Macroeconomic impacts of fiscal shocks on the Moroccan economy: a disaggregated SVAR analysis

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Abstract

Purpose – The present paper aims to evaluate the structural impact of exogenously induced fiscal shocks on the Moroccan economy. This entails an analysis of the effect on the GDP of COVID-19-induced fiscal shocks manifesting in terms of budgetary revenues and expenditures. A key aspect of this analysis addresses the size of the tax and fiscal multipliers.

Design/methodology/approach – The study examines the structural relationship between five variables during the period between Q1 2009 and Q2 2020 using an SVAR approach that allows for a dynamic interaction between ordinary expenditures and revenues on a quarterly basis.

Findings – Positive structural shocks on public spending are likely to negatively impact economic growth. Negative economic growth, in turn, will damage price levels and interest rates, mainly over the long term. However, public-revenue-multiplier-associated shocks exceed these price- and interest-rate multiplier-associated shocks. Indeed, a structural shock to ordinary revenues can have a positive but insignificant impact on the GDP stemming from the ensuing decrease in the government budget deficit that proceeds from the increase in government revenues.

Originality/value – This is one of the first studies in the Moroccan context to assess the impact of the current worldwide pandemic on public finances. In addition, this study highlights the importance of boosting economic recovery through public spending.

Keywords Budgetary shocks, COVID-19, Public finances, Morocco, Structural VAR

Paper type Research paper

1. Introduction

To ensure sustainable economic growth and development, an effective fiscal policy encompasses a well-designed and fair tax system and spending programs (Mahfouz *et al.*, 2002). Fiscal policy serves as an important lever of governmental control over the real

economy (Munir and Riaz, 2020). Under the umbrella of fiscal policy, the government undertakes measures designed to stabilize and mitigate the deleterious effect of exogenous shocks on the economy. Naturally, the authorities in charge of public finances have responsibilities transcending those of stabilization and mitigation of shocks that involve efficient allocation of resources, adjustments to public revenues and expenditures over the budget year impact national income. Ionela and Diana (2010) argue that fiscal policy balances the need to increase capital formation and marginal propensity to save by reducing levels of consumption with the need to reallocate resources through transfer payments with a view to creating an equitable income and wealth distribution system. Achievement of the latter need may come at the expense of the former.

Fiscal policy has been put to the test in Morocco with the onset of the COVID-19 pandemic. In the years preceding the economic shock induced by the pandemic, the Moroccan economy exhibited sustained annual GDP growth in the environs of 2.5%, only to plummet to −6.7% (on an annualized basis) in December 2020. In 2020, the fiscal deficit more than doubled to 7.7% of GDP from levels of 3.2% in 2019. Unemployment rose to 11.9% from 9.2% in the same period. On both a global and Moroccan level, the strict lockdown strategy adopted to contain the proliferation of the virus cut supply chains. During the same period, that all of Morocco's trading partners suffered economic trauma stemming from the coronavirus reduced export demand for Moroccan goods and services by 7.5%. In turn, the local demand for imports declined by 14.1%. The whole economy suffered from a current account deficit of 1.5% of GDP because of the decrease in tourist arrivals of 78.5% in 2020 relative to those in 2019.

Decreased tourism earnings, combined with weak domestic demand, resulted in lower tax receipts at a time when the Moroccan government faced significant pandemic-related expenses.

During the ongoing crisis, the overall macroeconomic outlook mainly expresses the authorities' efforts to maintain macroeconomic equilibrium after these external shocks. However, the additional borrowing required to cover the national debt surged to 76.9% of GDP in 2020, compared to 65.8% in 2019. Even prior to the pandemic, high public debt-burdened the Moroccan economy in part attributable to public infrastructure investment over the preceding decade (although, in accordance with the free trade agreement with the United States, the burden was partially reduced with the Moroccan undertaking to decrease – and ultimately – eliminate a basket of subsidies) (Al Kurdi, 2021).

In the period of the COVID-19 pandemic, the shock stabilization and mitigation role of fiscal policy are paramount given that it is manifest that, in the prevailing economic crisis, all fiscal components have been negatively impacted. In this context, this study seeks to uncover the dynamics driving reactions of macroeconomic variables triggered by various budgetary components with a view to measuring the exogenous shock of COVID-19 on GDP by calculating tax and fiscal multipliers. Inasmuch as the COVID-19 phenomenon indefinitely perpetuates, such tax and fiscal multipliers serve as a basis for predictions of the future effect of COVID-19 on economic growth in Morocco.

The remainder of this study proceeds as follows. While overviewing the literature on the interplay between fiscal policy and economic growth, section 2 compares and contrasts theoretical frameworks and research methodologies in this sub-field of macroeconomics with a view to identifying the SVAR approach as superior. Section 3 explains how the SVAR approach is used in the context of this research entailing a description of the sample selection procedure as well as the definition of key variables. Section 4 details the main findings of the empirical analysis. In section 5, budgetary multipliers are calculated. Finally, section 6 sets forth conclusions.

2. Theoretical frameworks and research methodologies

Extant research provides conflicting perspectives on the effectiveness of fiscal policy as a driver of economic growth (Perotti, 1999; Christiano *et al.*, 2011; Corsetti *et al.*, 2012). The current relationship between fiscal policy and economic activity attracts considerable attention in the economic debate (Diop and Diaw, 2015).

Given a dearth in the literature, Afonso and Sousa (2012) highlighted the need for collecting more empirical evidence on the effect of fiscal policy on the economy. For decades, fiscal policy has been used extensively to stabilize the economy and to redistribute wealth with a view to allocating the cost of governance on those with greater capacity to pay engendering more equity and fairness among social strata (Bhattarai and Trzeciakiewicz, 2017). In recessionary troughs, the Keynesian theory posits utilization of increased government spending and/or decreased taxes as fiscal prescriptions designed to buoy economic growth without generating inflation provided that (as is typical in economic downturns) the economy is far from full employment. Such expansionary fiscal policy, presupposing short-run price stability, increases aggregate demand, hence increasing income and employment and, as a result of multiplier effects, consumption. On the empirical level, Shaheen (2019) finds strong evidence on the impact of public expenditure on output generating concrete findings on the transmission channels of fiscal policy, the size of the multiplier generated by fiscal stimulus in the short term and the impact of fiscal policy on long-term growth.

On the flip side, however, addressing inflationary spirals by reducing public spending or increasing taxes comes at a high price according to Keynesian theory: engendering increased unemployment and decreased economic growth. Reducing households' permanent income by taxing them more and more to fund increased government spending delivers a wealth shock, which causes consumers to cut back on consumption. Under such circumstances, Baxter and King (1993) confirm that actual wage rates fall in consequence.

Departing from the Keynesian theory, the Mundell-Fleming model suggests that capital mobility and the exchange rate regime in place (factors of no avail in Keynesian economics) determine the effectiveness of the fiscal policy. Under the theoretical framework underlying this model, fiscal policy exerts no impact on real economic activity under conditions in which an economy exhibits a lack of capital mobility in a fixed-exchange-rate regime.

In contrast with the Keynesian theory, neoclassical theory takes a supply-side rather than demand-side approach to ascertain the effect of fiscal policy on GDP and other macroeconomic aggregates. The neoclassical general equilibrium model yields outcomes that are opposed to the Keynesian aggregate demand model. The responses of private consumption and the real wage rate to a shock in government spending vary depending on which model is espoused.

Empirically, Frédéric *et al.* (2016) adopted the methodology utilized by Blanchard and Perotti (2002) to study the short-term effects of Moroccan public spending on GDP, trade balances, real effective exchange rates and government consumption. They confirmed that the fiscal multipliers show a low persistence in the short run. Using annual data spanning the period 1980–2016, Tahri and Karim (2018) found that the fiscal multiplier is positive but relatively low. Interestingly, they found that the fiscal multiplier, at least with respect to positive shocks, decreases over time, completely vanishing after the fifth year.

Four approaches are widely used to evaluate fiscal policy shocks on macroeconomic variables (Munir and Riaz, 2020). The first method uses a binary variable to identify fiscal shocks that capture specific episodes (Ramey and Shapiro, 1998; Edelberg *et al.*, 1999). The second imposes a sign ($+/-$) restriction on the impulse response function (Mountford and Uhlig, 2009). The third identifies fiscal shocks based on the Cholesky order (Favero, 2002; Fatás and Mihov, 2001). The fourth identifies fiscal policy shocks by accounting for elasticities in fiscal variables and for lags in government decision-making in terms of policy formulation (Blanchard and Perotti, 2002; Perotti, 2004).

Beyond these four approaches, Blanchard and Perotti (2002) and Perotti (2004), in gaging the effectiveness of fiscal policy as an effective tool of economic policy, took the debate to a new level by proposing an evaluation of the dynamic effects of fiscal policy on macroeconomic variables through the mechanism of a structural vector autoregressive (VAR) model. Originally, the VAR approach, which Sims (1980) pioneered, was mainly used to study the impacts of monetary shocks with scant attention applied to the effects of fiscal shocks. However, Blanchard and Perotti (2002) re-engineered this methodology in a technique they dubbed Structural VAR, specifically crafted to address fiscal shocks. According to Slimani (2017), this SVAR is the most trustworthy technique for the economic analysis of budgetary policy.

Choosing the SVAR over the standard VAR model is justified by VAR's inability to capture simultaneous effects between variables. Kibala Kuma (2018) confirms that this shortcoming of the VAR model can bias economic policy. In contrast, the SVAR model renders transparent the effect of government economic policy on the inducement of structural changes on the economy brought about by shocks – in turn generating an ability to predict economic outcomes from explicit governmental decisions in response to these shocks, which, in contrast to their treatment in the VAR model, are no longer random or unidentified.

Moreover, the SVAR gives insights into the variations in the variables around their equilibrium values due to the fundamental role of unanticipated shocks – the main factors explaining the variations mentioned above. It is noteworthy that the vector autoregressive models most commonly used in the literature are SVARs, which rely on economic assumptions to determine causal relationships. It should be highlighted that this approach has received less criticism than others. The consensus among economists advocates its use in periods absent wars. According to Chibi et al. (2010), using VAR models is imperative to understand the nature of macroeconomic functioning, which requires a probabilistic dynamic model, which considers current and past random shocks. These models are the most practical for studying the impact of fiscal shocks on the economy. However, the downside of using the VAR technique to this end can stem from its inability to capture simultaneous effects between variables, which only SVAR can effectuate. Indeed, SVAR modeling exhibits several advantages over rival techniques. First, the VAR model boasts simplicity utile in estimating values in a low-dimensional system (Yegorov, 2004). Second, implementing an SVAR model engenders relatively few constraints. Third, estimates entailed in SVAR simulations are based on a limited number of economic assumptions. Fourth, SVAR can credibly simulate structural shocks. In this vein, Blanchard and Quah (1989) were among the first academics to propose an econometric identification of structural shocks in the presence of the usual orthogonalization constraints involving the resolution of a system of constraints proxied by econometric variables as effectuated by Biau and Girard (2005). Inasmuch as the aim of this paper, which revolves around identifying the structural shocks that negatively impact an economy in the wake of a shock-inducing crisis, mirrors that of Biau and Girard (2005), the latter's approach is adopted in this study.

3. SVAR modeling applied to COVID-induced fiscal shocks experienced in the Moroccan economy

3.1 Key variables and descriptive statistics

This study adopts variables delimited in the SVAR model used in Biau and Girard's (2005), which evaluated the effectiveness of fiscal policy in France. In that study, an SVAR model is articulated with five equations incorporating three main variables: ordinary revenue noted (T), ordinary expenditure noted (G) and GDP (y), allowing evaluation of the effects of fiscal policy on the economy directly. In addition, there are two control variables: price level (P) and interest rate (R), neutralizing the effect of monetary policy. A five-variable SVAR, neutralizing the effects of monetary policy, provides high explanatory power to the model pioneered by Blanchard and Perroti (2002).

Inasmuch as it allows us to capture changes in the response of governmental policy decisions to exogenous short-run shocks, the use of quarterly data – drawn from HCP's national accounts, TGR's reports and the IMF's monthly statistics – is critical covering the period from Q1 2009 to Q2 2020. Choosing this specific time frame is due mainly to the homogenous economic cycle after the subprime crisis and before the COVID-19 pandemic providing an ideal temporal horizon to model, using the SVAR approach, the interplay between the Moroccan fiscal policy and GDP. That SVAR needs to capture the dynamic changes induced by government revenues and expenditures on GDP mandates and the use of a large set of observations to ensure reliability.

Ordinary revenues and expenditures and GDP are expressed in real terms. The inflation rates or price levels are expressed as percentages, calculated from the IMF's aggregate indices. Finally, the interest rate is the three-month nominal interbank rate (Money Market Rate). Contrary to the approach initiated by Biau and Girard (2005), in calculating ordinary revenue, personal income tax and sales tax revenues are not separated from corporate tax revenues.

Table 1. Presents the descriptive statistics of the economic variables in the data-set for the period. Interest rates, while low overall, fluctuated between 1.93 and 3.4%, with a mean of 2.75%. Inflation was held in check, never even reaching 1.5% (below the regulatory limit of 2%).

3.2 SVAR specification

As a preliminary step before modeling, verifying the stationarity of the econometric series is essential to ensure relevance and validity conditions. How Moroccan economic activity reacts to fiscal shocks is illumined through structural vector autoregression modeling with a view to providing insight into how these shocks propagate through the economy.

The reduced form of the canonical quarterly VAR model can be written as:

$$X_t = \sum_{i=1}^{m} A_i X_{t-i} + U_t \tag{1}$$

Where, $X_t = [t_t, g_t, y_t, p_t, r_t]$ is the dimensional vector of the five endogenous variables. However, $U_t = [u_t^t, u_t^g, u_t^y, u_t^p, u_t^r]$ is the vector of canonical innovations. This vector captures the unpredictability encapsulated in past realizations of the endogenous variables. The parameter (m) denotes the number of lags in the model that can be determined using the Akaike norm (AIC) consistent with lags in monetary policy implementation from the onset of fiscal imbalances. In this study, one lag equates to one-quarter. Moreover, the Portmanteau test verified that canonical residuals obtained with the model are not auto-correlated.

Variables	Symbols	Measures	Sources	Obs	Mean	Min	Max
Ordinary revenues	T (t)	Log (value in billions)	MEFRA (TGR)	46	4.742033	3.794657	5.58687
Ordinary expenditures	G (g)	Log (value in billions)	MEFRA (TGR)	46	4.697825	3.63371	5.479688
GDP	Y (y)	Log (value in billions)	IMF and HCP	46	5.44268	5.183507	5.663492
Prices	P (p)	In %	IMF and HCP	46	0.29%	−0.82%	1.37%
Interest rates	R (r)	In %	IMF	46	2.75%	1.93%	3.40%

Note(s): The "TGR" is the national public Treasury
The "HCP" is the High Commission for Planning
Source(s): Authors' calculations

Table 1.
Key variables and descriptive statistics

In actuality, canonical residuals u_t^g and u_t^t do not have a precise meaning. Indeed, Perotti (2004) argued that these residuals could be interpreted as a function of three types of shocks: (1) mechanical and immediate responses, (2) systematic and instantaneous discretionary measures and, of particular relevance to this study, (3) autonomous discretionary (structural) shocks. By nature, each is independent of one another with no analog in the past macroeconomic environment. According to Biau and Girard (2005), structural shocks to public finances represent the government's autonomous discretionary decisions that affect public revenues and public spending.

Hence these last canonical residues can take the following form:

$$u_t^t = \alpha_{ty}u_t^y + \alpha_{tp}u_t^p + \alpha_{tr}u_t^r + \beta_{tg}e_t^g + e_t^t$$
$$u_t^g = \alpha_{gy}u_t^y + \alpha_{gp}u_t^p + \alpha_{gr}u_t^r + \beta_{gt}e_t^t + e_t^g$$

(2)

Where, e_t^t and e_t^g are the structural budget shocks. At the same time, α and β are the model's coefficients.

The identification of structural shocks requires the construction of the matrix P that verifies the following relationship: $u_t = P.e_t$; it is assumed that at each date t, the canonical innovations are expressed as linear combinations of the structural shocks embodied in the vector $e = [e^t, e^g, e^y, e^p, e^r]$.

Generally, we can identify the coefficients of the matrix P by adopting the approach initiated by Perotti (2004) and adopted by Biau and Girard (2005) following the steps below:

(1) Rewrite the equality $u_t = P.e_t$ as $A.u_t = B.e_t$ where $P = A^{-1}.B$.

(2) Fix some non-diagonal elements of A and B by assuming that any given innovation cannot affect another within the same quarter ($\alpha = 0$) or by assuming that it affects another within the quarter (if so, measure the effect to fix the element via the parameter α).

(3) Set the diagonal elements to 1 (vector normalization).

(4) Delimit the orthogonality of structural residuals used to conduct instrumental variable regressions that identify the remaining elements (the parameters γ and β).

This generates the following series of equations:

$$u_t^t = \alpha_{ty}u_t^y + \alpha_{tp}u_t^p + \alpha_{tr}u_t^r + \beta_{tg}e_t^g + e_t^t$$
$$u_t^g = \alpha_{gy}u_t^y + \alpha_{gp}u_t^p + \alpha_{gr}u_t^r + \beta_{gt}e_t^t + e_t^g$$
$$u_t^y = \gamma_{yg}u_t^t + \gamma_{yg}u_t^g + e_t^y$$
$$u_t^p = \gamma_{pt}u_t^t + \gamma_{pg}u_t^g + \gamma_{py}u_t^y + e_t^p$$
$$u_t^r = \beta_{rt}e_t^t + \beta_{rg}e_t^g + \gamma_{ry}u_t^y + \gamma_{rp}u_t^p + e_t^r$$

The first equation (u_t^t) signifies that an unpredictable change in budget revenue can be due to an unexpected movement in economic activity, prices and the interest rates within the quarter indicative of instantaneous response to a structural shock in government spending and ordinary revenues (the new residual). The second equation (u_t^g) is similar to the first.

The third equation (u_t^y) assumes that unanticipated fluctuations in prices and interest rates have no immediate impact on economic activity. In contrast, changes in government revenues and expenditures can rapidly impact GDP. However, the fourth equation illustrates that only unexpected changes in GDP, government revenues and expenditures impact prices. Inflation, a lag variable, responds to fluctuations in interest rates only after the elapsing of

more than one-quarter to influence inflation. The last equation implies that fiscal policy decisions can eventually beget offsetting monetary policy reactions. However, unexpected changes in GDP and price levels can have an immediate impact on interest rates.

Following the discussion above, we can write A and B as:

$$
A = \begin{pmatrix}
u_t^t & u_t^g & u_t^y & u_t^p & u_t^r \\
1 & 0 & -\alpha_{ty} & -\alpha_{tp} & -\alpha_{tr} \\
0 & 1 & -\alpha_{gy} & -\alpha_{gp} & -\alpha_{gr} \\
-\gamma_{yt} & -\gamma_{tg} & 1 & 0 & 0 \\
-\gamma_{pt} & -\gamma_{pg} & -\gamma_{py} & 1 & 0 \\
0 & 0 & -\gamma_{rY} & -\gamma_{rp} & 1
\end{pmatrix}
\quad
B = \begin{pmatrix}
e_t^t & e_t^g & e_t^y & e_t^p & e_t^r \\
1 & \beta_{tg} & 0 & 0 & 0 \\
\beta_{gt} & 1 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 \\
\beta_{rt} & \beta_{rg} & 0 & 0 & 1
\end{pmatrix}
$$

With the identification of the elements of both matrices, A and B, the coefficients of the parameter α can be denominated as follows:

(1) The coefficients α_{ty} and α_{gy} capture two effects of economic activity on government revenues and expenditures; namely, the effect of automatic stabilizers and the discretionary adjustment of fiscal policy in response to unexpected events within the quarter. It is noteworthy that quarterly data serves to eliminate discretionary responses channels. Indeed, Biau and Girard (2005) assume that governmental policy-makers need more than one-quarter to determine the nature of an exogenous shock and thus the implementation of reactive policies lag behind the initiation of the crisis, so it is instructive to assess the GDP elasticities for fiscal revenues and public expenditures ($\alpha_{ty} = 0,718$). Since the specific determination of the automatic responses of public spending to fluctuations in economic activity is difficult, however, $\alpha_{gy} = 0$;

(2) Ordinary elasticity of revenues to prices registers at $\alpha_{tp} = 0.36975$.

(3) During an increase in the price levels in the quarter, government spending decreases in real terms. Therefore, a negative elasticity is assumed $(-\alpha_{gp} = 1)(-\alpha_{gp} = 1)$

(4) Governments and households often resort to fixed-rate debt. According to Biau and Girard (2005), interest rates fluctuations do not instantaneously affect public debt charges or social deductions or investment income; thus, $\alpha_{tr} = 0$;

(5) In the same line, changes in interest rates are far from being disruptive of public spending, and for this reason, the coefficient α_{gr} must be equal to 0.

Therefore the cyclically adjusted residuals could be presented as follows:

$$
\begin{aligned}
u_t^{t.CA} &= u_t^t - \left(\alpha_{ty}u_t^y + \alpha_{tp}u_t^p + \alpha_{tr}u_t^r\right) = \beta_{tg}e_t^g + e_t^t \\
u_t^{g.CA} &= u_r^g - \left(\alpha_{gy}u_t^y + \alpha_{gp}u_t^p + \alpha_{gr}u_t^r\right) = \beta_{gt}e_t^t + e_t^g
\end{aligned}
\tag{3}
$$

According to Chibi et al. (2010), budgetary expenditures and revenues decisions are made within the same time interval, and therefore we take: $\beta_{tg} = 0$. Using the alternative assumption where $\beta_{gt} = 0$, would means that the coefficient β_{gt} can be estimated by the OLS method – at least after isolating the effects of e_t^t and e_t^g, which can be considered as instrumental variables of the 2SLS estimator, in order to determine the coefficients γ_{y_t} and γ_{y_g} in the canonical equation of GDP residuals. Repeating this procedure allows us to calculate

the matrices A and B, and, thus, of the matrix P, by determining the structural shock and then using it as an instrument in the systemic equation that follows.

In summary, upon set twenty-four "0" (including β_{tg}) ten "1" and six α, estimation of the three β and seven γ proceeds; these fifty coefficients precisely correspond to the elements of A and B, and thus, we can conclude that the matrix P is adequately identified.

4. Empirical analysis

The first step in the model estimation is to explain the long-term properties of the used series (i.e. to verify the presence of cointegration relationships between the model variables). The Akaike parameter (AIC) indicates that the time series used to conduct this research were unstable for all variables except for ordinary expenses. This means that non-stationary variables in level should be moved to the first difference. The tests indicate that the optimal number of lags for our model is one lag, which is different from the literature in which lags ranged from four to five periods. However, the Schwarz indicator (SC) indicates an optimal lag of zero. Since the information criteria do not allow us to decide on a single optimal lag, we will adopt a second-order lag since our model is based on panel data of 46 quarterly observations – more than sufficient in terms of prediction.

However, the portmanteau test ensures that the residuals obtained after estimating the standard VAR model are not autocorrelated. The results obtained (*p-value = 0.1818*) mandate acceptance of the null hypothesis, entailing the absence of residual autocorrelation, such that it is manifest that two lags are suffice.

Concerning the cointegration tests between variables, it should be noted that the Engle and Granger (1987) test indicates the existence of four long-run equilibrium relationships ($r = 4$ at the 5% level). Such results imply that these variables show similar behavior in the long run.

The following phase consists of estimating the canonical VAR model that justifies the move from canonical to structural innovations by identifying the coefficients of the matrix P, using the following equation: $u_t = P. e_t$.

Therefore,

$$A = \begin{pmatrix} 1 & 0 & -0.718 & -0.369 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ -3.1042 & 8.2405 & 1 & 0 & 0 \\ -7.8294 & -2.1547 & 47.501 & 1 & 0 \\ 0 & 0 & -0.001631 & 0.04238 & 1 \end{pmatrix}$$

$$B = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0.08749 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0.00225 & -0.001075 & 0 & 0 & 1 \end{pmatrix}$$

From these two matrices can be calculated the matrix $P = A^{-1} \cdot B$

$$P = \begin{pmatrix} 1.03549 & 0.355376 & -0.038941 & 0.016002 & 0 \\ 0.366632 & 0.128284 & 0.106602 & 0.003128 & 0 \\ 0.193185 & 0.046043 & 0.000661 & 0.023897 & 0 \\ -0.279138 & 0.871716 & -0.106602 & -0.003128 & 0 \\ 0.014398 & -0.037949 & 0.00452 & -0.00017 & 1 \end{pmatrix}$$

4.1 Impacts of a structural fiscal shock in public revenues
Analysis shows that in the short term, an increase in the budgetary revenue can have a negative effect of 0.018778% at the end of the first year on the budgetary expenditure; the third quarter after the shock marks the most significant fall of the entire forecast period (0.052090%). A repetitive trend characterizes the expenditure response function to increases in revenue. However, this increase in the governmental revenue induces a deterioration in public expenditure, in a linear pattern from 0.0267 to 0.00434%, between the second and fourth years. Ravnik and Zilic (2011) found identical results in Croatia.

Figure 1 indicates that an accumulated revenue shock can lead to an exponential fall in ordinary expenditure. Ordinary expenditure suffers an immediate effect of 0.012071% in the first quarter after the revenue shock and an accumulated negative effect of 0.31543% by the end of the fifth year. These results contradict those of Tahri and Karim (2018).

In general, a shock to government revenues does not seem to have a strong accumulated negative effect on economic growth because of the offsetting effect of increases in GDP in the short term. That an increase of 1% in government revenue has an insignificant positive effect on GDP, in the long run, confirms results reported by Tahri and Karim (2018), Munir and Sultan (2018) and Munir and Riaz (2020). In an examination of impulse response functions that limn the dynamic effect to a system, however, a shock in revenues triggers a corresponding adjustment to GDP growth as follows: decline followed by a rebound after two-quarters – effects that diverge from the findings of Ghazi (2018) using an SVAR model and Mossadak (2013) using a dynamic stochastic general equilibrium (DSGE) model. This divergence could be explained by the quarterly panel data, which offers greater scope for dynamism in the outputs, used to conduct the current analysis.

Moreover, prices respond positively to structural revenue shocks, confirming the results of Munir and Riaz (2020). The direct positive response of inflation during the first quarter after the shock cuts against the results of Biau and Girard (2005) and Tahri and Karim (2018). This increase in the inflation rates is estimated after one year of the shock at 0.19%, ascending to 0.34% in the long run. These results run contrary to those estimated by Chibi *et al.* (2010) in Algeria. It is manifest that the increase in ordinary revenue generates an inflationary effect following the increase in production (GDP). However, such a 1% increase in government revenue is far from triggering an interest rate crisis, as its impact varies from 0.02% in Q1 to 0.06% in Q20; moreover, such minor increments in interest rates can easily be attributed to indirect taxation that tends to increase the costs of loans and interest rates (Ghazi, 2018).

4.2 Impacts of a structural fiscal shock in public spending
A structural increase in ordinary expenditure could damage economic growth with a negative multiplier for almost the entire projection horizon. These results confirm those of Chibi *et al.* (2010), Ferrara *et al.* (2021) and Biau and Girard (2005) in the long run. However, they diverge from those of Munir and Riaz (2020) and Ghazi (2018). Nevertheless, Tahri and Karim (2018) have found a small effect of structural spending shock on GDP that fades by the end of the fifth year following the initial increase. We have already pointed out that fiscal policy affects economic activity only at a marginal level (−0.005%) in the first quarter after the shock in contrast to an accumulated negative effect of around −0.0157% at the end of the fifth year.

On the other hand, the impact of a positive spending shock on government revenue seems to exhibit a cyclical pattern albeit characterized by no discernible effect in the first quarter post-shock to an adverse effect by the end of the fourth year reflective of a 1% increase in expenditure inducing a 0.106% decrease in public revenue. Moreover, a 1% increase in public spending could generate deflation of 0.1% with the expectation of the perpetuation of this deflationary spiral through downwardly trending until stabilizing at the end of the first year
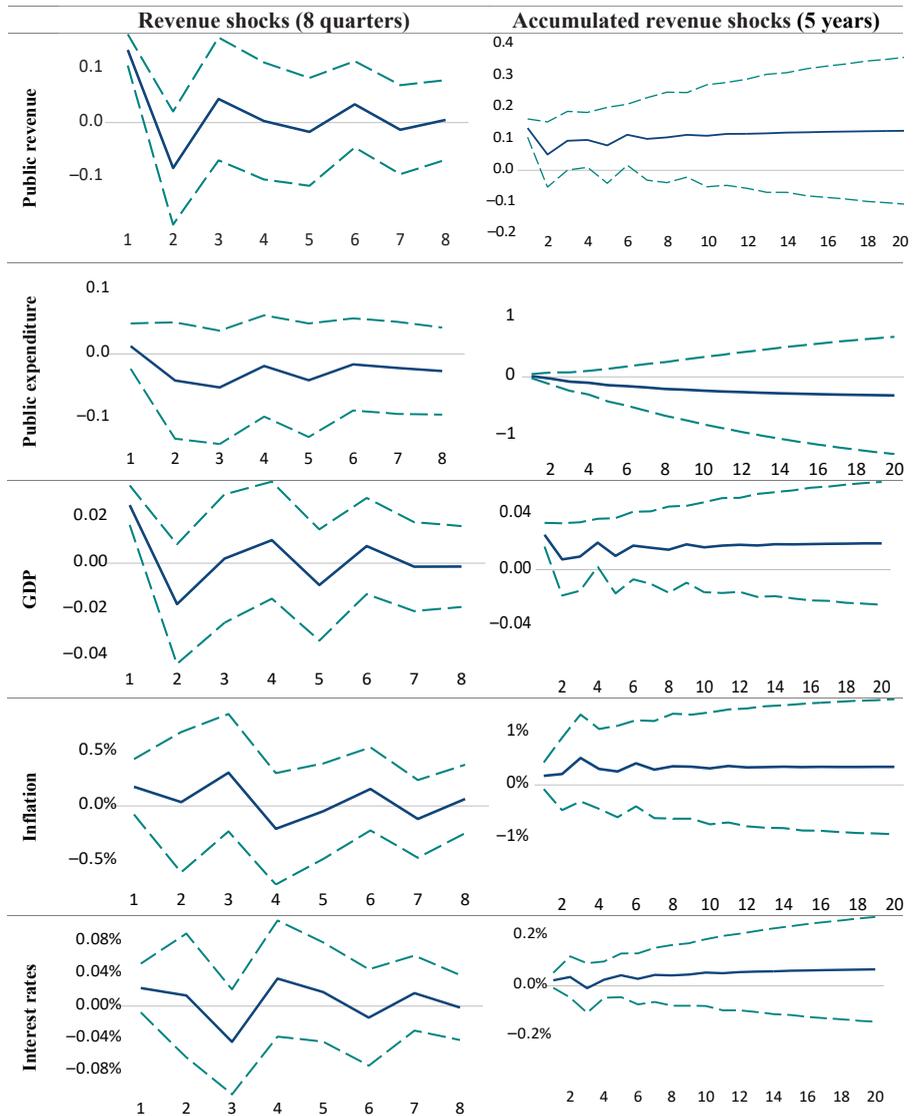
Figure 1.
Dynamic impacts of
public revenues shock
on the Moroccan
economy (functions–
responses)

Note(s): The charts in Figure 1 depict a p.p. response of the main macroeconomic variables
to public revenues shocks. The left column is the eight-quarter response. However, the right
column is the structural accumulated response of macroeconomic variables to 1% public
revenues shocks. The blue line is the impulse response function, while the discontinued green
lines represent the 95% confidence intervals

Source(s): Authors' own (EViews 10)

given the progressively diminishing, multi-quarter cascading of the spending shock's
impulse residual effect on prices. In the wake of an adverse effect on GDP stemming from
unexpected increases in public spending, fluctuations in price levels are explained by the

shock waves on economic activity deflationary levels compounding until attaining 10.54%, in aggregate, by the end of the fifth year. In response to a positive shock of 1% on public spending, interest rates record a relative decline in the first quarter just after the crisis, before resuming the downward spiral from the second year until the fifth year culminating with a marginal level of deflation (0.012%) at the end of the period of projection. Moreover, the adverse reaction of GDP to budgetary shocks elicits a long-term impact on interest rates on the order of 6.09%. Econometric findings of Tahri and Karim (2018) and Laamire and Zirari (2021), albeit through analysis of annual rather than quarterly panel data, corroborate these reactive patterns of GDP in response to an increase of 1% in ordinary expenditures (see Figure 2).

5. Budgetary multipliers

In general, the econometric literature predicts several types of budgetary multipliers (i.e. the impact multiplier and the cumulative multiplier). The method introduced by Spilimbergo et al. (2009) and recommended by Elkhdari et al. (2018) facilitates the calculation of multipliers expressed in monetary units (MAD). In this context, it is necessary to multiply the values from the impulse response functions by the average value of the GDP/BV ratio where BV is the Budgetary Variable (i.e. ordinary revenue or ordinary expenditure) with the caveat that structural estimations provide less efficient results in this type of analysis. Multipliers obtained through using a VAR approach consist of the following (see Table 2).

Analysis of multi-quarter sequencing of trends in the fiscal multiplier, that measures the size of the output change associated with a change in a fiscal instrument (Fuchs-Schündeln and Hassan, 2016), shows that expansionary fiscal policy buoys economic activities, with a spending multiplier exceeding one by approximately by the mid-point of the second year after the shock. This confirms a fundamental hypothesis of Keynesian economics that the fiscal spending multiplier is positive and high during a period of bad economic conditions. Indeed, Perotti (2004) obtained a spending multiplier greater than one unit for the United States before 1980. However, Phaneuf and Wasmer (2005) found that the Canadian government's spending multiplier equals 0.5 during expansions but exceeds one during recessions. These results mimic those of Bentour (2020) in the context of an examination of the impact of the government spending multiplier on economic activity in 18 Arab countries.

After five years, the fiscal multipliers are significant, rising from 0.09 MAD in the first quarter to 2 MAD indicative of economic recovery through public spending being more effective in the long run than in the long run. Regarding Gonzalez-Garcia et al. (2013), a fiscal multiplier that exceeds expectations can stimulate economic growth and further strengthen the sustainability of public finances. For, expansionary fiscal policies boost economic activities with the help of public debt. As a consequence of taking on incremental debt that weighs heavily on national financial resources, however, structural problems ensue stemming from the consequent increase in the debt ratio in the face of a decline in national output.

However, the tax multiplier, which is defined by Chinn (2013) as the ratio of the change in output to a change in government taxes, approximates that calculated by Ghazi's (2018), despite his using an alternative approach (recursive estimation) with a multiplier that varies from 0 in the first quarter (subsequent to a decline in revenue of 1 MAD) to −0.39 in the fifth year. According to the findings of several IMF reports (Gonzalez-Garcia et al., 2013; Abdel-Kader and Mooij, 2020), a significant negative tax multiplier would adversely affect economic growth in the future by, ultimately, eroding the tax base from which all taxes are collected.

In practical terms, in response to fiscal crises, the Keynesian approach mandates the adoption of a counter-cyclical economic policy that offsets downturns in consumption and private investment. In contradistinction to advanced countries that adopt a counter-

Expenditure shocks (8 quarters)	Accumulated expenditure shocks (5 years)
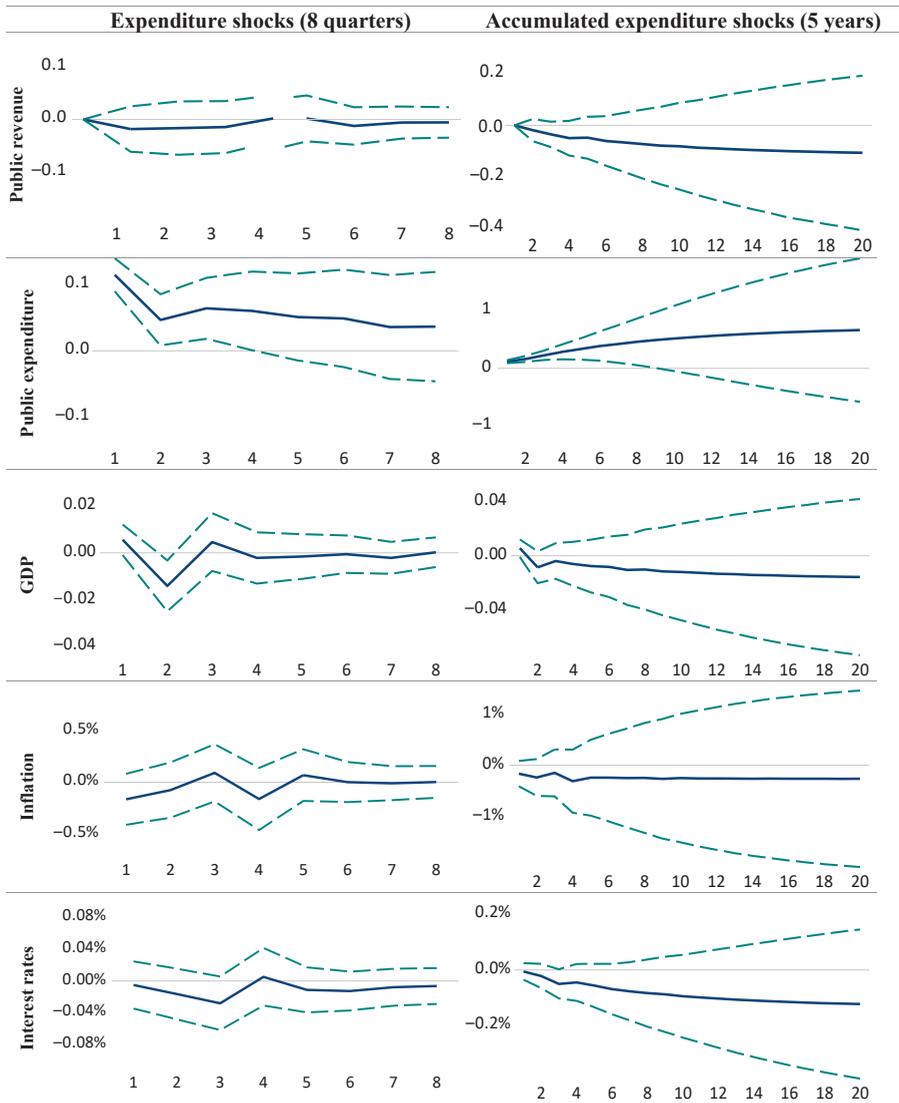
Figure 2.
Dynamic impacts of
public expenditure
shock on the Moroccan
economy (Functions–
Responses)

Note(s): The charts in Figure 2 depict a p.p. response of the main macroeconomic variables to expenditure shocks. The left column is the eight-quarter response. However, the right column is the structural accumulated response of macroeconomic variables to 1% expenditures shocks. The blue line is the impulse response function, while the discontinued green lines represent the 95% confidence intervals

Source(s): Authors' own (EViews 10)

cyclical policy in such circumstances, public spending in developing countries tends to increase in times of expansion and contracts in recession. Empirical research (Stiglitz and Gallagher, 2021; Yamani, 2012) indicates that countries with high public deficits are

oriented by multilateral lenders of last resort (IMF/World Bank) to follow a restrictive pro-cyclical policy when a crisis occurs – exacerbating the economic misery inflicted by the crisis. In a contractionary phase characterized by a deceleration in growth of the Moroccan economy, only an expansionary policy holds promise to revive national output, putting the economy back on track to achieve sustained long-term growth based albeit at the cost of increased deficit spending, ratcheting up the stock of public debt in the short-run, while laying a fiscal edifice for the reduction of the public debt in the long-run.

6. Conclusion

In examining the macroeconomic impacts of fiscal policy shocks in Morocco using the SVAR approach using panel data across five variables between the first quarter of 2009 and the second quarter of 2020, it is requisite to distinguish positive structural shocks to public expenditure from positive structural shocks to budgetary revenue. The results of the study highlight that:

A positive structural shock to public expenditure is likely to have a negative impact on public revenue, on a lagging basis and economic growth, which in turn applies downward pressure on prices and interest rates, given that shock waves sweeping across economic activities, especially in the long run, accumulate spurring reciprocal inverse movements in inflation and interest rates.

Conversely, a positive structural shock to budgetary revenue can have a negative effect on the budgetary expenditure on a lagging basis, but shocks to government revenues have an accumulated negative effect neither on economic growth nor on interest rates. Rather, a structural shock to government revenue can positively but insignificantly impact GDP by minimizing the budget balance gap, which, by reducing government borrowing, may stifle upward movement in real interest rates given the absence of "crowding out." Nonetheless, some inflation obtains cascading up to five-quarters out though then progressively disinflating.

Positive effects on the economic activity of fiscal multipliers exceed the negative effects on the economic activity of tax multipliers.

In light of the strength of fiscal multipliers, this analysis's central finding is that budgetary shocks work to stimulate the Moroccan economy. However, tax policy, used as a stimulus for incentivizing economic activities, suffers from a welter of incongruous provisions, engendering gross tax distortions that cascade over time, in a dynamic that inevitably acts to reduce the positive effects on economic activity from tax cuts (while augmenting the negative effects on economic activity from tax cuts). Perversely, rather than rationalizing the tax code, regulatory "reforms" undertaken in the 1980s only contributed to ponderous complexity. In partial counterpoise, however, digitalization of tax payment mechanisms has improved payment procedures and timeframes.

That private sector corporate tax rates in Morocco remain high compared to those of other emerging countries adversely impacts domestic corporate financial performance. Undue taxation engenders the proliferation of informal activities that erode the tax base. Only a genuine tax reform designed to institute fair taxation that aims to reduce tax rates through tax exemptions can capture tax foregone by inefficiencies and complexities that serve to drive economic actors into the informal economy encourage. An optimized tax system ought to

Quarters	1	4	8	12	16	20
Tax multiplier	0.1221	−0.044	−0.224	−0.37	−0.519	−0.673585
Fiscal multiplier	0.0995	0.4482	0.8384	1.2557	1.6465	2.0055712
Source(s): Authors' calculations						

Table 2.
Evolution of budget multipliers

incentivize private investors to undertake and develop entrepreneurial activities through investment in the formal economy on a national scale.

Economic distortions induced by irrational tax rates underlies the fragility of the Moroccan economy and its acute susceptibility to shocks. Distortions manifest when Moroccan companies turn to exempt activities to cash in on tax breaks resulting in an acute overconcentration in sectorial activities (e.g. construction of economic and social housing, maritime activities, agricultural and export) to the detriment of balanced development across all sectors. Sectorial skewing buoying sub-optimal production factors starve strategic sectors of investment that are value-creative (characteristic of high-value-added sectors). However, identifying a prescription is a higher-order problem than diagnosing the fiscal malaise besetting the Moroccan economy given that reduction in tax rates, at least in the short- and medium-term until long-term sustained growth obtains, will diminish financial resources for the State and, therefore, indirectly create macroeconomic imbalances.

Given these considerations, future research needs to include specific taxes variables in the SVAR model to assess their impact on macroeconomic variables. In addition, alternate economic proxies variables embedded in GDP (e.g. private consumption and aggregate investment) ought to be introduced as separate sub-aggregates to give further in into the outcome of structural fiscal shocks on the economy.

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