INTERNATIONAL MONETARY FUND

IMF Country Report No. 22/275

SAUDI ARABIA

SELECTED ISSUES

August 2022

This paper on Saudi Arabia was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with Saudi Arabia. It is based on the information available at the time it was completed on June 7, 2022.

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International Monetary Fund
Washington, D.C.

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July 14, 2022

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CONTENTS

THE NEED FOR A FISCAL ANCHOR AND POTENTIAL FISCAL RULES IN SAUDI ARABIA[1]

1. Oil price and production developments remain critical to Saudi Arabia's fiscal position. Despite efforts to diversify the economy, oil still accounted for about 40 percent of real GDP in the last few years, down from about 45 percent 10 years ago. The share of the oil economy in nominal GDP varies significantly with oil prices and was about 30 percent in 2021 but is projected to increase to about 40 percent in 2022. The importance of oil for the economy is also reflected in its large share of fiscal revenues. Oil revenues averaged 75 percent of total budget revenues since 2010 with large variations, peaking at 93 percent in 2011 and falling to 53 percent in 2020 as the COVID-19 crises pushed global oil demand down. As a result, fiscal balances have also varied with oil prices, with large surpluses during booms and deficits during times of depressed oil prices.

2. In the past, government spending tended to be procyclical, as it followed the swing in oil prices. Government revenues as well as expenditures are positively correlated with the oil price. Looking back, during the period of higher oil prices of 2003–14, annual expenditure grew by more than 14 percent on average, which compares to less than 1 percent average annual growth during the period of lower oil prices 1991–99. Similarly, it grew by 1½ percent on average during 2015–19 in the period following the sharp oil price drop in 2014 (which includes a 28 percent increase in 2018 as the oil price rebounded).[2] Fiscal balances have varied, with persistent deficits during 1991 through 1999, followed by a period of mostly surpluses, peaking at almost 30 percent of GDP in 2008, and then a sharp deterioration to a deficit of almost 16 percent in 2015.

3. Most recently, government spending did not increase with higher oil prices. Expenditures declined by almost 3½ percent in 2021 even as the oil price increased by more than 66 percent. This was all due to lower capital expenditure and current expenditure essentially staying flat with continued expenditure control in 2022 critical. The 2022 budget does envisage a substantial reduction in expenditure for 2022 and continued restraint for 2023 and 2024 and the authorities have expressed a clear commitment to break past patterns of increasing expenditures as oil revenues rise.

4. This development is the result of an intentional effort to improve fiscal management and reduce the sensitivity to–and dependence on–oil prices. The Saudi authorities have implemented broad fiscal reform in the last several years as part of Vision 2030 with a view to improve fiscal management and reduce oil dependency. Important progress includes (i) non-oil revenue mobilization, in particular the introduction and subsequent increase of VAT rates and revenue administration reforms; (iii) energy price reforms, although gasoline prices were capped in mid-2021; (iii) broad based expenditure rationalization and procurement reform; (iv) a move towards

[1] Prepared by Olivier Basdevant (FAD).

[2] During 2000-2002 expenditure grew by 28 percent in 2000 as the oil price jumped, followed by a sharp deceleration in expenditure growth in 2001-2002 as the oil price declined somewhat.

a Treasury Single Account; (v) more systematic fiscal risk assessment; (vi) improved budget disclosure; and (vi) strengthened debt management.

5. These efforts need to continue to ensure fiscal sustainability and should be combined with a comprehensive grasp of the fiscal stance and a clearly defined fiscal anchor. The institutional coverage needs to be expanded beyond the central government, including the Public Investment Fund (PIF) and the National Development Fund (NDF) to allow proper assessment of the fiscal position. Fiscal policy should furthermore continue to be guided by a medium-term fiscal framework (MTFF) that enhances expenditure prioritization. The authorities have made important progress in this area, and there are also advanced plans for the introduction of a fiscal rule to set expenditure targets, manage surpluses and finance deficits. However, to complement the existing level of debt to GDP ceiling an anchor for fiscal policy would be beneficial to set adequate policy goals.

6. The authorities have been preparing a Fiscal Sustainability Program (FSP), seeking to avoid excessive deficits, while supporting long-term objectives through dedicated public spending (infrastructure to support diversification and broader growth objectives). This paper offers options to support the goals of the FSP. In particular, it argues that an expenditure rule, based on a permanent income hypothesis (PIH) anchor, may best serve the county in reconciling its stabilization and growth objectives in the longer term.

A. Developing and Assessing a Long-Term Fiscal Anchor

Using the PIH as a Fiscal Anchor: Some Considerations

7. Resource-rich countries can use their resource revenue to accumulate a financial wealth that can in turn finance a sustainable non-resource primary fiscal deficit. Since these assets earn a positive rate of return, this allows current and future generations to run primary deficits equivalent to the rate of return on their level of assets. There are several frameworks that can provide anchors, based on policymakers' aversion to risk and/or social preferences (Box 1). For Saudi Arabia, with both significant resources in the ground and a need to diversify away from oil over time, the permanent income hypothesis (PIH) as an anchor for the design of fiscal policy deserves the most focus. In essence, the PIH 's design helps(i) achieve intergenerational equity by leaving future generations a financial wealth to sustain fiscal deficits, (ii) create flexibility throughout the medium-term, by making the adjustment to the long-term anchor gradual, and (iii) develop a prudent fiscal stance, as Saudi Arabia would save resource revenue to accumulate buffers that can be used in "bad" times.[3]

[3] See IMF (2012) for a more detailed discussion of PIH options.

Box 1. Alternative Fiscal Anchors in Resource-Rich Countries (RRC)[1]

A generally accepted principle is that future generations should also derive a benefit from resource wealth as well as the generation(s) living during the period of extraction. Alternatives to an intergenerational wealth sharing approach are possible, however, both more prudent (such as "bird-in-hand") and more profligate (such as "spend-as-you-go"), though both of these have drawbacks.

In the Bird-in-hand (BIH) approach, all resource revenues are invested in financial assets with consumption out of resource wealth equivalent only to the interest earned on accumulated financial wealth (i.e., not based on permanent income concepts). The approach is prudent, since it does not permit bringing forward consumption of (uncertain) future resource revenue and may be an appropriate anchor for some countries for example, if there is high degree of uncertainty about future resource revenues, borrowing constraints, either due to high cost or debt sustainability issues. This is also the case when absorption capacity issues prevent an efficient scale-up in spending. The drawbacks of the BiH are that future generations benefit more than the current and that it introduces some inflexibility to borrow for the financing of productive investment opportunities when they arise. This highly risk-averse approach might be appropriate for countries in an advanced stage of development and with a short resource horizon. Norway is implementing a type of BIH framework by setting a floor on the non-oil primary deficit not to exceed 4 percent of the accumulated financial wealth, which corresponds to the expected long-run real rate of return of its sovereign wealth fund. This model notably helps Norway produce the necessary savings to prepare for the rising costs of its pension system as the population ages.

The Spend-as-you-go (SAYG), on the other hand, is a highly procyclical approach, where the government automatically spends all resource revenues on receipt, to buy goods and services and to make capital investments. As a result, when natural resource revenue increases, the government increases its expenditures; when it decreases the government is forced to cut its expenditures.

The permanent Income Hypothesis (PIH) provides a more flexible anchor than the BIH, while bringing a better guiding instrument for the long run than the SAYG. Under the PIH, the total financial wealth (current wealth and the net present value of future oil revenue) is used to finance either a constant flow of revenue in real term or in real term per capita. Few countries have attempted to apply the PIH framework through a non-resource fiscal balance rule, and often deviated from it. Azerbaijan targeted a non-oil balance consistent with constant consumption out of oil wealth, but eventually moved to an ad-hoc balanced budget. Similarly, Timor-Leste set a floor on non-oil deficit in line with an estimated sustainable income, but subsequently the scaling up public investment led to deviations from the PIH.

If the current fiscal stance differs significantly from the stance consistent with the long-term fiscal anchor from the PIH, the gap will need to be closed with a fiscal adjustment or "transition." In designing the transition, countries can thus deviate for some time from the PIH to reach the long-term anchor after a few years (the so-called modified PIH, or mPIH, outlined in IMF, 2012). These deviations can also enable countries to factor the positive growth impact of the transition, if, for example, it is used to scale up investment to buttress growth prospects (the so-called fiscal sustainability framework, or FSF, see IMF 2012). The analysis of this report is primarily predicated on the mPIH.

[1]This box draws heavily on Basdevant, Hooley and Imamoglu, (2021).

8. The level of economically extractable reserves and oil prices matters greatly in defining the sustainable fiscal space in the long term. As shown in Table 1 and Figure 1 below, it is a critical parameter (the larger the reserves the higher the deficit). Any assumption would need to be based not only on the total reserves available, but also on the share that would be economically feasible to extract. In the case of Saudi Arabia, assuming long-term prospects for the oil market in the context of competition from other producers, including through alternative fuels would be

essential. We have assumed that the assessed reserves of about 260 billion of barrels of oil as of 2021 are exploited (baseline). We have also explored two alternative scenarios (see below). Given that the differences can be quite important, including for the fiscal strategy leading to the long term, it would be essential for the authorities to undertake this type of analysis regularly and to stress test their assumptions to ensure that their fiscal plans remain sustainable under a broad set of assumptions.

9. Uncertainty regarding PIH estimates calls for basing it on prudent assumptions. Moreover, it would be important to also: (i) keep flexibility over the short and medium term so as to not overly constrain fiscal policy, and (ii) revising regularly PIH estimates - either in the context of the preparation of medium-term fiscal framework or in case of large and persistent shocks to oil prices that would warrant a revision of the PIH and the corresponding fiscal framework. For our analysis, we assumed two initial scenarios:

- **A combination of demand/supply shocks**. The oil market would be affected by a demand shock (i.e., declining demand due to climate change reforms) as well as supply shocks (as producers would get knocked out of the market), resulting in higher oil prices. This would, overall, benefit Saudi Arabia, being a country with the lowest production cost. In this scenario, oil revenue, and more generally Saudi Arabia financial wealth, would be considerably higher.

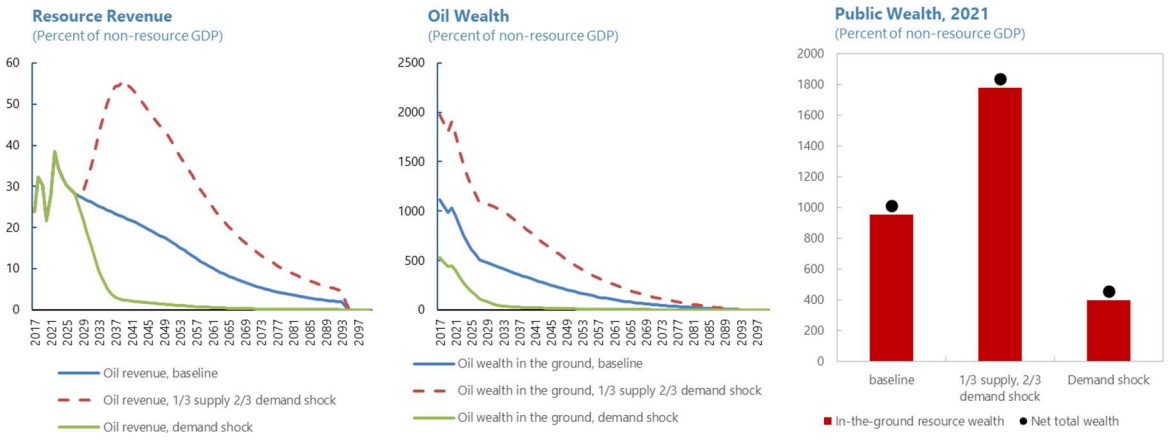
- **Demand shock only**. In this more pessimistic scenario, we assumed only the impact of a demand shock, which would translate into collapsing oil prices. This scenario has to be viewed as a low likelihood illustration of broader cases, as declining oil exports (due to reserves being no longer economically worthwhile to exploit) could generate a similar impact.

Table 1. Saudi Arabia: Key Assumptions Underpinning Resource Revenue Projection

	2021	2022	2023	2024	2025	2026	2027-36	2037-46	2047-56	2057-66	2067-76	2077-86	2087-96
							average over the period, unless otherwise indicated						
							(US$ per barrell, unless otherwise indicated)						
Oil production (millions of barrels per da	9.1	10.6	11.0	11.1	11.2	11.3	11.9	12.8	12.6	10.2	7.9	6.2	3.6
Oil reserves (billions of barrels) 1/	258.3	254.4	250.4	246.3	242.2	238.1	194.8	148.0	102.1	64.8	35.8	13.3	0.0
Oil price, baseline	69.1	106.8	92.6	84.2	78.5	74.7	79.4	96.8	118.1	144.0	175.6	214.1	261.1
Oil price alternative 1, "1/3 Supply – 2/3	69.1	106.8	92.6	84.2	78.5	74.7	120.7	237.4	292.2	356.2	434.2	529.2	645.1
Oil price alternative 2, "Demand"	69.1	106.8	92.6	84.2	78.5	74.7	42.6	9.7	8.5	7.7	7.0	6.3	5.7
							(Percent of non-resource GDP)						
Government oil revenues, baseline	28.1	38.4	34.4	31.9	30.3	29.2	20.2	16.0	12.0	7.5	4.4	2.6	1.2
Government oil revenues, alternative 1 2	28.1	38.4	34.4	31.9	30.3	29.2	29.4	39.2	29.7	18.5	10.9	6.5	3.0
Government oil revenues, alternative 2 2	28.1	38.4	34.4	31.9	30.3	29.2	11.8	1.6	0.9	0.4	0.2	0.1	0.0

Sources: IEA; and IMF staff projections.
1/ End of period data.

Figure 1. Resource Revenue Projections and Financial Wealth



Source: IEA; and IMF staff estimates and projections.

Properties of the Baseline Assumptions for the PIH

The permanent income hypothesis, based on assumptions presented above, could serve as a guiding principle (Table 2). Based on our assumptions, the main findings of using the PIH as a fiscal anchor under the baseline are as follows.

10. With a PIH anchor defined as constant in real terms, and with a transition period, the country would have ample room to meet public spending needs to support growth and diversification objectives. Under this assumption, the non-oil primary balance would decline from about 29 percent of non-resource GDP in 2022, to about 21 percent by 2028. This would be obtained at the cost of a slightly reduced fiscal space in the very long term, but with the benefit of a higher growth potential, and thus a higher GDP level that would benefit all future generations.[4] In contrast the PIH defined as a constant share of non-resource GDP would likely impose a too sharp adjustment, especially in light of the very large resources available, and the longer-lasting nature of Saudi Arabia's oil revenue (Box 2). Another option, should the authorities find it more in line with their own objectives, is to target a constant annuity per capita. However, reaching this norm would likely require a longer transition period than the one considered under the baseline (6 years, corresponding to the horizon of the IMF baseline projections and incorporating the fiscal consolidation efforts ongoing since 2016 and well in train for those years) as it would also imply a much larger adjustment than the one considered under our baseline.

11. The implementation of a fiscal rule can still be possible during that period of transition and would still be consistent with the transition to a PIH norm. In the case of the alternative scenarios, there are two motivations for the transition period to be different. In the demand shock one, the main reason is to preserve–to the extent possible–a gradual adjustment. The much-reduced

[4] As noted in Table 2, the adjustment would imply a transition of 6 years under the baseline and 15 years under the alternative scenarios.

fiscal space in this scenario would equally imply a much larger fiscal adjustment down the road. However, Saudi Arabia would still be expected to have ample resources to adjust gradually and avoid a very large annual adjustment that would be detrimental to growth. In the supply and demand scenario, the rationale for a longer adjustment period would be quite different: the fiscal space available would be so much larger that the government would have ample room to run larger deficits in the short- and medium-term, which could be helpful to meet spending needs for growth and diversification. Thus, the adjustment to the PIH norm would start only after that period of "scaled up" spending, which, consequently, would lead to a longer transition period than in the baseline.

12. While the PIH norm of a constant annuity in real term would imply a long-lasting fiscal prudence, most of the adjustment effort could be delivered by efforts already planned by the authorities through 2028. Beyond the medium-term, the constant annuity would imply a continued and gradual adjustment, of about ½ percentage point of non-resource GDP annually, slowly converging asymptotically towards 0. The advantage of a PIH norm with a deficit constant in real terms (vs. constant in percent of non-resource GDP), is that it allows for a much higher deficit during the transition period, thus potentially enabling the financing of development and diversification spending. The cost of such an approach though is that the deficit would need to be reduced after the transition period. Beyond 2028, i.e., beyond the horizon of fiscal adjustment plans discussed in the Staff Report, the adjustment could largely come from spending restraint and/or continued efforts in mobilizing domestic revenue. As such, while a sustained effort would be needed, it could be achievable without jeopardizing growth prospects.

Table 2. Saudi Arabia: Key Assumptions for the Computation of the Fiscal Anchor

	Baseline	Alternative 1/
Real sector	(Percent)	
Real non-resource GDP growth	2.8	2.8
Nominal non-resource GDP growth	4.8	4.8
Population growth	1.0	1.0
GDP deflator inflation	2.0	2.0
US GDP deflator inflation	2.0	2.0
Real interest rate	3.8	3.8
Nominal interest rate	5.8	5.8
Interest - GDP growth differential	1.0	1.0
Desired deposit and debt ratios		
Steady state government deposit/GDP ratio	17.6	17.6
Central government minimum gross debt ratio	20.0	20.0
	(Years)	
Transition period before sustainability anchor reached 2	6.0	15.0

Sources: IMF staff estimates.

1/ Assumptions common to both alternative scenarios

2/ The transition period is greater in both alternative scenarios than in the baseline. In the baseline, the duration of the transition is 6 years, which corresponds to the horizon of staff's baseline projections for the Article IV and incorporate the fiscal consolidation efforts under way since 2016. As such, during this period the potential ceiling given by the PIH would not be constraining, as the authorities would have time to gradually adjust to a level of the non-oil deficit broadly consistent with the PIH norm. In the case of the two alternative scenarios, the transition is much longer (15 years). In the demand shock scenario it simply reflects the fact that the adjustment to reach the PIH would be much larger, and, as a result, would require more time. In the supply and demand shock scenario, it would reflect that the authorities would have a lot more time to adjust, and thus could run higher deficits and support diversification needs further, and start their fiscal adjustment to the PIH later than in the baseline.

Box 2. Alternatives Measures of the PIH[1]

How to compute the permanent income hypothesis? The total financial wealth of the country, W, earn a return given by the nominal interest rate r, which can be used to finance a primary deficit (PD, the permanent income).

There are typically three alternative approaches to the PIH:

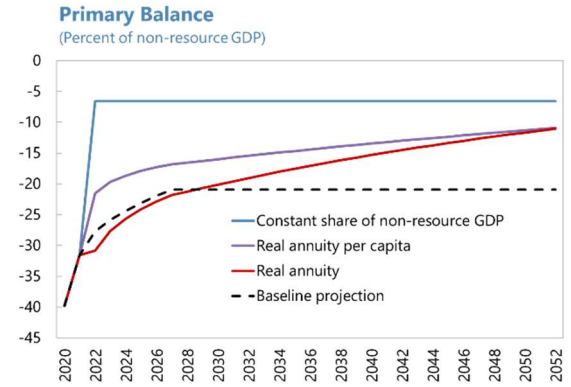
$$PD_t = (r - \gamma)W_t$$

With the following three alternatives for the parameter γ:

- $\gamma = \pi$, where π is the inflation rate. In this case the government only consumes the fraction $(r - \pi)W_t$ of the return, and leaves the residual, πW_t, to accumulate more wealth: $W_{t+1} = (1 + \pi)W_t$. As a result, financial wealth grows with the inflation rate and is constant in real terms, and, by extension, so does the primary deficit.

- $\gamma = g$, where g is the growth rate of the non-resource GDP. Like the mechanism described above, this option leaves both wealth and the primary balance constant in percent of non-resource GDP.

- $\gamma = \pi + n$, where π is the inflation rate and n the population growth rate. This option would leave wealth and the primary balance constant in real terms per capita.



Sources: IMF staff estimates and projections.

Applying these alternative approaches to the PIH from 2022 to Saudi Arabia would give the following outcomes:

[1] See Basdevant, Hooley, and Imamoglu, (2021).

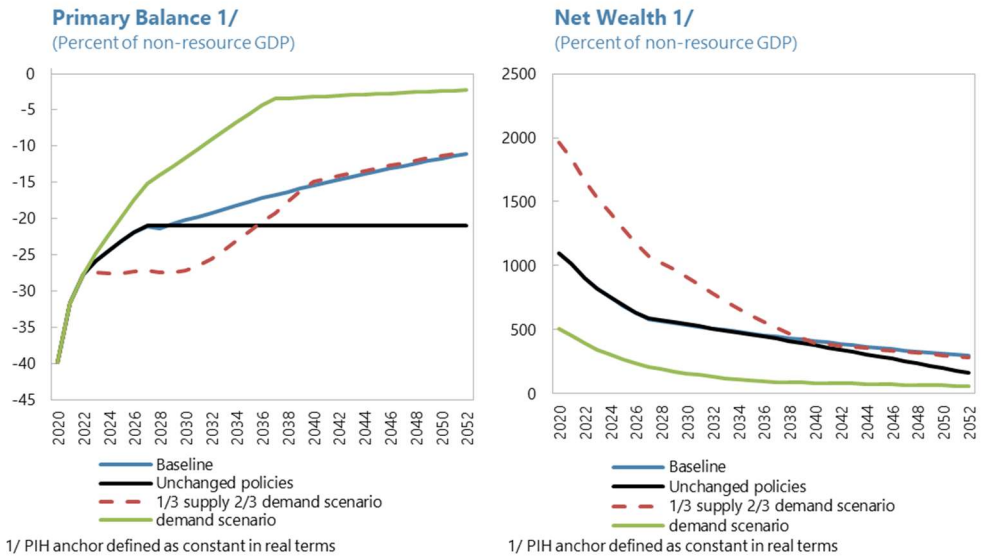
Stress-Testing the Baseline Assumptions

The underpinning methodology and assumptions on parameters are critical to guide the authorities in assessing their fiscal space throughout the long term. Overall, risks on assumptions underpinning the PIH, including growth and the implied fiscal adjustment, require careful analysis. In the context of their medium-term fiscal planning, the authorities would need to regularly assess how the underpinning PIH may have changed, and if potential changes would warrant a revision to the PIH.

13. Risks on the fiscal adjustment should also be factored in, as Saudi Arabia would still contemplate a large fiscal adjustment, albeit gradual. Thus, any fiscal rule would need to be crafted to accommodate both a transition period and a steady state once the transition has ended. In the examples of Figure 2, a transition of 6 years is assumed (15 in the two alternative scenarios), to create space for a gradual fiscal adjustment of about 1 percent of non-resource GDP annually (for achieving a PIH anchor of a constant deficit in percent of non-resource GDP) or of only ½ percent to achieve a PIH anchor that would keep the deficit constant in real terms (and thus declining in percent of non-resource GDP). Making the adjustment gradual would leave ample fiscal space to support public investment in the short and medium term and would also leave time to design supporting fiscal reforms (e.g., non-resource revenue mobilization or expenditure rationalization) to

reduce the non-resource deficit. However, one may also want to factor scenarios where the adjustment would either not be fully implemented or be implemented as intended but not delivering the expected savings.

Figure 2. A Modified PIH with a Transition Period



Source: IMF staff estimates and projections.

14. Uncertainty about the long-term warrant regular re-assessments of the PIH. As shown in Figure 2, different assumptions regarding the long term may lead to very different policy recommendations. When designing a medium-term fiscal strategy, this uncertainty would need to be factored in. First, underpinning parameters (e.g., long-term oil prices) could be based on prudent assumptions. By erring on the cautious side, the government would help reduce the risk building-up deficits that could later-on be assessed as excessive. Second, any fiscal strategy, especially when supported by a fiscal rule, would need to allow for the use of buffers, and, consequently, outlining what would be the fiscal response to sudden shocks. In particular, when shocks are deemed temporary and/or mild, the use of buffers (either as liquid assets or a low public debt that would allow rapid and low-cost market access), would help the government smooth the shock and maintain its spending plans. Third, while buffers can help, they would not be the best option for large and persistent shocks. In that case, the proper strategy would be to reassess the PIH. This is particularly true if following the pre-shock fiscal strategy would imply a fiscal stance inconsistent with the authorities' sustainability objectives.

15. A critical assumption made is on the interest rate-growth differential, the so-called r–g. The principle is fairly simple: the higher the interest rate, the higher the permanent deficit that can be financed by the returns on accumulated financial wealth. Conversely, the higher the GDP growth rate, the lower the deficit. In principle, engineering a higher growth rate in the long term could require a boost in public investment (infrastructure and human capital). In turn, this investment

would translate into a higher income for future generations. In terms of risk and stress-testing, it would be critical as the authorities' fiscal strategy is implemented, to regularly check to what extent public spending is efficient in supporting growth and diversification. A significant risk would be where public spending efficiency would not meet these goals, which could conversely affect the assessment of the sustainable deficit, in a context where non-resource growth could be lower than expected. There could be some upsides risks as well whereby high-quality spending would not only improve the economy's growth potential but would also serve as a catalyst for private investment, including foreign, which could further enhance Saudi Arabia's growth potential.

16. While the current medium-term framework is broadly consistent with the PIH norm under the baseline scenario, it also underscores the need for fiscal planning beyond the medium-term. Under the "unchanged policies" scenario (Figure 2), we assumed that beyond the medium term, policies would remain unchanged, and, as a result, the deficit would remain constant. This scenario would imply a steady deviation from the PIH, which would eventually threaten fiscal sustainability. Thus, while there are commendable measures already planned for the medium term, care should be given to build on these efforts to maintain the momentum of gradually adjusting to a more sustainable fiscal stance per the PIH guidance.

B. Fiscal Rules to Support the Long-Term Anchor

General Considerations When Designing Fiscal Rules, Notably for Resource-Rich Countries

Key lessons in this section:

- Fiscal sustainability and rules need to be articulated around an objective set in terms of ***net financial wealth*** of the public sector.
- Rules need to be ***flexible***: preserve counter-cyclical space; define escape clauses.
- ***Sovereign wealth funds*** need to be part of the design of the fiscal rules.
- ***Supporting institutions*** are essential: fiscal transparency, independent oversight.

17. Fiscal rules have a potential to prevent excessive deficits, smooth shocks, and address intergenerational equity challenges (Box 2). All resource-rich countries face the difficult challenge of balancing the need for spending now high levels of resource revenue against saving it for later i.e., for future generations and to deal with commodity price shocks. This balancing act is further complicated by potential political economy pressures translating into spending pressures (in bad times the pressure may come from a desire to support the economy, but in good times also where the population may feel unfair that the government decides to save some revenue at a time where there is no perceived need to save). These challenges could be addressed in multiple ways, and fiscal rules have often been considered/used, because of the fiscal discipline they bring, even though the early experience appears to be mixed (see IMF. 2015). To be successful, fiscal rules often need to rely on a broader set of fiscal institutions. Indeed, numerical fiscal rules can help achieve fiscal discipline and a desired goal of how much to save/spend from resource revenue, when they are supported by strong institutions, notably adequate budget planning and monitoring, strong public financial management, and broad political and social support for their ultimate objectives (IMF, 2012, 2015).

Box 3. Elements for Effective Fiscal Rules[1]

Fiscal rules constraint discretionary options for policymakers, to foster fiscal responsibility. Fiscal rules are usually numerical, in the sense that they set limits on budgetary aggregates (e.g., debt and/or deficit levels). These constraints are designed to be of a permanent nature.

Rules ought to be simple to provide political support, and need to avoid undue constraints, thus preserving flexibility for counter-cyclical policies. While numerical rules can foster fiscal discipline, they have also been criticized for unduly constraining other fiscal objectives (e.g., achieving growth objectives through increases in public investment). Following the global financial crisis of 2008, countries have established new rules or overhauled existing ones leading to the so-called second-generation fiscal rules, which typically include expenditure rules and/or fiscal effort rules. These rules are crafted to target objectives that are more under the control of fiscal authorities (for example, by focusing on cyclically adjusted fiscal balances).

Buffers and escape clauses reinforce rules' effectiveness and credibility, as the likelihood of triggering them is much higher in resource-rich countries. Care could be given to developing buffers to caution tail risks (i.e., very large oil revenue shocks) and avoid abrupt adjustment that could otherwise be unnecessarily disruptive. However, most escape clauses are primarily about triggers that would warrant the suspension of the rules, and the process to return to their application. Equally important is to have a clear strategy for reinstating the rule after its suspension. Additionally, escape clauses could include provisions to clarify the use of buffers, as well as to rebuild them after an adjustment period following a negative oil price shock.

Fiscal rules can benefit from transparency and independent oversight (IMF, 2013) and adequate public financial management systems. Engagement with the civil society can enhance fiscal transparency and encourage compliance with fiscal rules. The objectives of the fiscal rules must be widely understood and accepted by the public so that a political and social consensus can be reached. The publication of fiscal reports on rules implementation would encourage compliance, as it helps raise public awareness of how fiscal policy adjusts towards meeting the goals underpinning the rules.

[1] See Eyraud et al. (2018), and IMF (2009, 2012, and 2013).

18. Many RRCs have had experiences of fiscal rules being short-lived. One key lesson from these experiences is that fiscal rules ought to be set in a broader fiscal strategy context (IMF, 2009). In particular, the functioning of fiscal rules need to be robust to shocks (both in good times by limiting excessive deficits, and in bad times to avoid undesirable spending cuts or abrupt revenue measures). To do so, rules would typically need to build on well-defined escape clauses, which would clarify when a rule can be suspended, and under which procedure would it be reinstated.[5] This is particularly important in resource-rich countries, which, by nature, are subject to large swings in their commodity revenue. Often, rules would be either abandoned or significantly revised following a large commodity price shock (Russia in 2014, Ecuador following the global financial crisis).

19. Fiscal rules in RRC need to focus on long-term fiscal sustainability, notably once natural resources are exhausted, in terms of net financial assets. While a debt rule can achieve the goal of fiscal sustainability, RRC would need to have a more comprehensive approach by

[5] See IMF note on how to approach the design of escape clauses: https://www.imf.org/-/media/Files/Publications/covid19-special-notes/enspecial-series-on-covid19fiscal-rules-escape-clauses-and-large-shocks.ashx.

anchoring fiscal policy on net financial assets (IMF, 2012). This is essential to reconcile the objectives of fiscal sustainability with that of intergenerational equity. Furthermore, assessing the net financial assets positions would enable a design in the rule that would be fully consistent with the overall fiscal strategy, which would typically target, *inter alia*, the non-resource primary balance.

20. Sovereign Wealth Funds (SWF) should be used for stabilization and intergeneration equity.[6] While not necessarily part of fiscal rules per say, SWF are an integral part of the rules guiding budgets, especially in terms of resource-revenue sharing between the funds and the budget. In the aftermath of recent oil price collapses, commodity exporters that had buffers in their SWF used them to smooth the adjustment and avoid exchange rate pressures (Algeria, Azerbaijan, Iran, Kazakhstan, Kuwait, Saudi Arabia, UAE – World Bank, 2015). However, the ad-hoc use of SWF, have, in some cases created conflicts between the stabilization need and the intended investment for future generations. Overall, SWF are most helpful when they are set up as financing instruments funding the budget either for stabilization or long-term financing purposes (IMF, 2015), and have no spending authorities (to avoid the creation of extra-budgetary funds that would perform quasi-fiscal operations without proper oversight from fiscal authorities).

Options for Saudi Arabia Fiscal Rules

Key lessons in this section:

- ***A price smoothing rule may not be effective*** in achieving both objectives of preserving excessive volatility while creating adequate space for spending needs to meet diversification and growth objectives.
- ***An expenditure rule could provide adequate guidance***, provided that it is anchored on a well-defined long-term anchor provided by the PIH.
- ***Under the baseline scenario a cap on real expenditure growth could be set to 1 ½ percent annually (after 2028) without further revenue measures, and about 2 percent annually with revenue measures.***

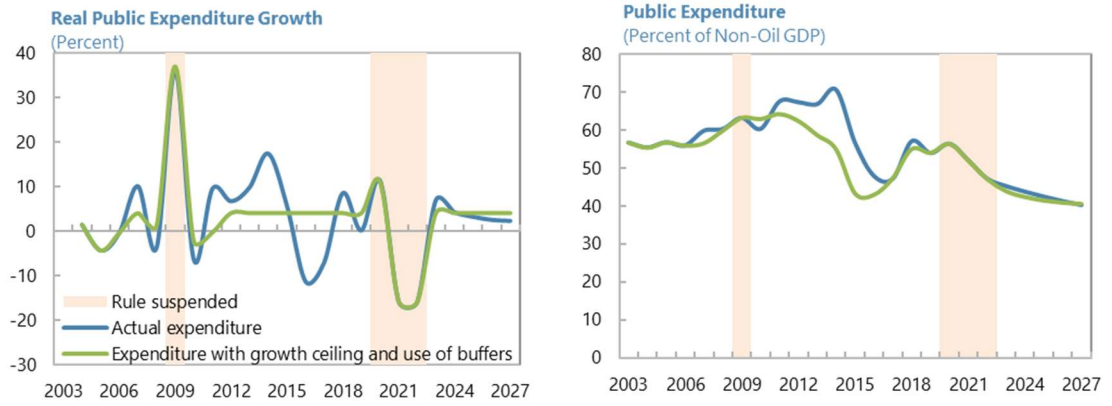
21. The implementation of the PIH might be further strengthened with a price smoothing rule, though such a rule may also exacerbate procyclicality in some circumstances. In case of a sudden and persistent drop in oil prices, a revenue smoothing rule based on past prices would imply maintaining the previous level of spending - when starting an adjustment to gradually reduce spending could be more appropriate. Price smoothing rules are not well suited—on their own—for commodity exporters given the highly uncertain behavior of oil prices (IMF, 2015). These are subject to large and persistent shocks that create significant challenges (adjustment for downturn, resisting excessive spending during upturns). The procyclicality of a price-smoothing rule could also be

[6] Many RRCs set up SWFs, to achieve objectives in terms of stabilization (Mexico), investment for future generations (Botswana, Iran, Norway, Saudi Arabia), or both (Russia).

mitigated by a companion rule e.g., defining a floor on net financial assets, to prevent excessive deficits during downturns.

22. An expenditure rule, anchored on a non-resource primary balance goal, should serve Saudi Arabia stabilization and growth objectives. To delink spending from resource revenue, the implementation of the PIH norm after a transition period, supported by two main numerical rules (i) a ceiling on expenditure growth and (ii) a target on net financial assets, which could be strengthened through a debt brake, would be the most relevant option. Such an expenditure rule would not only achieve the goal of providing counter-cyclical support and flexibility but would also support the joint objective of strengthening the PFM system through the development of a medium-term fiscal/expenditure frameworks (MTFF/MTEF). In a comparison of counter-factual exercises shows how an expenditure rule could help smooth spending throughout a prolonged period (Figure 3). While a revenue smoothing rule would have still induced relatively large swings, an expenditure growth rule (cap at 4 percent which is what was achieved over that period) would have better stabilized spending with a similar outcome.[7] In this counter-factual exercise, we assumed that an expenditure rule could have capped real expenditure growth at 4 percent, which is, roughly, the average observed over the period considered (2003-21). The property of such a spending rule is illustrated below, providing a smoother path of spending - with a similar outcome in terms of level of spending achieved towards the end of the sample. Note however, that by construction this exercise is purely counter-factual. As such, the recommendation of capping expenditure growth at 4 percent cannot be seen as a recommendation for the future, as it would heavily depend on projections of future parameters and would warrant caution in determining the ceiling.

Figure 3. Counterfactual Illustration of an Expenditure Rule



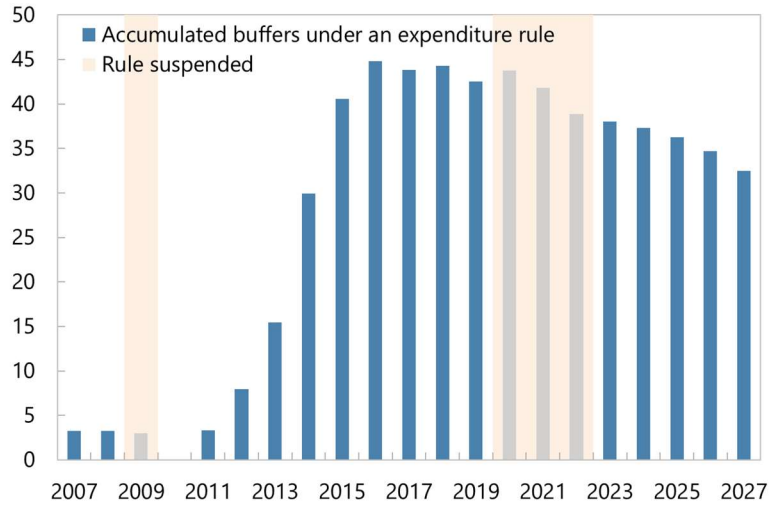
Sources: IMF staff estimates.

[7] Note that in this counter-factual exercise, the real expenditure growth would have been capped at 4 percent during both upward and downward changes in oil prices, except for periods where oil prices were so large that the rule would have been suspended anyway, which we illustrated by keeping spending at its actual level (and not the one recommended by the expenditure or revenue rules).

23. An expenditure rule could also adequately support the building of buffers. To be effective, the expenditure rule would need to be supported by adequate financial buffers. In the illustrative example provided above, stabilizing spending would also generate significant buffers (about 50 percent of non-resource GDP in a counter factual exercise), which would subsequently help guard the budget against cyclical fluctuations. This level of buffer was deducted from the difference between the actual spending over the period 2003–21, compared to that of expenditure implemented with a cap of 4 percent growth in real terms (as discussed in the previous paragraph). As such, this illustration of fiscal buffers can only be seen as indicative, and not a projection (or recommendation) of the required level of buffers in the future. The calibration of buffers would still depend on various factors, beginning with social preferences on risk-taking (Basdevant, Hooley, and Imamoglu, 2021). A comprehensive strategy would also need to factor when buffers are used, and when the budget needs to adjust (in case of large and persistent shocks).

Figure 4. Accumulated Under an Expenditure Rule: A Counter-Factual Illustration

(Percent of non-ressource GDP)

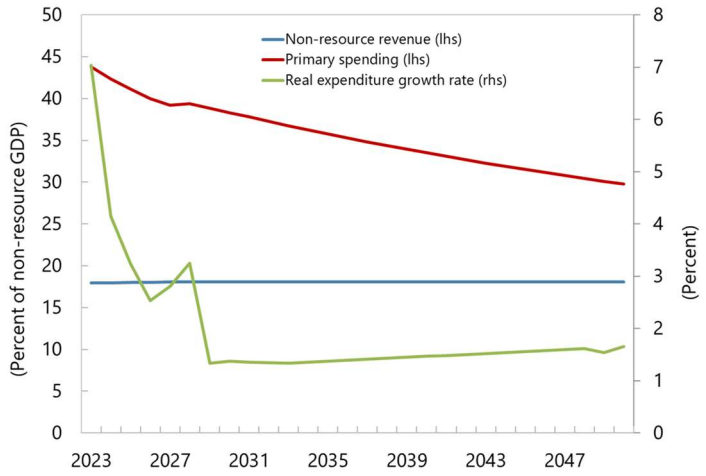


Sources: IMF staff estimates.

24. Looking forward, the authorities may want to consider a cap on real expenditure growth of 1½ percent annually, to implement the PIH anchor after the transition period. Assuming that, under the baseline, a PIH norm is implemented after a period of 6 years, the corresponding trends for revenue and expenditure would be depicted in Figure 5. Basically, it assumes that non-resource revenue would remain constant as a share of non-resource GDP, while expenditure would gradually decline, also as a share of non-resource GDP. However, this would not necessarily mean complex or painful fiscal measures to implement. It could be achieved primarily

expenditure at 1½ percent (Figure 5). With the assumed non-resource GDP growth rate of 2.8 percent (Table 2), the adjustment needed would be achieved. Further, a relative decline in expenditure could also be adequately mitigated by strengthening public expenditure management, to ensure that the quality of public spending increases over time.

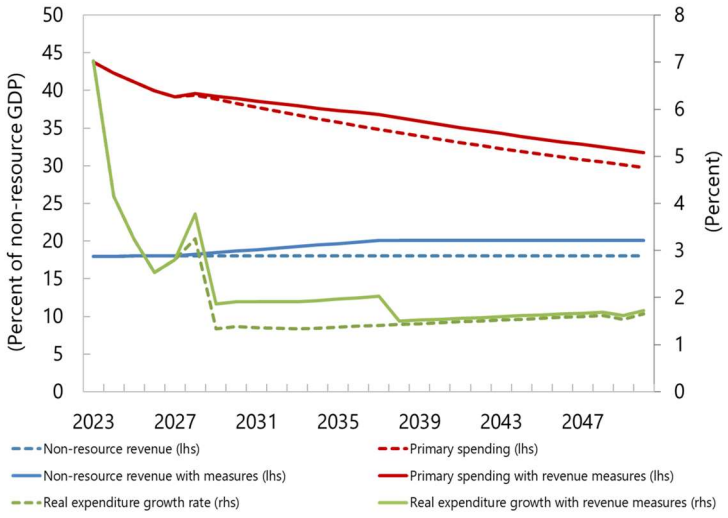
Figure 5. Expenditure Growth Consistent with the PIH



Sources: IMF staff projections.

25. The cap to get the adjustment necessary would also be lower if accompanied by additional revenue measures (Figure 6). Despite strong revenue measures taken recently (with the VAT rate tripling from 5 to 15 percent), Saudi Arabia is expected throughout the medium term, to have a tax-to-GDP ratio stable at about 14 percent by 2027 under the IMF's baseline projections. While significant, this would still leave Saudi Arabia way below the levels reached by emerging economies (about 18 percent of GDP) or the G20 (about 22 percent of GDP).[8] Thus, there would still be potential for Saudi Arabia to mobilize non-oil tax revenue over the long term. In the simulations below, we assumed that total non-oil revenue would increase gradually, over 10 years, from 18 percent of non-oil GDP in 2027, to 20 percent in 2037, reflecting a mix of tax policy and tax administration measures. The implications for the expenditure rule would be a less constraining path, where real expenditure growth could be roughly capped at 2 percent until the new revenue level is reached (Figure 6).

Figure 6. Expenditure Growth with Revenue Measures



Sources: IMF staff projections.

[8] Sources: IMF Fiscal Affairs Department Assessment of Revenue Tool, 2022.

Dealing with Shocks: How to Articulate the Rule Around Unforeseen Events

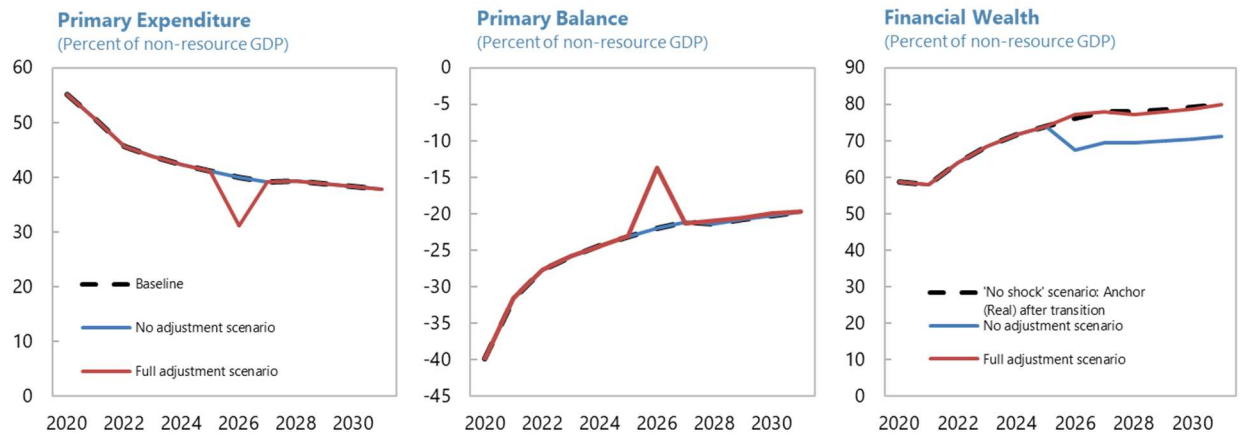
Key lessons in this section:

- **Escape clauses are essential in dealing with shocks** (to have room for counter-cyclical interventions, to revisit the expenditure cap ceiling when needed).
- **The rule needs to be able to accommodate both positive and negative shocks**.

26. Dealing with shocks: the principles underlying the cap on expenditure. When dealing with shocks, the rule would face, potentially two different situations. For positive shocks (notably a positive surprise on oil revenue), the recommendation would be fairly straightforward, as the expenditure growth cap would be applied to limit any excessive growth of spending. In case of a negative shock the problem would be potentially more complex. A one-off shock could for example warrant the continuation of the execution of the spending plan (as defined in the medium-term fiscal strategy). The economy may also need further support (beyond automatic fiscal stabilizers) as was the case during the COVID19 pandemic. Such support may lead to an increase in spending contradicting the rule ceiling, which would require having an escape clause defined in the rule.

27. Opting for smoothing temporary shocks (either by keeping spending plans unchanged or providing counter-cyclical stimulus) may still create medium-term financing challenges as it would imply depleting the country's financial wealth. In other words, maintaining spending plans or going further through the provision of a stimulus, could raise the need for greater adjustment later, with the view of rebuilding the pre-shock financial wealth of the country. We modeled a negative shock on oil prices in 2026 (a 30 percent reduction compared to the baseline), leading to a revenue loss of 6 percent of non-resource GDP (Figure 7). Keeping the spending plan unchanged would lead to a permanent decline in financial wealth of about 6 percent of non-resource GDP. As a result, the total net wealth available to finance future deficit would be reduced by this amount. However, according to staff estimates, Saudi Arabia would still have a total wealth of about 640 percent of non-resource GDP by 2026, so even a shock like this would only have a marginal impact on the long term. Further, negative shocks could also be expected to be counter-balanced by more positive ones in the future, thus helping the rebuilding of the financial wealth as envisaged under the PIH. Nevertheless, this example stresses how shocks would need to be factored in, not just for their immediate impact but also for the long-term fiscal strategy. In other words, this means assessing each time a large shock occurs, even if temporary, if it warrants a revision of the underlying PIH benchmark, and consequently the cap on real expenditure growth, or if it can be fully absorbed by using available buffers.

Figure 7. Example of a Temporary Shock



Source: IMF staff estimates and projections.

28. The expenditure rule could thus be strengthened by setting an explicit target on fiscal buffers. As discussed before, any fiscal rule would be challenged by negative and large shocks on oil prices. Some instruments such as debt-brakes can provide adequate flexibility, while also taking into consideration fiscal sustainability. Specifically, the definition of buffers would need to be fully incorporated in the fiscal rule:

- The equivalent of a **debt brake could, for example, set a floor on net financial assets of the government (NFA)**, so that when it falls below a threshold, automatic adjustment measures kick in to reduce spending and increase NFA. Ultimately it would largely depend on social aversion to risk. However, if we take as a benchmark the volatility of oil revenue in percentage of non-resource GDP, over the past ten years, a standard deviation of about 25 percent of GDP is noted (Table 3). In other words, assuming a medium-term framework of 3 years, adequate buffers to guard against oil revenue fluctuations could amount to 75 percent of non-resource GDP. Following a negative shock and a depletion of net financial assets, a rule on the floor of net financial assets could help further restrain expenditure growth, to ensure that over subsequent years buffers would be rebuilt.

- Further, **buffers would not necessarily need to be kept as accumulated financial assets**, especially at a time when the country is still recovering from a large shock. Keeping gross public debt low would preserve a capacity to borrow, thus providing the country with rapid access to financial markets. However, care would need to be given to the rationale of using debt instrument at high interest rates, while financial assets could be used at a lower cost.

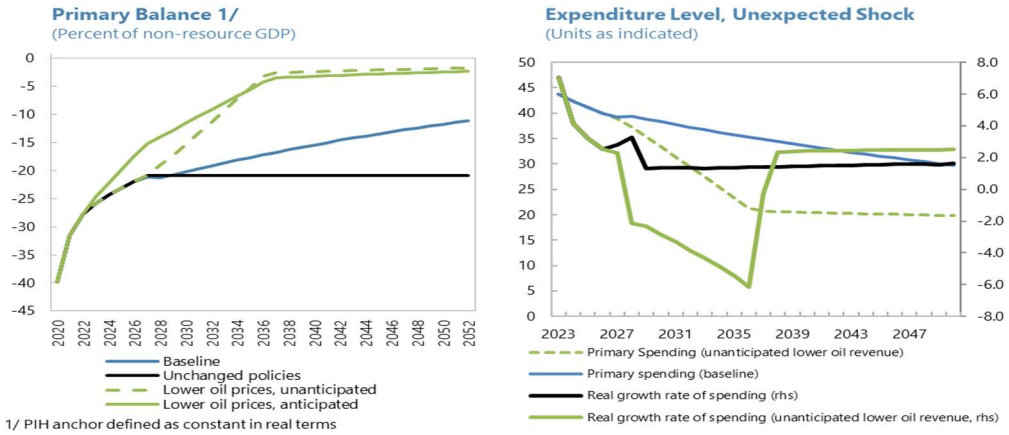
Table 3. Saudi Arabia: Calibration of Fiscal Buffers

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Average	Std. Dev.
	(Millions of Riyals)											(Unit)	
Oil revenue	1,034	1,145	1,035	913	446	334	436	611	594	413	562	…	…
Nominal non-resource GDP	1,223	1,362	1,488	1,615	1,768	1,797	1,824	1,891	1,964	1,908	1,998	…	…
	(Percent of non-resource GDP)												
Oil revenue	84.5	84.1	69.6	56.5	25.3	18.6	23.9	32.3	30.3	21.6	28.1	43.2	24.4

Sources: IMF staff estimates.

29. In case of persistent and large shocks on oil revenue, the parameters of the rule and the underpinning PIH could be revisited. Pending an eventual reassessment of the underlying PIH norm, an escape clause could also be triggered to suspend the application of the rule in case of a large and persistent shock. While a cap on expenditure growth could typically work under "normal" circumstances, it would not be sufficient to deal with shocks on oil prices that are very large and persistent. Unsurprisingly, with an unexpected shock on oil prices of the magnitude envisaged in the "demand" shock scenario, the country would have to implement a large–and relatively front-loaded–fiscal adjustment (Figure 8). Indeed, it would imply (after a transition period of about 6 years) that expenditure growth would need to be capped at -4 percent annually to ensure that the non-resource fiscal balance would adjust to a considerably reduced fiscal space. In short, triggering an escape clause in that case would not only be needed for potential counter-cyclical support, but mostly to ensure that the authorities could (i) reassess the PIH norm, (ii), reassess the transition period needed to achieve the PIH, and (iii) ensure that the cap on expenditure growth would be consistent with fiscal sustainability

Figure 8. Example of a Permanent and Large Shock



1/ PIH anchor defined as constant in real terms

Source: IMF staff estimates and projections.

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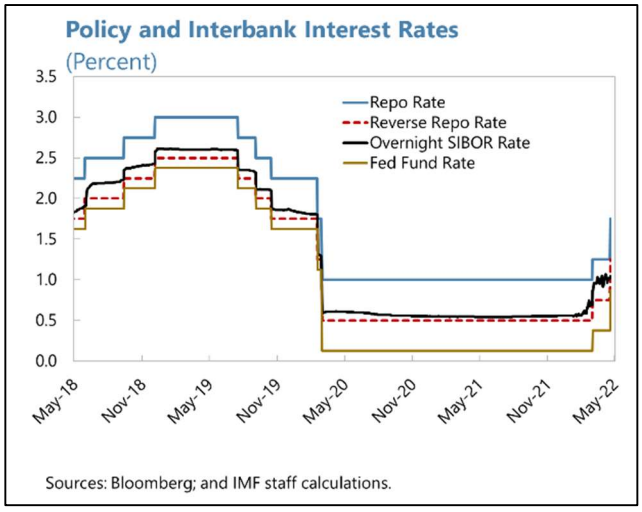
IMPACT OF U.S. MONETARY POLICY ON THE SAUDI ECONOMY AND BANKING SECTOR[1]

Central bank policy rates in Saudi Arabia follow U.S. policy rates given the pegged exchange rate regime. This can have implications for the overall economy and in particular the banking sector. This paper provides empirical evidence that spillovers from U.S. monetary policy to non-oil GDP growth and banking sector's performance depend on the level of oil prices. We find that U.S monetary policy tightening is likely to affect banks' profitability positively without hampering credit growth and asset quality. Overall, the results indicate that the ongoing Fed tightening cycle is not expected to adversely impact Saudi Arabia's economy given the current environment of high oil prices and liquidity.

A. Introduction

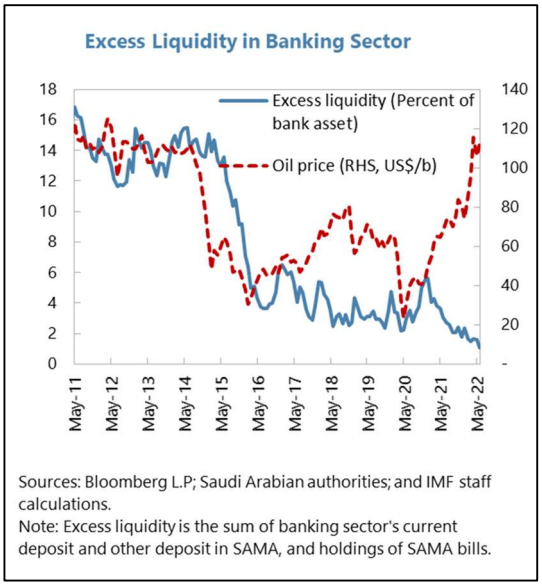
1. The primary objective of monetary policy in Saudi Arabia is to ensure price and exchange rate stability. Monetary policy in the Kingdom is anchored by the fixed exchange rate of the Saudi Riyal to the U.S. Dollar. The Saudi Central Bank (SAMA) remains committed to the nominal anchor as its monetary policy objective is to maintain monetary and financial stability to support economic growth.

2. Monetary policy rates in Saudi Arabia tend to move in line with the federal funds rate. With open capital accounts and a pegged exchange rate regime, monetary policymakers are faced with the "Mundellian Trilemma" – i.e., SAMA monetary policy cannot substantially deviate from the monetary policy stance in the U.S. From an operational viewpoint, SAMA's monetary policy toolkit includes policy rates, statutory reserve requirements, open market operations, direct deposits, and foreign exchange swaps. The policy rate corridor is comprised of the repo rate (the upper bound) and the reserve repo rate (the lower bound). SAMA determines the range of domestic interest rates by setting the repo and reverse repo rates relative to US policy rates. Within this range, the money market interest rate, i.e., the benchmark Overnight Saudi Inter-Bank Offered Rate (SAIBOR) changes accordingly.



[1] Prepared by Nordine Abidi and Fozan Fareed with data support from Tian Zhang (all MCD).

3. Historically, oil-price driven liquidity fluctuations represented the main challenge to SAMA's monetary policy. Taking the broad definition of "*liquidity*" as the subset of SAMA domestic currency liabilities vis-à-vis commercial banks that is readily available for payments purposes (essentially commercial bank excess reserves at SAMA), large external and fiscal surpluses during periods of high oil prices have generally been associated with increases in liquidity, and reversals during times of low oil prices. As a matter of fact, there is a clear relationship between Saudi Arabia's excess reserve ratio and real oil prices. The real oil price was stable around $25/barrel from 1993 to the early 2000s. It then increased in 2003 and has stayed above $40/barrel since 2004. Following an almost identical path, excess liquidity in Saudi Arabia was low through most of the 1990s and early 2000s and went up in 2004 and has stayed high since.



Sources: Bloomberg L.P; Saudi Arabian authorities; and IMF staff calculations.
Note: Excess liquidity is the sum of banking sector's current deposit and other deposit in SAMA, and holdings of SAMA bills.

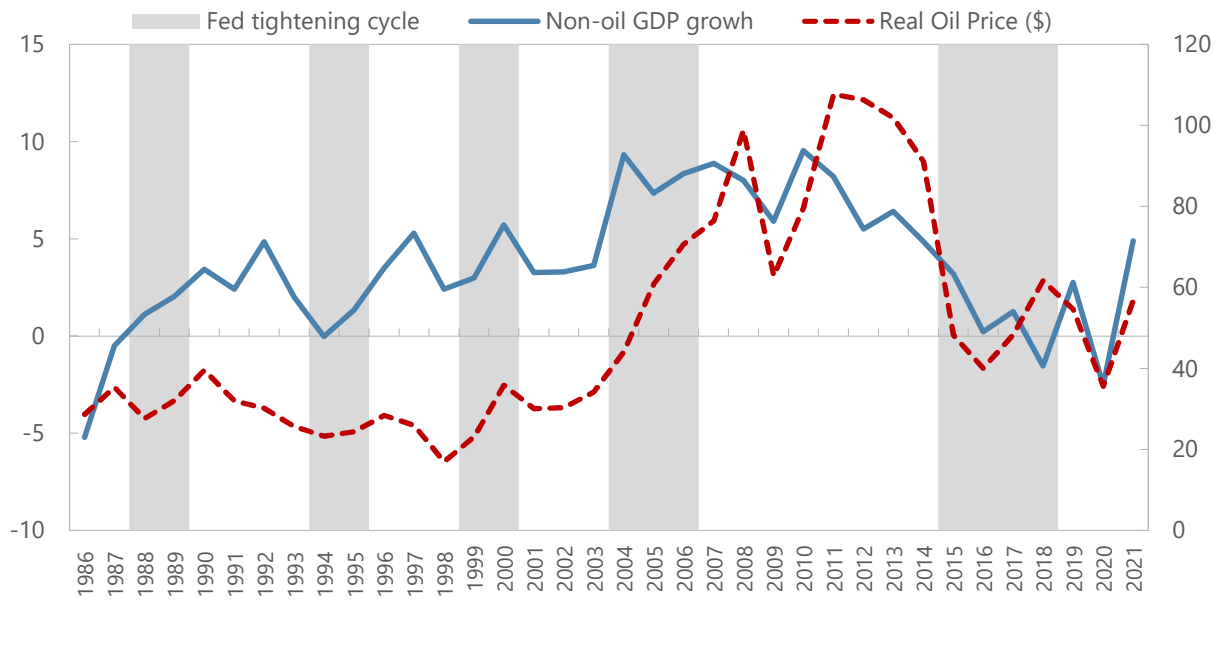
4. In the recent episode, SAMA adjusted its policy rate in line with the U.S. Federal Reserve normalization. While inflation in Saudi Arabia is currently lower than in the U.S., SAMA adjusted its nominal policy rates in line with the Fed given the currency peg framework. In particular, the central bank has raised policy rates by 125 basis points since March 2022. An important question is how these changes will affect the economic outlook in Saudi Arabia. Depending on oil price dynamics, risks to growth could be affected by the fast pace of interest rate hikes, and Saudi Arabia monetary policymakers should prepare for potential bouts of economic turbulence.

5. The main objective of this paper is to provide empirical evidence on the impact of U.S. monetary policy decisions on the Saudi economy and its banking sector. We analyze the impact of monetary policy decisions on non-oil GDP growth, equity prices and sovereign yields using panel VAR regressions. Furthermore, we conduct a thorough assessment of how the Saudi banking sector is impacted by the U.S. monetary policy decisions by exploiting bank-level panel data to isolate the impact on banks funding costs, asset rates, credit growth, profitability and asset quality. The rest of the paper is structured as follows. Section B discusses stylized facts about past U.S monetary policy tightening cycles and how they have interacted with Saudi Arabia's economic growth and oil prices. This section also provides stylized facts about the banking sector and highlights the substantial variations in banks' funding structures. Section C discusses our empirical strategy and presents the main results. Section D finishes with our concluding remarks.

B. Stylized Facts: U.S. Monetary Policy and the Saudi Economy

6. Historically, non-oil GDP growth in Saudi Arabia appears to be more sensitive during U.S. monetary tightening episodes when oil prices are low. The level of oil prices – through its effect on domestic liquidity – could potentially dampen or amplify the impact of nominal policy rate changes on non-oil GDP growth. Specifically, depending on liquidity conditions – associated with oil prices – market interest rates may deviate from policy rates (Adedeji, 2019). Too abundant liquidity due to high oil prices could lead banks to supply more loans to other financial institutions. This in turn could put downward pressure on banks' funding costs and prompt them to pass it on to borrowers in the form of lower lending rates. Therefore, oil price driven liquidity fluctuations can generate an undesired divergence with policy rates and impede monetary policy transmission. In this regard, monetary policy tightening that coincides with increased liquidity associated with higher oil prices could tend to have a more limited growth impact. While the opposite would be the case if monetary tightening is accompanied by lower oil prices and less liquidity.

Monetary Policy Tightening Cycles, Oil Prices and Non-oil GDP Growth



Source: Haver; IMF staff calculations.

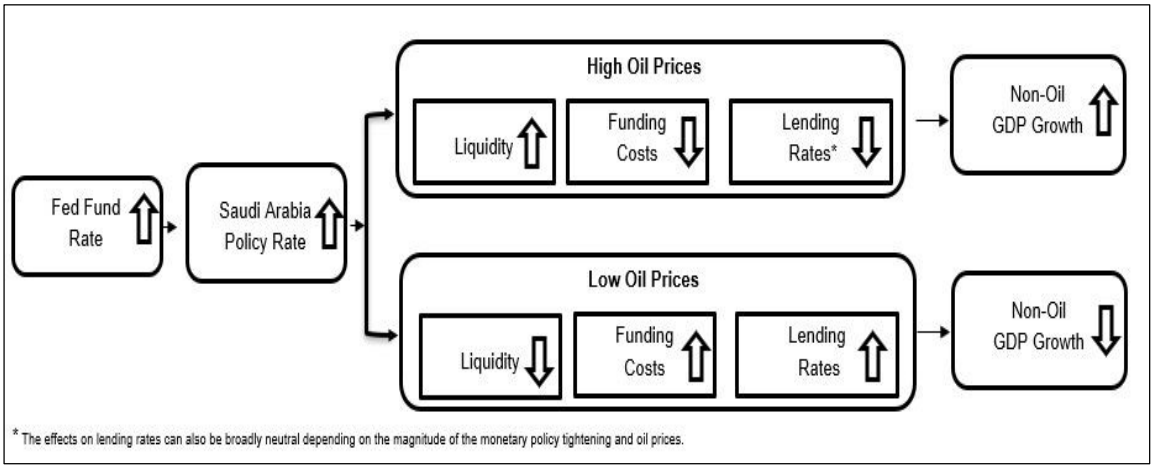
Table 1. Saudi Arabia: Overview of Past Fed Tightening Actions

First Tightening Action	Initial FFTR Target (%)	Final Tightening Action	Final FFTR Target (%)	Total Tightening (percentage points)	U.S. Business Expansion Peak	Saudi Average Non-Oil GDP response *	Saudi Median Non-Oil GDP response *
31-Mar-1983	8.5	Aug. 9, 1984	11.5	3	N/A	-2.13	-0.57
29-Mar-1988	6.5	16-May-1989	9.81	3.31	Jul-90	2.62	2.40
Feb. 4, 1994	3	Feb. 1, 1995	6	3	N/A	3.38	3.50
30-Jun-1999	4.75	16-May-2000	6.5	1.75	Mar-01	4.09	3.31
30-Jun-2004	1	29-Jun-2006	5.25	4.25	Dec-07	8.41	8.36
Dec. 16, 2015	0.00-0.25	Dec. 19, 2018	2.25-2.50	2.25	Feb-20	-0.44	-1.54

SOURCES: Federal Reserve Board of Governors, Federal Reserve Bank of St. Louis and NBER.
NOTE: "N/A" indicates that a recession didn't follow the tightening episode.
*Average three-year growth (from the year of final tightening plus two years)

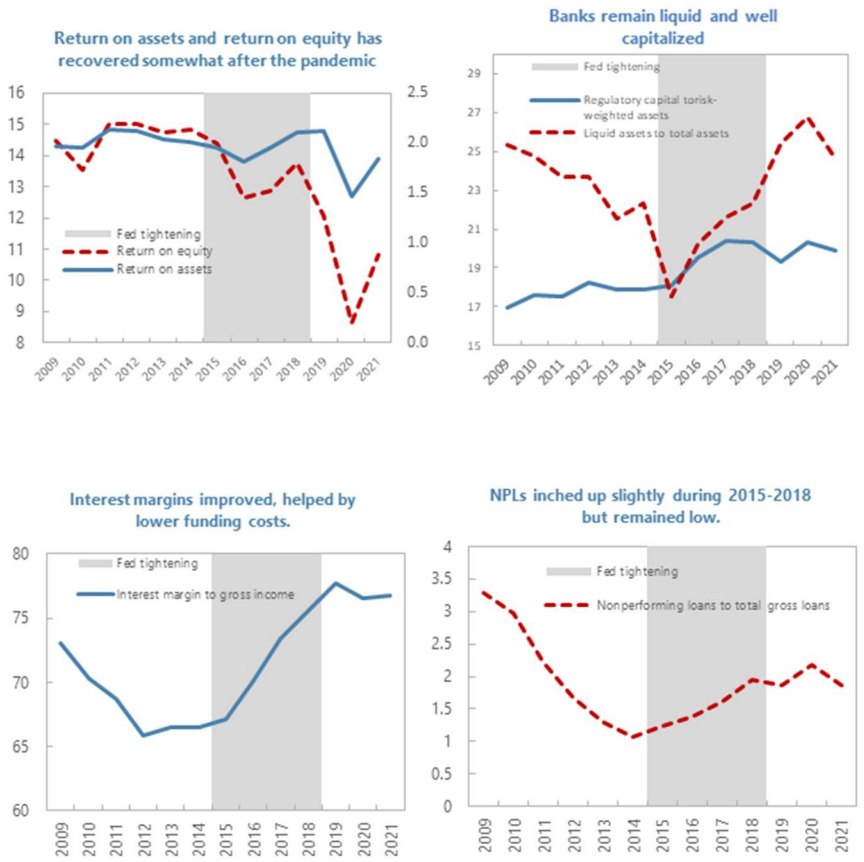
7. The transmission channels from U.S. monetary policy to Saudi Arabia are likely to depend on oil prices. Indeed, liquidity swings – due to oil price volatility – could complicate the implementation of SAMA monetary policy, with liquidity imbalances reducing the pass-through of policy rates to market rates. For instance, market interest rates may to a larger extent increase more than normally entailed by policy rates if oil prices and liquidity decline, with banks in turn charging higher rates for loans, slowing down the demand for credit and consequently economic growth.

Figure 1. Oil Prices and Monetary Policy Transmission Channel



8. The financial sector in Saudi Arabia is dominated by banks which have grown significantly over the past decade. Banks' total assets reached about 104.9 percent of GDP at the end of 2021, up from 67.6 percent of GDP in 2013. The banking sector is dominated by large banks with the top 6 banks accounting for 75 percent of total assets. During the Fed tightening cycle of 2015-2018, interest margins of the banks improved, helped mainly by lower funding costs. Currently, banks are well capitalized and liquid, and their profitability rebounded strongly in 2021 after falling in 2020 because of the covid-19 pandemic.

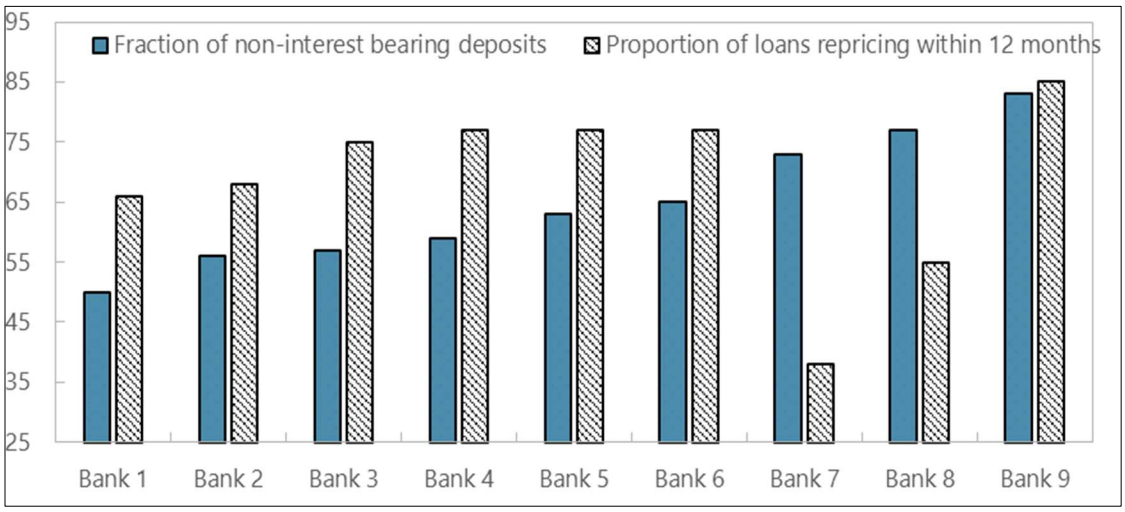
Figure 2. Banking Sector Performance
(In percent)



Source: IMF staff calculations.

9. The banking sector in Saudi Arabia relies heavily on non-interest-bearing deposits. About 65 percent of the banks' deposits are non-interest bearing, mainly to comply with Islamic banking principles. However, there is quite a lot of heterogeneity across banks as the fraction of interest-bearing deposits for some banks is around 50-55 percent while for others it is about 80 percent. Banks with a high proportion of non-interest-bearing deposits are likely to be well positioned to benefit from the interest rate hikes. Similarly, banks with a low proportion of loans repricing is more likely to be adversely affected by the U.S. monetary policy tightening.[2]

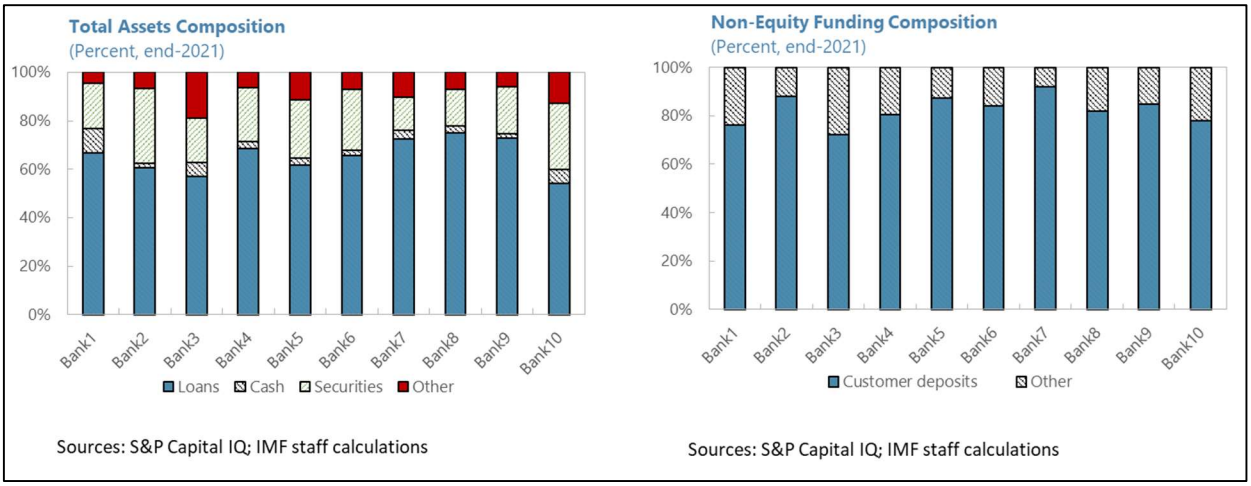
Banks' Non-Interest Bearing Deposits and Loans Repricing (2021)



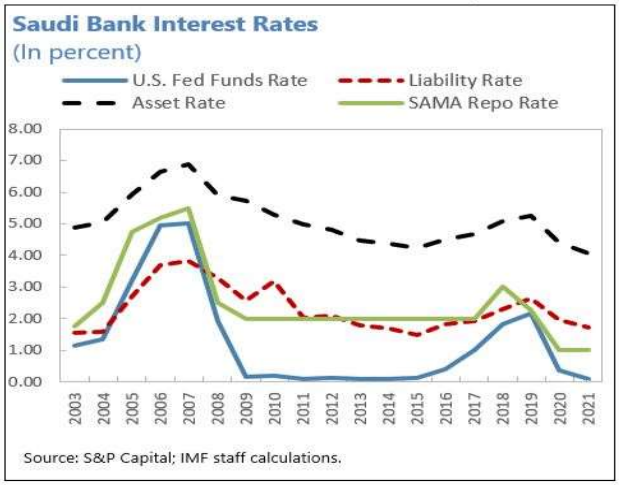
Source: Fitch Solutions; IMF staff calculations.

10. The assets composition of banks is relatively similar with loans comprising about 64 percent of assets, whereas non-equity funding is mostly comprised of customer deposits. Certain banks hold a larger proportion of investments, but their investment portfolios are generally quite conservative, mainly comprising Saudi government bonds and other investment-grade securities. The foreign currency book of banks is also relatively small. On the other hand, banks are funded mainly by customer deposits as they account for more than 80 percent of total non-equity funding in 2021. The share of wholesale funding remains low. Funding costs of banks have also benefitted from large government deposits at 0 percent interest rate in 2020.

[2] Banks with a high proportion of mortgage lending at fixed rates are more likely to be impacted by Fed tightening. Mortgage lending has been rapidly growing over the past two to three years to reach about 22 percent of sector loans by the end of 2021 as compared to 9 percent at the end of 2017 (Fitch, 2022).



11. The banks' liability and asset rates tend to move strongly with policy rates. The liability rate is defined by interest expense scaled by interest-bearing liabilities whereas the asset rate is measured as total interest income scaled by interest earning assets. The Saudi banking system is not isolated from the changes in the SAMA monetary policy as both rates tend to move in line with nominal policy rates. The spread between these rates (asset and the liability rate) underlines the dynamics behind the margins of banks.



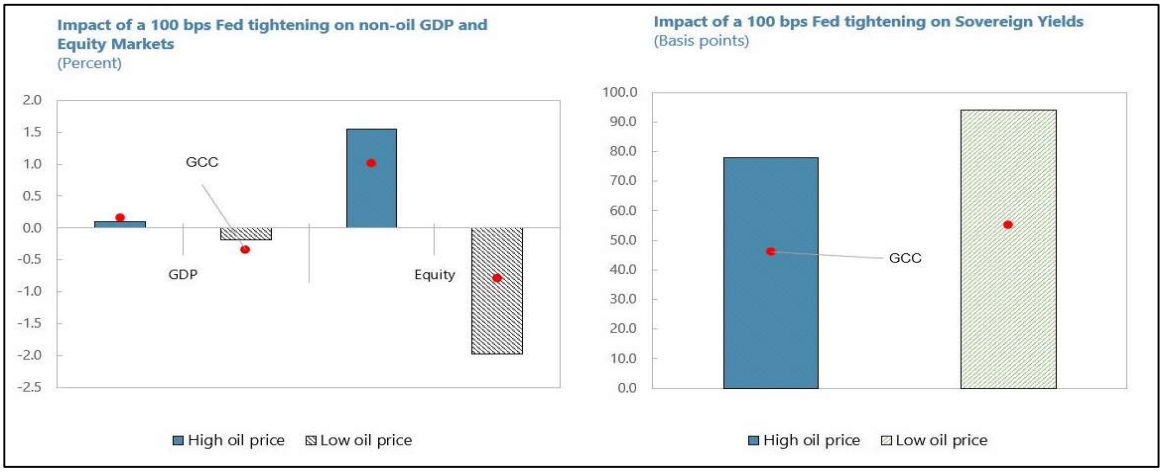
C. Empirical Evidence of Monetary Spillovers on Saudi Economy

12. We analyze the impact of U.S. monetary policy tightening on GCC and Saudi Arabia's economic and financial variables using a panel vector autoregression. In the baseline specification, following IMF's 2014 Spillover Report (IMF, 2014), the dependent variables include non-oil GDP growth, stock market indices and long-term sovereign bond yields. Control variables in this specification include the U.S. effective Fed Fund rates, the Chicago Board Options Exchange volatility index (VIX- as a measure of global uncertainty), domestic inflation and oil prices. The dynamic relationship between the dependent variables (Y) and control variables (X) is modeled as follows:

$$Y_{i,t} = \sum_{l=1}^{l=L} A_l \; Y_{i,t-l} + \sum_{l=0}^{l=L} B_l \; X_{t-l} + u_{i,t} \qquad (1)$$

13. We estimate this model using quarterly data covering the period 2018Q1-2021Q4. With a small sample size and limited time dimension, we report 6-month average responses, instead of average responses over a longer horizon. The time span is determined by the availability of sovereign yield data. Long term sovereign bond yields in GCC are proxied by bonds ranging from 5- to 13-year maturity. The average time to maturity of sovereign bonds in the sample is less than 10 years.[3]

14. The VAR estimates suggest that when oil prices are less than $45 per barrel, monetary spillovers to Saudi Arabia get amplified[4]. When oil prices are low, non-oil GDP growth declines by about 0.16 percent in Saudi Arabia. In contrast, the effect of Fed tightening is negligible when oil prices are high. The effect is slightly higher for GCC countries on average. Similarly, equity prices drop by about 2 percent when oil prices are low and increase by 1.5 percent when oil prices are above the $45 threshold. Sovereign yields amongst GCC countries increase by about 55 basis points when oil prices are low (94 basis points in Saudi Arabia) and only by 46 basis points when oil prices are high (78 basis points in case of Saudi Arabia). This result should be interpreted as that there is a level of oil price above which the impact from the U.S. monetary policy cycle becomes economically insignificant for Saudi Arabia. These findings are similar to the ones found by Adedeji et al. (2019). Therefore, in the current environment, high oil prices will likely mitigate spillovers from U.S. monetary policy normalization to Saudi Arabia.



D. Implications for the Banking Sector

15. There are substantial variations in banks' funding structures that can help tease out the impact of U.S. policy rate decisions. With a banking structure with low wholesale funding and a high percentage of unremunerated demand deposits, some banks finance their operations almost entirely through uncompensated deposits while others see their cost of funding oscillate with policy rates. We begin our analysis by using bank-level panel analysis, which covers the period from 2003-

[3] This method was also used in the recent REO, April 2022. This is similar to Adedeji et al. (2019) and Giovanni and Shambaugh (2008) who use foreign interest rates as exogenous variables. IMF (2014) decomposes the drivers of the US 10-year Treasury yield into money and real shocks.

[4] For the choice of the threshold, see IMF (2019).

2021. In the baseline equation (2), the main dependent variables are changes in liability and asset rates, return on equity, credit growth and asset quality. The main explanatory variable is the change in the U.S. Federal Funds Rate. All specifications included bank fixed effects and several controls to take into account macroeconomic fluctuations. Standard errors are clustered at the bank level.[5]

$$\Delta Y_{i,t} = \alpha_0 + \alpha_1 \Delta MP_t + \Gamma X_{i,t} + FEs + u_{i,t} \quad (2)$$

16. Our estimates suggest a significant pass through from U.S. interest rates to Saudi banks' liability and asset rates. Results in Table 2 suggest that when U.S. rates rise by 100 basis points, Saudi banks' liability rates rise by 51 basis points and their asset rates by close to 57 basis points. This could be explained by the fact that banks in Saudi Arabia have a relatively high share of variable-rate loans, which allow increases in banks' funding costs to be swiftly passed on to customers. Also, Saudi Arabia's banking system exhibits large proportion of deposits not receiving interest (i.e., for compliance with Islamic principles) but there is quite a lot of heterogeneity as discussed earlier.

Table 2. Saudi Arabia: Pass-through from US Rates to Saudi Bank Rates

VARIABLES	(1) Δ Liability Rate	(2) Δ Liability Rate	(3) Δ Liability Rate	(4) Δ Liability Rate	(5) Δ Asset Rate	(6) Δ Asset Rate	(7) Δ Asset Rate	(8) Δ Asset Rate
Δ Federal Funds Rate	0.488***	0.491***	0.550**	0.512**	0.461***	0.467***	0.581***	0.574***
	(0.128)	(0.133)	(0.170)	(0.189)	(0.044)	(0.048)	(0.074)	(0.082)
Δ Oil Price ($)			-0.163	-0.120			-0.283*	-0.274
			(0.147)	(0.150)			(0.142)	(0.150)
Log (Uncertainty Index)			0.326	0.330			0.657**	0.658**
			(0.308)	(0.308)			(0.247)	(0.247)
Crisis Dummies				-0.382*				-0.073
				(0.202)				(0.124)
		(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Bank Fixed Effects		Yes	Yes	Yes		Yes	Yes	Yes
Clustering	Banks	Banks	Banks	Banks	Banks	Banks	Banks	Banks
Observations	169	169	169	169	170	170	170	170
R-squared	0.176	0.178	0.185	0.193	0.211	0.231	0.268	0.268

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

17. Despite substantial differences in funding structures, banks' profitability seems to be insulated from shifts in U.S. policy rates. Our preliminary results suggest that the impact of tighter U.S monetary policy on banks' profitability is positive and statistically significant. Regressions controlling for bank time-invariant characteristics, oil prices and the Chicago Board Options Exchange Volatility Index (VIX), which reflects global uncertainty, confirm that an upward shift in

[5] See Appendix A for a detailed description of variables.

interest rates is associated with a rise in return on equity [6]. Overall, notwithstanding differences in funding structures, bank profitability is likely to remain insulated from shifts in nominal policy rates.

Table 3. Saudi Arabia: Pass-through from US Rates to Banks' Profitability

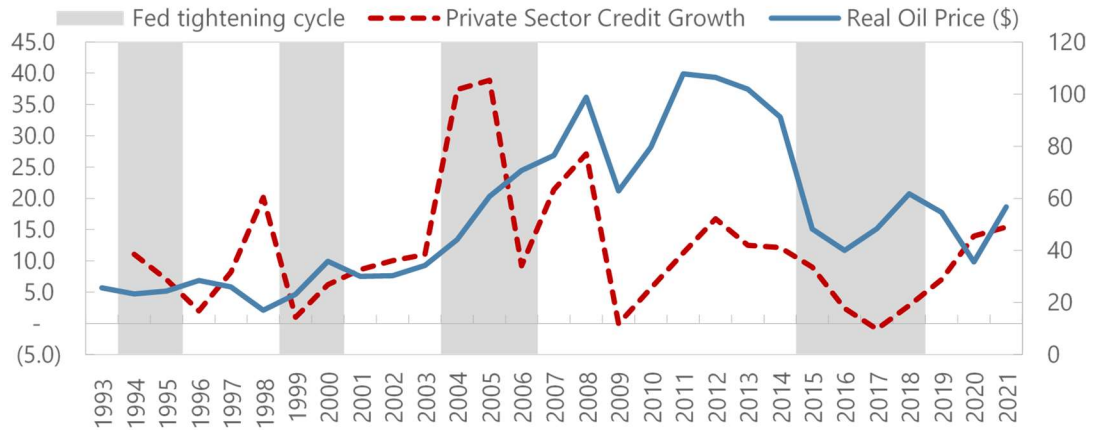
	(1)	(2)	(3)	(4)
VARIABLES	ΔROE	ΔROE	ΔROE	ΔROE
Δ Federal Funds Rate	0.020***	0.020***	0.021***	0.018**
	(0.005)	(0.005)	(0.006)	(0.006)
Δ Log (Oil Price)			0.021	0.025
			(0.015)	(0.018)
Δ Log (Uncertainty Index)			0.014	0.014
			(0.011)	(0.011)
Crisis Dummies				Yes
Bank Fixed Effects		Yes	Yes	Yes
Clustering	Banks	Banks	Banks	Banks
Observations	180	180	180	180
R-squared	0.078	0.386	0.393	0.408

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

18. Historically, there has been a limited impact of monetary policy tightening episodes on credit growth in periods when oil prices were high. Despite tightening episodes during 2004-2007 and 2015-2018, credit growth remained strong during these time periods as oil prices were at relatively high levels. At the aggregate level, the relationship between credit growth and monetary policy tightening is not quite visible. However, tightening episodes combined with low oil price levels seem to negatively impact credit growth.

Private Sector Credit Growth and Monetary Policy Tightening

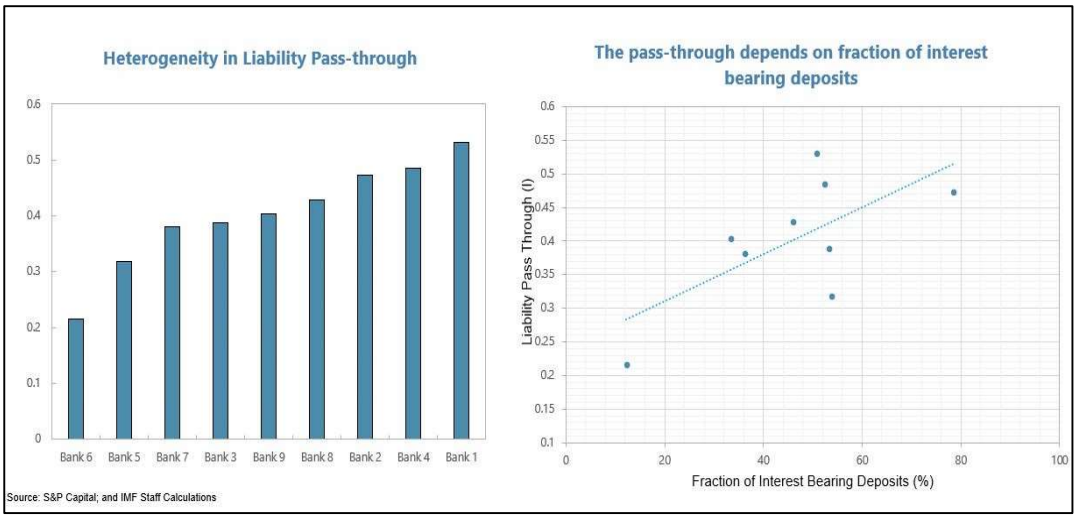


Source: Haver; IMF staff calculations.

[6] As shown in IMF (2019), the positive impact on profitability ratios is likely to reflect the high proportion of non-interest-bearing deposits or the ability of some banks to pass through rates to customers.

19. While at the aggregate level the impact of monetary policy tightening on credit growth might be muted, certain banks could be adversely affected. Therefore, we construct a measure of the overall sensitivity of bank liabilities to changes in U.S. monetary policy at the bank level: liability pass-through (LPT)[7]. Using bank level panel regressions, we estimate LPT in which the dependent variable is the change in the bank's liability rate, and the independent variable is the change in the U.S. Federal Funds Rate. The estimated coefficient α_1 is a measure of how sensitive a bank is to monetary shocks. For banks with a coefficient close to 1, liability rates respond almost one to one with U.S. monetary policy and these banks can be classified as sensitive banks. On the other hand, banks with a coefficient close to 0, liability rates do not respond strongly to U.S. monetary policy and can be classified as insensitive banks. We use LPT as our main measure of cross-sectional variation across banks.

20. The results of the liability pass-through suggest that some banks are more sensitive to U.S. monetary policy tightening. In line with our expectations, LPT is closely associated with the interest-bearing fraction of deposits as shown below. It is important to note that banks with similar fractions of interest-bearing deposits can have different LPTs. For instance, deposits may account for different fractions of liabilities and the strength of deposit franchises or market power may also vary.



21. The findings suggest that Fed tightening does not impact credit growth and asset quality. We find that credit growth is not affected even for banks with a higher passthrough. However, in an environment of low oil prices, monetary policy tightening can hamper credit growth for banks with high LPTs. Put differently, our findings support the idea that the fast pace of US interest rate hikes could hamper credit growth but only in an environment where oil prices are low. However, in the current context of high oil prices, the Saudi banking system is likely to easily absorb the higher rates and generate credit growth. Moreover, regarding asset quality as measured by the change in non-performing-loans, we do not find any significant impact of U.S. monetary policy tightening. This result holds even for banks with a higher liability passthrough. In equation (3) below, MP_t is the measure of U.S. monetary policy, LPT is a dummy that is equal to one if the bank has an

[7] We rely on the same methodology as in Adedeji et al. (2019).

estimated liability passthrough above the sample median value and Oil Price is a dummy that is equal to one if real oil prices are higher than $45 cutoff. The key coefficient of interest is α_1 which represents the triple interaction term.

$$\Delta Y_{i,t} = \alpha_0 + \alpha_1 \Delta MP_t * \mathrm{LPT_{I,t}} * \text{Oil Price} + \Gamma X_{i,t} + FEs + u_{i,t} \quad (3)$$

Table 4. Saudi Arabia: Pass-through from US Rates to Banks' Credit Growth

	(1)	(2)	(3)
VARIABLES	**ΔIn(Credit)**	**ΔIn(Credit)**	**ΔIn(Credit)**
Δ MP	-0.042	-0.080	-0.156
(Δ MP)*(LPT Dummy)		0.097	-0.762***
(Δ MP)*(LPT Dummy)*(Oil)			0.981***
Additional Controls	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Observations	138	138	138
R-squared	0.023	0.025	0.087

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Saudi Arabia: Pass-through from US Rates to Banks' Asset Quality

	(1)	(2)	(2)
VARIABLES	**Δ(NPLs)**	**Δ(NPLs)**	**Δ(NPLs)**
ΔMP	-0.074	0.031	0.009
(ΔMP)*(LPT Dummy)		-0.243	0.061
(Δ MP)*(LPT Dummy)*(Oil)			-0.338
Additional Controls	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Observations	154	154	154
R-squared	0.044	0.057	0.065

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

22. Additional robustness checks confirm our main findings. First, to account for quantitative easing in the aftermath of the financial crisis, we replace effective federal funds rate with Wu-Xia shadow Federal Funds rate when the federal funds rate hit the zero-lower bound, and the results confirm our main findings. Second, we also look at the increase in U.S. 10-year Treasury yields as a proxy for change in U.S. monetary policy decisions and our results remain robust. Third, we also add additional controls such as government spending and U.S. growth rate to control for potential endogeneity bias arising from omitted variable bias. Our main results still hold.

E. Concluding Remarks

23. This paper has looked at the impact of U.S. monetary policy decisions on the Saudi economy and the banking sector, with emphasis on the role of oil prices. Policy rates in Saudi Arabia broadly follow the U.S. policy rates, and the liability and asset rates of banks also tend to move strongly with the U.S. policy rates given the peg. Our results highlight that the level of oil prices play an important role in determining how changes in the U.S. interest rates affect non-oil GDP growth and banking sector's performance in Saudi Arabia. Liquidity fluctuations driven by oil prices could influence the impact of monetary policy tightening on non-oil growth. Our analysis indicates that the expected changes in the U.S. policy rates are not expected to negatively affect Saudi Arabia's economy given the current environment of high oil prices and liquidity.

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Appendix I. List of Variables and Definitions

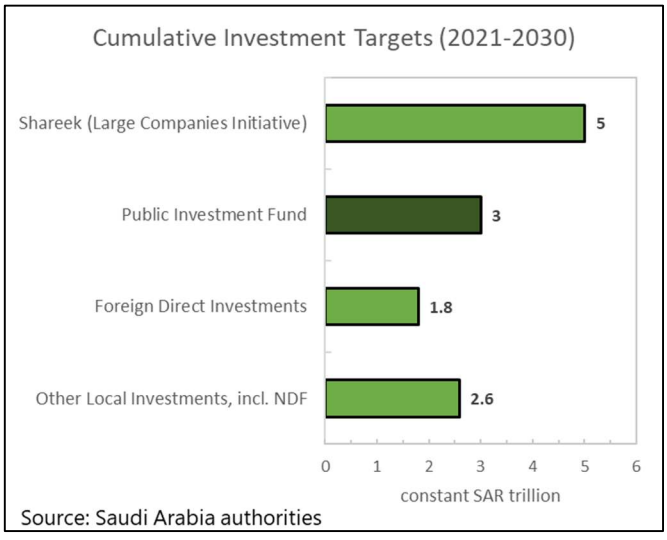
Variable	Definition	Source
Federal Funds Effective Rate	The federal funds rate is the interest rate at which depository institutions trade federal funds (balances held at Federal Reserve Banks) with each other overnight.	FRED database
Shadow rate	The shadow rate is the interest rate which reflects nominal policy rates when they are close to the zero lower bound.	Wu-Xia shadow rate
10 Year U.S. treasury yield	Market yield on U.S. Treasury Securities at 10-Year constant maturity.	FRED database
Liability Rate	The liability rate is interest expense scaled by interest-bearing liabilities.	S&P Capital data; IMF staff calculations
Asset Rate	The asset rate is total interest income scaled by interest earning assets.	S&P Capital data; IMF staff calculations
Non-interest-bearing deposits	Proportion of total deposits at the bank which are unremunerated.	S&P Capital data
Real Oil Price ($)	Brent oil price deflated by US CPI inflation.	Bloomberg
The Chicago Board Options Exchange volatility index (VIX- as a measure of global uncertainty)	VIX measures market expectation of near-term volatility conveyed by stock index option prices.	FRED database

ASSESSING THE NATIONAL INVESTMENT STRATEGY USING THE DIGNAR-19 MODEL[1]

As part of its "Vision 2030", the Kingdom of Saudi Arabia unveiled in October 2021 its National Investment Strategy (NIS), which was designed to diversify the Saudi economy and raise potential GDP growth. Simulations conducted with IMF's DIGNAR-19 model assessed the potential impacts of NIS and find that the overall goals—when supported by fiscal reforms, labor supply reform, and higher public sector efficiency— boost potential non-oil growth by 4.8 percentage points to about 8.8 percent in the medium term.

1. Under "Vision 2030", the authorities have set out to ramp up both public and private investment, attract FDI and diversify the economy. The NIS is under the supervision of the Council of Economic and Development Affairs (CEDA) and is supported by four pillars, namely, 1) developing new investment opportunities, in strategic sectors 2) broadening the investment base, 3) removing financial barriers to private sector investment, and 4) improve the competitiveness of the business environment. These objectives are backed by more than 40 initiatives. After a first phase focused on overhauling the regulatory framework, efforts are now turning to tackling structural challenges and attracting investments.

2. Under the NIS, Gross Fixed Capital Formation (GFCF) is expected to grow by 13 percent per year until 2030. In nominal terms, this corresponds to a total of SAR 12.4 Tr cumulative new investments in the Saudi Economy by 2030 (or about twice what would be invested if investments were growing at the historical average). In support of this strategy, the Public Investment Fund (PIF), Saudi Arabia's Sovereign Wealth Fund, is expected to invest at least SAR 150 bn per year in the Saudi economy. Important contributions are also expected from the National Development Fund (NDF), whose consolidated assets reached about 17 percent of GDP in 2019. In addition, the NIS seeks to unlock private investment through the *Shareek* program, or Large Company Initiative, expected to generate SAR 5 Tr in investments. At the current juncture,



Source: Saudi Arabia authorities

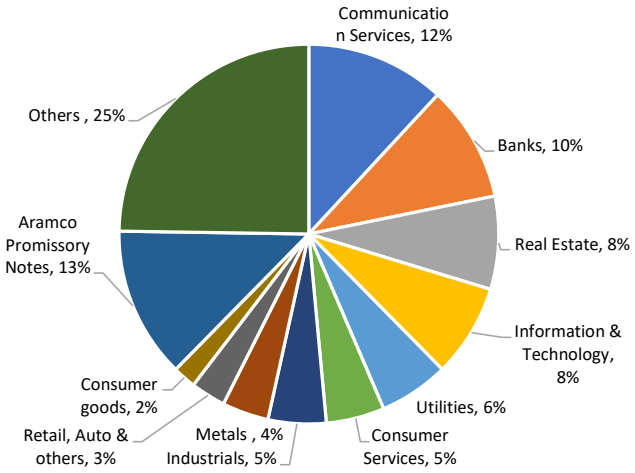
[1] Authors: Flavien Moreau (FIN) and Zamid Aligishiev (RES). Authors thank Cian Ruane (RES) for inputs, useful suggestions, and comments.

diversifying the Saudi economy remains a challenge, as around 60 percent of current annual investments are concentrated in the hydrocarbon sector, as well as more than half of the FDI.[2]

Box 1. NIS and Strategic Sectors

The NIS seeks to stimulate private investments, including in key strategic sectors that the PIF has been tasked to help develop. These 13 strategic sectors include: Aerospace and Defense; Automotive; Transport and Logistics; Food and Agriculture; Construction; Entertainment, Leisure, and sports; Financial services; Real Estate, Utilities and Renewables; Metals and Mining; Health care; Consumer Goods and Retail; and Telecom, Media, and Technology. As of December 2020, some of these sectors were already well represented among PIF total assts holdings. While the catalytical effect on private sector is expected to vary, evidence suggests potential strong response from private companies in sectors such as Entertainment, Health, and Renewables (IMF, 2020).

PIF sectoral diversification



Source: Moody's

3. Using the DIGNAR-19 model calibrated to the Saudi economy, we find that simulations of the initiatives undertaken under the NIS can substantially raise non-oil potential growth. However, the magnitude of the increase and its sustainability are subject to several uncertainties, in particular, concerning the returns on capital efficiency of investment expenditure and the degree to which reforms will be successfully implemented and deliver the expected results. To quantify these uncertainties and highlight the role of the key assumptions, we formulate several scenarios and examine different calibrations of the model**.**

4. Simulations from the DIGNAR-19 model help quantify growth dividends from each channel as well as the impact on private investment DIGNAR-19 is a dynamic general equilibrium model (see Aligishiev, Melina and Zanna, 2021) produced at the IMF to deliver

[2] Inward FDI jumped from SAR 20.3 bn in 2020 to SAR 72.4 bn in 2021, of which SAR 46.5 bn correspond to the sale of a 49 percent equity stake in Aramco Oil Pipelines to a consortium led by EIG.

quantitative macroeconomic assessments and policy scenario analyses in open developing economies.[3] The framework abstracts from the full input-output structure of the economy and incorporates three sectors of production (nontraded goods, non-resource traded goods and traded natural resources) as well as financially and non-financially constrained households.[4] The government has access to several fiscal instruments (productive and unproductive expenditures and various taxes) and both concessional and non-concessional debt, both domestic and external (see Annex I for key assumptions used for the calibration of the Saudi economy). We consider three scenarios:

- **Baseline**. This scenario is the one aligned with 38icroframework underpinning the July 2022 Article IV Consultations, which assumes that GFCF would keep growing at a rate of about 6 percent in nominal terms, with some partial implementation of the structural reforms under Vision 2030, delivering a medium-term non-oil GDP growth of 4 percent.

- **Moderate NIS investment scale up with stronger reform implementation**. This scenario is considering a richer set of policy changes, with fuller reform implementation, but a more measured pace of investment increases (9 percent on average on an annual basis after 2022, which, if sustained until 2030, would cover about 90 percent of the planned investments under the NIS). The reform scenario includes fiscal, labor, public investment, and regulatory reforms. Measures are assumed to be adopted in four areas: (1) a larger scale-up in combined public and PIF investment of 2.4 additional percent of GDP in 2022 and 5 percent of GDP in 2023-2026 ; (2) improvements in public investment efficiency is set to increase by 20 percentage points, following rationalization of procurements and other measure following PIMA guidelines (see Box 1); (3) fiscal reforms, including closing tax efficiency gap and rationalization of the high wage bill, including through strategic workforce planning and review, yield a gradual improvement of the fiscal balance of 0.5 percent of GDP by 2026; (4) labor market policies, boosting labor force participation, including of Saudi women, increases labor supply by 2 percentage points by 2026 relative to the baseline scenario.

- **NIS pure investment scale up**. This scenario assumes that the NIS investment targets are fully met and follow the 13 percent annual growth rate specified in the NIS. Implementation of structural reforms is assumed to be the same as in the baseline. Therefore, this scenario isolates the differential impact on non-oil potential output of the large NIS scale-up relative to the baseline.

[3] DIGNAR-19 is an extension of the Debt, Investment, Growth and Natural Resources (DIGNAR) model by Melina, Yang and Zanna (2014, 2016), which in turn is an extension of the Debt, Investment and Growth (DIG) model by Buffie and others (2012).

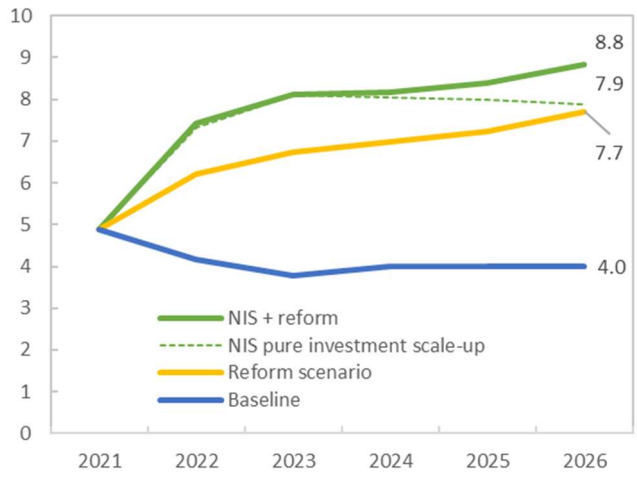
[4] See Baqaee Farhi (2019), Carvalho and Tahbaz-Salehi (2019) and Liu (2019) for recent advances in input-output macroeconomic modeling.

- **NIS investment scale up combined with reforms**. This scenario also assumes that NIS investment targets are fully met and that, additionally, all the policies envisaged in the reform scenario are implemented.

5. The scenario with full NIS investment scale-up combined with reforms could raise non-oil potential output growth to 8.8 percent in 2026, compared to 4 percent in the baseline scenario used in the current macro framework. Importantly, the impact from the pure investment scale-up itself would be hump-shaped, peaking in 2023 and slowly declining after that. In contrast, the reform package would build over time and help achieve long-lasting growth. Even if the full investment targets were not fully met, simulations show that a package of reforms coupled with a moderate investment scale-up would still boost non-oil potential growth at a gradual and sustained pace, reaching 7.7 percent in 2026 (Figure 1).

Figure 1. Raising Non-oil GDP

(Percent, y-o-y change)

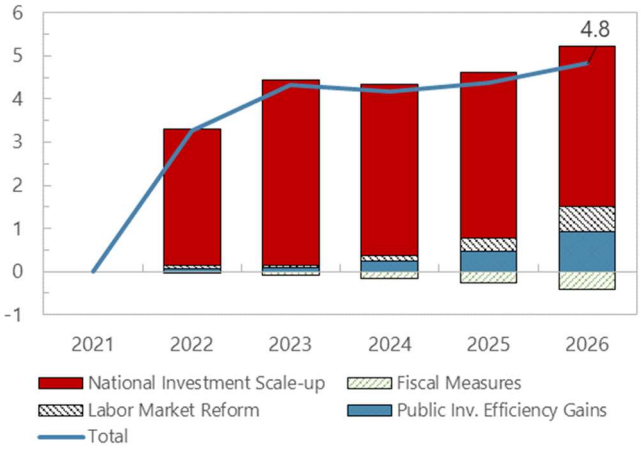


1/ The scenarios are computed using DIGNAR-19
Source: IMF staff estimates and projections.

6. Our results indicate that the combined effect of the reform package could deliver a medium-term increase in non-oil real GDP growth of 4.8 percentage points relative to baseline. The growth dividends build over time as reform indicators improve (Figure 2). While the steep ramp up in public spending, account for most of the potential output gain in the first years of the simulation horizon, backloaded dividends from labor market reforms and from gains in public investment efficiency boosts non-oil growth in the medium run, by about 0.5 and 0.8 percentage points respectively compared to the baseline. In 2026, dividends from the investment ramp up amount to 2.7 points, with a modest drag of 0.4 percentage point from fiscal measures.

Figure 2. Non-oil GDP Growth Dividends from Reforms

(Percentage points, relative to no-reform scenario)1/



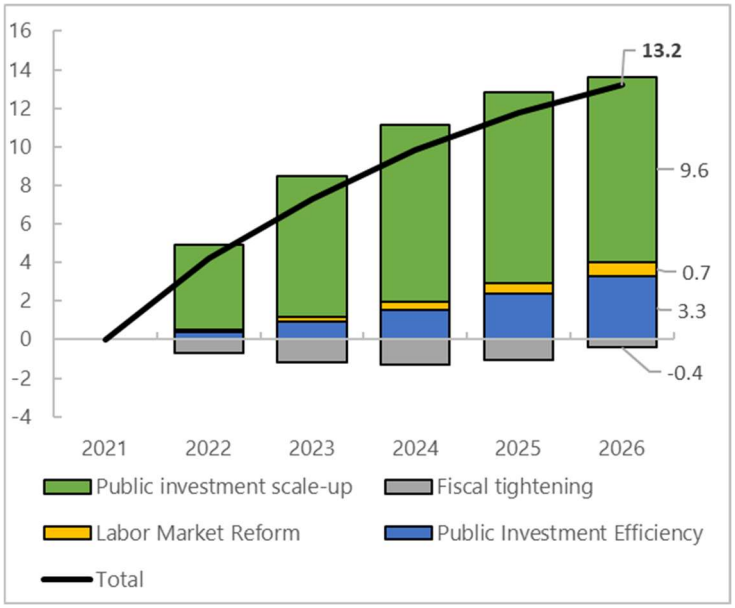
1/ Reforms effects are simulated using DIGNAR-19.

Source: IMF staff estimates and projections.

7. The growth gains implied by the reform scenario would help mitigate the risks related to an overreliance on oil revenues while catalyzing private investments. Private investments are expected to increase by up to 13.2 percentage point relative to the baseline (Figure 3)**.** Simulations confirms the key role of the PIF's investments in driving additional private investments, while benefitting from positive spillovers from improvements on the labor market and in public investment efficiency. Under this scenario, and thanks to the modest fiscal consolidation, debt would stay at its current level and inflation and pressures on the real exchange rate would be contained, allowing the Saudi economy to rebalance towards a less oil-reliant economy and generate more opportunities for the private sector.

Figure 3. Impact on Private Investment

(Percentage points, relative to baseline)1/

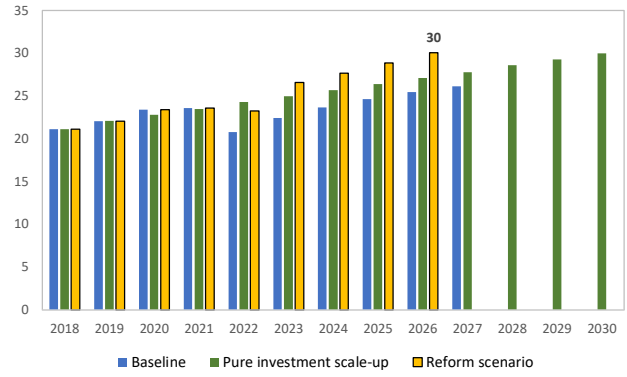


1/ Reforms effects are simulated using DIGNAR-19.
Source: IMF staff estimates and projections.

8. The Vision 2030 target of reaching an investment share of GDP of 30 percent would be reached earlier than 2030 in the reform scenario. While our main simulations anticipate a more modest annual increase in gross fixed capital formation (GFCF) of about 9 percent per year in nominal terms than expected under the NIS, GFCF as a share of GDP would rise faster than in the NIS forecasts, reaching 29 percent of GDP in 2026 and coming close to the range maintained by high-growth countries such as Korea or Singapore during the East Asian miracle. This faster pace is the result of discrepancies in investment multiplier assumptions, as, mechanically, lower multipliers result in higher GFCF shares for the same investment path.

Figure 4. Gross Fixed Capital Formation

(Share of GDP)



Sources: Saudi Arabia authorities, IMF staff estimates and projections.

9. From a quantitative standpoint, assumptions about investment multipliers therefore play an important role in driving these results. A wide range of multipliers can be found in the literature, reflecting a large heterogeneity in both countries' characteristics, the types of investment plans, and the economic context. Multipliers are higher when a country's current capital stock is low

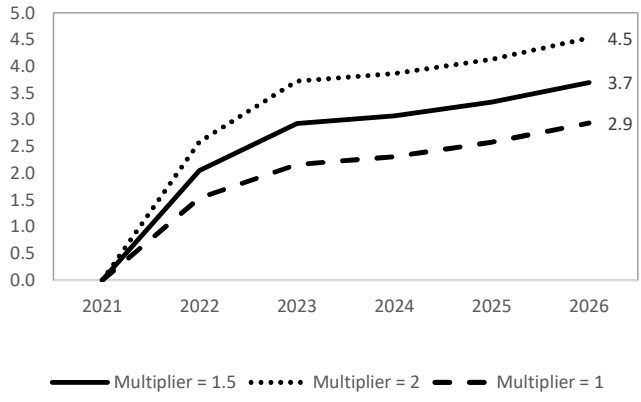
(Izquierdo et al 2019) or when monetary policy is close to the zero lower bound. Absorptive capacity can also place a constraint on the efficiency or large investment scale-up (Adler 1965, Presbitero 2016). In addition, recent research suggests that multipliers can be higher for green investments for renewable energy projects [1.1 – 1.7] compared to [0.4 – 0.7] for fossil fuel projects (Batini et al 2021), confirming the importance of adequate project screening and benefits from diversification away from the oil sector.

10. To improve the robustness of the findings, we consider a range of multipliers. Investment multipliers are endogenous in the DIGNAR model, as they depend both on characteristics of the Saudi economy and estimated macroeconomic relationships. The main channels in the model include public investment efficiency (see Box 2), reallocation across sectors, adjustment costs, and the response of the private sector. In our preferred calibration, the model leads to a multiplier of 1.5, which sits at the middle of the range of public investment multipliers surveyed in Vagliasindi et al 2022. Given the uncertainty, we also consider alternative specifications leading to multipliers of 1 and 2, which provide a range for the impact of the reform package and how large a catalytic role can be played by the PIF or through *Shareek* programs.

11. Alternative specifications continue to support a sizeable effect on non-oil potential growth. Setting the public investment multiplier at 1 – that is, one riyal in investment delivers one additional riyal in output in the medium-run – delivers an additional boost of 2.9 percentage point in the reform scenario compared to the baseline (Figure 5). In contrast, if the multiplier is twice larger, the boost could reach 4.5 percentage points.

Figure 5. Impact on Private Investment

(Percentage points, relative to no-reform scenario)



Sources: IMF staff estimates and projections.

12. Another important source of uncertainty is the trajectory of oil prices, and the consequences on the Saudi economy, public finance, and the ability to stick to the investment plans. While no specific commitments have been made to direct additional fiscal resources from the central government to the PIF, authorities expect the PIF's assets under management to grow from around SAR 2.3 Tr currently, or about 60 percent of GDP, to SAR 4 Tr in 2025, or about 90 percent of GDP. Such a growth of assets under management, if generated organically, would require PIF to consistently deliver returns twice the size of the economy's growth rate. Alternatively, returns on investment in the range commonly observed would fall short of the announced target for PIF's assets under management. As a result, in order to properly assess the future path of the PIF's assets under management and available investment capacity in both upside and downside scenarios, more

details on the PIF financial relationship with the central government and debt issuance plans would be required.[5]

Concluding Remarks

13. As projects are delivered, careful evaluation will allow to better assess the accuracy of the economic assumptions supporting the NIS. It will be important to assess the implicit multipliers associated with the various type of projects and account for uncertainty. Furthermore, these average multipliers are likely to exhibit substantial heterogeneity across projects, with Giga-projects carrying a high risk/ high return profile. Careful monitoring of projects through the PIF's Risk Committee and the NDF's new Impact Assessment Methodology will play an important role in maximizing medium-term risk-adjusted returns.

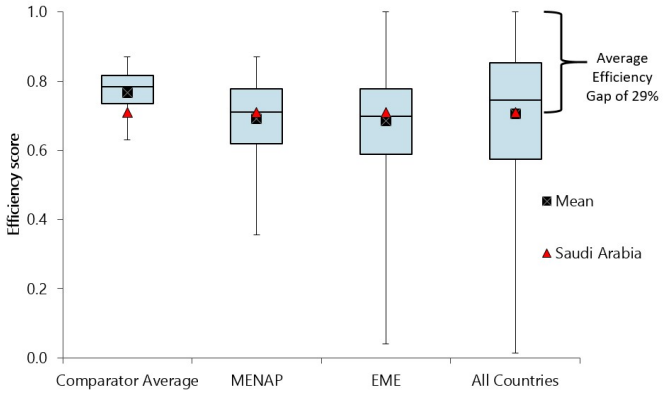
14. Policies to support innovation in key sectors could further lift potential output at longer horizons. While our simulations already find substantial gains, directing investments in R&D and technological upscaling in strategic sectors such as hydrogen or electric vehicles, may generate upside risks in the long run and complement improvements in the higher education system and human capital.[6] Towards such a goal, a national plan for Research, Development, and Innovation (RDI) was unveiled in July 2022, with a target of annual spending of 2.5 percent of GDP on research and development by 2040, with priorities including health, energy, and environmental sustainability.

[5] For details on the implications of oil prices on public finances, see the Selected Issue Paper on the fiscal anchor. PIF has received its debut credit ratings in February 2022 and may consider tapping the market gradually by issuing green bonds.

[6] Myers and Lanahan (2022) find particularly large spillovers from publicly funded R&D in the energy sector.

Box 2. Gains in Public Investment Efficiency

Public investment efficiency is the ability to translate a given level of spending into public goods, in particular economic and social infrastructure. On average, countries lose about one-third of their resources in the public investment process. As sources of inefficiencies are numerous and multidimensional Baum et al. (2020) builds a hybrid indicator accounting for both volume and quality of infrastructure and compute an efficiency frontier. With an efficiency of 0.71 measured over the past decade, Saudi Arabia faces significant gains from closing its efficiency gap. While there is no direct mapping between PIMA scores and the concept of public investment efficiency in the model (Gurara 2019), they can provide a good proxy for understanding the level of efficiency relative to peers and feasible room for efficiency gains.



Source. IMF, Fiscal Affairs Department and Baum, Tewodaj, and Verdier (2020)

Annex I. The DIGNAR-19 Model

30. The Debt Investment Growth Natural Resources and COVID-19 (DIGNAR-19) model is a Dynamic General Equilibrium (DGE) model of a real small open economy developed at the International Monetary Fund to help country teams with quantitative macroeconomic assessments and policy scenario analysis in Low-Income Developing Countries (LIDCs) and Emerging Markets (EMs) during the COVID-19 pandemic. It is an extension of the DIGNAR model by Melina, Yang and Zanna (2014, 2016)[7] that accommodates the effects of the COVID-19 pandemic. Both DIGNAR and DIG models have gained a wide measure of acceptance for policy work. Over the past eight years, they have complemented the IMF and World Bank Debt Sustainability Framework (DSF) analysis, with over 65 country applications, in the context of Fund programs and surveillance work, and are now part of the IMF-WB Multipronged Approach for addressing debt vulnerabilities. These models helped inform policy analysis, based on qualitative and quantitative scenario analysis, on issues such as public investment surges, fiscal consolidations, PFM reforms and the collapse of commodity prices, among others. See Gurara, Melina and Zanna (2019) for an overview of DIG and DIGNAR applications.

31. The multiplier associated with the public investment program is determined by the magnitude of the investment surge, the source of financing, and the parameterization of the model. The model incorporates three main economic mechanisms for the analysis of public investment scale-ups: (i) a growth-investment nexus, (ii) a fiscal response required to maintain debt sustainability, (iii) and potential for both crowding-in and crowding-out of private investment. Public investment is assumed to be productive but has diminishing returns. Higher public capital raises productivity of private factors and increases real output through:

$$y_t = A_t(K^G_{t-1})^{\alpha_g}(L_t)^{\alpha_N}(K_{t-1})^{1-\alpha_N}$$

where y_t is the real output of the economy; A_t is the total factor productivity; L_t is labor; K_t and K^G_t are private and public capital stock respectively. $\alpha_g \in (0,1)$ and $\alpha_N \in (0,1)$ govern the return on public capital and the labor share in production, respectively. The level of public capital at any given year is a sum of the stock of capital in the previous year, net of depreciation, and the new effective public investment expenditure. Formally:

$$\underbrace{K^G_t}_{\substack{New\ gov.\\ capital\ stock}} = \underbrace{(1-\delta)K^G_{t-1}}_{\substack{Old\ capital\ after\\ depreciation}} + \underbrace{\epsilon I^G_t}_{\substack{New\ investment\\ after\ waste}}$$

where I^G_t is the total public investment expenditure; $\delta \in (0,1)$ is the depreciation rate; and $\epsilon \in (0,1]$ governs the efficiency of public investment. Higher investment expenditure translates into higher capital stock, which in turn increases the marginal product of private capital. Higher marginal

[7] Which itself is an extension of the DIG model by Buffie and others (2012); Zanna and others (2019).

product of capital incentivizes the private sector to match higher public expenditure with more private investments. The strength of this crowding in effect depends on the size of the private investment adjustment costs:

$$\underbrace{K_t}_{\substack{New\ capital \\ stock}} = \underbrace{(1-\delta)K_{t-1}}_{\substack{Old\ capital\ after \\ depreciation}} + \underbrace{I_t}_{\substack{New \\ investment}} \underbrace{-\frac{\kappa}{2}\left(\frac{I_t}{I_{t-1}}-1\right)^2 I_t}_{Adjustment\ cost}$$

where I_t is private investment expenditure and $\kappa \in [0,1)$ governs the size of the adjustment cost. Higher values of α_g and ϵ increase the size of the investment multiplier, while higher values of κ decrease it.

32. Calibrating DIGNAR-19 for Saudi Arabia. The DIGNAR-19 model is calibrated at an annual frequency using recent data capturing salient features of Saudi Arabia's economy. Table 1 reports the key parameter values necessary to pin down the initial steady state. Where possible, parameters are calibrated in line with data provided by the IMF country team. The initial rate of return on standard infrastructure investment is set at 25 percent, approximately in the middle of the range of estimates identified by the World Bank (2010).[8] The initial efficiency of public investment is set at 70 percent in line with most recent country assessment. Additional parameters are as in Aligishiev, Melina and Zanna (2020).

[8] "Cost-Benefit Analysis in World Bank Projects" (2010) by Independent Evaluation Group identifies a 17–31 percent range.

Table 1. Calibrated Parameters and Initial Values for the Steady State
(In percent)

Definition	Value
Potential real GDP growth rate	3.2
Exports to GDP ratio	33.0
Imports to GDP ratio	16.9
Private investment to GDP ratio	13.3
Public investment to GDP ratio	12.1
Public consumption to GDP	20.0
Total public revenues to GDP ratio	40.0
Share of labor taxes in total public revenue	10.0
Share of consumption taxes in total public revenue	20.0
Share of government natural resource revenues in total government revenues	57.3
Public debt to GDP ratio	25.2
Private foreign debt to GDP ratio	53.8
Value added of the natural resource sector	40.0
Real interest rate on domestic debt	1.0
Initial return on public capital	25.0
Public Investment efficiency	70.0
Depreciation rate of public capital	7.0
Investment adjustment costs	5.0

Source: IMF staff calculations.

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