Online Annex 1.1. Model Simulations of Fiscal Support Measures

This annex provides details regarding the model simulations in Chapter 1. It shows that a well-designed and timely fiscal package can support an inclusive economic recovery while reducing public debt over time. The benchmark fiscal package highlights the role of two important factors: timing and composition of policies.

The model is an extension of Traum and Yang (2015)[1] and features two types of households: liquidity-constrained (representing the lower income group) and unconstrained (representing the higher-income group) that receive both labor and capital income (including from assets).[2] The initial conditions are constructed such that they roughly capture the size of the annual growth collapse in 2020 (about -3.7 percent) and the global public debt level at the end of 2020 (almost 100 percent of GDP). This baseline can be interpreted as a scenario without additional fiscal measures in 2021.[3] The output trajectory in the baseline is illustrative, assuming that economic growth is fast paced during the first two years and slowly converges to the pre-crisis growth path afterwards. The policy scenario adds to the baseline a fiscal package. In both scenarios, the policy interest rate is kept at the effective lower bound for another one and a half years.[4]

The Composition of the Benchmark Fiscal Package

The benchmark package consists of 1) targeted transfers to the lower-income group of 0.2 percent of GDP in the first year; 2) a frontloaded increase in public investment of 0.5 percent of GDP in the first two years; and 3) a delayed increase in the labor income tax rate on the higher income group by three years (Online Annex Figure 1.1). The annualized rate of return of public capital is assumed to be 11 percent. The simulation results show that this package can facilitate the recovery while putting the public debt ratio on a downward path in the medium term. Moreover, the consumption of lower-income group rises immediately, supporting the recovery and mitigating inequality. The magnitude of the consumption increase depends crucially on the fraction of liquidity constrained households and the size of additional transfers.

The benchmark package has a two-year cumulative output multiplier of above 1 and a long-term cumulative multiplier close to 2 (yellow bars in Online Annex Figure 1.2).[5] Note that public investment spending in normal times has a smaller output effects in the short run because of crowding-out effects. The short-run expansionary effects in the current simulation are mainly driven by higher targeted transfers and the monetary accommodation, which suppresses the crowding-out effects. The longer-run effects are supported by more productive public capital. In addition to targeted transfers, the short-run expansionary effect of a fiscal package can arise from other measures as well, such as increasing government consumption, which has comparable output multipliers as targeted transfers (*October 2020 Fiscal Monitor*). The fiscal support through targeted transfers, however, has the additional benefit of mitigating income inequality. Since lower-wage

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[1] The model structure and solution method differ from those in Traum and Yang (2015) in the following aspects. First, it models targeted cash transfers to the lower income group and differentiated income tax rates on the households of the two income groups. Second, it allows for the binding of the effective lower bound in monetary policy and can delay fiscal adjustments. Third, it is solved under perfect foresight, meaning that economic agents are aware of the full content of a fiscal package, and the government is fully committed to a policy announcement.

[2] The model calibration closely follows those used in the Online Annex 1.5 of October 2020 *Fiscal Monitor*. The share of the households in the low-income group is assumed to be 30 percent.

[3] The model does not directly feature a health block but relies on a large negative demand-side shock to generate the pandemic-induced recession in 2020, which have resulted in lower output, consumption, and private investment, rising public debt, and constrained monetary policy.

[4] This assumption implies that monetary authorities do not raise the policy rate until the third quarter of 2022. In the simulation, the effective lower bound is zero, applicable to advanced economies but not most emerging market and developing economies. For the interest rate paid on public debt, the model features an exogenous risk premium so that interest payments are not zero even when policy rates are at the effective lower bound.

[5] The multipliers presented here are subject to large uncertainty, owing to several frictions relevant to the pandemic (such as mobility restrictions and consumption behavior changes) and does not include the potential impact of vaccination on fiscal accounts. The model also does not consider the time-to-build aspect of public capital, which could reduce the short-run expansionary effect of public investment (Leeper and others 2010).

earners have been disproportionately affected by the economic contractions during COVID-19, targeted cash transfers can directly boost their income.

Online Annex Figure 1.1. The Macroeconomic Effects of the Benchmark Fiscal Package

Source: IMF staff estimates.
Note: The baseline has no additional fiscal actions relative to what was deployed in 2020. The horizontal axis represents the number of years. Pre crisis level refers to the steady state of the model for the entire simulation period.

Online Annex Figure 1.2. Cumulative Output Multipliers of Various Fiscal Packages
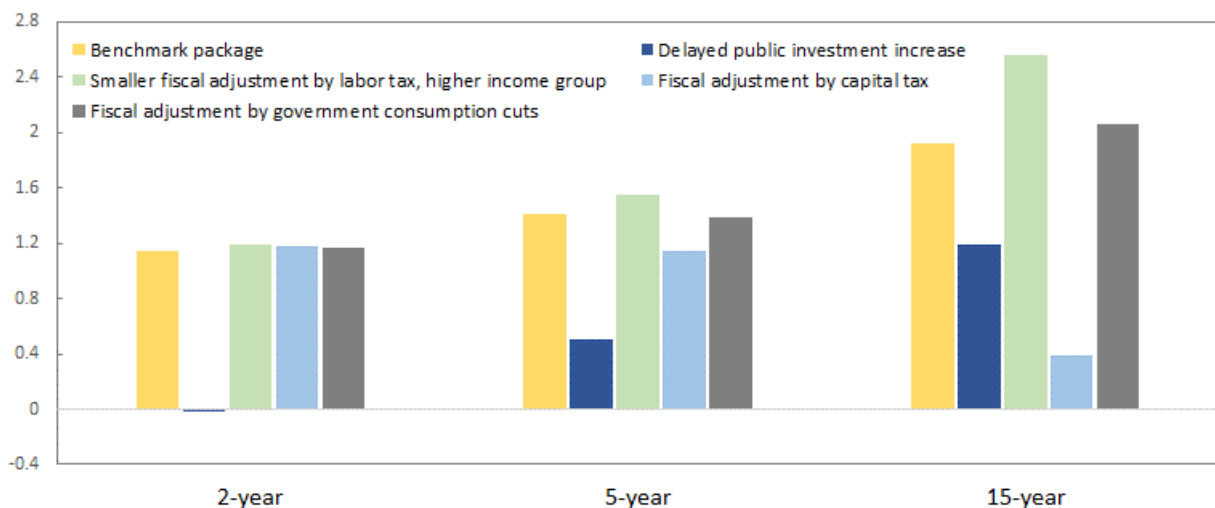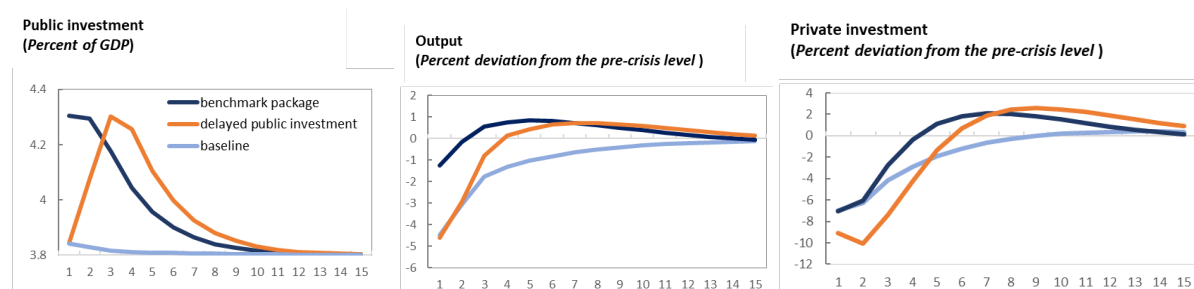

Source: IMF staff estimates.
Note: The cumulative output multipliers are the GDP increase in dollars for each dollar of combined stimulus of higher transfers and public investment as assumed in a fiscal package. Fiscal adjustments are modeled by fiscal reaction functions, in which various instruments react to the rising public debt-to-GDP ratio by the magnitudes sufficient to stabilize debt growth in the medium term.

The Timing of Fiscal Actions

The benchmark package frontloads public investment at a time when public debt is at a historical high. An alternative design is to postpone public investment. Such a strategy, however, could be less supportive of growth (Online Annex Figure 1.3). When public investment is postponed, the benefits of targeted transfers are offset by the negative effect of delayed public investment. Relative to the benchmark package, private investment rebounds with a delay—more so than the baseline without additional fiscal actions.[6] Anticipating higher future productivity, the private sector would postpone investment and wait to take advantage of additional public capital (which increases the productivity of private capital) in the future. Consequently, this would slow labor productivity growth and impede the employment recovery. As additional government demand is added in the later stages of the recovery, interest rates could rise more than in the benchmark package with frontloaded investment. A higher interest rate induces a bigger crowding-out effect of private investment, making the same increase in public investment less expansionary. Moreover, it does not lower the public debt to GDP ratio as the output level associated with a delayed increase in public investment is lower than in the benchmark case. Relative to the benchmark, the scenario of delayed public investment has almost zero multiplier in the short run and a smaller longer-run multiplier (dark blue bars in Online Annex Figure 1.2). The comparison between frontloaded versus delayed public investment suggests that it would pay off to provide greater short-term support when interest rates are low and economic slack is large.

Online Annex Figure 1.3. The Effects of a Delayed Public Investment Increase

Source: IMF staff estimates.
Note: The two fiscal packages differ in the timing of public investment only. The fiscal adjustment speed in the scenario of delayed public investment is also postponed accordingly. The horizontal axis refers to the number of years.

Balancing Greater Short-term Support and Medium-term Fiscal Discipline

In the medium term, reducing debt vulnerabilities and enhancing fiscal buffers are important goals. These objectives should be reflected in the design of a fiscal package and relate to both the size and the type of instruments for fiscal adjustments. The benchmark package has a relatively large increase in the labor income taxes. When the magnitude of the tax increase is insufficient, the public debt ratio can keep growing (Online Annex Figure 1.4). A smaller adjustment magnitude, on the other hand, yields much bigger output multipliers in the longer horizon (green bars in Online Annex Figure 1.2). This illustrates the tradeoffs between economic growth and public debt stabilization. For advanced economies that have ample fiscal space, fiscal adjustments should be postponed to maximize the benefits of support measures. For most emerging market economies and low-income developing countries that have little space, the need for fiscal adjustments can be more pressing.

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[6] Expectational effects of future government spending changes have been studied in the literature. Leeper and others (2010) find that a long delay in the time-to-build process for public capital can be counterproductive for public investment to serve as a stimulus as it can delay the recovery in private investment and labor as found here. Corsetti and others (2012) show that expecting a decline in future government spending reversal can reserve the crowding-out effect of a government spending increase, generating positive private consumption responses.

On the choice of policy instruments, the benchmark package assumes that tax revenues can be mobilized to reduce public debt. For some emerging market economies and low-income developing countries with limited tax capacity, an adjustment may have to be done through cutting less productive public spending. Simulations show that the package with government spending reorientation from less productive government spending to more productive public investment yields similar multipliers as the benchmark package (gray bars in Online Annex Figure 1.2). On the other hand, fiscal adjustments that raise capital income taxes have a large negative effect on output. Higher capital income tax rates discourage private investment, lower the marginal product of labor, and bring a long-lasting negative effect on output (that is, the longer-run output multipliers are much below 1).

Online Annex Figure 1.4. The Effects of a Smaller Fiscal Adjustment Magnitude
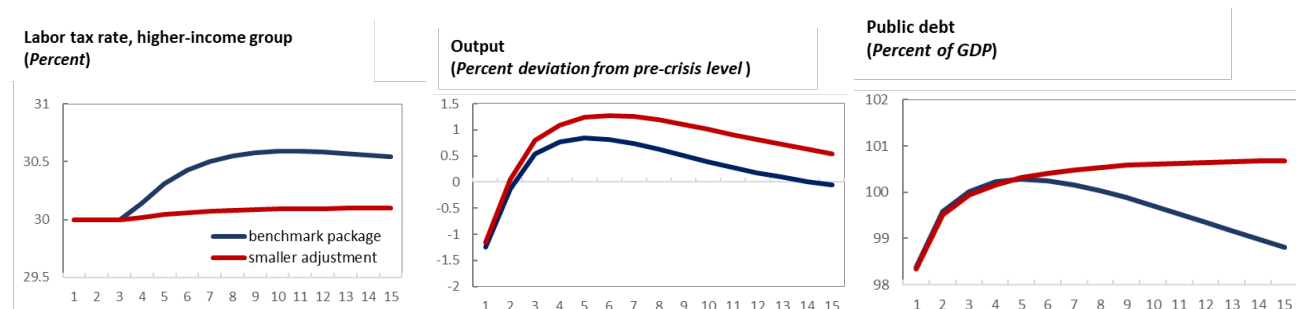
Source: IMF staff estimates.
Note: The horizontal axis refers to the number of years.

References

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