

Boosting Infrastructure in Emerging Asia

Ha Vu, Olivier Bizimana, and Masahiro Nozaki

INTRODUCTION

Infrastructure is essential to support sustainable and equitable growth in emerging and developing Asia. More and better-quality infrastructure is needed for countries in the region to maintain economic growth, advance to high-income levels, keep pace with profound economic and demographic changes, provide better services to citizens, and achieve Sustainable Development Goals (SDGs).

Policymakers considering building up the infrastructure stock need to look at potential macroeconomic and fiscal consequences. Boosting spending on infrastructure can raise growth in the short term by stimulating aggregate demand. It can also shore up potential growth in the long term as better infrastructure promotes the economy's productivity. Nonetheless, the spending boost can result in higher fiscal deficits and public debt if financed by borrowing, which can also crowd out private investment. Alternatively, a tax-financed spending boost can prevent increasing public debt, but the growth stimulus can be dampened by higher taxes on domestic demand or labor supply. The growth-debt trade-off inherent in financing infrastructure spending can be a key consideration for policymakers.

Whereas public investment can be an important catalyst for economic growth, the benefits depend crucially on how it is managed. Countries that are less efficient in public investment get less growth impact from boosting infrastructure spending (IMF 2015; Chapter 3 in this book). Inefficiencies are often due to weaknesses in public investment management. Improvements in infrastructure governance practices can help countries obtain the most economic benefits from their public investment. In this regard, emerging and developing Asian countries need to know how to improve governance practices to more effectively translate public investment into productive infrastructure.

This chapter accounts for these conditions in analyzing how emerging and developing Asian countries can build more and better infrastructure in an effective and efficient way.

The next part of the chapter assesses the region's infrastructure needs, looking at the current state of infrastructure, reviewing historical developments in

infrastructure spending, and analyzing the efficiency of public investment. It finds that emerging and developing Asian countries would need more and better public investment to improve infrastructure outcomes and reach SDGs.

After that, the chapter focuses on how to meet infrastructure needs. Using macroeconomic model simulations, the chapter analyzes whether an infrastructure spending boost should be financed by tax increases or government borrowing and finds that in the long term, the growth-debt trade-off could be resolved by financing with higher indirect taxes. The benefit of improving public investment efficiency in raising long-term growth is highlighted. How to improve public investment management in Asia is then discussed, drawing on Public Investment Management Assessments (PIMAs) by the IMF in 11 Asian countries. The discussion finds that there is substantial scope in the region for improving the appraisal and selection of infrastructure projects, the funding of maintenance spending, multiyear budgeting, and monitoring of public assets. Key policy and institutional recommendations form the conclusion.

THE STATE OF INFRASTRUCTURE AND PUBLIC INVESTMENT IN ASIA

Public investment has been higher in Asia than in other regions over the past 25 years. Government investment as a share of GDP in emerging and developing Asia (even when excluding China) was higher than all other regions during the 1990s and has always been above the average of emerging and developing Europe and Latin America and the Caribbean (Figure 8.1). It was also higher than emerging markets and low-income developing countries during 1990–2011 (Figure 8.2).

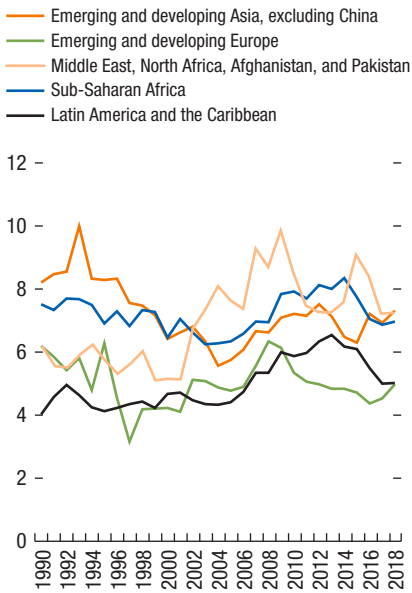
Government investment as a share of GDP in emerging and developing Asia was high during 1990–96 (at 8.5 percent, on average) but started decreasing after the 1997 Asian financial crisis. China has had even higher public investment than the rest of the region.¹ A pickup in infrastructure investment through public-private partnerships (PPPs) has been insufficient to compensate for the decrease in government investment spending.²

However, infrastructure outcomes in emerging and developing Asia are still lagging. According to survey-based measures, the infrastructure quality score in emerging and developing Asia is below emerging and developing Europe and the Middle East and North Africa (Figure 8.3). Perceptions are that infrastructure quality has stagnated since 2012, after converging with emerging markets until 2012 (Figure 8.4).

¹ Government infrastructure investment in China peaked at 32 percent of GDP in 1993, then decreased but still stayed high over the past couple of decades. It fell to 25 percent in 1997 following the Asian financial crisis, then 18 percent in 2007 during the global financial crisis and has hovered around 15 percent in recent years.

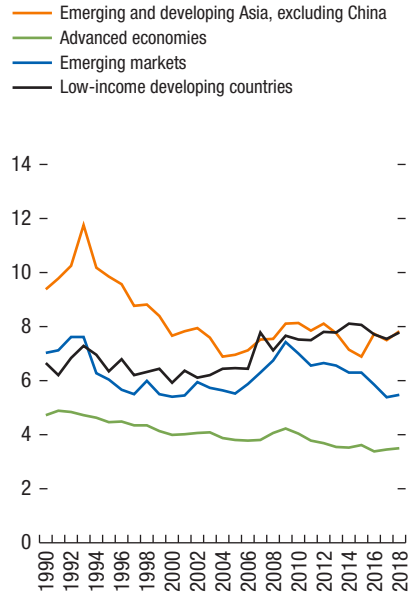
² In the last decade, a growing proportion of infrastructure services in Asia has been delivered through public-private partnerships (PPPs), though with significant differences across countries. Many PPP contracts were signed before the Asian financial crisis and after the 2007 global recession. The average nominal value of contracts reached 1.8 percent of GDP in 1998 and 2.2 percent in 2012.

Figure 8.1. General Government Investment, by Region
(Percent of GDP)



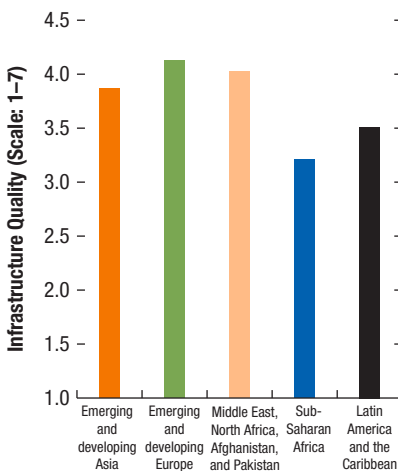
Sources: World Economic Outlook data; and IMF staff estimates.

Figure 8.2. General Government Investment, by Income
(Percent of GDP)



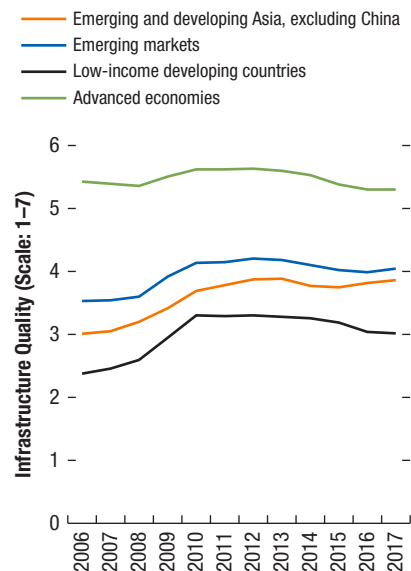
Sources: World Economic Outlook data; and IMF staff estimates.

Figure 8.3. Perception of Infrastructure Quality, by Region, 2017



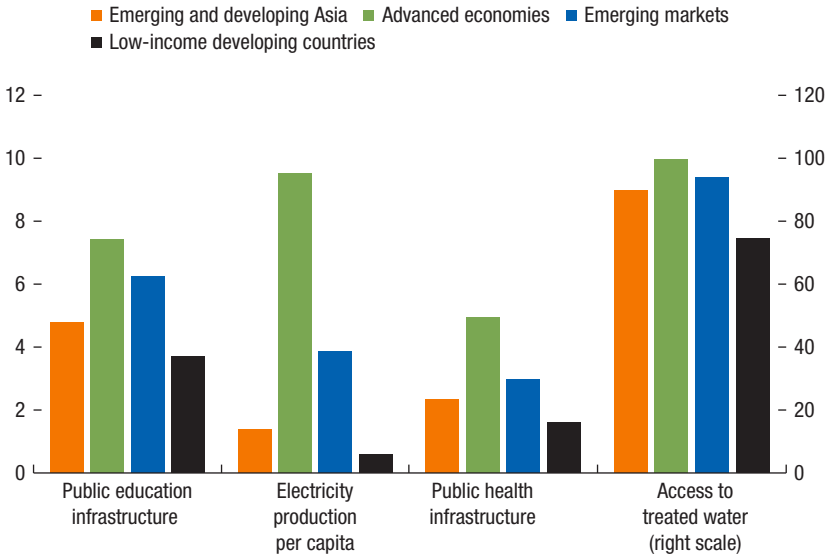
Source: World Economic Forum 2017.

Figure 8.4. Perception of Infrastructure Quality, by Income, 2006–17



Source: World Economic Forum 2017.

Figure 8.5. Measures of Infrastructure Access



Source: World Development Indicators 2017.

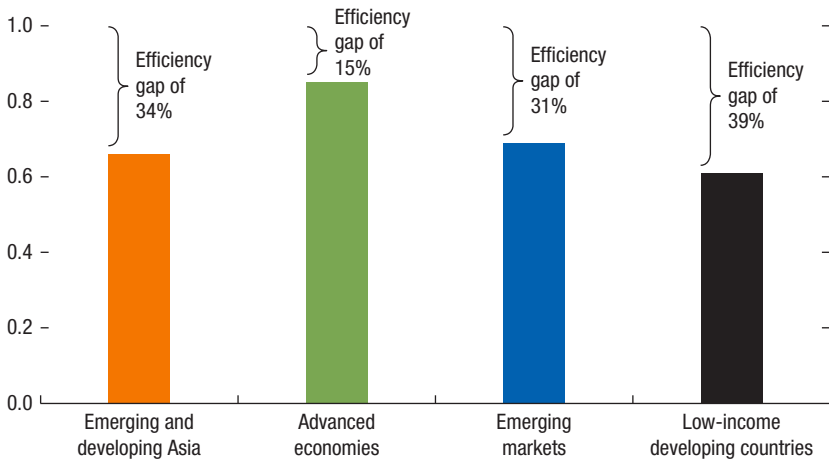
Note: Units vary to fit scale. Left scale: education infrastructure is measured as secondary teachers per 1,000 persons; electricity production as kilowatt-hours per 1,000 persons; and health infrastructure as hospital beds per 1,000 persons. Right scale: access to water is measured as percentage of population.

Physical measures of infrastructure also suggest emerging and developing Asia still lags behind emerging markets in the coverage of education infrastructure and electricity, and somewhat less so in access to public health infrastructure and water (Figure 8.5).

Therefore, emerging and developing Asia would need to improve the infrastructure outcomes of public investment spending. On average, countries lose over one-third of their resources in the public investment process owing to inefficiencies (see Chapter 3).³ This efficiency gap relative to best performers is smaller than observed in low-income developing countries but larger than the performance of emerging markets and advanced economies (Figure 8.6). This suggests there is scope to improve the efficiency of public investment spending.

In addition, emerging and developing Asia would need large investment spending to reach the SDGs. Chapter 4 in this book estimates that on average, Asian countries would need additional annual infrastructure investment of about 5 percent of GDP in water, roads, and electricity by 2030 to meet the SDGs. Currently, annual

³ The IMF has developed a methodology for estimating the efficiency of public investment. This is explained in Chapter 3. Simply stated, the estimate of a country's performance is based on an index of infrastructure outcomes compared with its per capita public capital, or cumulative spending on public investment. A "frontier," which consists of the countries achieving the highest output per unit of input, is drawn. The efficiency gap measures the relative difference between a country's performance and the best performers.

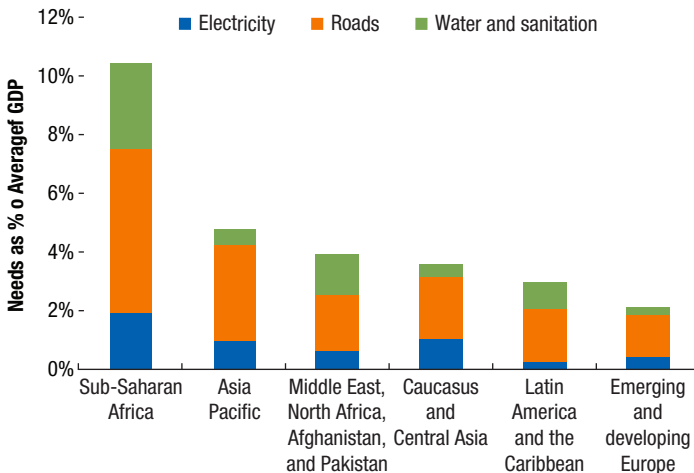
Figure 8.6. Public Investment Efficiency Scores

Source: Authors' calculations based on Chapter 3 of this book.

Note: The efficiency gap measures the relative difference between a country's performance and best performers.

government investment of about 7 percent of GDP in emerging and developing Asia covers all sectors, not just the three sectors. The needs for emerging and developing Asia are the second-largest of the five regions in the world, only below those for sub-Saharan Africa. The road sector in emerging and developing Asia would need the highest additional investment of over 3 percent of GDP (Figure 8.7).

Figure 8.7. Infrastructure Investment Needed to Achieve Sustainable Development Goals
(Percent of average GDP)



Source: Authors' calculations based on Chapter 4 of this book.

More and better investment spending in emerging and developing Asia could also lead to higher GDP growth. Chapter 2 suggests that increased investment spending in countries with better infrastructure governance leads to higher output.

HOW INFRASTRUCTURE SPENDING IN ASIA CAN BE BOOSTED

Policymakers needing to build infrastructure can benefit from knowing whether increased public infrastructure spending should be financed through higher taxes or borrowing. This question is addressed through the lens of the growth-debt trade-off in emerging and developing Asian countries, using macro-model simulations for selected countries, and by analyzing the macroeconomic benefit of making public investment management more efficient. The final part of the discussion looks at how to improve public investment management institutions in emerging and developing Asia, building on the PIMAs that IMF has conducted in the region.

Should Infrastructure Spending Increases Be Financed by Tax Measures or Borrowing?

The macroeconomic effects of public infrastructure improvement in Asia are evaluated using the IMF's Flexible System of Global Models (FSGM). The FSGM is an annual, multiregion, general equilibrium model of the global economy combining both micro-founded and reduced formulations of various economic sectors. In the model, total consumption consists of spending both from households that can save and from those who can only consume out of current income. Firms produce goods and services using labor and their holdings of private capital. The government purchases final goods directly, including consumption and investment goods, and makes transfers to households through various tax instruments. Monetary authorities set interest rates to achieve an inflation target in the medium term.

The FSGM is particularly well suited to analyze the macroeconomic effect of a ramp-up in public infrastructure spending. Indeed, government investment, in addition to affecting aggregate demand directly, also cumulates into the stock of public infrastructure, raising the economy wide level of productivity. The accumulation of public investment into public capital varies to some extent from country to country, depending on the efficiency of public investment management. Moreover, the model is set up so that the economy responds significantly to fiscal policy in both the short and the long terms. The FSGM's theoretical structure and simulation properties are laid out in André and others (2015).⁴ The simulations

⁴ This analysis uses the Asia and Pacific Department Model, a module of the Flexible System of Global Models (FSGM), which contains individual blocks for 15 Asian countries and 9 additional regions that represent the rest of the world (Annex 8.1).

are undertaken for six countries: India, four ASEAN economies (Indonesia, the Philippines, Thailand, Vietnam), and one small frontier economy (Sri Lanka).

The simulations assume a permanent increase in public investment of 1 percent of GDP phased in over five years, with varying financing scenarios. Though large infrastructure needs are apparent in the region, a 1 percent increase in public investment is used for simplicity and comparison across countries. Hence, the simulations show a conservative estimate of potential output gains. Moreover, given that the simulations assume a permanent shock, a more ambitious government investment program would significantly weaken public finances, would require sizable tax hikes that may not be politically feasible and/or would require combining alternative sources of funding such as through PPPs. Macroeconomic implications depend on how the investment increase is financed, particularly whether it is financed by tax or debt.⁵ The simulations consider four scenarios:

- *Scenario A: Tax financing through higher VAT.* The fiscal cost of the public investment increase is fully offset by a hike in indirect taxes, which would be equivalent to a VAT. This would imply a hike in the tax rate of about 1.3–1.7 percentage points.
- *Scenario B: Tax financing through higher income tax.* The fiscal cost is fully offset by a hike in direct taxes, split evenly between personal income tax (PIT) and corporate income tax (CIT). This would imply an increase in the PIT rate of about 0.8 percentage point and a rise in the CIT rate ranging from 2.0 to 3.9 percentage points, depending on countries.
- *Scenario C: Debt financing with a standard reaction of the interest rate to higher debt.* The public investment increase is fully financed by borrowing rather than by higher taxes.⁶ Because this would have an adverse effect on the interest rate and borrowing costs, the simulations assume an increase in the risk premium by 3 basis points per unit increase in the ratio of public debt to GDP (the debt-to-GDP ratio).⁷

⁵ The scope to finance infrastructure spending by rationalizing current expenditure is low in emerging and developing Asia, given generally low government expenditures and countries' need to increase social spending.

⁶ In the FSGM, this scenario is implemented by adjustment of the fiscal deficit target to the additional discretionary spending assumed in the policy experiment. In Scenarios C and D, the fiscal balance is affected by the cycle, reflecting the effects of automatic stabilizers, while general lump-sum transfers adjust to cover the increased debt-service costs associated with a permanently higher deficit. In principle, any expenditure or fiscal instrument in FSGM can be used for automatic adjustment toward the deficit target; general lump-sum transfers are used because they have the least distortionary effects.

⁷ The risk premium is exogenous in the FSGM and calibrated based on the increase in the debt-to-GDP ratio to better reflect the crowding-out effect of government debt. The assumption of 3 basis points is based on Kumar and Baldacci (2010), who find that appropriate risk-premium elasticities would be in the range of 3–5 basis points for a panel of advanced and emerging market economies. The conservative value of 3 basis points here is motivated by most of the selected economies having low debt-to-GDP levels (with the notable exceptions of Sri Lanka and India).

TABLE 8.1.

Growth-Debt Trade-Off with a Sharp Increase in Public Investment			
	Scenario A: Tax Financing through Higher Vat	Scenario B: Tax Financing through Higher Income Tax	Scenarios C and D: Debt Financing with a Reaction of the Interest Rate to Higher Debt
Benefits	<ul style="list-style-type: none"> A sharp increase in public investment raises growth because of fiscal multiplier effects and higher public capital stock. By construction, fiscal balance is unchanged, as the spending increase is offset by higher VAT collection. 	<ul style="list-style-type: none"> The increase raises growth because of fiscal multiplier effects and higher public capital stock. By construction, fiscal balance is unchanged, as the spending increase is offset by higher income tax collections. 	<ul style="list-style-type: none"> The increase raises growth because of fiscal multiplier effects and higher public capital stock.
Costs	<ul style="list-style-type: none"> Dampens private consumption, partially offsetting the growth impact of higher public investment. 	<ul style="list-style-type: none"> Dampens investment and labor supply and demand, partly offsetting the growth impact of higher public investment. 	<ul style="list-style-type: none"> Fiscal deficit and public debt increase over time. Higher borrowing costs crowd out private investment and depress capital stock, dampening the growth impact of higher public investment.

Source: Authors.

- *Scenario D: Debt financing with a benign reaction of the interest rate to higher debt.* A higher deficit would still lead to an increase in borrowing costs but at a lower elasticity of the risk premium at 1 basis point (rather than 3 basis points in Scenario C).

The macroeconomic benefits and costs of a sharp increase in public investment can be considered through the lens of growth-debt trade-off. Table 8.1 shows the benefits and costs by scenarios.

- Under tax-financed scenarios (budget neutral), the fiscal balance is unchanged, as the public investment increase is financed with higher consumption taxes. By contrast, under debt-financing scenarios, the fiscal balance worsens and public debt rises in parallel with the increase in public investment. This raises the government's borrowing cost, as higher public debt raises the risk premium.
- The increase in public investment lifts growth in the short and long terms. In the short term, higher aggregate demand raises output through multiplier effects. In the long term, higher public investment raises the public capital stock, boosting productivity. The resulting rise in the marginal productivity of capital and labor stimulates private investment and labor demand, also stimulating private consumption.
- The output gains are dampened as agents react to higher taxes or borrowing costs. In the tax-financed scenarios (A and B), higher taxes weaken private demand in the short term, partially offsetting the growth stimulus from

higher public investment spending. Whereas a VAT hike negatively affects private consumption, higher CIT and PIT rates, which weigh on firms' investment and labor demand and discourage labor supply, are generally more distortive than a VAT hike. IMF (2013) finds that corporate income taxes have the most negative effect on growth, followed by labor income taxes, then indirect taxes, and finally property taxes.

- In the debt-financing scenarios (C and D), the rise in the government's borrowing costs crowds out private investment and depresses the private capital stock over time, dampening growth in the short and long terms. This effect is weaker in Scenario D, where the assumed elasticity of the risk premium to public debt is lower.

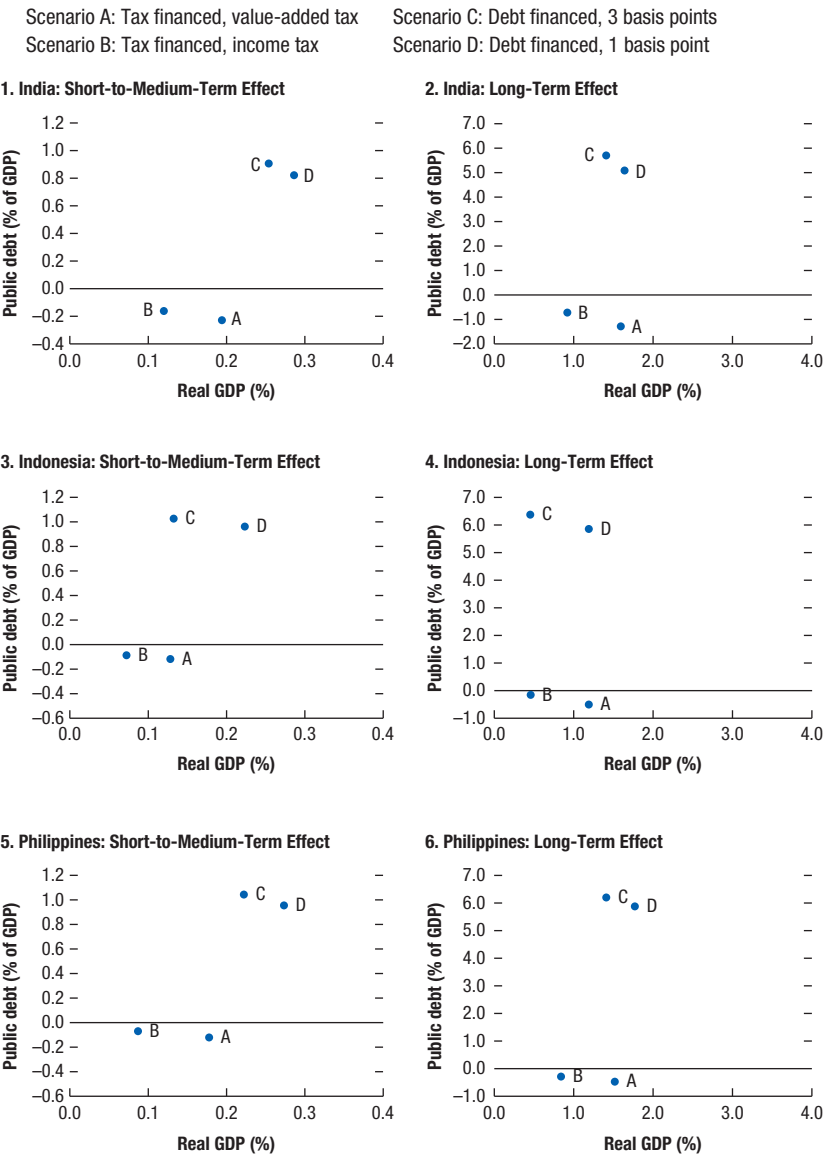
Simulation results shown in Figure 8.8 quantify the growth-debt trade-off for each of the six economies. The figures plot simulated outcomes for real GDP and the debt-to-GDP ratio, showing the difference from the status quo (that is, without an infrastructure spending increase) in 3 years and 10 years after the beginning of the sharp increase in public investment. The 3- and 10-year outcomes represent short-to-medium-term effects and long-term effects. The key findings are as follows:

- The sharp public investment increase raises real GDP in all countries and in all scenarios. In the short-to-medium term, a boost in aggregate demand from multiplier effects is not fully offset by a weakening in private consumption or investment. The net impact on output in the short-to-medium term is larger for Vietnam (0.2–0.4 percent depending on scenarios) than for the rest of the economies (0.1–0.3 percent).⁸ In the long term, the positive growth feedback from the higher public capital stock kicks in, while domestic demand recovers. The net long-term effect on output is large for Vietnam (2.0–3.0 percent), relatively small for Indonesia (0.5–1.2 percent), and between 1.0 percent and 2.0 percent for the rest. Overall, countries with higher initial government investment efficiency record the largest cumulative increase in real GDP in the long term.⁹
- Among tax-financed scenarios, the output boost in the short-to-medium term and the long-term is larger when the public investment increase is financed by a VAT hike (Scenario A) than by an income tax hike (Scenario B), in line with the expectation that a VAT hike would be the less distortive. Similarly, among debt-financing scenarios, the output boost is stronger under Scenario D than under Scenario C, because the former assumes a

⁸ The implied short-term fiscal multiplier is 0.5 for India, 0.3 for Indonesia, 0.3 for the Philippines, 0.3 for Sri Lanka, 0.4 for Thailand, and 0.3 for Vietnam. They are in line with the estimates presented in the IMF Technical Note on fiscal multipliers (Batini and others 2014).

⁹ The calibration of the parameter of public investment efficiency is based on the combination of long-term output elasticity of government investment (see Ligthart and Suárez 2005) and estimates of the survey-based quality indicators published in the IMF policy paper "Making Public Investment More Efficient" (2015).

Figure 8.8. Growth-Debt Trade-Off with a Sharp Increase in Public Investment

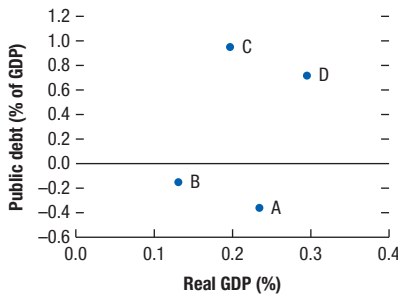


Source: IMF staff calculations from Flexible System of Global Models simulations.

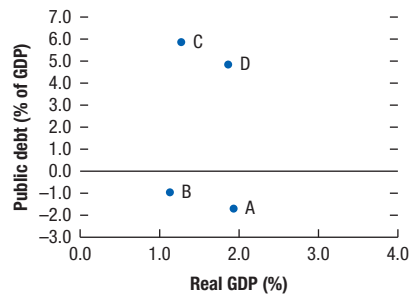
Note: The panels in the figure plot simulated outcomes for Scenarios A, B, C, and D, showing the difference, as a percentage of GDP, from the status quo (that is, without a sharp increase in infrastructure spending) in real GDP levels and public debt (for example, a positive value for Scenario A means that the outcome is larger under the scenario than under the status quo). The short-to-medium-term effect represents the difference 3 years after the start of the spending boost, and the long-term effect is set at 10 years.

Figure 8.8. Growth-Debt Trade-Off with a Sharp Increase in Public Investment
(continued)

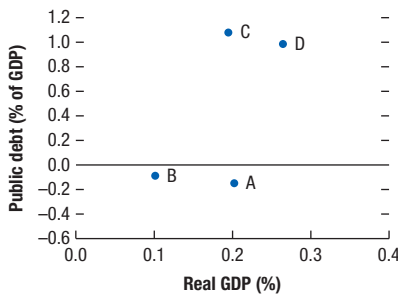
7. Sri Lanka: Short-to-Medium-Term Effect



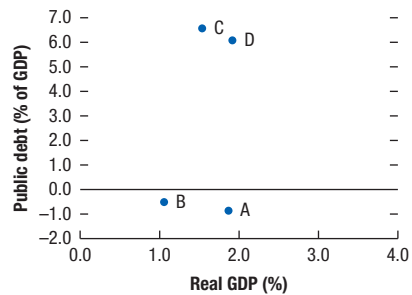
8. Sri Lanka: Long-Term Effect



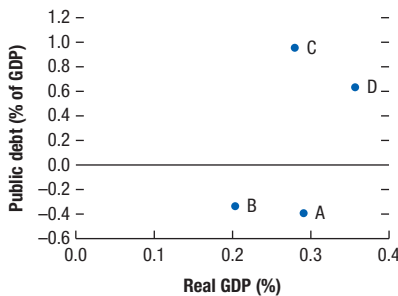
9. Thailand: Short-to-Medium-Term Effect



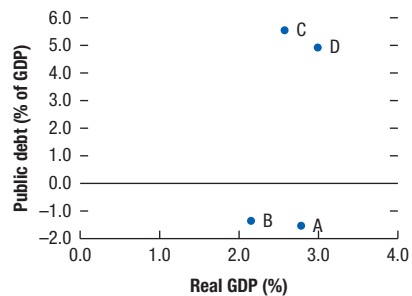
10. Thailand: Long-Term Effect



11. Vietnam: Short-to-Medium-Term Effect



12. Vietnam: Long-Term Effect



Source: IMF staff calculations from Flexible System of Global Models simulations.

Note: The panels in the figure plot simulated outcomes for Scenarios A, B, C, and D, showing the difference, as a percent of GDP, from the status quo (that is, without an infrastructure spending boost) in real GDP levels and public debt (for example, a positive value for Scenario A means that the outcome is larger under the scenario than under the status quo). The short-to-medium-term effect represents the difference 3 years after the start of the spending boost, and the long-term effect is set at 10 years.

more benign reaction of the interest rate to debt increase, limiting the weakening in private investment.

- As expected, the ratio of public debt to GDP rises in debt-financing scenarios (C and D) by 5–7 percentage points in the long term. On the other hand, tax-financing scenarios (A and B) see a slight decrease in the debt-to-GDP ratio, reflecting higher GDP levels owing to the sharp increase in public investment, while the fiscal balance remains unchanged.

Which Financing Option Would Better Address the Growth-Debt Trade-Off: Tax Financed or Debt Financed?

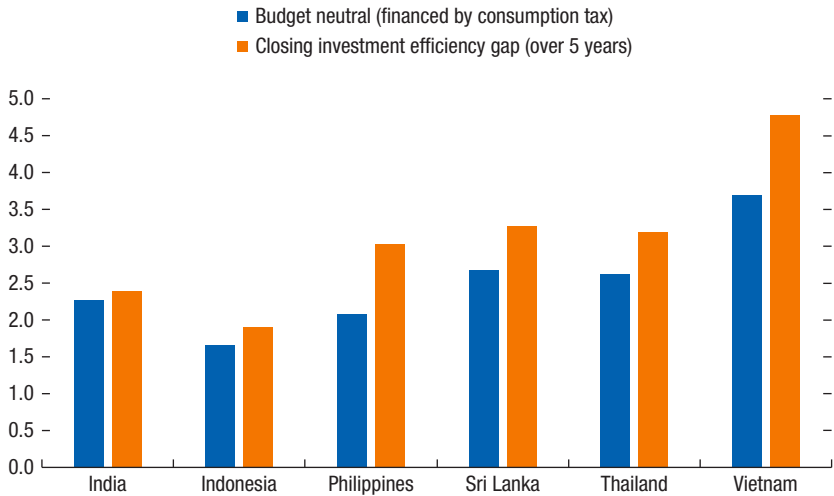
- In the short-to-medium term, a debt-financed public investment boost would achieve higher multiplier effects than a tax-financed boost, as long as the resulting increase in borrowing costs can be contained.¹⁰ Because the larger multiplier effects are associated with higher public debt, the scenario with debt-financed public investment (Scenario D) may still not be preferred to the VAT-financed scenario (Scenario A).
- In the long term, however, the relative attractiveness of debt financing (Scenario D) diminishes, as the output boost under Scenario D is broadly the same as under VAT-financing (Scenario A) in all countries. This is because even a benign increase in risk premium associated with a rising debt-to-GDP ratio in Scenario D damps down private investment over time, reducing output gains in the long term. Scenario A achieves a relatively high output boost with no increase in public debt, while the public debt increases in Scenario D. This suggests that VAT-financing is superior to debt financing in solving the growth-debt trade-off in the long term.

Policymakers would also need to be mindful of the negative impact of VAT rate increases on income inequality. Indirect taxes such as VAT may be regressive; that is, they levy a higher burden (relative to income or expenditure) on the poor than on the rich. While income inequality is not captured by the model here, the regressive impact can be reduced in that the accompanying infrastructure spending boost is pro-poor (for example, developing local roads that improve accessibility of rural areas). The regressive impact can be ameliorated by strengthening public spending that benefits the poor relatively more, such as for education, health care, and targeted social safety nets.

The growth-debt trade-off can be lessened by the growth payoff of improving public investment efficiency. The output boost from a public investment increase would be large in a country with high public investment efficiency, because it would be able to build more infrastructure with a given amount of

¹⁰ For all countries, the short-and-medium-term output boost is slightly larger in Scenario D than in Scenario A, whereas it is broadly comparable between Scenarios C and A.

Figure 8.9. The Effect of Higher Public Investment on Real GDP, Year 10
(In percent deviation from control)



Source: IMF staff calculations.

public investment. In addition, the resulting rise in productivity raises labor demand and wages, further lifting private consumption in the long term. To illustrate these, FSGM simulations are conducted to gauge output gains from closing the public investment efficiency gap under the VAT-financing scenario (A) in each of the six countries. Results reported in Figure 8.9 show that closing the efficiency gap over five years would boost the year-10 output by 0.6–1.1 percentage points, with an exception of India and Indonesia where the improvement is only 0.1–0.3 percentage point.

How Can Public Investment Efficiency Be Improved in Asia?

Strengthening infrastructure governance can help countries improve public investment efficiency. Analysis in Chapter 3 suggests that the average country loses about 30 percent of the returns on its investment to inefficiencies in its public investment management processes, with substantial scope for improving public investment efficiency across income groups. Improvements in public investment management can help countries reduce more than half of their inefficiency gap.

Emerging and developing Asian countries could improve infrastructure governance by focusing reform efforts on their weakest and most critical practices of public investment management. The initial results of the PIMAs for 11 countries

Figure 8.10. Institutional Strength and Effectiveness of Public Investment Management in Emerging and Developing Asia



Source: IMF Public Investment Management Assessment missions, 2015–19.

in Asia¹¹ show that most public investment management practices in the region have good *institutional strength* (Figure 8.10). However, effectiveness in their *implementation* is generally lower.

The average of PIMA scores in Asian countries are mostly in the middle range. Institutional strengths lie mostly in the planning and implementation phases, where three out of five practices each meet at least medium scores. These scores reflect the somewhat good practices in fiscal framework and rules that provide overall targets for fiscal policy, the planning of national and sectoral public investments, the use of alternative financing means for infrastructure such as PPPs, the procurement law and regulations, the availability of funding within a budget year, and the general oversight of the infrastructure investment portfolio. However, Asian countries, on average, have weaker institutional strength in several other public investment management practices. These include the coordination between the central government and local governments as well as oversight of infrastructure investments by state-owned

¹¹ The IMF has conducted PIMA missions in 11 countries in Asia and the Pacific: Bangladesh, Indonesia, Kiribati, Malaysia, Maldives, Mongolia, the Philippines, Sri Lanka, Thailand, Timor-Leste, and Vietnam. Also see the PIMA background and methodology in Chapter 8.

enterprises, project appraisal and selection, maintenance funding, and monitoring of public assets.

Within Asia, while emerging markets and low-income developing countries share certain similarity in public investment management institutions, several distinct strengths and weaknesses are apparent. Financing for capital spending is usually made in a timelier manner in emerging markets. This helps sectoral ministries plan and commit expenditure on capital projects in advance based on more reliable cash flow forecasts. In contrast, because of lack of funding and weak capacity of cash management low-income developing countries often have cash rationing, leading to delays of project implementation. However, low-income developing countries are stronger than emerging markets in Asia in several practices such as procurement of major projects and budgeting for investment. Many major projects in low-income developing countries are funded by international organizations, which generally have competitive and transparent procurement. Budgeting for investment in low-income developing countries often protects capital investment by allowing multiyear contracts and being more restrictive in shifting funding from capital to current expenditure during budget execution.

Public investment management practices in Asia are generally better in the planning and implementation phases but worse in the allocation phase than in other regions. Clear areas of comparative strength for Asia are in fiscal rules, coordination between entities, alternative infrastructure financing in the planning phase, and in procurement, the availability of funding, and portfolio and project management during implementation. In the allocation phase, shortcomings in Asia include the practices of budget comprehensiveness and unity, and maintenance funding. Asian economies share common weaknesses with the rest of the world in project appraisal and selection, multiyear budgeting, and monitoring assets.

The least effective public investment management institutions in Asia are involved in appraising and selecting projects, maintenance funding, multiyear budgeting, and monitoring of public assets. Not only is design strength already low but effectiveness in implementation is even lower.

- *Project appraisal:* Most countries in the sample have weak mechanisms for project appraisal. Major projects are often not subject to rigorous technical, economic, and financial analysis (7 out of 11 countries in the sample). Time to evaluate major projects is often insufficient and often no standard appraisal methodology is applied (5 out of 11). Low-quality appraisal makes it difficult to choose between competing projects and often leads to delays in implementation.
- *Project selection:* Most of the countries (7 out of 11) do not have an effective review of major projects by a central ministry before projects are included in the budget. Project selection is often not transparent, and it lacks clear and published criteria (7 out of 11). Nearly all countries (9 out of 11) lack

a pipeline of already-vetted projects that is used for selecting projects for inclusion in the budget.

- *Maintenance funding:* More than half of the countries lack a standard methodology for estimating needs and funding for routine maintenance and major improvements of infrastructure assets. Most (5 out of 7) do not have information on funding for routine and capital maintenance by a ministry or agency responsible for it but aggregate such spending.
- *Multiyear budgeting:* Nearly all of the countries (9 out of 11) do not publish projections about overall or disaggregated capital spending by a ministry or sector over a three- to five-year horizon. Almost all (10 out of 11) do not have multiyear ceilings on capital expenditure by ministry, sector, or program. Nearly half of the countries (5 out of 11) do not publish projections about the total construction cost of major capital projects.
- *Monitoring of public assets:* Asset registers in more than half of the countries (6 out of 11) are neither comprehensive nor updated regularly. Most of the countries (7 out of 11) do not include the value of nonfinancial assets in government financial accounts and do not record the depreciation of fixed assets in operating statements.

While emerging and developing Asian countries address common infrastructure governance weaknesses, they could also learn from successful practices in the region. These include fiscal rules that support fiscal sustainability in Indonesia, national and sectoral strategies guiding investment allocation in Vietnam, the strong PPP framework in Timor-Leste, an effective mechanism to protect ongoing investment projects in the Philippines, e-procurement in Bangladesh, practical portfolio monitoring in Malaysia, and comprehensive asset monitoring in Mongolia (see Box 8.1). While lessons can be learned among peers in the region and the world, each country would have to implement specific reforms, with their sequencing and solutions dependent on the country's situation.

Box 8.1. Examples of Good Public Investment Management Practices in Emerging and Developing Asia

- *Fiscal targets and rules:* In Indonesia, fiscal policy is guided by statutory limits on general government deficit and debt. These rules have served Indonesia well in achieving fiscal responsibility and ensuring debt sustainability. A medium-term fiscal framework with major fiscal aggregates provides adequate top-down input into the budget formulation.
- *National and sectoral planning:* In Vietnam, the government prepares a large number of national and sectoral strategies for public investment, most being published and clearly linked. The recently adopted Law on Planning is meant to streamline the sectoral and national planning process. The overall medium-term investment plan framework, which has been developed by the Ministry of Planning and Investment in accordance with the Public Investment Law and in cooperation with the Ministry of Finance, aims to determine the overall funding framework.

Box 8.1 (continued)

- *Alternative infrastructure financing:* In Timor-Leste, the public-private partnership decree-law provides a comprehensive overview of the government's approach to identification, development, selection, and implementation of these partnerships. This includes criteria for assessing and selecting projects, and requirements for value-for-money reviews of project proposals. The methodology ensures that relevant risks and liabilities—explicit and contingent—are identified and systematically recorded. The partnerships process is managed by a dedicated unit in the Ministry of Finance. Public-private partnerships have been used to mobilize private sector knowledge and experience in the implementation of complex projects, rather than as a financing mechanism.
- *Budgeting for investment:* In the Philippines, a two-tier budgeting approach protects funding for ongoing projects in the annual budget and over the medium term. Annual budget estimates for ongoing projects (Tier 1) are first prepared by line agencies, discussed with the Department of Budget and Management during Tier 1 hearings, and then approved by the Development Budget Coordination Committee and included in a published budget priorities framework. The allocation of new spending is discussed during later hearings about new projects (Tier 2 hearings). In addition, outlays are appropriated on an annual basis with multiyear obligation authority for new projects. Multiyear commitments are included in the budget documentation.
- *Procurement:* In Bangladesh, the web-based electronic government procurement system, e-GP, covers procurement of works, goods, and services. The methods used in e-GP have been largely competitive. The public has access, through the e-GP website, to tender documents, bid statistics, and summary contract data relating to each tender and to key performance information covering all tenders announced. The e-GP has the capability to produce analytical reports and publishes on its website a quarterly performance indicators report, covering 42 indicators. A data dashboard and a civil engagement feature will allow the public to provide feedback on contract implementation.
- *Portfolio management and oversight:* In Malaysia, a project monitoring system called SPP II assists the government in gaining effective oversight of all projects. The system generates reports that ministries and agencies can use for weekly monitoring, as well as producing monthly reports to help senior management. Yearly monitoring reports are generated to enable politicians to have a condensed view of the progress and status of all projects. Reports are simple to understand and can be interpreted by technical, financial, and political personnel. There is no wasted information to clutter the system.
- *Monitoring of public assets:* In Mongolia, comprehensive asset surveys are conducted every four years for all nonfinancial assets, including infrastructure. The State Local Property Management System, a manually updated software system, keeps track of assets. Tangible assets, including buildings, construction, roads, and bridges, are reported in the balance sheets. They are valued initially at acquisition cost and subsequently depreciated in accordance with International Public Sector Accounting Standards. Depreciation of fixed assets is captured in the government income statement, using depreciation methods allowed by IPSAS 17.

Source: IMF Public Investment Management Assessment missions, 2015–19.

CONCLUSIONS

This chapter assesses the need to scale up infrastructure investment in emerging and developing Asia and how to deliver it. Reviews of past developments, cross-country comparisons, and simulation-based analyses lead to four key messages.

First, emerging and developing Asia needs more and better investment spending to improve infrastructure outcomes and reach SDGs. Infrastructure quality in the region has stagnated since the early 2010s at a level below other regions, while public capital stock has decreased relative to GDP since 2000. Emerging and developing Asian countries have sizable infrastructure spending needs, estimated at about 7 percent of the region's GDP in 2030, to meet the SDGs. Infrastructure investment through PPPs picked up in the mid-2000s but has not offset the decline in government infrastructure spending.

Second, in emerging and developing Asia, financing an infrastructure spending boost with higher indirect taxes would be desirable in the long term in view of a growth-debt trade-off. Macroeconomic model simulations for India, Indonesia, the Philippines, Sri Lanka, Thailand, and Vietnam suggest that it matters how an infrastructure spending boost is financed. In the short-to-medium term, assuming a benign borrowing risk premium, the growth pickup would generally be higher with debt financing than with tax financing. With debt financing resulting in higher public debt, policymakers face a growth-debt trade-off. Among tax options to finance the spending boost, indirect taxes such as VAT are less distortive and generate more economic growth than income taxes. In the long term, the size of the growth pickup does not differ between VAT financing and debt financing, although VAT achieves a slight decrease in the debt-to-GDP ratio. While VAT financing would be a preferable option for policymakers for the long term, they would need to be mindful of its negative impact on income inequality, which can be dealt with by strengthening public spending that brings relative strong benefits to the poor, such as education, health care, and targeted social safety nets.

Third, emerging and developing Asia can benefit from improving public investment efficiency, which helps produce more and better-quality infrastructure for every unit of money spent on infrastructure investment. The region's public investment is generally less efficient than in advanced and emerging market economies. Model-based simulations for the countries selected in this chapter suggest that a reduction in the public investment efficiency gap would substantially increase the size of the long-term expansion in output from an infrastructure spending boost, thus helping to resolve the growth-debt trade-off.

Fourth, emerging and developing Asian countries could enhance public investment efficiency by focusing reform efforts on their weakest and most critical practices of public investment management. PIMAs by the IMF for 11 of the region's countries suggest that the design of institutions dealing with public investment management is relatively strong but the countries' implementation

of infrastructure projects is less effective. Specifically, emerging and developing Asia would have substantial scope for improving the appraisal and selection of projects, the funding of maintenance spending, multiyear budgeting, and monitoring of public assets. Emerging and developing Asian countries can also learn from the good practices of their peers.

ANNEX 8.1. ASIA AND PACIFIC DEPARTMENT MODEL SIMULATION RESULTS

The macroeconomic effects of public infrastructure improvement in Asia are evaluated using the Asia and Pacific Department Model, a module of the Flexible System of Global Models (FSGM), which contains individual blocks for 15 Asian countries and nine additional regions that represent the rest of the world. The simulations are undertaken for India, four Southeast Asian economies—Indonesia, the Philippines, Thailand, and Vietnam—and one small frontier economy—Sri Lanka (see Annex Figures 8.1.1 through 8.1.6).

Assumptions

The simulations assume a permanent increase in public investment of 1 percent of GDP phased in over five years. Monetary policy responds endogenously to the shock by following a standard monetary policy rule, whereby interest rates are adjusted as inflation and the output gap change.

The baseline simulations are carried out assuming that agents learn about the policy step by step—and that the policy is fully credible only after five years (imperfect foresight).¹²

As the macroeconomic implications differ depending on how investment spending is financed, the policy experiments are assessed under two financing scenarios: budget neutrality (tax financed) and debt-financing scenarios.

Under the budget neutrality scenario, any fiscal cost of the policy push is offset by an increase in revenue that keeps the deficit target unchanged. In the tax-financed scenario, two forms of financing are considered: (1) an increase in indirect tax (consumption tax—VAT) of 1 percent of GDP and (2) a hike in direct taxes split evenly between personal income tax (PIT) and corporate income tax (CIT)—0.5 percent of GDP respectively.

Under the debt-financing scenario, the deficit target adjusts to the additional discretionary spending assumed in the policy experiment. Under this scenario, general lump-sum transfers only adjust to cover the increased debt-service costs

¹² Alternative experiments also explore the cases in which policies are assumed to be fully credible—that is, the entire path of implementation is known to economic agents at the beginning of the shock (perfect foresight). In this alternative scenario (perfect foresight), policies have sizable short-term effects, as agents fully internalize the impact of the policies at the time of their announcement and frontload spending accordingly.

associated with a permanently higher deficit.¹³ In both financing scenarios, the fiscal balance is affected by the cycle (reflecting the effects of automatic stabilizers).

Moreover, given that the debt-financed public investment increase can raise borrowing costs, the experiments incorporate the assumption of a risk premium associated with rising public debt as a proportion of GDP. As the orders of magnitude of the increase in the risk premium are uncertain, two calibrations are examined. The baseline debt-financing scenario sets the risk premium at 3 basis points per unit increase in the debt-to-GDP ratio. This assumption is based on Kumar and Baldacci (2010) who find debt elasticities in the range of 3–5 basis points for a panel of advanced and emerging market economies. This conservative value is motivated by debt-financing most of the selected emerging Asian economies having low debt-to-GDP levels (with the notable exception of Sri Lanka and India). An alternative calibration assumes that the risk premium increases by 1 basis point per unit increase in the debt-to-GDP ratio.

The implications of improving the efficiency of public investment within each financing scenario are also assessed. According to the IMF's Public Investment Efficiency Indicators, there is scope for improvement in most of the selected Asian emerging economies. We compare a scenario of unchanged efficiency (baseline) with a subscenario of improved efficiency. We evaluate the effects of closing the public investment efficiency gap, as measured by the survey-based quality efficiency indicator, over five years.

Results: Macroeconomic Effects of Boosting Public Investment

The increase in public investment lifts real GDP in the short and long terms in both the tax-financed and the debt-financed scenarios. The output gains differ, however, depending on how the public investment spending is financed. The most significant output gains in the long term are generated under the consumption-tax-financing scenario. Hence, as a baseline scenario for the tax-financed variant, a consumption tax increase is preferred over direct taxes (both CIT and PIT), as it has the least long-term distortionary effects on capital and labor supply. The 1 percent of GDP permanent increase in consumption tax assumed to finance public investment spending implies a tax-rate hike of about 1.3–1.7 percentage points. For all selected Asian emerging economies, the increase in real GDP is more muted in the long term when direct taxes are raised, as they hamper private investment and capital stock. Moreover, higher CIT and PIT weigh, to a lesser extent, on private consumption in the short term, as they

¹³ In principle, any expenditure or fiscal instrument in FSGM can be used for automatic adjustment toward the deficit target. General lump-sum transfers are used because they have the least distortionary effects.

discourage firms' labor demand and posttax wages to households. By contrast, with the notable exception of Vietnam, a hike in indirect taxes (VAT) discourages private consumption in the short term.

It should be noted also that direct-tax financing—split evenly between PIT and CIT—generates smaller output gains than deficit financing with a low risk premium (a 1 basis point per unit increase in the debt-to-GDP ratio) in the medium and long terms.

Under the baseline tax-financed scenario (consumption tax), the public investment push leads to significant output gains in the long term. Higher public investment raises the public capital stock, which boosts general productivity of the economy. The resulting rise in the marginal productivity of capital and labor stimulates private investment and raises labor demand. This lifts private consumption in the long term. In the short term, however, the increase in taxes dampens private consumption, partially offsetting the stimulating impact of higher public investment spending. Inflation is higher in the short and medium term, owing to positive output gaps, but converges to baseline in the long term given a stabilizing monetary policy.

Exports increase in this scenario as a response to higher production and the real exchange rate depreciation. The real net export position improves in the long term, as demand for imports is dampened by higher costs. The current account balance is permanently weaker relative to baseline because of a lower income balance, reflecting a deteriorating net foreign asset position.

All in all, the rise in public investment financed with consumption taxes results in cumulative increases in real GDP of between 3.5 percent and 7.0 percent in the long term. Countries with higher calibrated values for efficiency record the largest cumulative increase in real GDP in the long term: Vietnam displays the largest gains (7.2 percent), followed by Sri Lanka (5.9 percent), Thailand (5.7 percent), India (5.4 percent), and the Philippines (4.6 percent). The public investment scale-up has the smallest impact in Indonesia (3.6 percent).

The long-term effect on real GDP of a deficit-financed increase in public investment is more muted. The adverse effects on output become apparent as the risk premium associated with a higher debt-to-GDP ratio rises. In the short-to-medium term (5 to 10 years), for most of the selected economies, deficit financing with a low risk premium generates as much output gains as the tax-financed scenario. The GDP impact is more muted under the baseline deficit-financed scenario (3 basis points per unit increase in the debt-to-GDP ratio) because the rise in government borrowing costs crowds out private investment and depresses the capital stock. However, private consumption is higher. Labor supply expands by more than in the tax-financed scenario, as households need to work more to offset the lower transfers required to stabilize public debt in the long term. For most of the selected emerging Asian economies, the current account balance deteriorates in the short-to-medium term and improves in the long term in the baseline deficit-financed scenario, as the reduction in net

savings in the public sector is more than offset by the increase in net savings in the private sector. A lower increase in the risk premium (1 basis point per unit increase in the debt-to-GDP ratio) has a smaller dampening effect on private investment, and hence on real GDP in the long term. As a result, the current account balance in the scenario with a lower risk premium deteriorates permanently because of the lower income balance, as households substitute foreign assets for domestic assets.

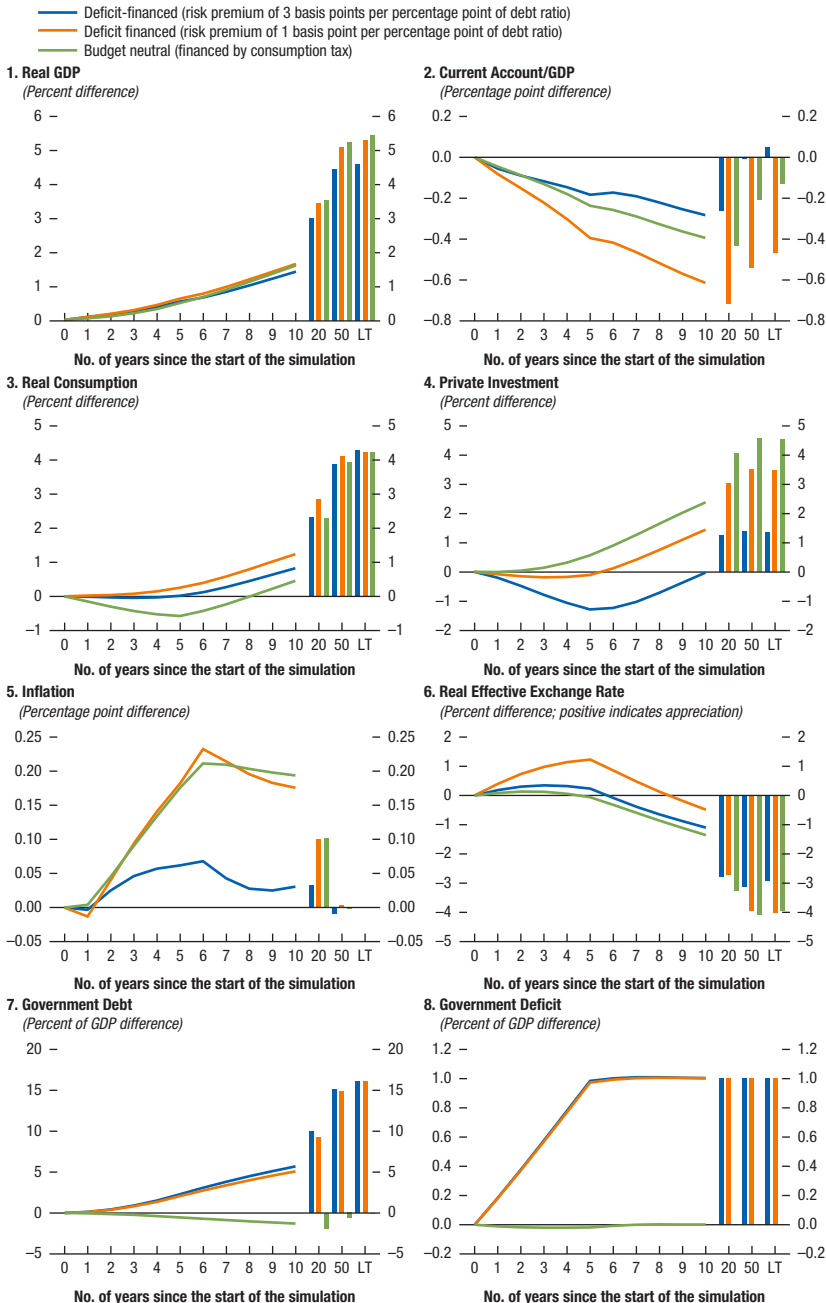
Overall, the long term GDP impact of higher public investment in the baseline deficit-financing scenario is particularly more muted in Indonesia, Sri Lanka, and Thailand (about 1.5 percentage points lower than in the tax-financed scenario). These are economies in which deficit financing crowds out the most private capital in the long term.

Under the tax-financed scenario, the general government balance target is unchanged, while the debt-to-GDP ratios improve slightly in the short-to-medium term, reflecting the impact of higher output, and converge to steady state in the long term. By contrast, in the baseline deficit financing scenario—by assumption—the deficit target-to-GDP ratios rise by the same amount as public investment spending, while the debt-to-GDP ratios increase significantly, by about 15 percentage points in most of the selected economies, in the long term. Thailand registers the largest increase in the GDP-to-debt ratio in the long term (23 percentage points), reflecting a lower inflation rate.

Eliminating the inefficiency in public investment generates additional output gains in both the tax-financed and the deficit-financed scenarios. Closing the public investment efficiency gap would add between 1.0 and 1.8 percentage points to real GDP in the long term. The largest additional GDP gains are observed in Vietnam (2.0 percentage points) and the Philippines (2.0 percentage points), followed by Sri Lanka (1.3 percentage points), Thailand (1.2 percentage points), and Indonesia (0.6 percentage point). India, which is close to the efficiency frontier, records the smallest additional GDP gains in the long term (0.3 percentage point).

Annex Figure 8.1.1. Macroeconomic Effects of Boosting Public Investment in India

(One percent of GDP over five years)

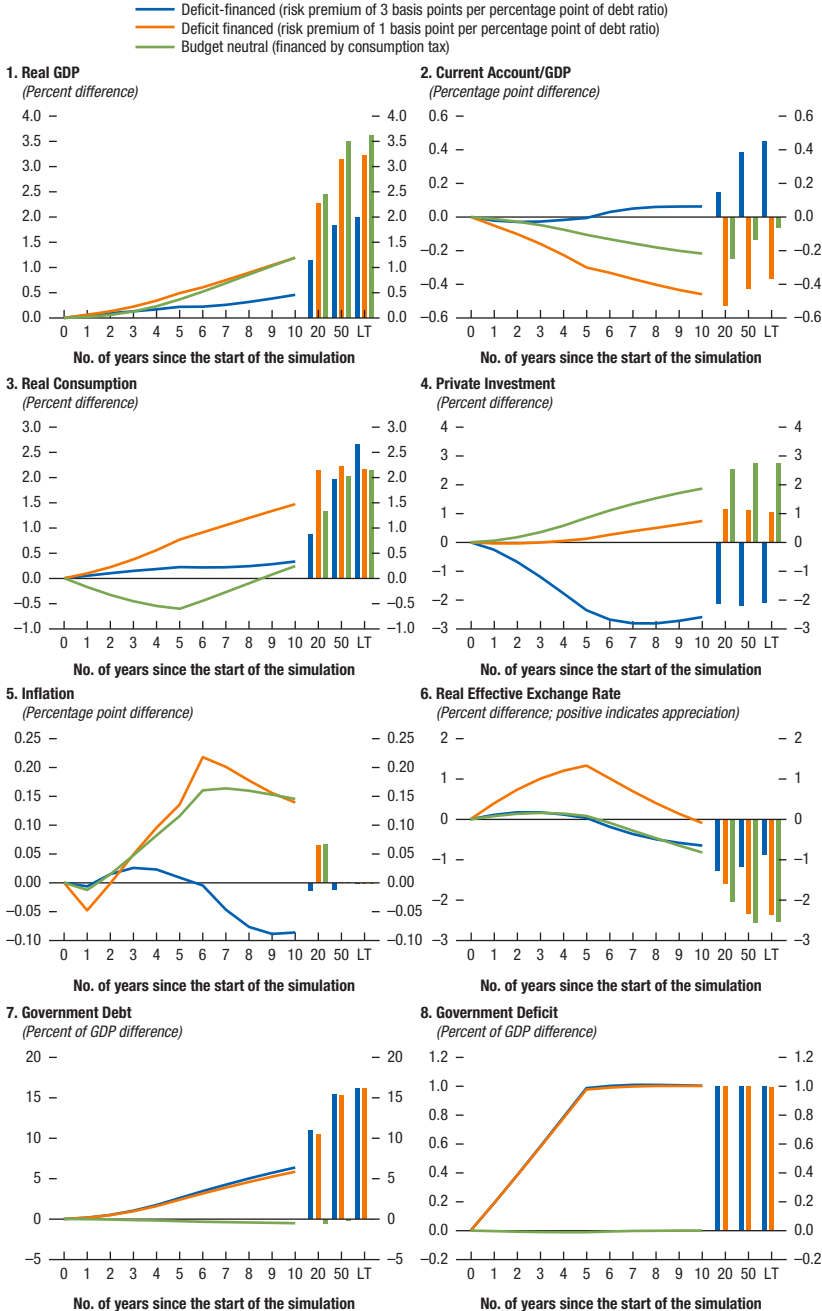


Source: IMF staff calculations from Flexible System of Global Models simulations.

Note: "LT" refers to the steady-state value.

Annex Figure 8.1.2. Macroeconomic Effects of Boosting Public Investment in Indonesia

(One percent of GDP over five years)

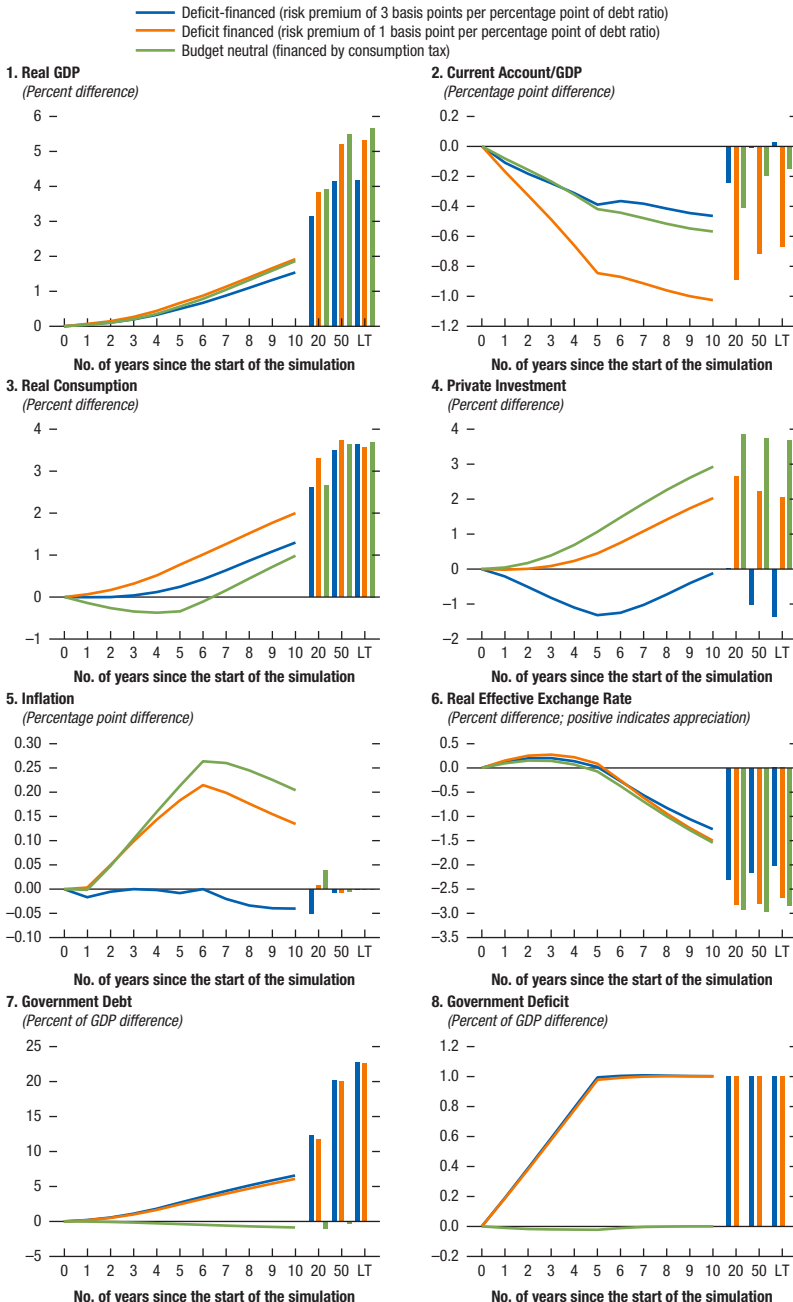


Source: IMF staff calculations from Flexible System of Global Models simulations.

Note: "LT" refers to the steady-state value.

Annex Figure 8.1.3. Macroeconomic Effects of Boosting Public Investment in Thailand

(One percent of GDP over five years)

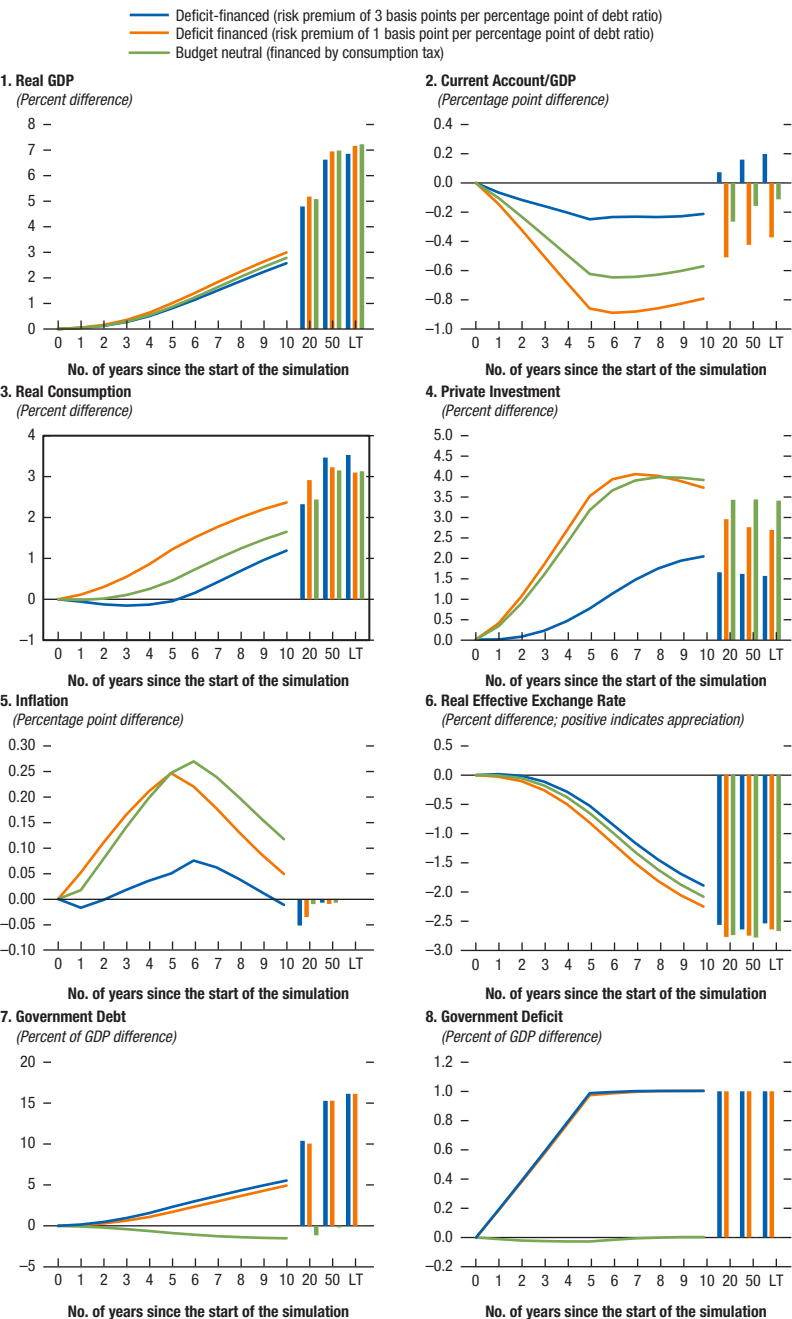


Source: IMF staff calculations from Flexible System of Global Models simulations.

Note: "LT" refers to the steady-state value.

Annex Figure 8.1.4. Macroeconomic Effects of Boosting Public Investment in Vietnam

(One percent of GDP over five years)

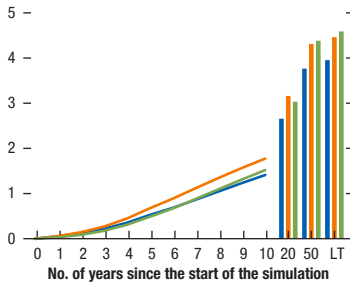


Source: IMF staff calculations from Flexible System of Global Models simulations.
Note: "LT" refers to the steady-state value.

Annex Figure 8.1.5. Macroeconomic Effects of Boosting Public Investment in the Philippines (One percent of GDP over five years)

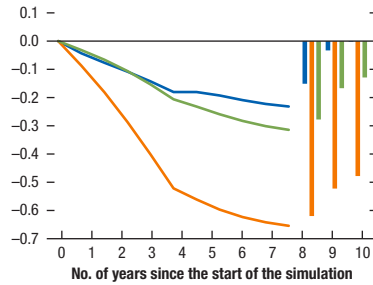
1. Real GDP

(Percent difference)



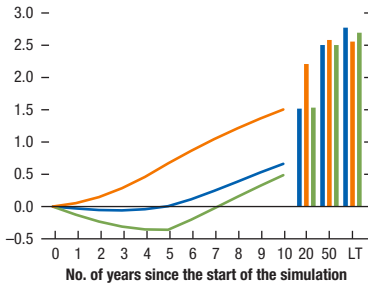
2. Current Account/GDP

(Percentage point difference)



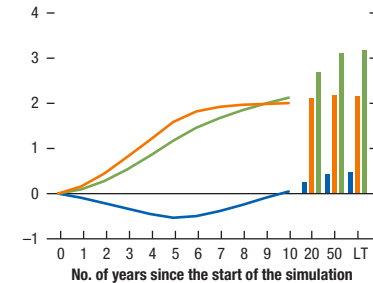
3. Real Consumption

(Percent difference)



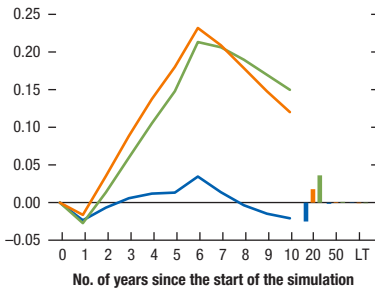
4. Private Investment

(Percent difference)



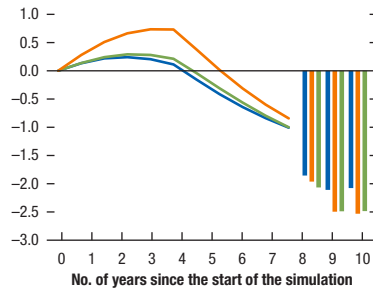
5. Inflation

(Percentage point difference)



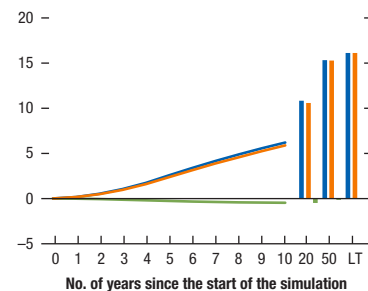
6. Real Effective Exchange Rate

(Percent difference; positive indicates appreciation)



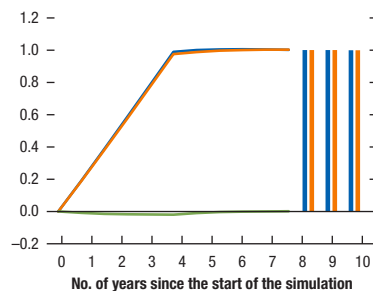
7. Government Debt

(Percent of GDP difference)



8. Government Deficit

(Percent of GDP difference)

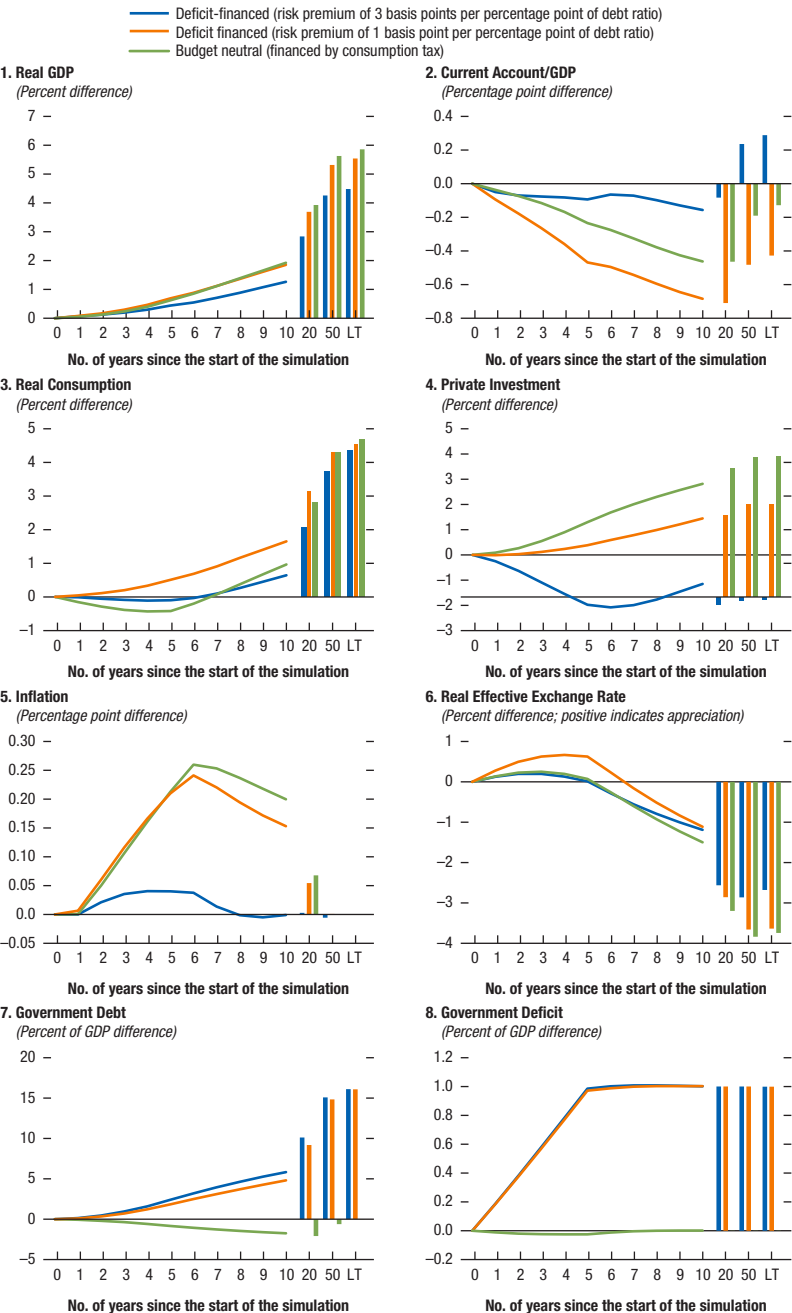


Source: IMF staff calculations from Flexible System of Global Models simulations.

Note: "LT" refers to the steady-state value.

Annex Figure 8.1.6. Macroeconomic Effects of Boosting Public Investment in Sri Lanka

(One percent of GDP over five years)



Source: IMF staff calculations from Flexible System of Global Models simulations.

Note: "LT" refers to the steady-state value.

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