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The Global Investment Slowdown

Challenges and Policies

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Abstract

Investment growth in emerging market and developing economies (EMDEs) is expected to remain below its average rate of the past two decades through the medium term. This subdued outlook follows a decade-long, geographically widespread investment growth slowdown before the COVID-19 pandemic. An empirical analysis covering 2000-21 finds that periods of strong investment growth were associated with strong real output growth, robust real credit growth, terms of trade improvements, growth in capital inflows, and investment climate reform spurts. Each of these factors has been decreasingly supportive of investment growth since the 2007-09 global financial crisis. Weak investment growth is a concern because it dampens potential growth, is associated with weak trade, and makes achieving the development and climate-related goals more difficult. Policies to boost investment growth need to be tailored to country circumstances, but include comprehensive fiscal and structural reforms, including repurposing of expenditure on inefficient subsidies. Given EMDEs' limited fiscal space, the international community will need to significantly increase international cooperation, official financing and grants, and leverage private sector financing for adequate investment to materialize.

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The Global Investment Slowdown: Challenges and Policies

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I. Introduction

As the COVID-19 pandemic began in 2020, emerging market and developing economies (EMDEs) had experienced a slowdown in real investment growth spanning much of the previous decade, from nearly 11 percent in 2010 to 3.4 percent in 2019. In EMDEs excluding China, investment growth tumbled more sharply: from 9 percent in 2010 to a mere 0.9 percent in 2019. The slowdown during the 2010s occurred in all EMDE regions, in both commodity-importing and commodity-exporting economies, and in a large share of individual economies.

In advanced economies, by contrast, investment growth was more sluggish but also more stable, hovering around its long-term average of 2 percent per year. Investment growth in advanced economies outpaced GDP growth during the 2000s and 2010s slightly, except for brief periods after the 2001 slowdown and 2009 recession. In contrast, in EMDEs, investment growth outpaced GDP growth by several percentage points in the 2000s but fell below output growth after 2013.

The pandemic triggered a severe investment contraction in EMDEs excluding China in 2020—a far deeper decline than in the 2009 global recession triggered by the global financial crisis. EMDEs including China did not avoid an investment contraction in 2020, as they had in 2009 (figure 1.A). In advanced economies, however, investment shrank in 2020 by less than it had in 2009, buttressed by very large fiscal support packages and steep monetary loosening. After a sharp rebound in 2021, investment growth in EMDEs is projected to revert to a pace still below the average during the previous two decades. The medium-term investment growth outlook remains subdued, and has been downgraded substantially, along with the GDP growth outlook. This is due to the effects of the Russian Federation's invasion of Ukraine on commodity markets and supply chains, as well as historically high debt-to-GDP ratios and the sharp tightening of financing conditions as monetary policy responds to rising inflation.

Slowing investment growth is a concern because investment is critical to sustaining long-term growth of potential output and per capita income. Capital accumulation raises labor productivity, the key driver of the long-term growth of real wages and household incomes through capital deepening—equipping workers with more capital—and by incorporating productivity-enhancing technological advances.

Slowing investment growth has also held back progress toward meeting the Sustainable Development Goals (SDGs) and fulfilling commitments made under the Paris Agreement. Meeting these goals will require filling substantial unmet infrastructure needs, including growing needs for climate-resilient infrastructure and infrastructure that reduces net greenhouse gas emissions. Given limited fiscal space in EMDEs, scaling up investment will require additional financing from the international community and the private sector.

Against this backdrop, this paper addresses four questions: First, how has investment growth evolved over the past decade, and how does the performance of investment during the 2020 global recession compare to previous recessions? Second, what are the key factors associated with investment growth? Third, what are the implications of weak investment growth for development prospects? And fourth, which policies can help promote investment growth?

The paper makes several contributions to the literature on investment. It is the first study to examine investment growth since the pandemic and Russia's invasion of Ukraine in a large sample of EMDEs. Second, since foreign direct investment (FDI) is a potentially critical source of technology spillovers and financing, this paper reviews 62 studies since 1990 on the link between FDI, on the one hand, and output and aggregate domestic investment, on the other hand. Third, the paper examines the likely medium- and long-term consequences of the damage to investment in EMDEs from the pandemic and the war in Ukraine, focusing on the effects on productivity, potential output growth, trade, and the ability to achieve the SDGs and climate-related goals. Fourth, the paper provides fiscal and structural policy recommendations to revive investment growth, including measures to promote private capital mobilization and capitalize on new opportunities created by the pandemic.

Previous studies analyzing investment in EMDEs have tended to be either based on pre-global financial crisis data, confined to analysis of the global financial crisis, or focused on specific regions (Anand and Tulin 2014; Bahal, Raissi, and Tulin 2018; Caselli, Pagano, and Schivardi 2003; Cerra et al. 2016; Qureshi, Diaz-Sanchez, and Varoudakis 2015). Firm-level studies include Magud and Sosa (2015) and Li, Magud, and Valencia (2015). Investment weakness in advanced economies has been explored in Banerjee, Kearns, and Lombardi (2015); IMF (2015); Leboeuf and Fay (2016); Ollivaud, Guillemette, and Turner (2016). This study updates and extends two previous studies of investment trends and correlates in a large sample of EMDEs (World Bank 2017; 2019b).

The paper presents five main findings. First, compared to the years following the global financial crisis, the investment recovery following the COVID-19 pandemic is proceeding more slowly. The slow recovery partly reflects the widespread impact of the pandemic on investment: investment contracted in nearly three-quarters of EMDEs during the pandemic. The effects of the pandemic and the war in Ukraine are expected to extend the prolonged and broad-based slowdown in investment growth in EMDEs during the 2010s. The slowdown occurred in all regions, in commodity-exporting and commodity-importing economies, and in private and public investment growth.

Second, empirical analysis in the paper finds that investment growth in EMDEs over the past two decades is positively associated with output growth and, to a lesser degree, real credit growth and capital-flow-to-GDP ratios. Terms of trade improvements (for energy-exporting EMDEs) and investment climate reform spurts are associated with strengthening real investment growth. In contrast, in advanced economies, the most important correlate of investment growth is output growth, and other factors co-vary less strongly with investment growth than in EMDEs.

Third, investment growth in EMDEs in 2022 remained about 5 percentage points below the 2000-21 average, and by nearly 0.5 percentage points in EMDEs excluding China. For all EMDEs, projected investment growth through 2024 will be insufficient to return investment to the level suggested by the pre-pandemic (2010-19) investment trend. This investment weakness dampens long-term output growth and productivity, is associated with weak global trade growth, and makes meeting development and climate goals more challenging.

Fourth, a sustained improvement in investment growth in EMDEs requires the use of policy tools and international financial support, with appropriate prescriptions dependent on country circumstances. Macroeconomic policy can support investment in EMDEs in a variety of ways, including through preserving macroeconomic stability. Even with constrained fiscal space, spending on public investment can be boosted by reallocating expenditures, freeing resources by moving away from distorting subsidies, improving the effectiveness of public investment, strengthening revenue collection, and engaging the private sector to co-finance infrastructure and other investment projects. Structural policies also play a key role in creating conditions conducive to attracting investment. Institutional reforms could address a range of impediments and inefficiencies, such as high business startup costs, weak property rights, inefficient labor and product market policies, weak corporate governance, costly trade regulation, and shallow financial sectors. Setting appropriate, predictable rules governing investment, including for public-private partnerships (PPPs), is also important.

Fifth, a review of the literature since 1990 finds mixed evidence on the relationship between FDI and output growth but a mostly positive relationship between FDI and domestic investment. That said, several country characteristics, time period specifics, and features of FDI have influenced the relationship between FDI, output growth, and investment. Greenfield investment in upstream and export-intensive, non-primary sectors has tended to be more conducive to growth and investment. FDI also tended to raise growth and investment more in countries with better institutions, more skilled labor forces, greater financial development, and trade openness.

In this paper, investment refers to real gross fixed capital formation, including both private and public investment. Gross fixed capital formation includes produced tangible assets (for example, buildings, machinery, and equipment) and intangible assets (for example, computer software, mineral exploration, entertainment, and original writing or art) used for more than one year in the production of goods and services. Investment growth is calculated with countries' real annual investment at average 2010-19 prices and constant 2019 U.S. dollars as weights for 69 EMDEs and 35 advanced economies (table 1). These economies have represented about 97 percent of global GDP since the mid-2000s. A decomposition of investment into type of use, such as buildings, transport equipment, and information and communications technology (ICT) equipment, is not possible due to limited comparable data for EMDEs. Data availability also prevents a separate econometric exploration of private and public investment.

II. Trends and fluctuations in investment growth

After reaching historic highs in the lead-up to the global financial crisis, global investment growth slowed substantially in the 2010s, largely reflecting weakening investment growth in EMDEs, where it was widespread. In each year between 2012 and 2020, investment growth was well below the pre-global financial crisis (2000-08) average in over half of EMDEs. The slowdown during the 2010s occurred in both commodity-exporting and commodity-importing EMDEs, and in all EMDE regions and in each of the three largest EMDEs. This slowdown in EMDE investment growth in the decade before the pandemic happened alongside comparatively stable—albeit more sluggish—investment growth in advanced economies, occurred in most EMDEs, and involved slowdowns in both private and public components. Although investment growth in

EMDEs remained above that in advanced economies, the difference in investment growth rates, especially in the second half of the decade, was much smaller than in the 2000s.

The investment contraction in EMDEs excluding China in 2020, the first year of the COVID-19 pandemic, was historically large, and far deeper even than during the global recession in 2009. The outlook for investment growth in EMDEs is weak and has been downgraded due to legacies of the pandemic and spillovers from the war in Ukraine, although the full effects of these events on investment remain unclear.

II.1 Pre-pandemic slowdown

Several key features of investment growth in EMDEs during the pre-pandemic decade are evident. Investment growth in EMDEs fell from nearly 11 percent in 2010 to 3.4 percent in 2019. In EMDEs excluding China, investment growth tumbled more sharply: from 9 percent in 2010 to a mere 0.9 percent in 2019 (figure 1.A and B). The slowdown during the 2010s occurred in both commodity-exporting and commodity-importing EMDEs, and in all EMDE regions (figure 1.C; Vashakmadze et al. 2018). Slowing investment growth in China made a large contribution to the aggregate EMDE slowdown (figure 1.D). The slowdown was also observed in private and public investment growth, which grew at a slower pace in the 2010s than in the previous decade (figure 2.A and B).

The slowdown in investment growth reflected international and domestic factors. For commodity-exporting EMDEs, a steep drop in oil and metal prices between mid-2014 and early 2016, and the associated deterioration in the terms of trade, were key factors.[2] In China, investment growth slowed following a domestic policy shift in 2010 toward more reliance on consumption and less reliance on investment and exports. Weak economic growth in advanced economies and high corporate leverage also generated investment-dampening spillovers to EMDEs during this period (Banerjee et al. 2020).

A moderate uptick in EMDE investment growth in 2016-18 reflected, in part, a pickup in the growth of global manufacturing output and trade (World Bank 2019b). The recovery was further supported by a rebound in oil and metal prices in 2017-18, which encouraged capital expenditures in the commodity-dependent regions of Latin America and the Caribbean (LAC) and Sub-Saharan Africa (SSA). Public borrowing from China to finance infrastructure projects under the Belt and Road Initiative supported investment in countries in several regions, predominantly in East Asia and Pacific (EAP), Europe and Central Asia (ECA), and South Asia (SAR) (Council on Foreign Relations 2022; World Bank 2019b).

II.2 Collapse and rebound during the COVID-19 pandemic

The COVID-19 pandemic disrupted business operations and caused a spike in uncertainty. This resulted in a sharp contraction in aggregate investment in EMDEs, marking a departure from the previous global recession in 2009 when such a contraction was avoided (figure 3.A). EMDEs

[2] These issues are discussed in Kose et al. (2017); Stocker et al. (2018); and Vashakmadze et al. (2018). Several large commodity-exporting economies—including Brazil, the largest of these economies—experienced severe recessions during the commodity price collapse.

excluding China suffered an especially sharp investment contraction, of more than 8 percent—a deeper decline than in 2009. China was a notable exception thanks to a large fiscal stimulus equivalent to about 6.5 percent of GDP (IMF 2021).

In EMDEs excluding China, investment shrank by about 2 percentage points more in 2020 than in the 2009 global recession, despite easier financial conditions and the provision of sizeable fiscal stimulus in many large EMDEs (figure 3.B and C). A key difference between the 2009 and 2020 decline in EMDE investment growth was the number of affected EMDEs. About 70 percent of EMDEs experienced an investment contraction in 2020, compared to 55 percent in 2009 (figure 3.D). Regionally, the investment contraction in 2020 was sharpest in Latin America and the Caribbean and South Asia, the regions where output also declined the most. Yet, while more EMDEs experienced a recession in 2020 than in 2009, in the median EMDE recession, the decline in investment was less severe in 2020 than in 2009, and the subsequent rebound more pronounced (figure 4.A). The terms of trade shock associated with the 2020 global recession, however, severely affected EMDE commodity exporters. The median EMDE commodity exporter saw a sharper decline in investment in 2020 than in 2009, with a shallower recovery (figure 4.B).

Investment in advanced economies also shrank in 2020, by 3.4 percent; however, this was far less than the 10.5 percent plunge in 2009. Unlike the aftermath of the 2009 financial crisis, the investment contraction in 2020 was dampened by massive fiscal and monetary stimulus, and there were much smaller disruptions in financial markets and in access to finance. By the end of 2021, investment in advanced economies had already exceeded projections made just prior to the pandemic, in January 2020. The post-2020 investment recovery in advanced economies also proceeded more quickly than the recoveries after other global recessions during the past two decades.

III. Macroeconomic backdrop

Slowing investment growth in EMDEs in the decade before the pandemic occurred in the context of a worsening global macroeconomic environment. Compared to 2002-07, the global economy was characterized in 2010-19 by slower output growth, lower commodity prices, lower and more volatile capital inflows to EMDEs, higher economic and geopolitical uncertainty, and a substantial buildup of public and private debt (Kose and Ohnsorge 2020).

Investment tends to respond, and respond more than proportionately, to economic activity, a phenomenon dubbed the accelerator effect (Shapiro, Blanchard, and Lovell 1986). EMDE per capita output growth slowed sharply in the decade following the global financial crisis, from 7.5 percent in 2010 to 3.9 percent in 2019. There was a roughly parallel growth slowdown in EMDEs excluding China—from 5 percent in 2010 to 1.6 percent in 2019. To the extent that the slowing of growth in EMDEs was more structural than cyclical or transitory, sluggish investment growth can also be expected to persist (Didier et al. 2015; World Bank 2022a). The sources of the slowdown in output growth varied across EMDEs, but they included lower commodity prices, spillovers from weak growth in major economies, weakening productivity growth, tightening financial conditions, and a maturing of supply chains that slowed global trade growth. A 1 percentage point decline in U.S. or euro area output growth has been found to reduce aggregate EMDE investment growth by more than 2 percentage points (World Bank 2017).

In China, growth slowed gradually as the economy was rebalanced from investment- and export-driven growth in manufacturing to consumption-driven growth in services. This transition reduced commodity demand and prices, with adverse spillovers to commodity-exporting EMDEs (Huidrom et al. 2020; World Bank 2016a). A 1 percentage point decline in China's output growth has been estimated to slow output growth in commodity-exporting EMDEs by about 1 percentage point after one year, with associated effects on investment growth (World Bank 2017).

In advanced economies, output growth in the decade after the global financial crisis was generally weaker than in the decade before, despite unprecedented monetary policy stimulus and easy financing conditions. The euro area crisis was followed by a recession in 2012-13. Rising trade tensions, as well, hindered euro area growth prospects near the end of the decade (World Bank 2019a).

Almost two-thirds of EMDEs are reliant on exports of energy, metal, or agricultural commodities. Most commodity prices (in U.S. dollar terms) fell sharply from early-2011 peaks, with metal and energy prices plunging by more than 40 percent to troughs in 2016, followed by moderate recoveries in the following three years (figure 5.A). Surging U.S. oil production and a shift in OPEC policy in mid-2014 triggered an oil price plunge during 2014-16 that caused widespread disruptions in oil-exporting countries. By the end of 2019, energy prices were 21 percent below their 2010 levels, industrial metal prices 19 percent below, and agricultural commodity prices 13 percent below. As a result, the terms of trade of commodity exporters deteriorated by about 6 percent between 2011 and 2019, and those of oil exporters by 27 percent. EMDEs with lower terms-of-trade growth experienced lower investment growth during 2000-21 (figure 5.B).

After rising during most of the 2000s, annual growth of real credit to the private sector (from domestic and foreign financial institutions) in EMDEs began to retreat during the 2007-09 global financial crisis, and subsequently slowed further, from 11.5 percent in 2011 to a trough of 4.8 percent in 2016, before stabilizing at around 6 percent in 2019-21 (figure 6.A). Average credit growth in 2011-19 was highly uneven across EMDEs, however, with some countries experiencing credit surges despite overall downward trends. In contrast to the three decades before the global financial crisis, when around 40 percent of credit booms were accompanied or followed by investment surges within one or two years, credit booms since 2010 have been unusually "investment-less." Virtually none of the credit booms in EMDEs since the global financial crisis have been accompanied or followed by investment surges (annex 1). In several countries, rapid credit growth instead fueled above-average consumption growth.

Despite slowing credit growth since the global financial crisis, the ratio of outstanding credit to GDP has risen steadily (figure 6.B). In the median EMDE, private credit as a share of GDP rose by 20 percentage points of GDP from 2000 to 2021, and by 27 percentage points in commodity-importing EMDEs. About four in ten EMDEs had private credit-to-GDP ratios exceeding 60 percent in 2021, up from one in ten in 2000. High leverage can lead to financial stress, restrict future access to credit, and divert resources from productive investment (Banerjee and Duflo 2005; World Bank 2022b). EMDEs with lower credit growth and higher private debt-to-GDP ratios experienced slower investment growth during 2000-21 (figure 6.C and D).

Foreign direct investment (FDI) inflows to EMDEs have risen substantially over time, yet their growth has slowed since 2010, partly due to weak activity in advanced economies. Growth of non-FDI inflows has shown more resilience and volatility, reflecting investors' search for higher yields amid low interest rates in advanced economies, a shift from bank to nonbank flows, and increased interest from institutional investors (Cole et al. 2020; McQuade and Schmitz 2016). The global financial crisis led to a significant decrease in the average interest cost of outstanding government debt in advanced economies. In contrast, the average interest cost of outstanding government debt in EMDEs barely decreased due to persistently high risk premia and increased reliance on international borrowing, particularly in foreign currency and on nonconcessional terms (United Nations 2022). Nevertheless, compared to the period leading up to the global financial crisis (2000-07), there were twice as many sudden stop events in EMDEs in the years prior to the COVID-19 pandemic (2011-19). During sudden stops, non-FDI inflows tend to decline much more sharply and for longer than FDI flows (Eichengreen, Gupta, and Masetti 2018).

The literature has produced mixed findings on the link between FDI and investment (annex 2). Although there is evidence that FDI has a positive relationship with economic growth and investment, mainly in countries with well-developed financial markets, the literature has not found a consistent and significantly positive effect (Alfaro et al. 2004; OECD 2015). One possible explanation for the mixed evidence is that FDI crowds out domestic investment (Farla, de Crombrugghe, and Verspagen 2016).

Policy uncertainty increased in many EMDEs after the global financial crisis, owing to a variety of factors, including geopolitical tensions in Eastern Europe, security challenges and conflicts in the Middle East, and acute domestic political tensions in several EMDEs. While the effects of uncertainty on investment and output growth are clearly negative, their scale depends on the context. Studies have shown that the effects have been more pronounced in countries that have a lower tolerance for uncertainty or where uncertainty interacts with other constraints such as access to credit (Carrière-Swallow and Céspedes 2013; Hofstede 2001; Inklaar and Yang 2012).

IV. Empirical analysis of investment growth

A panel regression analysis formalizes the role of macroeconomic factors in driving the investment weakness. Investment growth is estimated for 57 EMDEs covering 2000-21 as the dependent variable in a system generalized method of moments (GMM) panel regression, similar to Nabar and Joyce (2009). Drivers of investment growth, such as the marginal return to capital and risk-adjusted cost of capital, are proxied by real output growth, terms of trade growth, real private credit growth, the capital flow-to-GDP ratio, and a dummy variable for large improvements in the investment climate.

Real annual investment growth in EMDEs is found to be positively associated with real output growth, real credit growth, terms of trade improvements, increasing capital flow-to-GDP ratios, and investment climate reform spurts (annex 3; tables 2 and 3). These results are consistent with other studies that find a wide number of the drivers of investment growth (G20 2016; IMF 2015; Libman, Montecino, and Razmi 2019). The importance of corporate borrowing as a driver of investment growth has also been found in other studies (Garcia-Escribano and Han 2015). The finding of a positive link between institutional quality, financial development, and investment

growth is also in line with previous work (Lim 2014). While the coefficient of reform spurts is large and highly statistically significant, these events do not explain much of the variation in EMDE investment growth during 2000-21. On average, there were 0.8 investment profile reform spurts in the sample per year and the majority of these occurred before 2010.

For advanced economies, which did not experience a slowdown in investment growth during the decade prior to the pandemic, output growth is the most important covariate of the explained yearly variation in investment growth during 2000-21. Other factors, such as real credit growth and the ratio of capital flows to GDP, are much less correlated with investment growth, while still significant.[3] Compared to EMDEs, investment growth in advanced economies is slightly more correlated with terms of trade, and less correlated with capital flows and real credit growth.

Using the results of the main regression for EMDEs to predict the contribution of the explanatory variables to investment growth shows that between 2000 and 2021, investment growth in EMDEs was primarily correlated with real output growth, followed by real credit growth (figure 7.A). Declining capital flow-to-GDP ratios contributed negatively to investment growth in commodity importers in multiple years since 2011, while energy exporting EMDEs experienced particularly low credit growth after 2015 (figure 7.C and D).

The contribution of terms of trade was more volatile and comoved strongly with investment growth in energy exporting EMDEs, particularly during periods of falling or rising oil prices in 2015-16, 2020, 2017-18, and 2021 (Stocker et al. 2018). The negative shock to the terms of trade of energy-commodity exporters may be viewed as having lowered investment growth by reducing the expected return to capital in the exporting sector (Bleaney and Greenaway 2001). In contrast, improving terms of trade did not significantly offset the factors that slowed investment growth in commodity importers, in part because the improvement was less pronounced than the deterioration experienced by commodity exporters.

In 2020-21, the output growth collapse and rebound generated even larger swings in investment growth. In energy exporters, these were amplified by terms of trade swings in the same direction. Low real credit growth did not compensate for the collapse in output in 2020 and then held back the recovery in 2021 both in commodity exporters and importers alike.

V. Investment prospects

After a robust rebound in 2021, investment growth is projected to average 3.5 percent per year in EMDEs, and 4.1 percent in EMDEs excluding China, in 2022-24, below the long-term (2000-21) average rates for both country groups (figure 8.A). Commodity-exporting EMDEs are projected to have lower investment growth rates than tourism-reliant EMDEs (figure 8.B). Investment growth is projected to be below the individual country trend of the past 20 years for about three-fifths of EMDEs for 2023 and 2024.

Following the global financial crisis, EMDEs excluding China returned to the investment level implied by the pre-crisis trend within two years (figure 9.A). China contributed materially to the recovery of investment in EMDEs, helping to raise investment above the level suggested by the

[3] At a significance level of 10 percent or better.

pre-crisis trend by 2010 (figure 9.B). Following the 2020 global recession, projected investment growth through 2024 in all EMDEs will be insufficient to return investment to the level suggested by the recent pre-pandemic trend from 2010-19 (the period between the highly disruptive 2009 and 2020 global recessions). This is partly due to the weakness of the investment recovery in China (figure 9.C). Investment in EMDEs excluding China is projected to return to its pre-pandemic trend by 2024, with the recovery after the global recession in 2020 taking two years longer than after the global financial crisis (figure 9.D).

The weak outlook for investment reflects several factors, and may deteriorate further if the global economy tips into recession (Guénette, Kose, and Sugawara 2022). Uncertainties about the post-pandemic economic landscape, the war in Ukraine, and elevated inflation and borrowing costs, may discourage investment for some time. Tighter financial conditions are limiting the fiscal support governments can provide to stimulate public investment (World Bank 2023). At the same time, the legacy of high corporate debt, at the highest level in decades in EMDEs, may constrain investment growth after the pandemic (Caballero and Simsek 2020; Stiglitz 2020). In China, investment growth is projected to remain well below the average of the past two decades: regulatory curbs on the property and financial sectors and continuing mobility restrictions related to the pandemic will both be restraining factors, in an environment of slower economic growth.

The globally synchronous nature of monetary (and fiscal) policy, while necessary to contain inflation and preserve creditworthiness, may compound the effects of tightening, creating potentially adverse consequences for investment. The empirical analysis in this paper finds that slowing GDP growth and slowing credit growth are both associated with slower investment growth. Other empirical studies have found similar results. For example, in a study of a large sample of firms in 13 EMDEs, Borensztein and Ye (2018) find that while higher debt-service capacity was correlated with higher investment growth, when a firm's debt burden rose above a certain threshold, debt restrained investment.[4]

On the bright side, there is evidence that investment in digital technologies and sectoral reallocation has boosted productivity, at least in advanced economies, although it remains to be seen how long-lasting these improvements will be (Criscuolo et al. 2021). Their positive effects on TFP in the first year of the pandemic appear to have been outweighed by negative factors in major advanced economies (Bloom et al. 2020).

VI. Implications of weak investment growth

Weakening investment growth has lasting implications for global trade as well as for long-term output growth and EMDEs' ability to reach development and climate-related goals. The slowing of capital accumulation in EMDEs, and consequently of technological progress embedded in investment, implies slowing productivity growth and potential output, with adverse implications for EMDEs' ability to catch up with advanced economy per capita incomes.

[4] As described in annex 3, the regression analysis tested for non-linear effects of credit growth and credit-to-GDP thresholds. The results were not significant at the aggregate country level.

VI.1 Slower global trade growth

Investment tends to be more import-intensive than other components of demand, particularly through the trade in capital goods. Weakening investment growth, therefore, contributed to the slowdown of trade before the pandemic (figure 10.A and B; Bobasu et al. 2020; IMF 2016; World Bank 2015a). Capital goods imports by EMDEs tend to embody efficiency-enhancing technology transfers (Alfaro and Hammel 2007). Hence, the slowdown in such transfers may also have contributed to slowing EMDE productivity growth. The global investment weakness was further accompanied by a pullback in cross-border investment by multinational companies, which accounts for one-third of global trade (Lakatos and Ohnsorge 2017). This slowdown occurred at the same time as, and may have been partly due to, the implementation by several countries of additional regulatory measures and nontariff barriers, such as restrictions on FDI and limitations on foreign purchases in public procurement.

Global trade also propagates a pickup or slowdown in investment growth across countries (Freund 2016). Trade can facilitate more efficient allocation of capital goods, in turn improving overall productivity and rates of return on capital, thus encouraging investment (Mutreja, Ravikumar, and Sposi 2014). For example, the marginal product of capital does not vary much between low- and high-income countries, and EMDEs where the relative prices of investment goods are high, compared to consumption prices, will tend to have lower real investment rates (Caselli and Feyrer 2007; Hsieh and Klenow 2003). Countries engaged in deepening trade integration have seen the price of investment goods fall relative to the prices of consumption goods, especially between 2005 and 2011, thus boosting investment rates (Lian et al. 2019). Indeed, trade openness has been found to be positively correlated with capital accumulation (Alvarez 2017; Sposi et al. 2019; Wacziarg and Welch 2008).

The deep global recession of 2020, together with pandemic-related lockdowns, led to a collapse of global trade in 2020. The subsequent recovery in trade was hampered by continuing supply and shipping bottlenecks, weak demand, and continued pandemic-related mobility clampdowns in some countries. The war in Ukraine has further slowed global trade growth by disrupting commodity markets, logistics networks, and supply chains (Ruta 2022).

VI.2 Slower potential output growth

The prospect that investment growth will remain weak in the medium term raises fundamental concerns about the economic health of EMDEs, and about meeting the infrastructure needs of expanding and urbanizing populations in many EMDEs. Before the COVID-19 pandemic, potential output growth—the rate of growth achievable at full capacity utilization and full employment—had already slowed in EMDEs (Kilic Celik, Kose, and Ohnsorge 2020; World Bank 2018). Projected low investment growth in the medium-term will further weaken potential output growth through 2030. This will result in capital accumulation contributing, on average, 0.6 percentage points a year less to EMDE potential growth in 2022-30 than in 2011-19. However, filling physical capital investment needs could partially offset the projected slowdown in potential growth during 2022-30 (figure 11.A; World Bank 2021a).

Weaker investment growth leads to weaker potential output growth by lowering total factor productivity (TFP) growth. In contrast, increased investment often involves the adoption of productivity-enhancing technologies, including in the investment goods sector itself (Colecchia and Schreyer 2002; Hsieh and Klenow 2007; OECD 2016a). Weaker investment and TFP growth can also be a symptom of market distortions that subsidize investment by less productive firms (Restuccia and Rogerson 2008). Alongside slowing investment growth, TFP growth in EMDEs slowed in the decade prior to the pandemic to 1.2 percent per year in 2010-19, on average, from 2.3 percent per year in 2000-08 (figure 11.B and C). EMDEs with low investment growth tend to also have low TFP growth (figure 11.D). The slowdown happened despite evidence of somewhat faster cross-country technology absorption from countries at the productivity frontier (Comin and Ferrer 2013; Moelders 2016). Along with investment growth, TFP growth in EMDEs is projected to remain weak during the next decade. Weak TFP growth would also be reflected in slower labor productivity growth—the key driver of long-term of growth in real wages and household incomes (Blanchard and Katz 1999; Feldstein 2008).

Achieving the SDGs and climate-related goals requires increasing investment in EMDEs. Raising infrastructure investment is especially important, following several years of subdued public infrastructure investment growth in EMDEs before the pandemic (Foster, Rana, and Gorgulu 2022; Vorisek and Yu 2020). Meeting greenhouse gas emissions reduction commitments, advancing the clean energy transition, and capping the rise in temperature is expected to require an investment in infrastructure and other adaptations of several trillion of U.S. dollars per year (table 5; Black et al. 2022; IEA 2021a,b; IPCC 2022; Songwe, Stern, and Bhattacharya 2022). For a partial set of EMDEs, building resilience to climate change and putting countries on track to reduce emissions by 70 percent by 2050 is estimated to require investment of 1 to 8 percent of GDP annually between 2022-30, with higher investment needed in LICs (figure 12.A; World Bank 2022c).[5] Similarly, the increase in spending needed to achieve the SDGs (relative to GDP) will be much larger for LICs than for the average EMDE (Gaspar et al. 2019). Substantial additional financing from the global community and the private sector will be needed to close investment gaps.

To achieve the SDGs related to infrastructure (electricity, transport, water supply and sanitation) and infrastructure-related climate change preparation (flood protection, irrigation) in low- and middle-income countries, an average investment of $1.5-$2.7 trillion per year (4.5-8.2 percent of these countries' combined annual GDP) during 2015-30 is required. This investment is mostly needed for transport and electricity (Rozenberg and Fay 2019), depending on policy choices and the quality and quantity of infrastructure services, with variance across regions (figure 12.B). The 4.5 percent of GDP estimate anticipates investment in renewable energy; transport and land-use planning resulting in denser cities and less expensive, more reliable public transport and development of reliable railway systems for freight; and deployment of decentralized technologies such as minigrids and water purifications systems in rural areas. Gaps in investment relative to the levels needed to reach the health-related SDGs also remain substantial (Stenberg

[5] The range of 1-10 percent is for all countries with Country Climate and Development Reports as of late 2022.

et al. 2017; UNCTAD 2014).6 Likewise, investment in education is vital to achieving schooling-related SDGs, closing education achievement gaps created by the pandemic, and supporting long-term income growth (Barro 2013; Psacharopoulos et al. 2021).7

Investment in infrastructure has multiple potential benefits. For one, it appears to be inversely correlated with income inequality in EMDEs. The channels through which infrastructure investment lowers income inequality and poverty can be direct, for example by employing low-income households or providing services at lower cost and better quality, or indirect, for example by lowering trade costs in stimulating economic growth.8 Investment in climate-related resilience and adaptation, as well as mitigation, is central to eliminating extreme poverty and achieving the SDGs. Such investment is perhaps most crucial in low-income and high-poverty countries, which are particularly vulnerable to the impact of climate change and increasingly frequent adverse weather events on agriculture, energy generation and usage, and water availability (World Bank 2022c). Green infrastructure and the adoption of environmentally sustainable technologies can support faster growth in the long term, while also mitigating climate change (OECD 2020; Strand and Toman 2010). Improving and expanding access to infrastructure can enhance productivity (Bizimana et al. 2021; Calderón, Moral-Benito, and Servén 2015; Perez-Sebastian and Steinbuks 2017). Public investment in infrastructure has also been found to create jobs, especially in LICs (Moszoro 2021).

VII. Policies to promote investment growth

EMDEs' investment needs—to bolster resilience to climate change, smooth the transition away from growth driven by natural resources, improve social conditions, and support long-term growth of output and per capita income—are substantial. The urgent need to ramp up investment in EMDEs is clear. The challenges demand a multi-pronged strategy featuring a variety of fiscal and structural measures to boost public and private investment growth, with the specific priorities differing by country circumstances.

Fiscal and structural policy, especially over the medium and long term, can make a substantial dent in filling large investment needs in EMDEs. It is also clear that the multilateral institutions will need to assist EMDEs in financing their investment needs. Yet constrained fiscal space and the limited resources of multilateral development banks mean that the private capital

[6] Stenberg et al. (2017) estimate that meeting the health-related targets under SDG 3 in low- and middle- income countries would require about $370 billion (1.9 percent of GDP) of additional spending per year through 2030, mostly for health workers, infrastructure, and health equipment.

[7] Psacharopoulos et al. (2021) estimate that lifetime losses in incomes from school closures during the COVID- 19 pandemic will amount to 0.8 percent of global GDP per year over the next 45 years. Barro (2013) finds that 1 additional year of male upper-level schooling can raise GDP growth by 1.2 percentage points per year. Jones (2003) theoretically shows how educational attainment can be interpreted as an investment rate.

[8] Calderón and Servén (2014) review multiple channels through which infrastructure investment affects the poor; Ferreira (1995) and Getachew (2010) discuss the role of public infrastructure investment and Madeiros, Ribeiro, and do Amaral (2021) the role of infrastructure investment; and Maliszewska and van der Mensbrugghe (2019) examine the role of infrastructure investment in lowering trade cost and generating opportunities for the poor.

mobilization has become vital to filling investment needs (Bhattacharya and Stern 2021; United Nations 2019; World Bank 2022h).

It is critical to design policies that can stimulate investment with lasting benefits while discouraging opportunistic behavior, and to focus on high quality investment projects (G20 2019). Successfully leveraging private sector capital to boost investment requires a set of policies to balance the risks, costs, and returns of investment projects, and overcoming common obstacles to private investment, such as poor business conditions, insufficient project pipelines, and underdeveloped domestic capital markets.

Two areas with strong growth potential are investment in digital capabilities and the clean energy transition. The pandemic created new opportunities for the adoption of digital infrastructure in commerce and governance, while energy market volatility due to Russia's invasion of Ukraine and an increasingly urgent need to meet climate goals have made the development of clean, renewable, and affordable energy sources a priority.

The pandemic also underscored the need for investing in health and education. Healthier individuals are more productive, better at creating and adapting to new technologies, and inclined to invest more in education (Aghion, Howitt, and Murtin 2011). They also have a longer life expectancy and are likely to save more, which feeds back into investment (Zhang, Zhang, and Lee 2003). Investing in education is necessary not only to make up for the effect of lost schooling on future earnings, but also to explore how new approaches to learning and digitalization can reduce inequality in education in EMDEs, provided the appropriate underlying conditions, including the necessary infrastructure, are in place (Bashir et al. 2021; Muñoz-Najar et al. 2021; Wilichowski et al. 2021). In the long term, investment in education is needed to spur research and development, and ultimately, innovation.

VII.1 Fiscal policy

Public investment in infrastructure, education, and public health systems can be paid for in several ways. First, funding can be raised through government borrowing, including through counter-cyclical fiscal stimulus programs during economic downturns. The extended low interest rate environment in the decade or more before 2022 offered an opportunity for many governments to borrow for investment projects, with limited risks to long-term fiscal sustainability (OECD 2016b). With debt burdens now at historically high levels and financing costs rising with global interest rates, however, EMDEs have limited capacity for expansionary fiscal policy financed by increased borrowing. Countries that are in or near debt distress can focus on fiscal sustainability in the short term to free fiscal resources for investment while taking care to protect spending on essential health, education and other social programs (Glassman et al. 2023; World Bank 2022b).

Second, increased public investment can be financed by increasing revenues or cutting other expenditures. Revenues could be increased by strengthening tax administrations, broadening tax bases, or raising tax rates. Revenue-to-GDP ratios are particularly low in South Asian and Sub-Saharan Africa (World Bank 2015b, 2016b). Even without tax rate increases, efforts to remove exemptions, tighten tax administration, and broaden tax bases could yield revenue gains that

increase resources to finance public investment projects. Measures that have proven successful in the past include the adoption of digital payments, taxpayer and property registration, and monitoring compliance (Okunogbe and Santoro 2021).

Expenditures could also be reallocated toward growth-enhancing investment from expenditures that are less productive or less clearly aligned with policy priorities. For example, eliminating distortive agriculture and fossil fuel subsidies would free sizable funds for investment in renewable energy, health, education, and targeted social safety net programs, even in fiscally constrained EMDEs (World Bank 2022d). Similarly, identifying inefficient spending on high-cost medicines and other health expenditures for which lower-cost alternatives are available offers large spending efficiency gains (Glassman et al. 2023). For commodity-exporting economies, well-implemented fiscal rules and stabilization funds allow governments to use windfall gains earned when commodity prices are high to smooth government investment and expenditures during economic downturns or when commodity prices are low. Pro-cyclical fiscal policy in commodity-exporting countries has been found to worsen the depth of economic downturns (World Bank 2022a). Counter-cyclical fiscal rules need to also take into account spending on health, education and other social safety net expenditures which are often discretionary even in countries that implemented fiscal rules (Glassman et al. 2023).

Third, within an existing envelope of public investment spending, it may be possible to improve spending efficiency and increase the benefits to growth (Buffie et al. 2012). For example, medium-term budget frameworks can improve spending predictability while greater transparency of expenditures and independent spending evaluations can generate incentives to improve efficiency. Better coordination between different levels of government can reduce duplication and inconsistencies (Mandl, Dierx, and Ilzkovitz 2008; St. Aubyn et al. 2009). Limiting contractual and institutional risks related to public-private partnerships in infrastructure can reduce contingent liabilities, while careful monitoring of state-owned enterprises can limit the need to inject fiscal resources into these companies (Dappe et al. 2022; Dappe, Melecky, and Turkgulu 2022). In some countries, there is also capacity to improve budget execution of planned public investment (World Bank 2022e).

Engaging the private sector to co-finance infrastructure and other investment projects can limit the use of fiscal resources and diversify risks. EMDEs can also boost private capital mobilization through the use of syndicated loans, guarantees, and credit enhancement and disaster risk management instruments. Multilateral institutions have been engaged in offering all of these products to EMDEs in recent years, easing the challenges borrowers in these counties face when seeking financing from investors (World Bank 2022h, 2022i). Although private investors require adequate returns to compensate them for the risk they take on, they can improve the efficiency of infrastructure investment by contributing necessary skills and operational experience.

For EMDEs, boosting public investment can have large benefits in terms of output because multipliers tend to be large (Izquierdo et al. 2019). Few studies estimate the fiscal multipliers of infrastructure investment in EMDEs, but the existing literature suggests that investment in green and digital infrastructure may have high multipliers (Vagliasindi and Gorgulu 2021). With the right conditions, public investment can boost private investment. A positive effect on private

investment from public investment is more likely in the presence of falling trade barriers and privatization efforts, especially if the stock of infrastructure is low, and if access to credit is not constrained (Bahal, Raissi, and Tulin 2018; Erden and Holcombe 2005).

Fiscal policy can also support private investment indirectly. Prospects for growth of demand and output play a major role in private investment decisions. To the extent that a growth slowdown in EMDEs is cyclical, counter-cyclical fiscal stimulus can help raise private investment during and after a downturn, assuming there is policy space (Cerra, Hakamada, and Lama 2021; Huidrom, Kose, and Ohnsorge 2016). However, expansionary fiscal policy can also crowd out private investment, thereby hindering economic growth. If increased government borrowing, through the pressure it puts on credit markets or through reactions of the central bank, leads to increases in interest rates and domestic currency appreciation, the cost of financing will increase and reduce a country's international competitiveness. For example, high levels of public investment in China after the global financial crisis initially boosted economic growth but also saddled cities with large amounts of public government debt (Huang, Pagano, and Panizza 2020). This increase in local public debt tightened financial conditions and lowered private investment by local manufacturing firms. Conversely, reducing fiscal deficits can, in some circumstances, boost private investment (Essl et al. 2019).

Monetary policy also has a role in supporting the growth of private investment, primarily by establishing an environment of low and stable inflation over the medium term, which will foster confidence in macroeconomic stability (World Bank 2022f). Monetary policy can also play a countercyclical role through its management of interest rates and credit growth. This can support investment growth when activity is weak and inflation is low, while also restraining investment when the economy is overheating.

VII.2 Structural policy

Structural reforms of many types can reduce constraints to investment and ultimately boost investment growth. The empirical results in this paper suggest that investment climate reform spurts and higher real credit growth have been associated with stronger investment growth (annex 4). This positive impact is also apparent in a panel regression of investment growth on large spurts and setbacks in investment climate reforms among 60 EMDEs during 1984-2022 (figure 13.A). Reform spurts are associated with significantly higher investment growth—by about 6 percentage points, on average. The impact of reform setbacks is more mixed (figure 13.B; annex 4).

Reforms that improve the business and regulatory climate can enable investment increasing the willingness of investors to extend long-term financing to domestic firms, thus reducing roll-over risks and, if financing is put toward infrastructure or research and development, yielding returns over decades. Business environment reforms can also amplify the positive effects of investment, such as less informality and more job creation.[9] Informal firms are both less productive and

[9] For the linkages between reform measures and investment growth, see Andrews, Criscuolo, and Gal (2015); Calcagnini, Ferrando, Giombini (2015); Corcoran and Gillanders (2015); Field (2005); Munemo (2014); Reinikka and Svensson (2002); Schivardi and Viviano (2011); and Wacziarg and Welch (2008).

capital intensive than formal firms (IMF 2019; Ohnsorge and Yu 2021). Structural reforms that encourage entry of informal firms into the formal sector can therefore raise investment and potential output growth, particularly in countries where informal firms are prevalent. Reducing business startup costs has been linked to higher profitability of incumbent firms, and greater investment in information and communications technology. Stronger property rights can encourage business and real estate investment. Labor and product market reforms that increase firm profitability can encourage investment. In countries where access to finance is constrained, measures to promote financial deepening could boost investment, although risk indicators must be monitored to avoid financial instability (Kiyotaki and Moore 2005; Sahay et al. 2015).

Addressing climate change and building a resilient and reliable energy infrastructure requires structural reforms that encourage private investment participation and lower barriers of access for the private sector. In many EMDEs, governance and institutional reforms are necessary to improve and unify the often fragmented regulatory and institutional environment, including regional cooperation in, for example, electricity trade. Unpredictable regulatory and policy risk is one of the reasons that the cost of capital for solar energy producers is two to three times higher in EMDEs (excluding China) than in advanced economies (IEA 2022).

EMDEs have made significant progress in establishing robust policy frameworks for renewable energy and energy efficiency since 2010, but the gap with regulatory frameworks of advanced economies is still large, especially for LICs (ESMAP 2020). Medium-term policy targets and development plans can lower the policy uncertainty holding back private investment (World Bank 2022b). For energy-importing EMDEs, Russia's invasion of Ukraine has underscored the energy security benefits of relying on a diversified mix of energy inputs, transitioning to clean energy sources, and improving the energy efficiency of buildings and production processes (World Bank 2022g).

Setting appropriate, predictable rules relating to investment decisions can boost investment and help avoid potential pitfalls. Using firm-level data, Gutierrez and Philippon (2017) find that when firms invest less than would be expected based on their market performance, two-thirds of this shortfall is explained by corporate governance and industry concentration. Improvements in the planning and allocation of investment and in the implementation of public investment management systems, including reforms that resolve problems of asymmetric information and moral hazard, can enhance the benefits of infrastructure investment. This can be achieved, for example, through the establishment of a sound legal and institutional setting, robust appraisal systems, and effective procurement and monitoring systems (Gardner and Henry 2021; Kim, Fallov, and Groom 2020). For EMDEs where PPPs for infrastructure investment are common, a robust PPP governance structure can limit fiscal risks and avoid opportunistic renegotiations (Dappe, Melecky, and Turkgulu 2022; Engel, Fischer, and Galetovic 2020). A robust PPP regulatory framework is especially critical in LICs, where related reforms are lagging (World Bank 2020a).

Developing digital and technological infrastructure can be an important driver of investment growth. Policies to stimulate private and public investment include closing the rural access gap to broadband networks, aligning regulations with international standards, implementing regulation that encourages competition, ensuring price affordability for consumers, and

educating the workforce in ICT relevant skills (OECD and IDB 2016). Between 2003 and 2018, new high-speed undersea internet connections to Africa, in the presence of a reliable electricity supply, increased FDI flows into the technology and financial sectors and expanded the size of investment projects (Mensah and Traore 2022). In Nigeria, the expansion of mobile broadband internet led to an increase of consumption by covered households, lower poverty rates, and raised labor market participation (Bahia et al. 2020). Multilateral institutions have a role to play in assisting EMDEs develop a pipeline of projects of interest to investors.

In many EMDEs, underdeveloped and illiquid domestic financial markets limit investment, especially for small- and medium-sized firms (World Bank 2015c). Compared to advanced economies, banks extend less credit to the private sector as a share of GDP in EMDEs. This access gap to credit is largest for loans with long maturities (United Nations 2022). Development of domestic capital markets in EMDEs encompasses not only improving financial institutions but also developing private markets for equity and debt. Policies to expand financial intermediation and access to credit include lowering information asymmetries (for example on the credit worthiness of debtors), building the legal infrastructure for contract enforcement to lower collateral requirements, providing partial credit guarantees to intermediaries to mitigate specific risks and market failures, developing a digital infrastructure to lower market access costs for firms and small financial institutions, and establishing disclosure rules for asset allocation and investment decisions (United Nations 2022; World Bank 2022h).

Local currency equity and debt markets facilitate the entry of institutional investors, such as pension funds and private equity firms, which have a higher risk tolerance and allow firms to access financing in EMDEs with a less-developed financial intermediation infrastructure (United Nations 2022). Development of these markets can be supported by multilateral development banks through the use of innovative products such as catastrophe bonds as well as blue and green bonds, provision of liquidity in local currency in the most illiquid capital markets, as well as assistance and advice to governments on building the necessary regulatory and institutional framework (World Bank 2015; World Bank 2022h). Risk indicators must be monitored to avoid financial instability as domestic capital markets are developed, however (Kiyotaki and Moore 2005; Sahay et al. 2015).

Trade-related reforms, such as simplifying border procedures, eliminating unnecessary duties and improving trade-related transport infrastructure, could help increase trade flows, with associated benefits for investment (Breton, Farrantino, and Maliszewska 2022). Lowering uncertainty related to at-the-border trade costs and committing to current or reduced tariff levels as well as other non-tariff barriers will decrease trade costs and encourage investment. These reforms should be accompanied by high-quality and well-maintained infrastructure, such as ports and airports (World Bank 2021b). In some EMDEs, lower barriers to cross-border trade finance would help close the trade finance gap and support trade growth (IFC and WTO 2022).

Membership in trade and integration agreements, such as the most recent African Continental Free Trade Area, solidifies reforms, which should benefit a country's investment climate, particularly if such agreements boost integration into global value chains and help lower the cost of tradable investment goods (machinery and equipment), for which EMDEs still face significantly

higher costs than advanced economies (Lian et al. 2019). These reforms should include standardization of inspection and labeling requirements, which add significant costs to trade even if tariffs are low (Moïsé and Le Bris 2013). Lower trade barriers can integrate participating economies in regional and global value chains, while investment, intellectual property rights, and competition protocols aim to increase cross-border investments (Echandi, Maliszewska, and Steenbergen 2022; World Bank 2020b).

In the long term, many commodity-exporting EMDEs need to diversify their economies so that terms of trade shocks are less likely to impact investment decisions. This can be done by, for instance, moving production up the value chain or building infrastructure that promotes the growth of activity outside the natural resource sector. EMDEs will also increasingly need to develop policies to offset the investment-dampening effects of population aging (Aksoy et al. 2019; Zhang, Zhang, and Lee 2003).

VIII. Conclusion

Investment growth slowed during the decade prior to the pandemic. On an aggregate level, the investment collapse in EMDEs in 2020 (including or excluding China) was larger than in the global recession in 2009, and the return to the pre-recession trend is expected to take longer. The slowdown of investment growth in EMDEs during the decade prior to the pandemic and the subdued prospects for investment growth in the medium term can be observed, to varying degrees, in all six EMDE regions.

The empirical analysis in this paper finds that strong real output growth, robust real credit growth, terms-of-trade improvements, growth in capital inflows as a share of GDP, and investment environment reform spurts are associated with strengthening real investment growth. For advanced economies, where investment growth was much lower than in EMDEs during the 2010s but also more stable, output growth is found to be the most important correlate of investment growth during 2000-21.

At a time when investment growth is projected to be sluggish in most EMDEs, fiscal space for expansion of public investment is limited, and borrowing conditions are much tighter than during the long period of easy credit in the decade prior to the pandemic. Policy makers will need to identify innovative ways to fill unmet investment needs. Meeting climate goals and SDG targets, and supporting long-term growth requires sound fiscal policies, including debt sustainability, as well as targeted investment and reforms.

The sequencing and implementation of these reforms should reflect country-specific circumstances. For example, in countries in acute fiscal stress, the priority may be to improve spending efficiency in public investment. In countries with anemic private investment, the priority may be business climate reforms, including robust competition policy, to foster private investment. In countries with large foreign direct investment, the priority may be to improve human capital to ensure that such foreign direct investment is growth-enhancing.

Fiscal policies include increasing spending efficiency, implementing counter-cyclical fiscal rules, and strengthening tax administration and revenue collection. Fiscal policy to boost investment

will need to be complemented by additional financing from the international community and the private sector. Structural reforms are needed to crowd in private investment, such as lowering tariffs and non-tariff barriers to trade, improving the business climate, and putting in place predictable rules such as governance structures that enable PPPs. Public and private investment can both play important roles in boosting long-term growth prospects by supporting productive sectors or expanding infrastructure (including digital, transportation, and electricity infrastructure), improving health sector outcomes, and improving and expanding education. The need for investment in education is particularly significant in view of the impact of school closures during the pandemic.

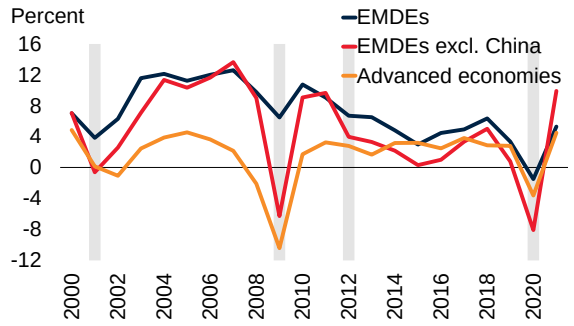
Future research on investment could focus on several areas. One is to identify the policies most likely to boost public and private investment growth, and thereby the growth of output and per capita incomes. Promising research questions relate to the relative effectiveness of various institutional reforms in raising investment growth, and the quantitative benefits of investments in infrastructure and ICT (Libman, Montecino, and Razmi 2019; Mensah and Traore 2022). Public infrastructure investment has been found to stimulate structural transformation and productivity (Perez-Sebastian and Steinbuks 2017).

Human development is strongly correlated with income per capita and economic growth. Countries with higher income levels tend to have not only a larger share of workers in the formal sector, where wages are typically higher than in the informal sector, but also a larger share of jobs that provide health care benefits, job stability, and good working conditions (Hovhannisyan et al. 2022). These job quality attributes improve access to health care, allow households to send their children to school, and minimize the chance of experiencing catastrophic expenditures. Yet, within countries, there is often large heterogeneity in the quality of jobs across sectors of the economy (ILO 2008 and 2013; OECD 2015). Identifying sectors and structural reforms that increase investment opportunities with the highest likelihood of providing good quality jobs will help close the education and health gaps to achieve the SDGs.

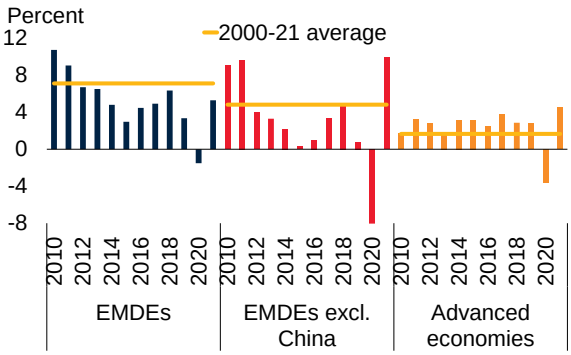
Another underdeveloped area of research is understanding the role of intangible investment (for example, intellectual property) in driving growth and productivity. Related questions will become increasingly important as EMDEs transition to knowledge- and technology-based economies. Data limitations, however, especially in EMDEs, are hindering progress (Crouzet et al. 2022). The international community could support national statistical agencies in EMDEs to improve their capacity to measure and collect data on intangible investment.

Figure 1 Investment growth

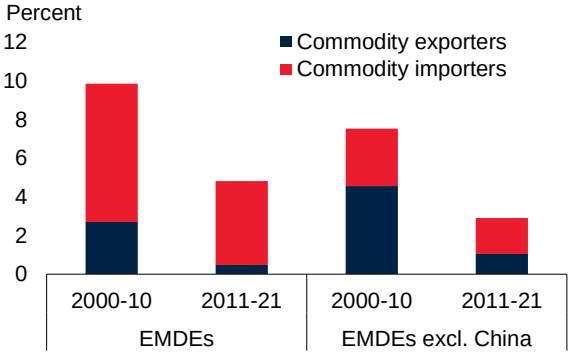
A. Investment growth



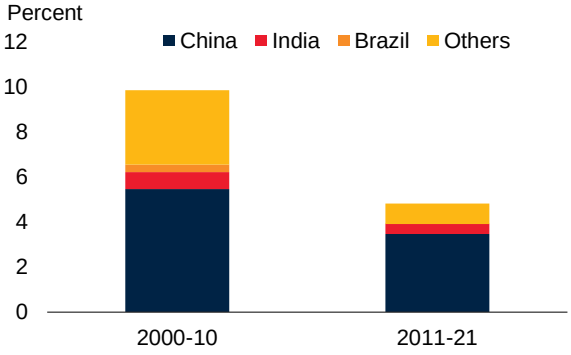
B. Investment growth relative to long-term average



C. Contribution to EMDE investment growth, by commodity exporter status



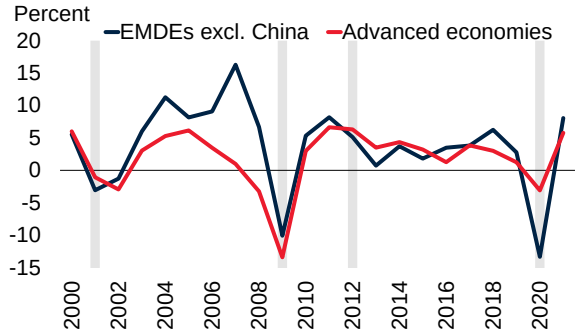
D. Contribution to EMDE investment growth, by country



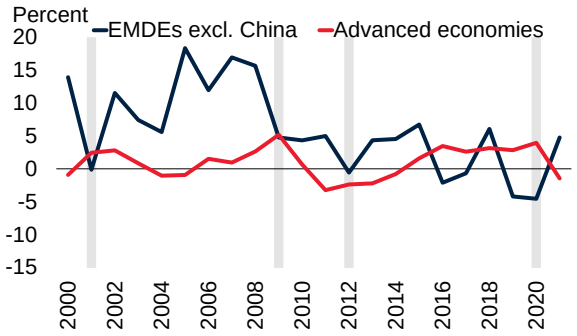
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Investment refers to gross fixed capital formation. Investment growth is calculated with countries' real annual investment in constant U.S. dollars as weights. Shaded areas indicate global recessions (in 2009 and 2020) and slowdowns (in 2001 and 2012).
A.B. Sample includes 69 EMDEs and 35 advanced economies. Last observation is 2021.
C.D. Bars show the percentage point contribution of each country or country group to EMDE investment growth during the indicated years. Height of the bars is average EMDE investment growth during the indicated years. Sample includes 69 EMDEs.

Figure 2 Private and public investment growth

A. Private investment growth



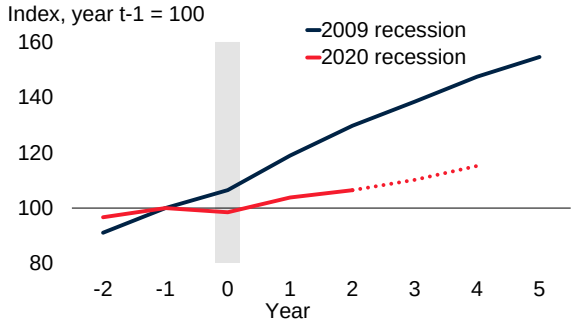
B. Public investment growth



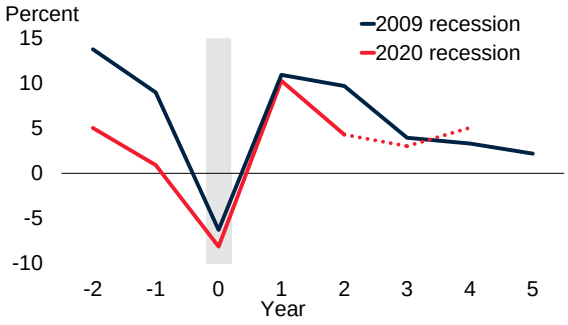
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies.
A.B. Investment growth is calculated with countries' real annual investment in constant U.S. dollars as weights. Shaded areas indicate global recessions (in 2009 and 2020) and slowdowns (in 2001 and 2012). Sample includes 32 EMDEs excluding China and 11 advanced economies. Last observation is 2021.

Figure 3 Investment around global recessions

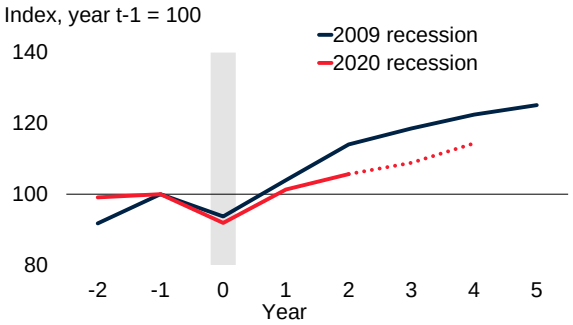
A. Investment in EMDEs



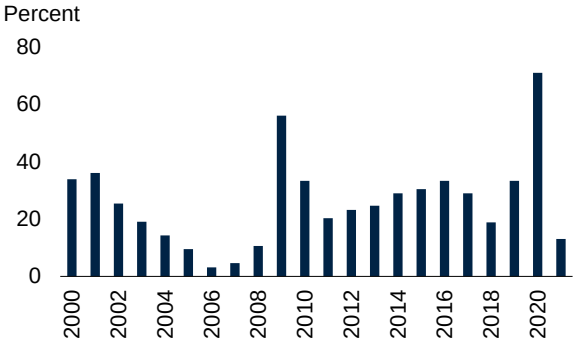
B. Investment growth in EMDEs excluding China



C. Investment in EMDEs excluding China



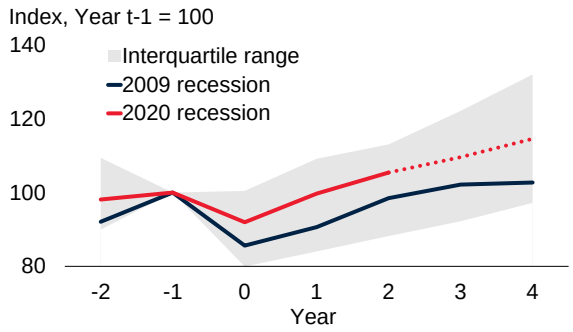
D. Share of EMDEs with an investment contraction



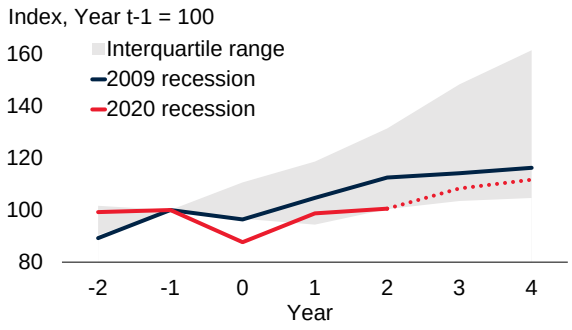
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Investment refers to gross fixed capital formation. Investment growth is calculated with countries' real annual investment in constant U.S. dollars as weights.
A.-C. On the x-axis, year zero refers to the year of global recessions in 2009 and 2020. Dotted portions of lines are forecasts.
A.-D. Sample includes 69 EMDEs.

Figure 4 Median investment around domestic recessions and terms of trade shocks

A. Median investment in EMDEs around domestic recessions



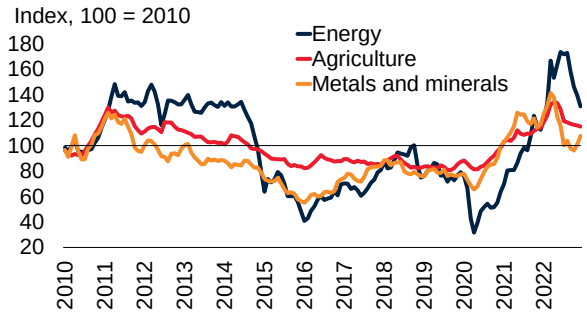
B. Median investment in EMDE commodity exporters around domestic terms of trade shocks



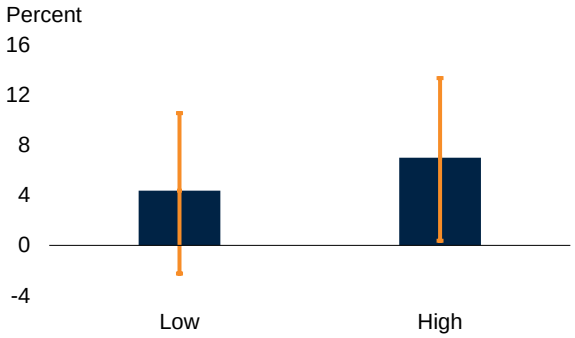
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Investment refers to gross fixed capital formation. Dotted portions of lines are forecasts. Sample includes the 69 EMDEs that experienced a recession during that period.
A. On the x-axis, year zero refers to the year of national or global recession. Shaded area shows the interquartile range of investment for domestic recessions that occurred between 1979 and 2020, excluding the global recessions in 2009 and 2020,
B. On the x-axis, year zero refers to the year of national terms of trade troughs. Shaded area shows the interquartile range of investment for domestic terms of trade troughs that occurred between 1979 and 2020, excluding terms of trade shocks in 2009 and 2020. Data for 2009 and 2020 only include commodity-exporting EMDEs that also experienced a terms of trade trough in 2009 or 2020. Terms of trade troughs were identified using the Harding Pagan method, adjusted for annual data.

Figure 5 Commodity prices, terms of trade, and investment growth

A. Commodity prices



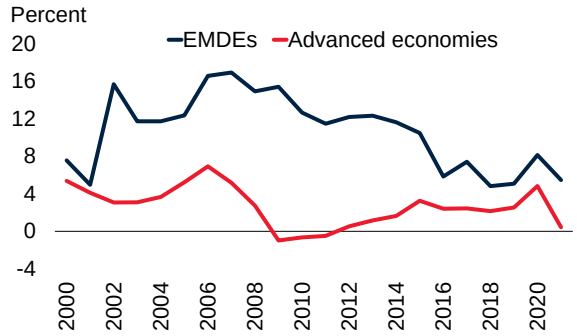
B. Investment growth in EMDEs with high and low growth in terms of trade, 2000-21



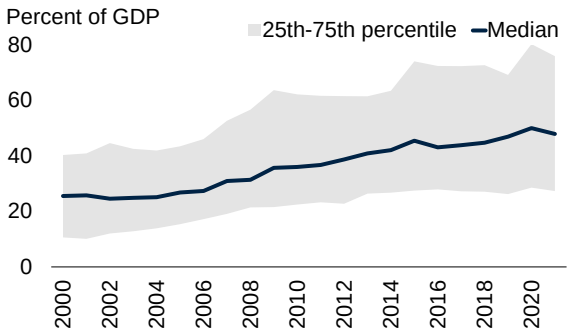
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies.
A. Energy index includes crude oil (85 percent weight), coal, and natural gas. Agriculture index includes 21 agricultural commodities. Metals and minerals index includes the six metals traded on the London Metal Exchange (aluminum, copper, lead, nickel, tin, zinc) plus iron ore. Prices indexes are calculated using commodity prices in nominal U.S. dollars. Last observation is December 2022.
B. Bars show group medians; vertical lines show interquartile ranges. "Low" and "high" indicate annual terms of trade growth in the top and bottom third of the distribution, respectively. Difference in medians between "low" and "high" subsamples is significant at the 1 percent level. Sample includes 69 EMDEs.

Figure 6 Credit growth, debt, and investment growth

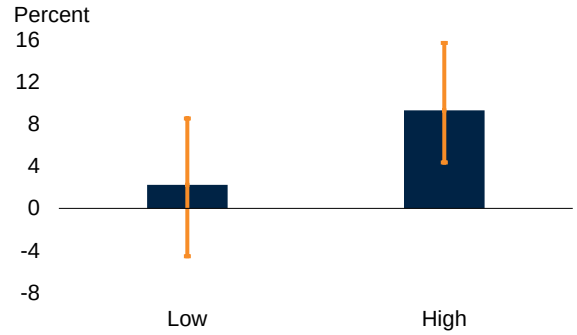
A. Private credit growth in EMDEs



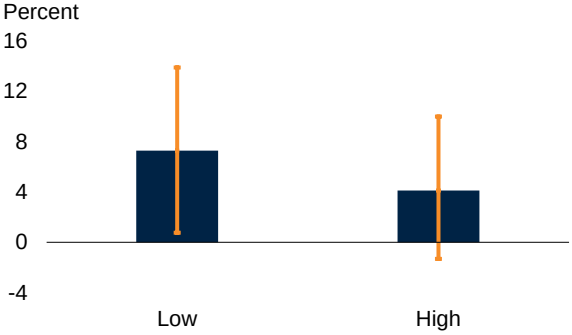
B. Private debt in EMDEs



C. Investment growth in EMDEs with high and low credit growth, 2000-21



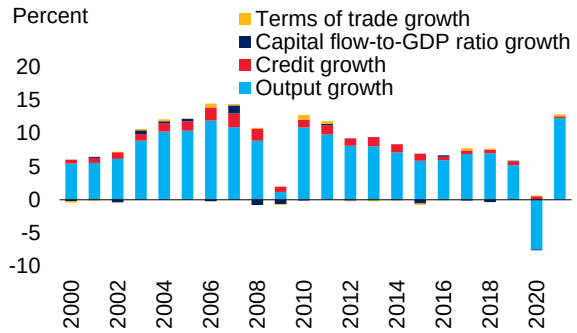
D. Investment growth in EMDEs with high and low private debt-to-GDP ratios, 2000-21



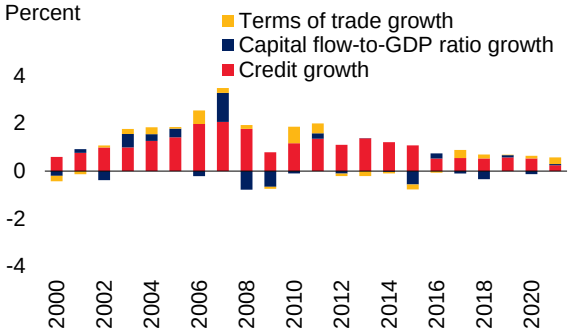
Sources: Bank for International Settlements; Haver Analytics; IMF International Financial Statistics database; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies.
A. Private credit refers to real annual credit growth to the private sector. Lines show weighted averages with countries' real annual investment in constant U.S. dollars as weights. Sample includes 69 EMDEs and 35 advanced economies. Last observation is 2021.
B. Private debt refers to domestic credit to the private sector as a percent of GDP. Sample includes 71 EMDEs. Last observation is 2021.
C. D. Bars show group medians; vertical lines show interquartile ranges. "Low" and "high" indicate years when annual credit growth (C) and private debt-to-GDP ratios (D) were in the bottom and top third of the distribution, respectively, during 2000-21. Difference in medians between "low" and "high" subsamples is significant at the 1 percent level.
C. Sample includes 69 EMDEs.
D. Sample includes 68 EMDEs.

Figure 7 Estimated contribution of explanatory variables to predicted investment growth

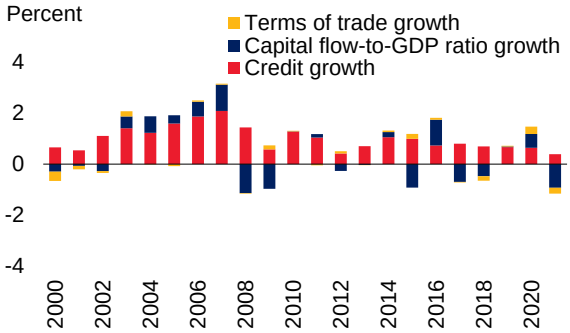
A. Drivers of EMDE investment growth



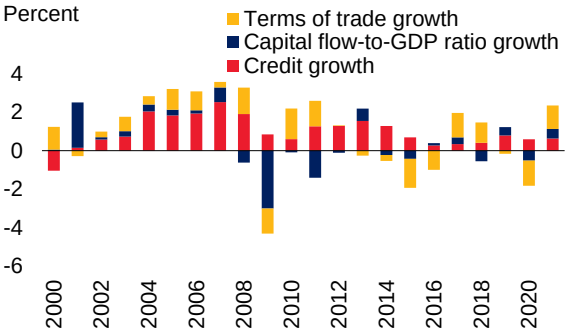
B. Drivers of investment growth in excess of GDP growth in EMDEs



C. Drivers of investment growth in excess of GDP growth in EMDE commodity importers



D. Drivers of investment growth in excess of GDP growth in EMDE energy exporters



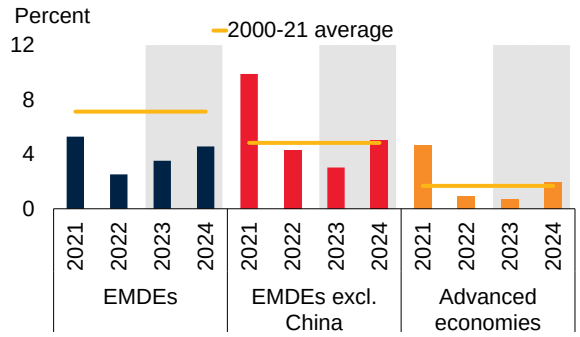
Source: World Bank.

Note: EMDEs = emerging market and developing economies.

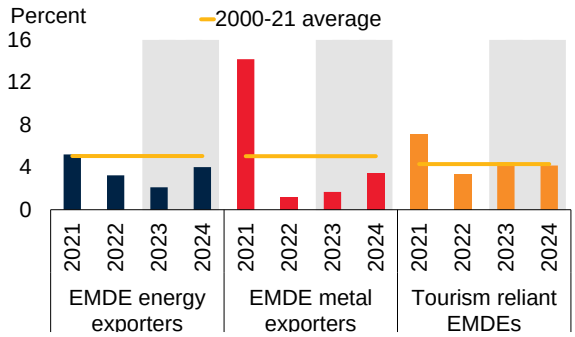
A.-D. Estimated impact of explanatory variables on investment growth in 57 EMDEs during 2000-21, based on the system generalized method of moments (GMM) estimation presented in the chapter. Bars show the contribution of each explanatory variable to predicted investment growth (defined, for each variable, as the coefficient shown in the regression results in column 1 of table 2 multiplied by the actual value of the variable). For presentational clarity, the charts show only the four explanatory variables with the largest contributions to predicted investment growth. Panels B, C, and D highlight the smaller but still significant contribution to investment growth after accounting for output growth. Last observation is 2021.

Figure 8 Investment growth outlook

A. Investment growth: short-term forecasts



B. Investment growth: short-term forecasts, by EMDE subgroup



Sources: Haver Analytics; United Nations World Tourism Organization; World Bank; World Development Indicators database.

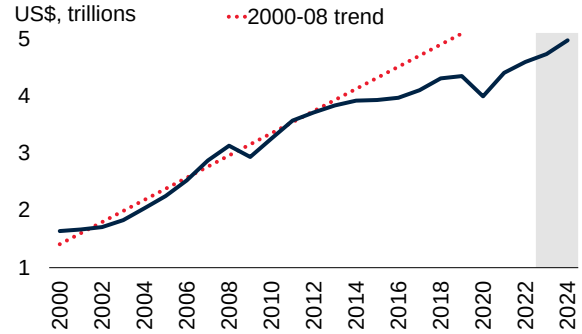
Note: EMDEs = emerging market and developing economies. Investment refers to gross fixed capital formation. Gray shading indicates forecasts.

A.B. Investment growth is calculated with countries' real annual investment in constant U.S. dollars as weights. Sample includes 69 EMDEs and 35 advanced economies.

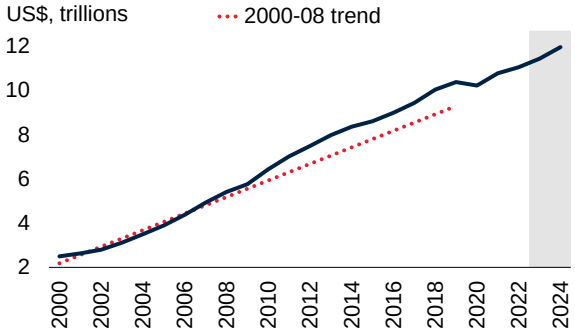
B. Sample includes 15 EMDE energy exporters, 9 EMDE metals exporters, and 14 tourism-reliant EMDEs.

Figure 9 Investment compared to trend

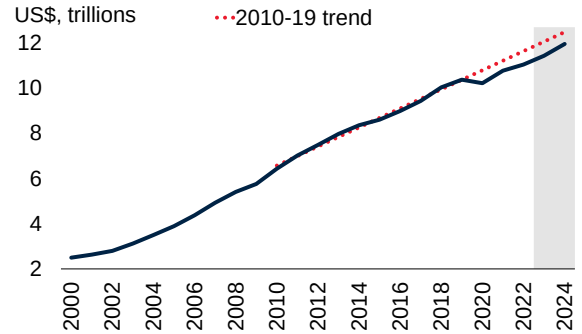
A. Investment in EMDEs excluding China compared to trend before the global financial crisis



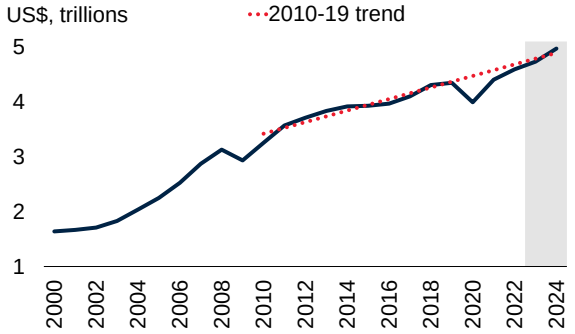
B. Investment in EMDEs compared to the trend before the global financial crisis



C. Investment in EMDEs excluding China compared to pre-COVID-19 trend



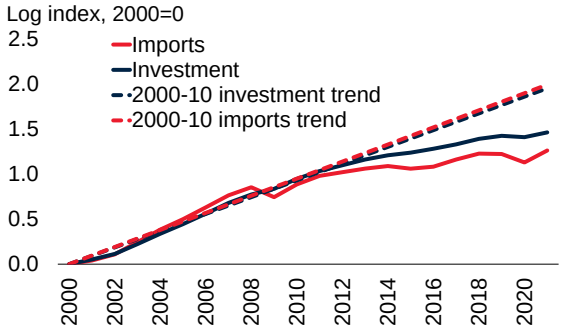
D. Investment in EMDEs compared to pre-COVID-19 trend



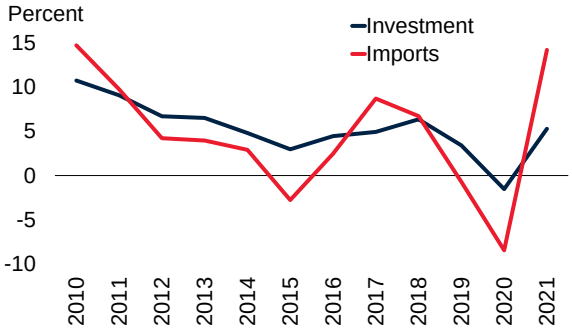
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Investment refers to gross fixed capital formation. Investment levels after 2022 are forecast. Trendlines are calculated using linear regression on investment levels during 2010-19 and 2000-08. Gray shading indicates forecasts. Sample includes 69 EMDEs.

Figure 10 Slowdown in growth of investment and trade

A. EMDE investment and imports



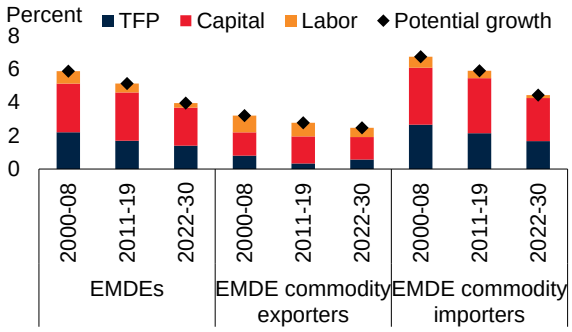
B. EMDE investment and import growth



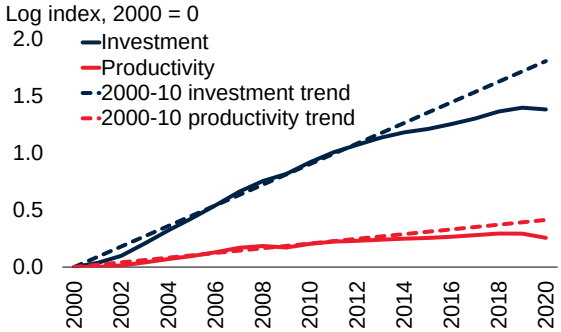
Sources: Haver Analytics; World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Investment refers to gross fixed capital formation.
A. Levels of real gross fixed capital formation and imports.
B. Aggregate investment growth is calculated with real annual investment in constant U.S. dollars as weights.

Figure 11 Growth of investment, productivity, and potential output

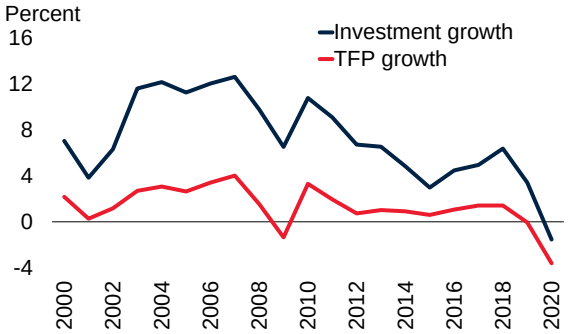
A. Potential output growth



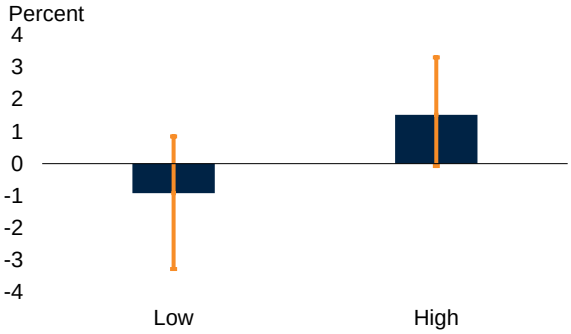
B. EMDE investment and total factor productivity



C. Investment and total factor productivity growth in EMDEs



D. Total factor productivity growth in EMDEs with high and low investment growth, 2000-20



Sources: Dieppe (2021); Haver Analytics; International Labour Organization; Penn World Tables; UN World Population Prospects; World Bank.

Note: EMDEs = emerging market and developing economies; TFP = total factor productivity.

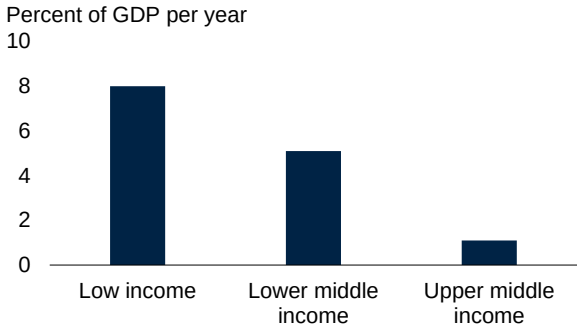
A. Potential output growth based on production function estimates. Sample includes 53 EMDEs.

B.C. Total factor productivity is derived from labor productivity (output per worker) by adjusting for human capital and capital deepening; see Dieppe (2021). Investment refers to gross fixed capital formation. Investment growth and TFP growth are calculated with countries' real annual investment in constant U.S. dollars as weights. Sample includes 69 EMDEs.

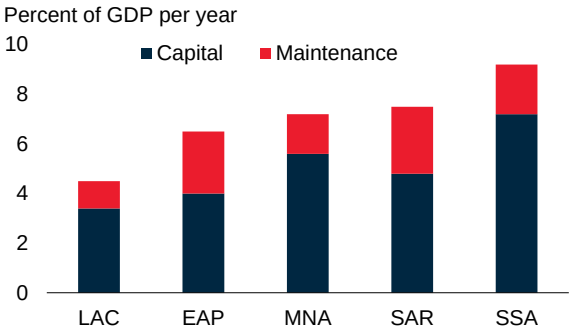
D. Bars show group medians; vertical lines show interquartile ranges. "Low" and "high" indicate years when annual investment growth was in the bottom and top third of the distribution, respectively, during 2000-20. Difference in medians between "high" and "low" subsamples is significant at the 1 percent level. Sample includes 69 EMDEs.

Figure 12 Investment needs related to climate goals and the Sustainable Development Goals (SDGs) in EMDEs

A. Additional investment needs for a resilient and low-carbon pathway, 2022-30



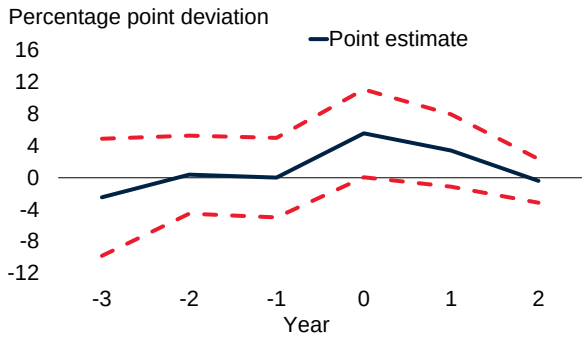
B. Average annual investment needs in infrastructure sectors related to SDGs, by region



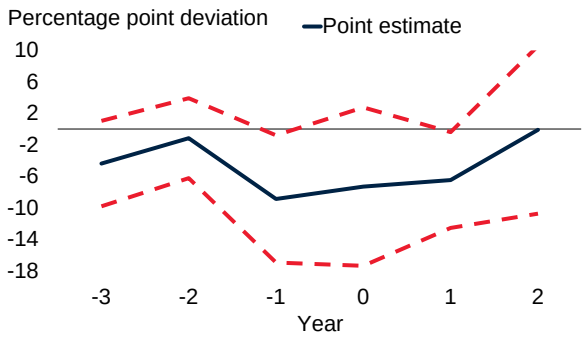
Sources: Rozenberg and Fay (2019); World Bank (2022c); World Bank.
Note: EAP = East Asia and Pacific, LAC = Latin America and the Caribbean, MNA = Middle East and North Africa, SAR = South Asia, SSA = Sub-Saharan Africa.
A. Bars show the annual investment needs to build resilience to climate change and put countries on track to reduce emissions by 70 percent by 2050. Depending on availability, estimates include investment needs related to transport, energy, water, urban adaptations, industry, and landscape. In some Country Climate and Development Reports, especially those for low-income and lower-middle-income countries, estimated investments include development needs, especially those linked to closing the infrastructure gaps—such as solar mini grids to provide energy access—and cannot be considered entirely "additional" to pre-existing financing needs.
B. Bars show average annual spending needs on electricity, transport, water and sanitation, flood protection, and irrigation during 2015-30. Country sample includes low- and middle-income countries, as defined in the technical appendix of Rozenberg and Fay (2019).

Figure 13 Investment growth around reform spurts and setbacks in EMDEs

A. Investment growth around reform spurts



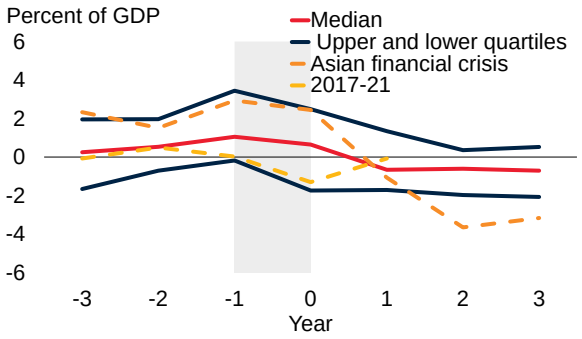
B. Investment growth around reform setbacks



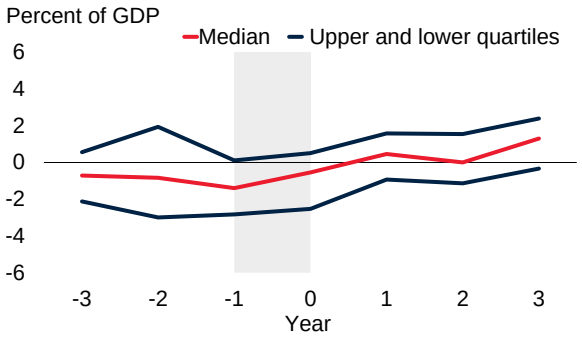
Sources: International Country Risk Profile; World Bank.
Note: EMDEs = emerging market and developing economies. Sample includes 60 EMDEs from 1984-2022. Reform spurts and setbacks are defined in annex 4. Solid lines show the increase in investment growth around a reform spurt (panel A) or setback (panel B) at year = 0 relative to the countries not experiencing a reform spurt or setback. Dashed lines show the 95 percent confidence interval.

Figure B.1.1. Investment and consumption growth during credit booms and deleveraging episodes

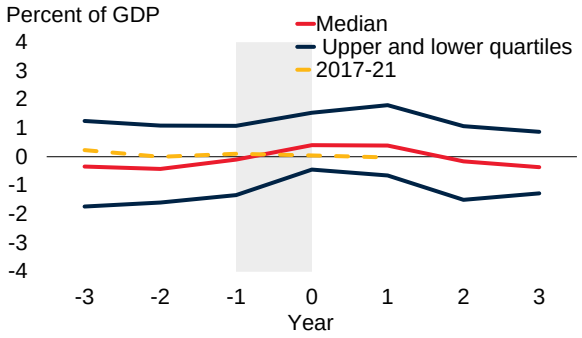
A. Investment around credit booms



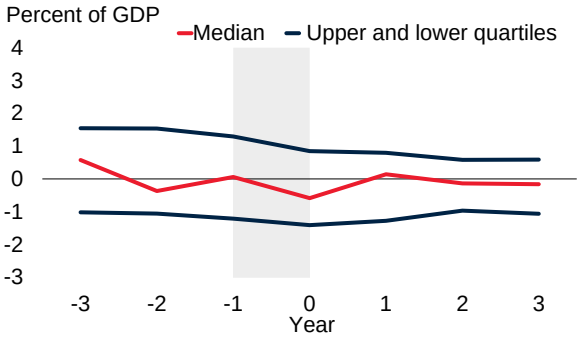
B. Investment around deleveraging episodes



C. Consumption around credit booms



D. Consumption around deleveraging episodes



Sources: World Bank; World Development Indicators database.

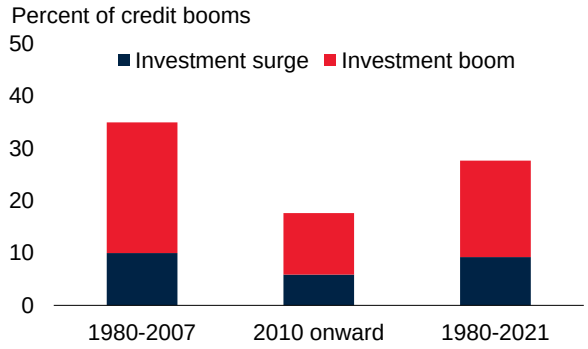
Note: Red lines show sample medians of the cyclical component of investment in percent of GDP (derived by Hodrick-Prescott filter); blue lines show the corresponding upper and lower quartiles, based on data for 1980-2021 for 55 EMDEs. Shaded areas indicate credit booms. A credit boom is defined as an episode during which the cyclical component of the nonfinancial private sector credit-to-GDP ratio (using a Hodrick-Prescott filter) is larger than 1.65 times its standard deviation in at least one year. The episode starts when the cyclical component first exceeds one standard deviation. It ends in a peak year ("0") when the nonfinancial private sector credit-to-GDP ratio declines in the following year. A deleveraging episode is defined correspondingly. To address the end-point problem of a Hodrick-Prescott filter, the dataset is expanded by setting the data for 2022-24 to be equal to the data in 2021 (2020 if data for 2021 is unavailable). The sample is for available data over 1980-2021 for 55 EMDEs.

A. The orange dashed line is the median of the six EMDEs (China, Indonesia, Malaysia, Mongolia, the Philippines, and Thailand) that were affected by the 1997 Asian financial crisis (1997 is t=0). The yellow dashed line for 2017-21 (where t=0 for year 2020) shows the sample median for the corresponding period.

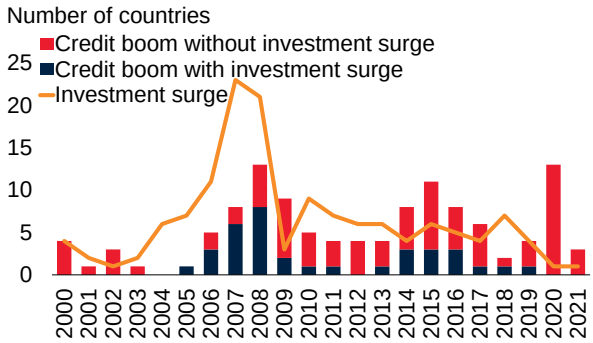
C. The yellow dashed line for 2017-21 (where t=0 for year 2020) shows the sample median for the corresponding period.

Figure B.1.2. Coincidence between investment surges and credit booms

A. Investment surges during credit booms in EMDEs



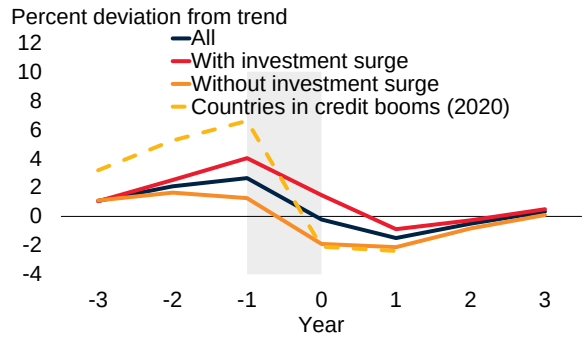
B. Investment surges during credit booms in EMDEs



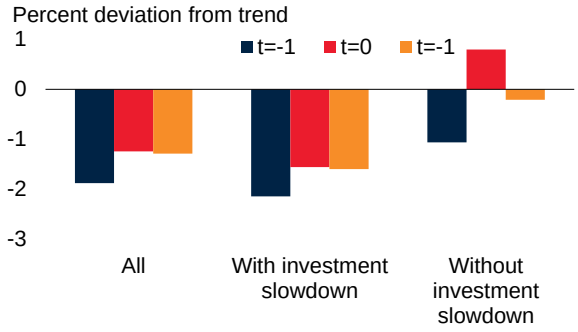
Sources: World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Credit booms are defined as in figure B.1.1. Investment surge is defined as years when the cyclical component of the investment-to-GDP ratio is at least one standard deviation above the HP-filtered trend (1.65 standard deviations for investment booms). Data availability as in figure B.1.1.
A. Investment surges during the peak year (t=0) or the following year (t=1).

Figure B.1.3. Output growth during credit booms and deleveraging episodes

A. GDP during credit booms



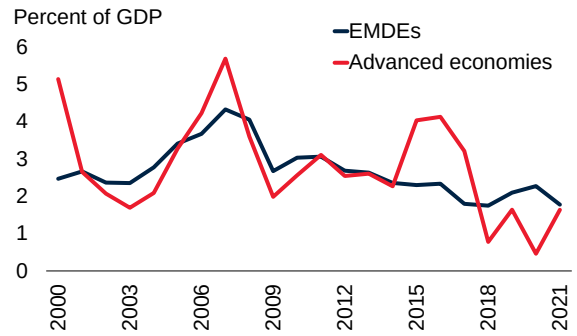
B. GDP during deleveraging episodes



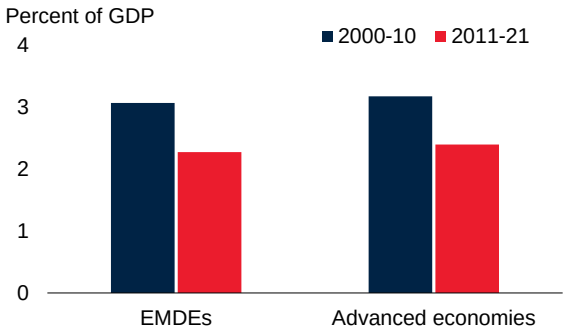
Sources: World Bank; World Development Indicators database.
Note: EMDEs = emerging market and developing economies. Credit booms are defined as in figure B.1.1. Investment surges and slowdowns are defined as in figure B.1.2. The sample includes available data over 1980-2021 for 55 EMDEs.
A. Group medians for the cyclical components of GDP in percent of its trend (derived using a Hodrick-Prescott filter) for all credit booms (blue line), credit booms with investment surge (red line; occurred in two years around t=0), and credit booms without investment surge (orange line). The median cyclical components of GDP in percent of its HP-filtered trend for the four countries (China, Georgia, Jamaica, and Qatar) experiencing credit booms in 2020 are shown in the yellow dashed line.
B. Group medians for the cyclical components of GDP in percent of its trend (derived using a Hodrick-Prescott filter) for all deleveraging episodes (blue bar), deleveraging episodes with investment slowdown (red bar; occurred in two years around t=0), and deleveraging episodes without investment slowdown (orange bar).

Figure B.2.1 Trends in FDI since 2000

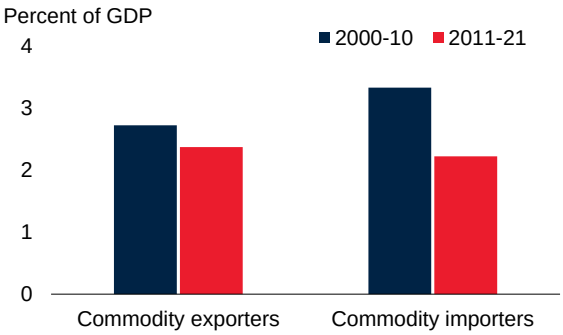
A. FDI inflows



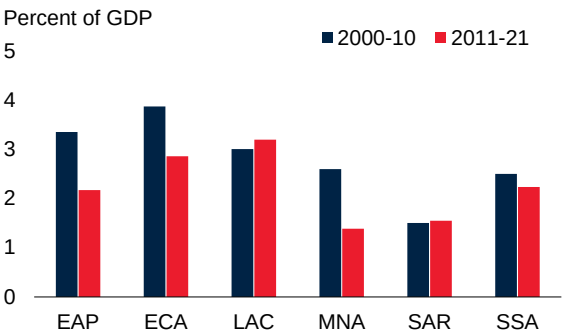
B. FDI inflows, by decade



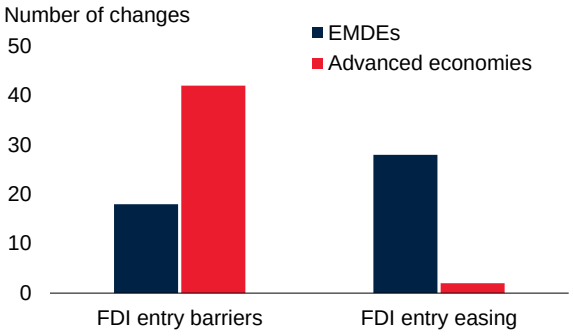
C. FDI inflows in EMDE commodity exporters and importers



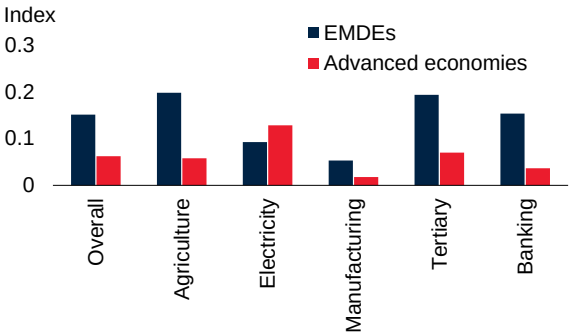
D. FDI inflows in EMDE regions



E. FDI barriers and easing measures, 2020-22



F. FDI restrictions index, by sector, 2010-20



Sources: OECD FDI Restrictiveness Index; United Nations Conference on Trade and Development; World Bank; World Bank FDI Entry and Screening Tracker.

Note: FDI is net FDI inflows (percent of GDP). EMDEs = emerging market and developing economies; EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MNA = Middle East and North Africa; SAR = South Asia; SSA = Sub-Saharan Africa; FDI = foreign direct investment.

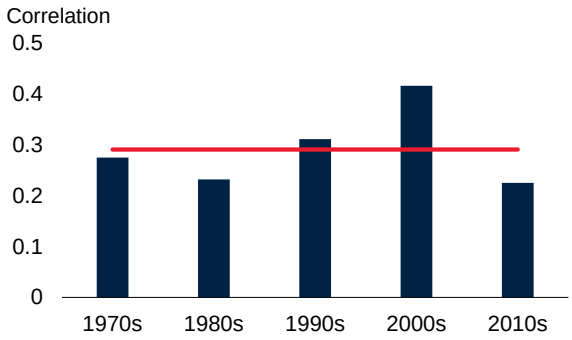
A. Last observation is 2021.

A.-D. Sample includes 36 advanced economies and 139 EMDEs. Bars show GDP-weighted annual averages of FDI during 2000-10 and 2011-21, respectively (B-D).

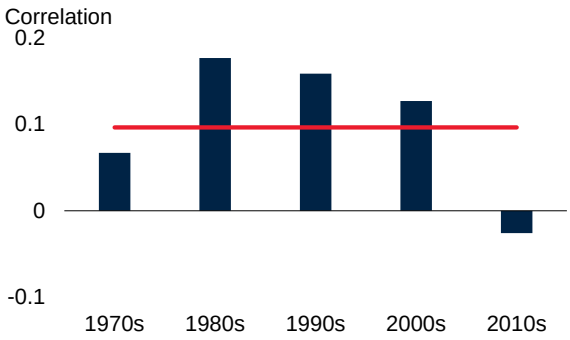
E.F. Number of FDI entry barriers and FDI entry easing policies, during 2020-22, including 24 advanced economies and 22 EMDEs (E). Bars show averages during 2010-20, including 32 advanced economies and 51 EMDEs (F). The indexes range from zero (no restrictions) to one (complete restrictions).

Figure B.2.2 Correlation of FDI, investment, and growth in EMDEs

A. Correlation between FDI and investment



B. Correlation between FDI and growth



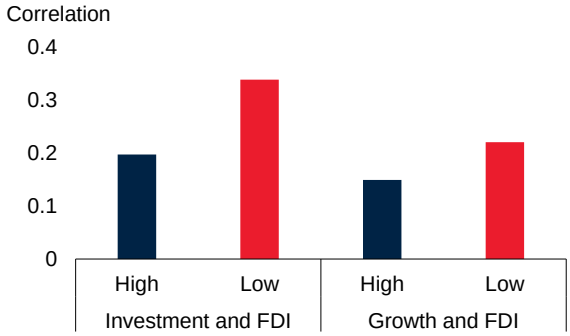
Source: World Bank.

Note: FDI is net FDI inflows as percent of GDP. EMDEs = emerging market and developing economies; FDI = foreign direct investment.

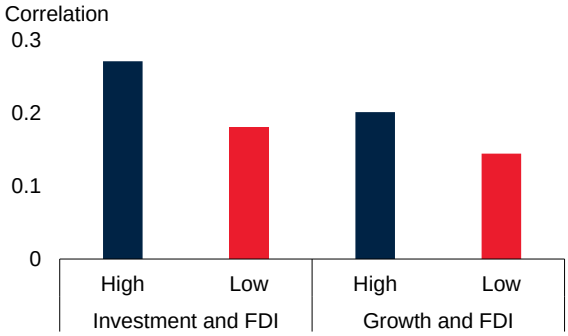
A.B. Bars show the pooled correlation between FDI and gross fixed capital formation (percent of GDP) or between FDI and GDP per capita growth (percent). The red horizontal line shows the aggregate correlation for the period 1970-2020. All correlations are computed using a constant sample of 71 countries. All positive correlations are statistically different from zero.

Figure B.2.3 Correlation of FDI, investment, and growth in EMDEs by host country conditions

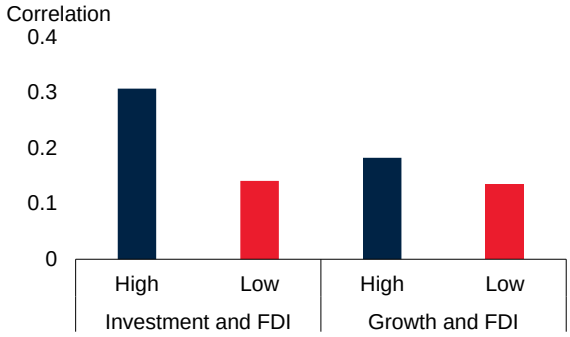
A. Correlation, by financial development



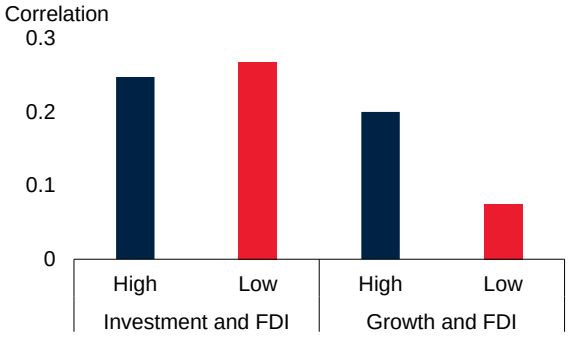
B. Correlation, by trade openness



C. Correlation, by human capital



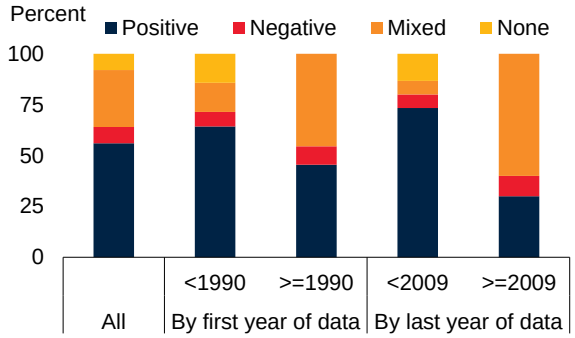
D. Correlation, by institutions



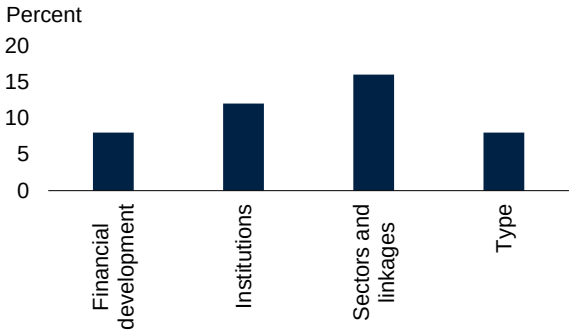
Sources: PRS Group's International Country Risk Guide; World Bank.
Note: FDI is net FDI inflows (percent of GDP). EMDEs = emerging market and developing economies; FDI = foreign direct investment.
A.B. Bars show the pooled correlation between FDI and gross fixed capital formation and between FDI and GDP per capita growth for countries with high (greater than the 75th percentile blue bars) and low (lower than the 25th percentile, red bars) levels of financial development or levels of trade openness. Financial development is measured as private credit as share of GDP. Trade refers to trade as a share of GDP. Differences between country groups are not statistically significant.
C.D. Bars show the pooled correlation between FDI and gross fixed capital formation and between FDI and GDP per capita growth, for countries with high (blue bars) and low (red bars) levels of human capital or institutions. For human capital, high refers to pupil-to-teacher ratio less than the 25th percentile; and low refers to pupil-to-teacher ratio greater than the 75th percentile. For institutions, high refers to countries above the median and low refers to countries below the median of the investment profile index in the PRS Group's International Country Risk Guide. Differences between country groups are not statistically significant.

Figure B.2.4 Summary of empirical studies of FDI and investment in EMDEs

A. Findings on the relationship between FDI and investment



B. Studies on FDI and investment that account for initial conditions and type of FDI



Sources: World Bank, based on 25 studies: Agosin and Machado (2005); Ahmed et al. (2015); Al-Sadig (2013); Amighini, McMillan, and Sanfilippo (2017); Ang (2009a); Arndt, Buch, and Schnitzer (2010); Ashraf and Herzer (2014); Borensztein, De Gregorio, and Lee (1998); Bosworth, Collins, and Reinhart (1999); Chen, Yao, and Malizard (2017); Eregha (2012); Ha, Holmes, and Tran (2022); Jude (2019); Kamaly (2014); Lautier and Moreaub (2012); Makki and Somwaru (2004); Mileva (2008); Mody and Murshid (2005); Morrissey and Udomkerdmongkol (2012); Ndikumana and Verick (2008); Nguyen (2021); Pels (2010); Tang, Selvanathan, and Selvanathan (2008); Wang (2013); and World Bank (2017).

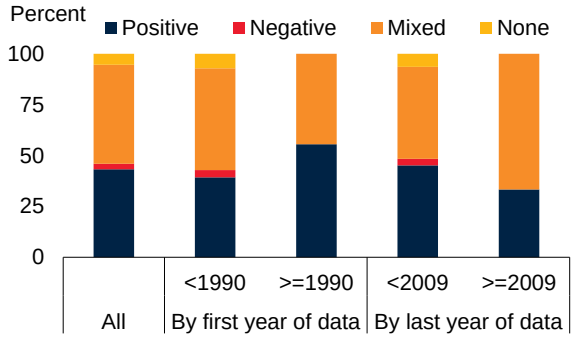
Note: EMDEs = emerging market and developing economies; FDI = foreign direct investment.

A. Bars show share of papers that find statistically significant positive, negative, mixed, or missing relationships between FDI and investment. The shares of results are also shown by restricting papers based on the start date of their empirical analysis (before and after 1990) and the end date of their empirical analysis (before and after 2009).

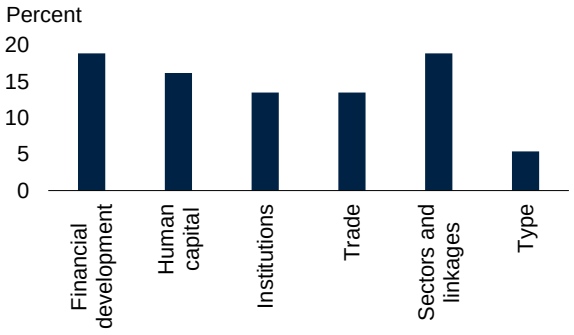
B. Bars show the share of surveyed papers on FDI and investment that find a statistically significant role for specific initial conditions, as shown along the x-axis. "Sectors and linkages" refers to different effects of FDI on investment depending on the sector of FDI (that is, manufacturing or services). "Type" refers to different effects of FDI on investment depending on whether FDI is greenfield or mergers and acquisitions.

Figure B.2.5 Summary of empirical studies of FDI and growth in EMDEs

A. Findings on the relationship between FDI and output growth



B. Studies on FDI and output growth that account for initial conditions and type of FDI



Sources: World Bank, based on 37 studies: Alfaro (2003); Alfaro and Charlton (2013); Alfaro et al. (2004); Alguacil, Cuadros, and Orts (2011); Ali and Asgher (2016); Ang (2009b); Aykut and Sayek (2007); Azman-Saini, Law, and Ahmad (2010); Balasubramanyam, Salisu, and Sapsford (1996); Benetrix, Pallan, and Panizza (2022); Bengoa and Sanchez-Robles (2003); Blanchard et al. (2016); Borensztein, De Gregorio, and Lee (1998); Busse and Groizard (2008); Carkovic and Levine (2005); Chakraborty and Nunnenkamp (2008); Choe (2003); Chowdhury and Mavrotas (2006); Cipollina et al. (2012); De Mello (1999); Driffield and Jones (2013); Gao (2004); Hansen and Rand (2006); Harms and Méon (2018); Hermes and Lensink (2003); Herzer (2012); Kohpaiboon (2003); Lee and Chang (2009); Luu (2016); Makki and Somwaru (2004); Mehic, Silajdzic, and Babic-Hodovic (2013); Nair-Reichert, and Weinhold (2001); Osei and Kim (2020); Prasad, Rajan, and Subramanian (2007); Romer (1993); Wang (2009); and Wang and Wong (2011).

Note: EMDEs = emerging market and developing economies; FDI = foreign direct investment.

A. Bars show share of papers that find statistically significant positive, negative, mixed, or missing relationships between FDI and growth. The share of results are also shown by restricting papers based on the start date of their empirical analysis (before and after 1990) and the end date of their empirical analysis (before and after 2009).

B. Bars show share of papers on FDI and growth that find a statistically significant role for specific initial conditions, as shown along the x-axis. "Sectors and linkages" refers to different effects of FDI on growth, depending on the sector of FDI (that is, manufacturing or services). "Type" refers to different effects of FDI on growth depending on whether FDI is greenfield or mergers and acquisitions.

Annex 1 Investment-less credit booms[10]

Credit to the private sector has at times risen sharply in some emerging market and developing economies (EMDEs). But these credit booms have been unusually "investment-less." Virtually none of the credit booms since 2010 have been accompanied by investment surges of the kind that were common in earlier episodes. In 2020, private credit surged in 13 EMDEs, supporting private consumption during the pandemic, while investment fell notably below trend. The absence of investment surges during credit booms has tended to be followed by lower output growth once the credit booms unwound.

Introduction

Over the past decade, credit to the nonfinancial private sector from domestic and foreign lenders has risen rapidly in several emerging market and developing economies (EMDEs) while investment growth has slowed. In the past, credit booms have often financed rapid investment growth, with investment subsequently stalling. Against this background, this annex addresses three questions: First, how has total investment, including both private and public investment, evolved during credit booms and deleveraging episodes in EMDEs? Second, how often have credit booms been accompanied by investment booms? And, third, how has output growth evolved during credit booms and deleveraging episodes?

The results indicate that while investment often rose sharply during previous credit booms, this has not been the case for credit booms since 2010. In particular, none of the credit booms that occurred in 2020 were accompanied by investment surges. This pattern is cause for concern because, in the past, when credit booms were unwound and the boom was not accompanied by an investment surge, output growth has tended to slow more.

Data and definitions

Credit to the nonfinancial private sector consists of claims—including loans and debt securities—on households and nonfinancial corporations by the domestic financial system as well as external creditors. Annual credit data are available for 14 EMDEs for 1980-99 and 55 EMDEs for 2000-21. Data for the broadest definition of credit are sourced from the Bank for International Settlements (BIS) for 14 EMDEs from 1980 to 2021: Argentina, Brazil, China, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Russia, Saudi Arabia, South Africa, Thailand, and Türkiye. For other EMDEs, where credit from the domestic banking system remains the main source of credit (Ohnsorge and Yu 2016), annual data on claims by banks on the private sector, sourced from the IMF's *International Financial Statistics*, are used to proxy credit to the nonfinancial private sector. This increases the sample by another 41 EMDEs, mainly from 2000 onward. These additional EMDEs include Azerbaijan, Bahrain, Bangladesh, Bolivia, Botswana, Bulgaria, Chile, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Egypt, Gabon, Georgia, Ghana, Guatemala, Honduras, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Mauritius, Mongolia, Namibia, Nigeria, Oman, Pakistan, Panama, Paraguay, Peru, the Philippines, Qatar, Senegal, Serbia, Sri Lanka, Tunisia, Ukraine, Uruguay, República Bolivariana de Venezuela, and Zambia.

[10] This annex was prepared by Shu Yu.

A credit boom is defined as an episode during which the private sector credit-to-GDP ratio is more than 1.65 standard deviations above its Hodrick-Prescott (HP) filtered trend (that is, within the 90 percent confidence interval) in at least one year (Ohnsorge and Yu 2016; World Bank 2016b). An episode starts when the deviation first exceeds one standard deviation and ends when the credit-to-GDP ratio begins to fall below one standard deviation above trend. Conversely, a deleveraging episode is defined as an episode during which the private sector credit-to-GDP ratio is more than 1.65 standard deviations below trend in at least one year. The deleveraging episode starts when the ratio falls more than one standard deviation below trend and ends when the credit-to-GDP ratio rises above one standard deviation below trend.

Credit booms and deleveraging episodes are studied within a 7-year event window that covers their peak or trough years (t=0), the three prior years, and the three subsequent years. In the sample used here, there have been 65 credit booms and 32 deleveraging episodes in 55 EMDEs. A typical credit boom lasted about 2 years, while an average deleveraging episode lasted about 2.5 years.

Investment behavior during credit booms and deleveraging episodes

Credit booms have typically been associated with rising investment. During the median credit boom over the past two to three decades, real investment grew by 1 percentage point of GDP above its long-term (HP-filtered) trend until the peak of the credit boom (figure B.1.1.A). In one-quarter of previous credit booms, the real investment-to-GDP ratio dropped about 3.5 percentage points below its long-term (HP-filtered) trend during the two years after the peak. Investment swung sharply in the most pronounced credit boom and bust episodes. For example, during the Asian financial crisis of the late 1990s, investment contracted by an average of 35 percent in Indonesia, Malaysia, the Philippines, and Thailand in 1998 and expanded by 16 percent in 2000.

Similarly, investment growth slowed during deleveraging episodes. Real investment dropped below its long-term trend by about 2 percentage points of GDP during the last three years of the median deleveraging episode (figure B.1.1.B). After the trough of a typical deleveraging episode, real investment growth bounced back and, within three years, rose near or slightly above its long-term trend.

Credit and investment booms together

Although investment growth tends to rise during credit booms, not all credit booms are associated with investment booms. For instance, Mendoza and Terrones (2012) document that the coincidence between investment booms and credit booms in EMDEs between 1960 and 2010 was about 34 percent (26 percentage points lower than the coincidence in advanced economies). The moderate coincidence of credit booms and investment booms may reflect credit booms that mainly fueled consumption (Elekdag and Wu 2013; Mendoza and Terrones 2012). In one-quarter of past credit booms, consumption rose above its HP-filtered trend by 3 percentage points of GDP during the peak of the credit boom (figure B.1.1.C). Consumption on average fell below trend by about 1 percentage point of GDP in the median deleveraging episode (figure B.1.1.D).

Following former studies and in parallel to credit booms, an investment surge is defined as an episode during which the investment-to-GDP ratio is at least one standard deviation higher (compared with 1.65 standard deviations higher for investment booms) than its HP-filtered trend. Similarly, an investment slowdown is defined as an episode in which the investment-to-GDP ratio is at least one standard deviation below its HP-filtered trend.[11]

Investment surges in advanced economies occurred more often with credit booms than in EMDEs, and the rise in investment was more rapid. In EMDEs, about one-third of credit booms were accompanied by investment surges or booms around the peak year of a credit boom (figure B.1.2.A). More than 65 percent of investment surges that coincided with credit booms during the peak year qualified as investment booms in advanced economies, but only 56 percent of such investment surges turned out to be investment booms in EMDEs.

After the global financial crisis, the coincidence between credit booms and investment surges during the peak year of a credit boom dropped significantly (figure B.1.2.B). In 2007, half of the EMDEs in a credit boom were also experiencing an investment surge, and two-thirds in 2008. However, from 2010 onward, there have been very few instances of simultaneous credit booms and investment surges, except in 2015. As the number of EMDEs in a credit boom increased from two in 2010 to seven in 2015, the number of EMDEs in investment surges dropped from nine to six.[12] In the years prior to the pandemic, the number of credit booms subsided, before rising again in 2020.

For the 13 countries experiencing credit booms in 2020 (Botswana, Brazil, Chile, Georgia, Honduras, Jamaica, Panama, Peru, the Philippines, Qatar, República Bolivariana de Venezuela, Türkiye, and Saudi Arabia), consumption as a share of GDP was about in line with the median during past credit boom episodes, while investment as a share of GDP was lower than in previous credit episodes (figure B.1.1.A). Credit booms in 2020 seemed to support consumption during the pandemic rather than fueling investment surges as in some of the former credit booms (such as the 1997 Asian financial crisis).

Output during credit booms and deleveraging episodes

In general, output has expanded during credit booms, but by less than investment (Mendoza and Terrones 2012). On average, in the year before the median credit boom peaked over the whole sample period from 1980 to 2020, output increased, by about 2.5 percent above trend in the median country in cases when there was an investment surge. However, in cases when there was no investment surge, output was slightly lower than trend (figure B.1.3.A). As credit booms unwound from their peaks, output dropped below trend by about 1 percent over two years in the absence of investment surges. However, when there were investment surges, output was slightly above trend. That a credit boom without an investment surge is more disruptive to output than a credit boom with an investment surge may reflect the absence of a boost to potential output from capital accumulation that could be provided by an investment surge. In countries

[11] The results are similar when investment growth, instead of the investment-to-GDP ratio, is used.

[12] The six countries are Ghana, Côte d'Ivoire, Namibia, Oman, Saudi Arabia, and Zambia. The identification of Saudi Arabia is not supported by investment growth data.

that experienced credit booms in 2020, output peaked at nearly 8 percent above trend in the year before the peak of the credit boom, much higher than in past credit booms, before falling to 2 percent below trend in the peak year of the credit boom.

During the median deleveraging episode, output fell by almost 2 percent below trend in the year prior to the trough and remained below trend until two years after the trough (figure B.1.3.B). If the deleveraging episode was accompanied by an investment slowdown, the decline in output was sharper. In the median episode, it took three years for output to surpass its trend following the deleveraging trough.

Conclusion

Since 2010, numerous EMDEs have experienced periods of rapid private sector credit growth. In contrast to many previous episodes, however, these credit surges have in most cases not been accompanied by investment surges. This was particularly the case during the 2020 global recession, when credit-to-GDP ratios surged in 13 EMDEs to support private consumption while investment fell far below trend. Output growth in the leadup to the most recent credit booms has been higher than in previous episodes, but lower at the peak of the boom. During all credit boom episodes between 1980 and 2002, output suffered a larger downturn during the unwinding of the boom when credit booms occurred without investment surges.

Annex 2 Macroeconomic implications of foreign direct investment in EMDEs[13]

Inflows of foreign direct investment (FDI) to emerging market and developing economies (EMDEs) have trended downward since the turn of the century, raising concern about negative macroeconomic implications. With that in mind, this annex reviews the literature on FDI. Covering research since 1990, a literature survey concludes that there are mixed results on the correlation between FDI and investment as well as FDI and growth in EMDEs. Although the literature lacks consensus, there is broad agreement that initial conditions in host countries can be important for linking FDI to domestic investment and growth.

Introduction

Inflows of foreign direct investment (FDI) to emerging market and developing economies (EMDEs) as a share of GDP have slowed over the past decade (figure B.2.1.A and B). The decline was broad-based, affecting commodity-exporting and commodity-importing EMDEs, and four of the six EMDE regions (figure B.2.1.C and D).

Several reasons have been proposed for the decline. These have included the maturation of global value chains and tightening FDI regulations.[14] In the 2010s, global value chain formation stagnated after two decades of rapid expansion (Qiang, Liu, and Steenbergen 2021). In addition, in the midst of the global financial crisis, a number of countries imposed restrictions on FDI after many years of FDI liberalization around the world (Sauvant 2009). During the COVID-19 pandemic, barriers to FDI were also raised in both advanced economies and EMDEs, although, in EMDEs, an even larger number of measures were introduced to lower such barriers (figure B.2.1.E). Over the past decade, barriers to FDI have generally been higher in EMDEs than in advanced economies, regardless of the sector receiving the FDI (figure B.2.1.F). If geopolitical tensions intensify and lead to a further retrenchment in global value chains, it is possible that many EMDEs will face a prolonged period of FDI weakness.

Slowing FDI inflows, FDI restrictions, and frequent changes to them, raise concerns about the effects on aggregate investment and output growth in these economies. Slowing FDI may also impede productivity-enhancing "collateral" benefits (Kose et al. 2009). With more FDI, countries may benefit from pressure for stable macroeconomic policies, financial development, and stronger institutions. However, the strength of the relationship between FDI and investment or growth remains a long-standing matter of debate, with mixed findings in the literature.

Correlations between FDI inflows and investment and FDI inflows and output growth have been weak, less than 0.3 and 0.1, respectively, during 1970-2020, with variation depending on the time period and country characteristics (figures B.2.2.A and B, B.2.3.A-D). These correlations are somewhat lower in countries with better developed financial systems, possibly because of greater consumption smoothing afforded by financial development. And conversely, the correlations are somewhat larger in countries with high trade openness, better institutions, or a more skilled labor force, suggesting complementarities between these factors and FDI that can

[13] This annex was prepared by Hayley Pallan.

[14] U.S.-China trade tensions since 2018 appear not to have led to a considerable decline in FDI in China yet, largely due to the presence of global value chains in capital-intensive industries (Blanchard et al. 2021).

amplify growth dividends.

Against this backdrop, this annex surveys prior empirical studies on FDI to address two questions: First, what is the link between FDI and investment? And, second, what is the link between FDI and output growth?

The annex documents that the literature has found mixed evidence on the relationship between FDI and output growth but a mostly positive relationship between FDI and investment. FDI tended to raise growth and investment more in countries with better institutions, more skilled labor forces, greater financial development and openness and when FDI was directed at manufacturing rather than the primary sector or services.

The remainder of the annex reviews 62 studies of FDI, of which 25 pertain to investment and 37 to output growth, covering up to 150 countries and using data for 1960-2018. b These studies were selected based on two criteria: They include EMDEs in the empirical analysis and they focus on the macroeconomic implications of FDI received in host economies. More than 80 percent of the studies are cross-country, and more than 65 percent of these cross-country studies use exclusively EMDE samples.

Findings of the literature on FDI and investment

The majority of the studies (60 percent) find a positive, statistically significant correlation between FDI and investment, sometimes called “crowding in” (figure B.2.4.A; Ang 2009a; Kamaly 2014). This consensus is generally found regardless of whether the empirical analysis includes data prior to 1990. However, papers that include data after 2009 generally find mixed results.

Another 30 percent of studies on FDI and investment find mixed effects, and only two each find a negative effect or no effect. Mixed effects are recorded in the survey if a paper finds a combination of positive, negative, or no effects. One of the studies finding no effect is based on subnational data for China; the other uses a predominantly Latin American and Caribbean country sample between the 1970s and 2000s. The two studies finding outright negative effects employ Generalized Method of Moments techniques to avoid endogeneity or seek to identify long-run relationships, in contrast to other studies that rely mostly on OLS regressions (Eregha 2012; Morrisey and Udomkerdmongkol 2012).

The strength of the relationship between FDI and investment, which is mostly positive, depends on country characteristics, initial conditions, and types of FDI (figure B.2.4.B). Initial conditions important for investment include financial development and institutions in the host economy.

The positive link between FDI inflows and domestic investment is stronger when countries have higher levels of financial development (Jude 2019). FDI may have served as a catalyst for economic activity when domestic firms had access to sufficient financing to invest in expansions. On the other hand, low financial development may hinder investment. In contrast, in the two decades after the collapse of the Soviet Union, financial development appears to have been associated with a weaker correlation between FDI and investment in Europe and Central Asia (Mileva 2008).

Regarding institutions, the positive relationship between FDI and investment is found to be stronger in countries with better institutions (as measured by the World Bank's Country Policy and Institutional Assessments) or competitiveness (Mody and Murshid 2005; Nguyen 2021). Political stability is shown to dampen the negative relationship between FDI and domestic investment (Morrissey and Udomkerdmongkol 2012).

FDI is associated with more investment when it is occurs in the manufacturing sector, directed to sectors that mainly source inputs domestically, or in sectors that are export-oriented (Amighini, McMillan, and Sanfilippo 2017; Ha, Holmes, and Tran 2022). These categories of FDI may encourage investment through foreign firms purchasing domestic inputs, foreign firms selling domestic firms cheaper inputs, or helping local firms integrate in global value chains. FDI is associated with less investment when it is directed to sectors that mainly compete with domestic producers (Ha, Holmes, and Tran 2022). The latter would occur when foreign firms reduce demand for domestic inputs, as they are replaced by FDI inputs, resulting in less investment by local firms no longer in demand.

FDI can take the form of mergers and acquisitions or greenfield investment. Since mergers and acquisitions primarily involve a transfer of ownership, the net impact on domestic investment is unclear. In contrast, greenfield investment directly injects new capital in host countries and is associated with more domestic investment (Ashraf and Herzer 2014; Jude 2019). While greenfield FDI tends to create more investment overall, the effect is strongest in the long run (Jude 2019). Greenfield FDI include capital-intensive start-up activities and it take times to observe their direct benefits and spillovers.

Findings of the literature on FDI and output growth

The evidence on the relationship between FDI and output growth has been mixed, with a positive relationship identified more often in samples starting after 1990 than in samples covering earlier years (figure B.2.5.A).[15] Only one study used using long-term cointegration methods for a pre-1990 sample and identified a statistically significant negative relationship between FDI and output growth in 44 EMDEs between 1970 and 2005 (Herzer 2012). The broader mixed findings may reflect reverse causality running from growth to FDI, third factors driving both FDI and growth, or heterogeneity across time periods and country samples. Several studies have attempted to disentangle the direction of causality and control for a comprehensive set of other factors.

As in the literature on FDI and investment, the strength of the relationship between FDI and output growth depends on initial conditions in host countries, and on types of FDI (figure B.2.5.B). Such initial conditions included country characteristics, such as financial development, the quality of institutions, human capital, and the extent of integration with the global economy.

The association between FDI and output growth is stronger in countries with more developed financial systems, in part because domestic firms in those countries are able to finance

[15] This is consistent with findings from a review of the literature before the global financial crisis (Kose et al. 2009).

expansions that allow them to supply multinationals (Alfaro et al. 2004; Azman-Saini, Law, and Ahmadi 2010; Bengoa and Sanchez-Robles 2003; Hermes and Lensink 2003). Since the financial and capital account liberalizations of the 1990s, however, the link between financial development and growth has weakened (Benetrix, Pallan, and Panizza 2022). This weakening may reflect threshold effects in the rapid financial system growth that followed liberalizations. For example, there appears to be a private credit-to-GDP threshold above which the relationship between FDI and growth is no longer positive, possibly because of an increased incidence of financial crises (Osei and Kim 2020).

The positive link between FDI and output growth is stronger in countries with a higher-skilled workforce, possibly because these countries are better equipped to absorb the productivity-enhancing new technology that typically accompanies FDI (Bengoa and Sanchez-Robles 2003; Borensztein, De Gregorio, and Lee 1998; Romer 1993; Wang and Wong 2011). Since the 2000s, however, the amplifying role of human capital in the relationship between FDI and output growth appears to have diminished (Benetrix, Pallan, and Panizza 2022).[16]

Strong institutions, as measured by indices of business regulation and freedom from government intervention, are associated with a stronger positive link between FDI and output growth or a dampened negative link (Alguacil, Cuadros, and Orts 2011; Driffield and Jones 2013; Herzer 2012). Conversely, excessive regulation is associated with a weaker link between FDI and output growth (Busse and Groizard 2008).

Trade openness and global integration are associated with a stronger link between FDI and output growth (Balasubramanyam, Salisu, and Sapsford 1996; Kohpaiboon 2003; Makki and Somwaru 2004). However, in countries that rely heavily on primary sector exports, FDI and growth are found to be negatively correlated (Herzer 2012).

FDI in the manufacturing sector is found to be positively correlated with output growth, while FDI in other sectors has no significant correlation, or even negative correlation (Ali and Asgher 2016; Aykut and Sayek 2007; Chakraborty and Nunnenkamp 2008; Wang 2009). FDI in high-tech, capital-intensive, and high-skill industries is associated with high output growth (Alfaro and Charlton 2013; Cipollina et al. 2012). Conversely, FDI in the primary sector, which tends to have few linkages to other domestic sectors, is not associated with greater output growth (Alfaro 2003).

Greenfield FDI is found to have a positive effect on output growth (Harms and Méon 2018), while mergers and acquisitions are associated with lower output growth (Luu 2016).

Conclusion

As summarized in a review of 62 studies, the literature has found mixed evidence on the relationship between FDI and output growth but there is mostly a positive relationship between

[16] These recent results may reflect the strong ties between global value chains and FDI (Adarov and Stehrer 2021; Qiang, Liu, and Steenbergen 2021). For example, Antràs (2020) explains that global value chains may lessen the prerequisites for a country to receive FDI because some segments of global value chains in developing countries require less skills than high value-added segments.

FDI and investment. That said, several country characteristics, time period specifics, and features of FDI have influenced the relationship between FDI, output growth, and investment. Greenfield investment in upstream and export-intensive, non-primary sectors tends to be more conducive to growth and investment. FDI also tended to raise growth and investment more in countries with better institutions, more skilled labor forces, greater financial development, and trade openness.

Policies can aim to encourage types of FDI or, more broadly, improve the country-level conditions that make FDI more growth-enhancing. These policies include, for example, efforts to invest in education for a higher-skilled workforce capable of absorbing new technologies. Limiting trade restrictions can help countries attract, and benefit from, FDI related to global value chains, as EMDE country segments of global value chains typically produce inputs that are used in other parts of the production process or goods for sale elsewhere, which need to be exported to final consumers. Countries can also support financial development to attract FDI. In the long run, improving institutions and ensuring political stability can help generate growth- and investment-enhancing FDI inflows. Furthermore, investment promotion agencies have been found to have a positive effect on attracting FDI to targeted sectors (Harding and Javorcik 2011).

Annex 3 Determinants of investment growth

Empirical framework

Framework. Investment decisions are based on the expected marginal return of capital and the risk-adjusted cost of financing the investment. While public investment decisions may also involve other considerations, private investment accounts for the majority of investment in EMDEs, about three-quarters of total gross fixed capital formation.

Therefore, investment is modelled as the level of investment *I* chosen such that the marginal return on capital (*MPK*) equals the cost of capital, which is the sum of the risk-adjusted real interest rate r and the rate of depreciation of capital δ, absent binding constraints:

$MPK = r + \delta$

As a result, investment *I* also depends on the determinants of the marginal product of capital—especially total factor productivity TFP and the existing stock of capital *K*. Since investment decisions are about the expected future returns to capital, the cost of capital also includes a risk premium π:

$I = I\ (TFP, K, r, \pi, \delta)$

A higher cost of capital—whether due to higher risk premia or higher risk-free real interest rates—would reduce investment, whereas higher productivity, lower depreciation, or a low capital stock would raise it.

To proxy these factors, the regression includes real output growth, terms of trade growth, real credit growth, change in capital flows as a percent of GDP, and a dummy for investment reform spurts. As exports are included in GDP, output growth also captures trade growth beyond the impact through terms of trade.

Data sources

Real investment growth is calculated from real gross fixed capital formation taken primarily from Haver Analytics and, for countries or years not available in Haver Analytics, from the World Bank's World Development Indicators (WDI) or *Global Economic Prospects* (GEP) for 2021. Real output growth is taken from the World Bank's GEP. Real credit growth to the private sector and the credit-to-GDP ratio in the robustness section are taken from the Bank for International Settlements and supplemented with data from the International Financial Statistics (IFS) published by the International Monetary Fund (IMF). Credit growth proxies both depth of the financial sector as well as the cost of financing investment, since data on comparable financing cost for a sufficiently large number of countries over the past two decades is not available. Terms of trade are from WDI and, for 2021, from the GEP. Capital flows are calculated using data on the sum of FDI, portfolio flows, and changes in external bank liabilities from the IFS. Missing data for all three flow variables are imputed by taking the average of adjacent years. This imputation is limited to at most two consecutive missing observations per economy. Reform spurts are calculated using the Investment Profile Index taken from the PRS Group's International Country Risk Guide (ICRG). Reform spurts are defined as a two-year increase in the index above two times

the standard deviation of the country-specific index. The data set includes a panel of 57 EMDEs and 31 advanced economies and covers the period from 1999 to 2021. The regression starts in 2000 and allows for lagged variables.

Methodology

The analysis estimates the correlates of investment growth in 57 EMDEs for the period 2000-21 in a system generalized method of moments (GMM) framework, with the third to sixth lag used to instrument the differenced equation and second lags for the level equation. These GMM-type instruments are used for output growth, real credit growth, growth in capital flows, and terms of trade growth. The econometric framework is similar to that of Nabar and Joyce (2009). However, the focus in this paper is on investment growth—a critical component of overall output growth (ultimately, the source of rising living standards)—rather than changes in the investment-to-GDP ratio, which would only capture changes in investment growth relative to output growth. Use of investment growth is in line with recent studies on advanced economies and individual EMDEs.[17] The results are shown in table 2. The sample is unweighted to avoid a small number of EMDEs dominating the results (China and India, for example, account for a large share of total EMDE investment). Lastly, the terms of trade, real credit growth, and capital flow variables exclude the top and bottom 1 percent of observations in the entire sample to deal with outliers. Standard errors are clustered at the country level.

Robustness

Table 3 details a range of robustness checks. The regressions are robust to using OLS with fixed effects instead of system GMM (to account for the initial level of capital, for example). Further, when dividing capital flows into its components, the change of FDI flows is not significant, but the changes in portfolio and bank flows are. The credit-to-GDP ratio is not significant once China is excluded from the sample, and credit growth does not exhibit non-linear behavior. The regression is also robust to adding advanced economies to the sample (excluding Ireland, Malta, and Singapore, as these countries are large outliers for capital flows). Further robustness checks in the system GMM specification include controlling for various institutional quality variables from ICRG, time fixed effects, as well as the relative price of capital from Penn World Table 10. These additional variables were not significant while the main results are generally robust. Only the coefficient on terms of trade becomes insignificant when global trend variables are included. The subsamples of commodity-importing EMDEs and commodity-exporting EMDEs are too small to generate significant results.

[17] Banerjee, Kearns, and Lombardi (2015); Barkbu et al. (2015); Bussiere, Ferrara, and Milovich (2016); and Kothari, Lewellen, and Warner (2015) cover advanced economies. Anand and Tulin (2014) covers India.

Annex 4 Investment growth and reforms

Values in figure 13 are based on a panel data regression in which the dependent variable is real investment growth. A spurt (setback) is defined as a two-year increase (decrease) above (below) two times the country-specific standard deviation of the investment profile index, a component of the International Country Risk Guide (ICRG) published by the PRS Group. The sample spans 60 EMDEs over 1984-2022. Overall, there are 44 reform spurt events and 10 reform setback events.

In the regression, t denotes the end of a two-year spurt, and s the end of a two-year setback. The coefficients are dummy variables for spurts and setbacks over the [t – 3, t + 2] or [s – 3, s + 2] window around these episodes (table 4). In figure 13, "reform" at time t refers to the two-year change from t – 2 to t. All coefficients show the investment growth differential of economies during an episode compared to those that experienced neither improvements nor setbacks. All estimates include time fixed effects to control for global common shocks and country fixed effects to control for time-invariant heterogeneity at the country level.

Table 1 Economies in the investment sample

Emerging market and developing economies (EMDEs)			Advanced economies
East Asia and Pacific	**Latin America and the Caribbean**	**South Asia**	Australia
Cambodia *	Argentina	India *	Austria
China *	Belize	Nepal *	Belgium
Indonesia	Bolivia	Sri Lanka *	Canada
Malaysia *	Brazil		Croatia
Mongolia	Chile	**Sub-Saharan Africa**	Cyprus
Philippines *	Colombia	Benin	Czech Republic
Thailand *	Costa Rica	Botswana	Denmark
Vietnam *	Dominican Republic *	Burkina Faso	Estonia
	Ecuador	Côte d'Ivoire	Finland
Europe and Central Asia	El Salvador *	Equatorial Guinea	France
Albania *	Guatemala	Ghana	Germany
Armenia	Honduras	Kenya	Greece
Belarus *	Jamaica *	Mali	Hong Kong SAR, China
Bulgaria *	Mexico *	Mauritius *	Iceland
Hungary *	Nicaragua	Mozambique	Ireland
North Macedonia *	Panama *	Namibia	Israel
Poland *	Paraguay	Niger	Italy
Romania *	Peru	Nigeria	Japan
Russian Federation	Uruguay	Rwanda	Korea, Rep.
Türkiye *		Senegal	Latvia
Ukraine	**Middle East and North Africa**	South Africa	Lithuania
	Algeria	Tanzania	Malta
	Bahrain	Togo	Netherlands
	Iran, Islamic Rep.	Uganda	New Zealand
	Kuwait		Norway
	Lebanon *		Portugal
	Morocco *		Singapore
	Oman		Slovak Republic
	Saudi Arabia		Slovenia
	United Arab Emirates		Spain
			Sweden
			Switzerland
			United Kingdom
			United States

Source: World Bank.

Note: * indicates EMDE commodity importers. Each EMDE is classified as a commodity importer or commodity exporter. An economy is defined as commodity exporter when, on average in 2017-19, either (1) total commodity exports accounted for 30 percent or more of total exports or (2) exports of any single commodity accounted for 20 percent or more of total exports. Economies for which these thresholds were met due to reexports were excluded. When data were not available, judgment was used. This taxonomy results in the classification of some well-diversified economies as importers, even if they are exporters of certain commodities (for example, Mexico).

Table 2 Correlates of investment growth

Dependent variable: real investment growth (percent)	(1) EMDEs	(2) Advanced economies
Real GDP growth (percent)	1.807***	1.699***
	(13.66)	(16.85)
Real credit growth (percent)	0.132***	0.060**
	(3.22)	(2.25)
Terms of trade growth (percent)	0.095*	0.127***
	(1.95)	(3.07)
Investment climate reform spurt	6.970*	0.638
	(1.78)	(0.31)
Change in capital flows (percent of GDP)	0.218**	0.060***
	(2.15)	(3.42)
Constant	-2.854***	-1.231***
	(-5.30)	(-5.95)
Observations	1,024	625
Number of economies	57	31

Source: World Bank.
Note: Results of a panel system GMM regression for 57 EMDEs and 31 advanced economies during 2000-21. Column (1) denotes the baseline regression for EMDEs. Column (2) shows the regression for advanced economies (excluding Malta, Ireland, and Singapore, as these countries are large outliers for capital flows). Real GDP growth, real credit growth, terms of trade growth, as well as change in capital flows are treated as endogenous. Standard errors are clustered at the country level. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3 Correlates of investment growth robustness

Dependent variable: real investment growth (percent)	(1) EMDE excl. China	(2) Split capital flows	(3) Credit to GDP ratio excl. China	(4) Real credit growth squared	(5) Nominal credit growth	(6) Global
Real GDP growth (percent)	1.839***	1.840***	1.979***	1.855***	1.854***	1.743***
	(14.04)	(12.73)	(17.58)	(14.06)	(13.85)	(19.29)
Real credit growth (percent)	0.132***	0.148***		0.102		0.102***
	(3.28)	(3.32)		(1.60)		(3.16)
Terms of trade growth (percent)	0.084*	0.092*	0.116**	0.084*	0.086*	0.091*
	(1.75)	(1.78)	(2.25)	(1.87)	(1.75)	(1.85)
Investment climate reform spurt	7.834*	3.165*	8.173**	6.384*	7.701*	4.375*
	(1.87)	(1.83)	(2.01)	(1.82)	(1.99)	(1.80)
Change in capital flows (percent of GDP)	0.219**		0.195**	0.226**	0.203**	0.132***
	(2.16)		(2.05)	(2.14)	(2.17)	(3.55)
Change in FDI flows (percent of GDP)		0.102				
		(0.91)				
Change in portfolio flows (percent of GDP)		0.343**				
		(2.60)				
Change in net liabilities of financial corporations (percent of GDP)		0.076***				
		(2.90)				
Change in credit-to-GDP ratio (percent of GDP)			0.123			
			(1.38)			
Real credit growth squared				-0.000		
				(-0.20)		
Nominal credit growth					0.089**	
					(2.32)	
Constant	-2.861***	-3.049***	-2.509***	-2.719***	-3.221***	-2.056***
	(-5.34)	(-5.79)	(-4.72)	(-5.46)	(-5.23)	(-6.15)
Observations	1,002	948	1,022	1,024	1,037	1,649
Number of economies	56	57	56	57	57	88

Source: World Bank.
Note: Results of a panel regression for 56-57 EMDEs and 31 advanced economies during 2000-21. Number of economies varies based on data availability. Columns (1) to (5) are variations of the system GMM regression in column (1) of table 2. Column (1) excludes China from the sample. Column (2) separates capital flows into the three components. Column (3) replaces real credit growth with the change in the credit-to-GDP ratio, excluding China. Column (4) tests for non-linearity of real credit growth. Column (5) replaces real credit growth with nominal credit growth. Column (6) estimates the baseline for a global sample of 31 advanced economies (the sample excludes Malta, Ireland, and Singapore, as these economies are large outliers for capital flows). All additional control variables in columns (1) to (5) are assumed to be endogenous. Standard errors are clustered at the country level. T-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4 Investment growth around investment climate reform spurts and setbacks

Dependent variable: Investment growth	
t-3	-2.460
	(3.752)
t-2	0.385
	(2.501)
t-1	0.014
	(2.550)
Period t of reform spurt	5.577**
	(2.815)
t+1	3.417
	(2.320)
t+2	-0.393
	(1.403)
s-3	-4.395
	(2.772)
s-2	-1.163
	(2.592)
s-1	-8.891**
	(4.129)
Period s of reform setback	-7.323
	(5.137)
s+1	-6.490**
	(3.108)
s+2	-0.098
	(5.438)
Observations	1,854

Source: World Bank.
Note: The regression includes time and country fixed effects. t indicates the period of the significant reform spurt, and s the period of the significant reform setback as defined in annex 4. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5 Estimates of climate-related investment needs

Author(s) and year	Climate target	Investment need and gap	Investment need as percent of GDP	Concept (total need vs. additional need)	Time coverage	Country coverage	Sectors or adaptations covered	Methodology
Black et al. (2022)	Capping temperature increase at +2°C	$0.5 trillion, or 0.4 percent of global GDP (0.7 percent for HICs, 0.3 percent for LICs)	Total annual need of 0.4 percent of GDP (2021-30)	Total need	In 2030	Global	"Cleaner technologies"	CGE and a sector-based "assessment tool"
Citi (2022)	Net zero emissions	$2.6 trillion per year for 2021-25, rising to $3.8 trillion per year from 2026-30	Total annual need of 2.6 percent of GDP (2021-25); rising to 3.3 percent of GDP (2026-30)	Total need	Until 2030	Global		IEA Net Zero Scenario modeling by UNFCCC Race to Zero campaign, with support from Vivid Economics, Citi GPS
Hallegatte et al. (2018)	Not specified, but implicitly nationally determined contributions (NDCs) of the Paris Agreement	$115 billion per year	Total annual need of 0.1 percent of GDP (2020-30)	Total need	2020-30	Global		Accounting exercise: the global estimate is derived based on per capita costs of adaptation for 50 countries with available NDC data, assuming NDCs reflect actual needs
IEA (2021)	Investment needed to limit global warming to +1.5°C	Need of around $4 trillion (2020 $) per year; gap of around $3 trillion (2020 $) per year	Total annual need of 4 percent of GDP; additional need (gap) of 3 percent of GDP (2020-30)	Both total need and additional need	By 2030	Global	Clean electricity; decarbonization in buildings, industry, transport; low-emission fuel production	IEA World Energy Model simulations
IEA (2022)	World on track for net zero emissions (consistent with +1.5°C) by 2050	Need of around $4.8 trillion (2021 $) per year, or nearly percent 4 of global GDP	Total annual need of 4 percent of GDP (2021-30)	Total need	By 2030	Global	Fuels, electricity, infrastructure, end-use adaptations (efficiency, electrification, renewables)	IEA Global Energy and Climate (GEC) Model

Table 5 Estimates of climate-related investment needs *(continued)*

Author(s) and year	Climate target	Investment need and gap	Investment need as percent of GDP	Concept (total need vs. additional need)	Time coverage	Country coverage	Sectors or adaptations covered	Methodology
IPCC (2018)	Investment needed to limit global warming to +1.5°C	$2.4 trillion per year (2010 $) or 2.5 percent of global GDP	Total annual need of 2.5 percent of GDP (2016-35)	Total need	2016-35	Global		Multi-model framework with multiple simulations
IPCC (2022)	Investment needed to limit global warming to +1.5°C or +2°C	$2.3 trillion (2015 $) per year over 2023-52 to meet the +1.5°C goal and $1.7 trillion (2015 $) per year to meet the +2°C goal	Total annual need of 1.2 percent of GDP (2023-52)	Total need	2023-52	Global		Multi-model framework with multiple simulations
IRENA (2022)	Investment needed to limit global warming to +1.5°C	$5.7 trillion per year	Total annual need of 5.3 percent of GDP (2021-30)	Total need	Until 2030	Global	Infrastructure, energy	IRENA macro-econometric model
McCollum et al. (2018)	NDC scenario: assuming implementation of NDCs by all countries by 2030	$130 billion (2015 $) per year	Annual additional need (gap) of 0.1 percent of GDP (2015-30)	Additional need	To 2030	Global	Energy	Six energy and integrated assessment models: AIM/CGE, IMAGE, MESSAGEix-GLOBIOM, POLES, REMIND-MAgPIE, and WITCH-GLOBIOM
	+2°C target	$320 billion (2015 $) per year	Annual additional need (gap) of 0.4 percent of GDP (2015-30)					
	+1.5°C target	$480 billion (2015 $) per year	Annual additional need (gap) of 0.5 percent of GDP (2015-30)					

Table 5 Estimates of climate-related investment needs *(continued)*

Author(s) and year	Climate target	Investment need and gap	Investment need as percent of GDP	Concept (total need vs. additional need)	Time coverage	Country coverage	Sectors or adaptations covered	Methodology
McKinsey Global Institute (2022)	Net-zero emissions transition by 2050	Need of $9.2 trillion per year; gap of $3.5 trillion per year	Total annual need of 6.8 percent of GDP; annual additional need (gap) of 2.6 percent of GDP (2021-50)	Both total need and additional need	2021-50	Global	Infrastructure, energy	Net zero emissions 2050 scenario defined by the Network for Greening the Financial System (NGFS), as the NGFS Current Policies scenario as a counterfactual in the REMIND-MAgPIE model
OECD (2017)	66 percent probability of staying below 2°C temperature increase	$6.9 trillion (2015 $)	Total annual need of 7.5 percent of GDP (2016-30)	Total need	Annual average during 2016-30	Global	Energy supply and demand, transport, water and sanitation, telecom	
The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability (2020)	Halt decline in biodiversity between now and 2030	Need of $722-967 billion annually; gap ("biodiversity financing gap") of $598-824 billion annually	Total annual need of 0.7-1.0 percent of GDP; annual additional need (gap) of 0.6-0.8 percent of GDP (2019-30)	Both total need and additional need	Until 2030	Global	Biodiversity	Accounting exercise
Rockefeller Foundation and Boston Consulting Group (2022)	Net zero emissions	$3.4 trillion mitigation finance needed annually over 2020-25 and $4.1 trillion over 2026-30	Total annual need of 3.7 percent GDP (2020-25), rises to 3.8 percent GDP (2026-30)	Total need	Until 2030	Global		Extrapolations based on IEA NZE scenario

Table 5 Estimates of climate-related investment needs *(continued)*

Author(s) and year	Climate target	Investment need and gap (nominal)	Investment need as percent of GDP	Concept (total need vs. additional need)	Time coverage	Country coverage	Sectors or adaptations covered	Methodology
UNEP (2022)	Limit temperature increase to 1.5° or 2°C	Need of $11 trillion (average annual need of $379 billion) for 1.5°C scenario; $9.5 trillion (average annual need of $328 billion) for 2°C scenario		Total need	2022-50	Global		Model of Agricultural Production and its Impacts on the Environment (MAgPIE v4.1), developed by Vivid Economics, and off-model analysis
Baarsch et al. (2015)	Limit temperature increase to 2°C	$0.2 trillion (2012 $) per year	Total annual need of 0.7 percent of GDP (2030)	Total need	2030	Middle- and low-income countries, excluding China	Adaptation and resilience	Integrated assessment model (AD-RICE2012)
		$0.5 trillion (2012 $) per year	Total annual need of 0.6 percent of GDP (2050)		2050			
IEA (2021b)	Net zero emissions by 2050	$1.4 trillion per year	Total annual need of 2.1 percent of GDP (2026-30)	Total need	2026-30	EMDEs, excluding China	Electricity, end-use energy efficiency (buildings, transport) and renewables	Scenario analysis (methodology unclear)
Markandya and González-Eguino (2019)	High-damage and low-damage scenarios	$29-411 billion by 2030 and $71 billion $1.09 trillion by 2050 (lower and upper bounds reflect low-damage/high discount rate and high-damage/low discount rate scenarios)	Total annual need of 0.1-1.3 percent of GDP (2030) Total annual need of 0.1-1.5 percent of GDP (2050)	Total need	2030, 2050	Developing countries		Integrated Assessment Model (IAM)

Table 5 Estimates of climate-related investment needs *(continued)*

Author(s) and year	Climate target	Investment need and gap	Investment need as percent of GDP	Concept (total need vs. additional need)	Time coverage	Country coverage	Sectors or adaptations covered	Methodology
Narain, Margulis, and Essam (2011)	Adaptation to limit temperature increase to 2°C	$70-98 billion per year (2005 $)	Total annual need of 0.2-0.3 percent of GDP (2010-50)	Total need	Average during 2010-50	Developing countries	Infrastructure, coastal zones, water supply, agriculture, fisheries, forests and ecosystems, human health, extreme weather	Modeling exercises, including some CGE exercises
Rozenberg and Fay (2019)	Limit temperature increase to 2°C and fill investment needs	$640 billion-$2.7 trillion per year (2015 $)	2-8.2 percent of GDP (2015-30)	Total need	Average per year during 2015-30	Developing countries	Energy, transport, water and sanitation, irrigation, flood protection	Accounting exercises benchmarked against goals, CGE models
World Bank (2022c)	Resilient and low-carbon pathway		Need of 8 percent of GDP in low-income countries, 5.1 percent of GDP in lower-middle-income countries, and 1.1 percent of GDP in upper-middle-income countries		To 2030	24 developing countries	Infrastructure, transport, energy/electricity, water and sanitation, urban, landscape, and industry	Scenario analysis

Source: World Bank.

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