
Canada	Owyang, Ramey and Zubairy (2013)	1.6	1
Australia	Alesina and Perotti (2016)	1.7	0.5
Italy	Giavazzi and Pagano (2019)	1.4	0.8
New Zealand	Hamer-Adams and Wong (2018)	0.24	-0.1
Panel of advanced economies	Riera-Crichton et al. (2012)	2.7	0.6

From a theoretical perspective, it is unclear whether higher multipliers are an expected feature of advanced economies in contrast to their emerging counterparts (Batini, 2014).[17] Therefore, it is not feasible to attribute nor ascertain these estimates to an economy's state of development. Empirical literature, however, does suggest that multipliers in EMEs are smaller, with the magnitude of expenditure multipliers outweighing that of revenue.

The multi-horizon plot adopts a faintly unconventional shape. For total expenditure in Figure 2, the peak multiplier observed at earlier horizons is most likely driven by the disbursement of cash transfers. Unlike most advanced economies (AEs), transfer payments as a redistributive tool are exercised largely on a discretionary basis in Malaysia. Amount disbursed per recipient under the different iterations of cash transfer

[17] Theoretically, there exist a number of conflicting factors contributing to the viability of fiscal multipliers being higher in EMEs than AEs or vice-versa. The former encapsulates factors such as a higher proportion of credit-constrained households, a less effective monetary policy response, and lower automatic stabilisers. The latter includes inefficiencies in public spending that contribute to leakages.

programmes[18] are not systematically calibrated[19] to respond to macroeconomic conditions. It would usually be introduced at the annual Budget or as additional stimulus and implemented over a short[20] cycle. Comparatively, the per pax entitlement of institutionalised measures such as the Bantuan Warga Emas or the Bantuan Orang Kurang Upaya are also sizeably less[21] than these auxiliary cash transfer policies. The peak impact therefore could demonstrate the immediate relief of cash transfer programs to the consumption of vulnerable households given their high marginal propensity to consume. Secondly, in Figure 2, we attribute the subdued impact at the fourth quarter to the lagged materialisation of investment spending on real output. Due diligences of government projects are typically comprehensive, encompassing many stages such as licencing and procurement of supplies and services, therefore resulting in implementation lags.[22] Consistent with the subsequent rebound of the multiplier around the eighth quarter, the gains in real output from capital-type spending begin to manifest after despite potential leakages through import content.[23] Third, we note the highly persistent effects arising from a change in total government spending rather than the more commonly seen inverted-U trajectory (Baum et al., 2012; Coenan et al., 2012) – whereby impacts to growth peak after certain quarters.

For total revenue in figure 3, the almost immediate impact observed could partially reflect transition effects by economic agents prior to a permanent adjustment in their behaviour following changes in taxation policies. Malaysia has demonstrated several cases of pronounced responses following changes in taxation policies. After implementation of the Goods and Services Tax (GST)[24] for instance, private consumption reported troughs of 4% in the third quarter of 2015, compared to historical average of 7.1% between 2010 and 2019. Anticipation of new tax regime precipitated

[18] Including Bantuan Rakyat 1Malaysia (BR1M), Bantuan Sara Hidup (BSH) and Bantuan Keluarga Malaysia

[19] Linkages between cash transfer programmes with the state business cycle can be further supported through several reforms namely, the disbursement of assistance under a consolidated means-tested programme, or introduction of conditionalities, for example, eligibility conditioned on job search efforts (Bank Negara Malaysia, 2020).

[20] Typically of one year.

[21] As of 2022, an elderly in Malaysia receives up to RM500 in cash assistance under the Bantuan Orang Emas while under the Bantuan Keluarga Malaysia, such individuals may receive up to RM600. Largest entitlement for the latter program is to low-income households with a potential receipt of up to RM2,000.

[22] E-Perolehan, 2022

[23] Import content for fixed asset expenditures are estimated at around 20-25% for Malaysia

[24] The Goods and Services Tax (GST) was implemented effective 1st April 2015.

by this value-add-tax could have resulted to a frontloading of purchases, in which private consumption recorded a growth of almost 8% in the first quarter of 2015, preceding the expected adjustment to consumption decisions and resulted in sharp decline to consumption immediately after the tax measure is implemented. These impacts are also seen in the US whereby goods purchases were on a high after the announcement of a tax measure before declining sharply post-implementation (D'Acunto, 2018; Crossley et al, 2014). Persistency of the revenue multiplier on the other hand could be explained by the high contribution of direct taxes to Malaysia's revenue stream – of which when faced with a shock, precipitates a more distortionary impact on growth (OECD 2009; European Commission 2010).

In Figures 2 and 3, multipliers from the extended sample that includes periods impacted by COVID-19 and the Asian Financial Crisis possess similarly stylised shapes to our benchmark specification. We concur that these similarities allude to some degree of robustness in our central findings as the trajectory on growth and its disaggregated components remain stable even when accounting for periods with relatively more idiosyncrasies. The notable difference in the peak multiplier of total expenditure, on the other hand, is most likely due to a lagged materialisation of several COVID-19 measures. Even at the onset of recovery, i.e., amid domestic reopening in 2021, successive rounds of stimulus packages were announced to remedy economic scarring. The inclusion of the 2021 subperiods could introduce a bias on our multiplier estimates as changes in expenditure data have not had time to reflect on growth.

6.2 NARDL

Overall, the NARDL results suggest broadly asymmetric impacts between a positive and negative change in Malaysia's fiscal variables on growth. On the revenue side, the modest increase in GDP immediately following a positive shock could be explained by the increase in government spending from the higher revenue collection. For example, revenue influxes in Malaysia in 2011 and 2012, have been immediately rechannelled to finance spending. In the long run however, the adverse impact on growth registered could be driven by a gradual deceleration in public spending growth following structural decline in tax buoyancy throughout the sample periods.

Following a negative revenue shock, the lack of a significant response in the short run could be due to inelastic responses from economic agents. For example, despite the various episode of reduction in company income tax rate[25], this does not immediately lead to an increase in short-term growth. In the long run, impacts registered are highly negative. This could be potentially explained by the tendency for company income tax rate to be reduced during periods of economic slowdown within the sample period used.

On the expenditure side, the negligible impact in the short run following a positive shock could be due to gestation periods of new expenditure programmes such as new infrastructure projects or new public initiatives.[26] In the long run, however, contribution to growth from a positive shock is large as expenditures begin to have spill-over impact on the economy as well as impact from new programmes that started to gain traction.

Comparison against the result for negative expenditure shock additionally saw that the impact magnitude on growth is higher for a positive expenditure shock. This is likely following the tendency for additional expenditure to be accorded on productive spending (e.g. supplies and services) whereas expenditure cuts tend to be on less productive spending, including grants and transfers.

7. Policy Implication

Several key policy implications could be drawn from these findings. For example, in the effort to broaden and diversify the revenue base, there is a need to ensure that the measures introduced are well formulated in order to contain impact on growth. The tendency for weaker responses to negative revenue shocks vis a vis a positive revenue shocks signal the need to judiciously design the revenue measures to ensure a more effective role of fiscal policy in supporting growth.

On the expenditure side, our findings suggest that stronger impact on growth would be observed should new expenditure measures are backed by strong revenue

[25] Company income tax rate was reduced from 30% in 1997 to 28% in 1998, to 27% in 2007, to 26% in 2008, to 25% in 2009, and to 24% in 2015

[26] For example, the announcement of Wage Subsidy programme at the onset of the COVID-19 pandemic in 2020 was slow to gain traction following the unfamiliarity with the features, eligibility criteria and validation process of the initiatives before eventually picking up.

generation (i.e. positive relationship between positive revenue shock and growth). Negligible short-run impact of positive expenditure shocks additionally highlights the need to ensure a more holistic rollout of any new programmes which would facilitate a more efficient utilisation of expenditures.

Beyond these, the findings also provide insights on potential strategy for an effective crisis response. In particular, it suggests that positive expenditure shocks (particularly on current expenditures) would be most supportive of growth when responding to temporary but sharp decline in growth. This is in comparison to negative revenue measures which are found to yield limited immediate impact on growth.

8. Conclusion

Our empirical studies suggest that the fiscal multipliers in Malaysia are broadly aligned with other countries in the Emerging Market Economies (EMEs), both in terms of magnitude and directions. The persistency and asymmetries of the fiscal multipliers also corroborate with observations seen in other countries. Importantly our results for fiscal multipliers in Malaysia provide important insights and policy implications. However, literatures on fiscal multiplier in Malaysia is still at a nascent stage with only quantification of impact magnitude being well-documented. Future research could explore, among others, the empirical significance of disaggregated components of revenue and expenditure on growth, analysing impact on specific GDP components as well as account for potential influence of cyclical and conjunctural factors, such as liquidity environment, on fiscal multipliers in Malaysia.

Appendix I: Variance Decomposition

Table 6: Variance Decomposition (1998Q1- 2019Q3)

Percentage of variations in	Horizon	Due to Innovation in:				
	(Years)	ΔGDP	ΔTE	ΔTR	ΔIR	CU
Quarters Relative Variance in: ΔGDP						
	1	100	0	0	0	
	4	76.18935	14.03522	9.02647	0.748957	
	8	70.78582	8.02339	18.31092	2.879875	
	12	66.98216	5.202732	23.42267	4.392438	
	20	62.47242	3.347699	28.15445	6.02544	
	30	59.90232	2.721676	30.47403	6.901976	
	40	58.67109	2.478235	31.53623	7.314448	
	50	57.98754	2.349708	32.1202	7.542557	
Quarters Relative Variance in: ΔTE						
	1	8.173449	91.82655	0	0	
	4	16.1587	65.96354	9.937637	7.940128	
	8	16.76566	59.98518	14.04328	9.205876	
	12	17.7591	56.90595	15.79644	9.538515	
	20	19.39609	53.59623	17.32749	9.680189	
	30	20.85514	51.21606	18.24446	9.684342	
	40	21.89596	49.60769	18.82774	9.668603	
	50	22.65789	48.44227	19.24526	9.654587	
Quarters Relative Variance in: □TR						
	1	7.311259	25.87427	66.81447	0	
	4	13.25543	29.56275	52.92609	4.255718	
	8	19.21143	25.88486	48.92322	5.980485	
	12	23.85483	22.61092	46.8792	6.65505	
	20	29.50766	18.53491	44.7449	7.212532	
	30	33.33129	15.79845	43.34671	7.52355	
	40	35.55078	14.21707	42.53643	7.695717	
	50	36.96224	13.2124	42.02118	7.804176	
Quarters Relative Variance in: ΔIR						
	1	1.925782	21.82414	0.034143	76.21593	
	4	1.538935	49.42472	3.537119	45.49922	
	8	2.211838	50.85657	7.267229	39.66437	
	12	2.504444	50.81098	8.60881	38.07576	
	20	2.694349	50.62068	9.181927	37.50304	
	30	2.765614	50.53441	9.272479	37.4275	
	40	2.803211	50.49505	9.297524	37.40422	
	50	2.830033	50.46865	9.312357	37.38896	

Notes: The last column provides the percentage of forecast error variances of each variable explained collectively by the other variables. The column in bold represent the impact of their own shock.

Table 7: Variance Decomposition (1996Q1- 2021Q2)

Percentage of variations in	Horizon (Years)	Due to Innovation in: ΔGDP	ΔTE	ΔTR	ΔR	CU
Quarters Relative Variance in: ΔGDP						
	1	100	0	0	0	
	4	86.70792	10.9597	1.728112	0.604274	
	8	78.99799	9.692933	6.744828	4.56425	
	12	72.91319	7.358759	11.3276	8.400453	
	20	64.5992	4.684582	17.5252	13.19102	
	30	59.13615	3.342749	21.48816	16.03294	
	40	56.29068	2.726876	23.52787	17.45457	
	50	54.62942	2.379904	24.71488	18.27579	
Quarters Relative Variance in: ΔTE						
	1	13.30144	86.69856	0	0	
	4	19.59256	68.69338	8.113548	3.600518	
	8	17.70397	61.65693	13.95446	6.684634	
	12	17.48625	58.03978	16.30859	8.165372	
	20	18.26769	54.12132	18.11091	9.500078	
	30	19.44959	51.20986	19.02451	10.31603	
	40	20.42584	49.15765	19.56895	10.84756	
	50	21.19358	47.59684	19.96555	11.24403	
Quarters Relative Variance in: ΔTR						
	1	12.90275	16.72628	70.37097	0	
	4	26.21886	18.71841	54.39643	0.666302	
	8	29.14847	17.19905	50.76975	2.882733	
	12	30.95803	15.61995	48.57952	4.842503	
	20	33.25749	13.2707	45.85277	7.619042	
	30	34.92521	11.42851	43.83185	9.814435	
	40	35.96485	10.2511	42.55549	11.22856	
	50	36.67061	9.446979	41.68604	12.19637	
Quarters Relative Variance in: ΔIR						
	1	3.362035	9.270519	0.216271	87.15118	
	4	2.485427	27.50973	9.51365	60.49119	
	8	1.729515	30.7179	15.6939	51.85869	
	12	1.703702	31.14572	18.10374	49.04684	
	20	2.117815	30.70215	19.57035	47.60969	
	30	2.709318	30.15664	20.02039	47.11365	
	40	3.216633	29.76948	20.20775	46.80613	
	50	3.633735	29.4683	20.33237	46.56559	

Notes: The last column provides the percentage of forecast error variances of each variable explained collectively by the other variables. The column in bold represent the impact of their own shock.

Figure 3: Variance Decomposition (1998Q1- 2019Q3)

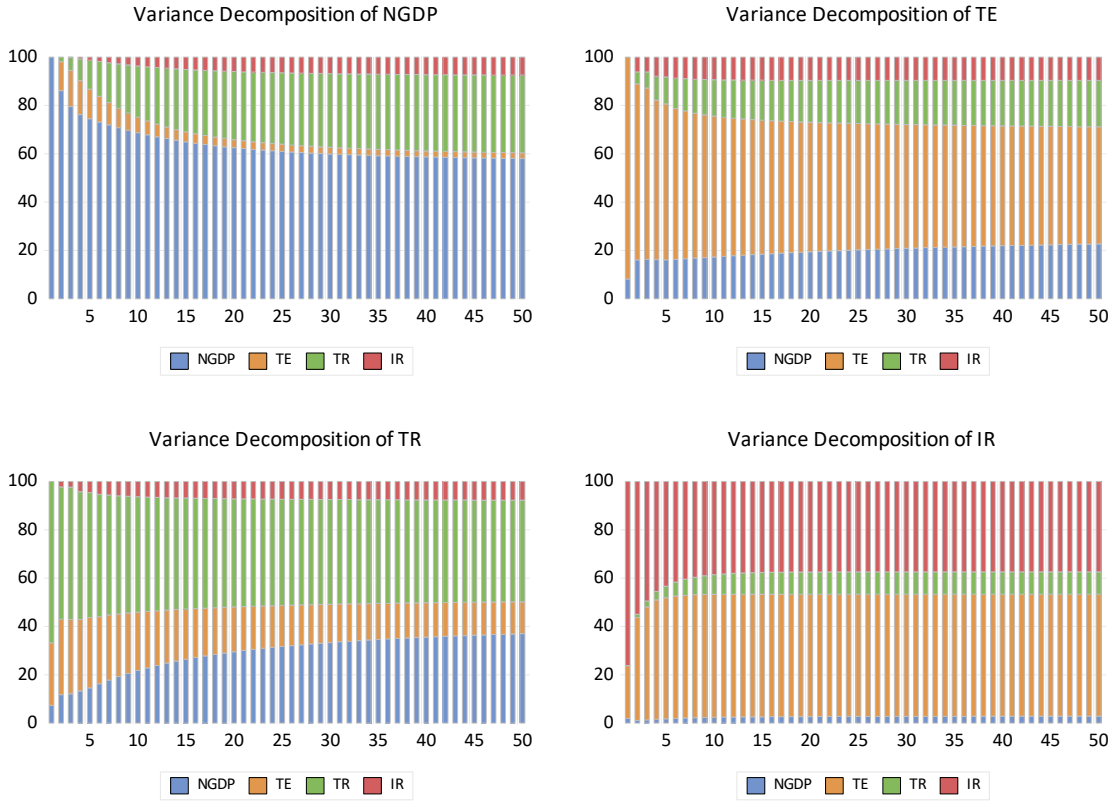
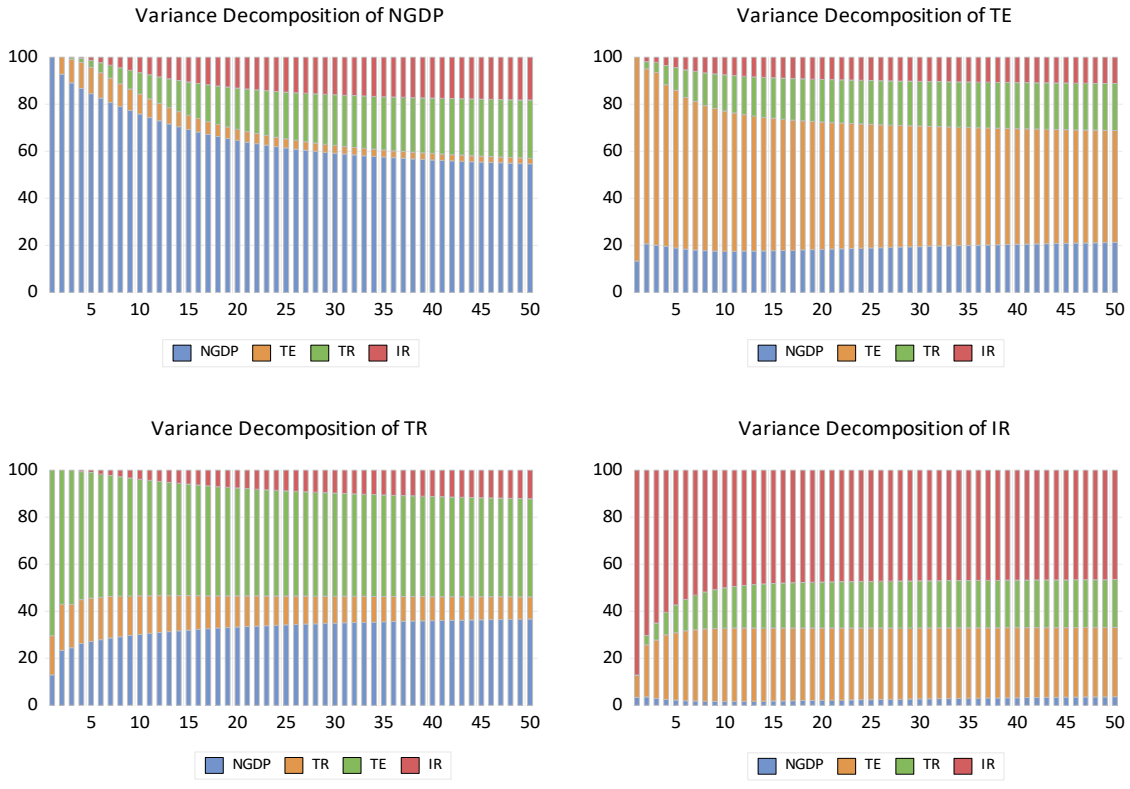


Figure 4: Variance Decomposition (1996Q1- 2021Q2)



Appendix II: Dynamic Multiplier Plot[27]

Figure 5: Dynamic TE and TR Multiplier (1998Q1 – 2019Q3)

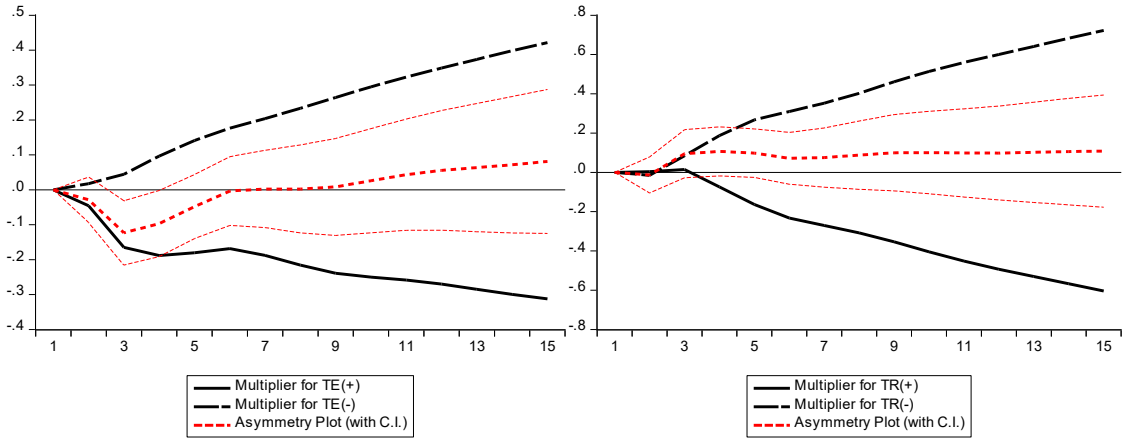
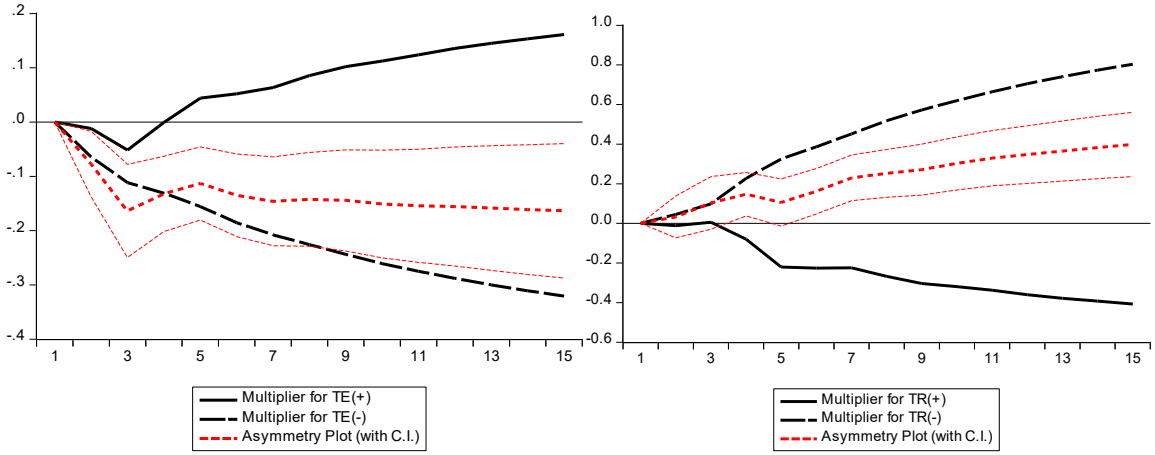


Figure 8: Dynamic TE and TR Multiplier (1996Q1 – 2021Q2)



[27] Dynamic multiplier graphs as shown are plotted to assess the asymmetric adjustment of the TE and TR multiplier. The curve TE(+) or TR(+) describes the asymmetric adjustment of GDP to a positive discretionary change in TE or TR, and vice versa for the curves TE(-) and TR(-).

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