Since the global financial crisis, credit to the nonfinancial private sector has risen rapidly in several 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 box addresses the following questions:

- How has total investment, including both private and public investment, evolved during credit booms and deleveraging episodes in EMDEs?
- How often have credit booms been accompanied by investment booms?
- How has output growth evolved during credit booms and deleveraging episodes in EMDEs?

The results indicate that while investment often rose sharply during previous credit booms, this has not been so for credit booms since 2010. This pattern is cause for concern since, when credit booms unwind, GDP growth tends to contract more if the credit boom was not accompanied by an investment surge.

**Data and methodology.** 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. Details of the dataset can be found in Annex 3.1A.

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 in at least one year (World Bank 2016b; Ohnsorge and Yu 2016). An episode starts when the deviation first exceeds one standard deviation and ends when the credit-to-GDP ratio begins to fall. 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 begins to climb.

Although investment growth tended to rise during credit booms, not all credit booms were associated with investment booms. For instance, Mendoza and Terrones (2012) document that the coincidence between investment booms and credit booms in EMDEs was about 34 percent (26 percentage points lower than the coincidence in AEs). The moderate coincidence of credit booms and investment booms may reflect credit booms that mainly fueled consumption (Mendoza and Terrones 2012; Elekdag and...
BOX 3.1 Investment-less credit booms (continued)

FIGURE 3.1.1 Investment growth during credit booms and deleveraging episodes

In EMDEs, in the median credit boom, investment grew by about 1 percentage point of GDP above its long-term trend until the credit boom peaked. It dropped below its long-term trend by 1-2 percentage points of GDP before deleveraging episodes reached their troughs.

A. Investment during credit booms

B. Investment during deleveraging episodes

C. Consumption during credit booms

D. Consumption during deleveraging episodes

Sources: Bank for International Settlements; Haver Analytics; International Financial Statistics, International Monetary Fund; World Development Indicators, World Bank. Notes. The red lines show sample medians while the blue lines show the corresponding upper and lower quartiles. 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 and 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 2016-18 to be equal to the data in 2015. Sample is for available data over 1980-2015 for 55 EMDEs. 2015 data are not available for Gabon, Nigeria, Senegal, and Venezuela, RB. Data are not available for Argentina until 1994, Brazil until 1993, China until 1984, Hungary until 1989, Poland until 1992, Russia until 1995, Saudi Arabia until 1993, and Turkey until 1986. Please see the main text of World Bank (2016b) for a detailed description of the sample.

A.B. The cyclical component of investment in percent of GDP (derived by Hodrick-Prescott filter). The yellow dashed line is the median annual investment growth rate of the six EMDEs (China, Indonesia, Malaysia, Mongolia, the Philippines, and Thailand) that were affected by the 1997 Asian Financial Crisis (year 1997 is set to be t=0).

C.D. The cyclical component of private consumption in percent of GDP (derived by Hodrick-Prescott filter). The yellow dashed line for 2012-15 shows the sample median for the corresponding period. 2015 data are not available for Bahrain, Bolivia, Costa Rica, Hungary, India, Jamaica (also for 2000-01), Kazakhstan, Kuwait, Oman, Panama, Thailand, Tunisia, and data are not available for Zambia and Venezuela, RB (in 2014).
In a quarter of past credit booms, consumption rose above its Hodrick-Prescott filtered trend by 3 percentage points of GDP during the peak of the credit boom. Consumption on average fell below trend by about 1 percentage point of GDP during deleveraging episodes (Figure 3.1.1).

Following former studies and in parallel to credit booms, investment surges are defined as years when the investment-to-GDP ratio is at least one (1.65 for investment booms) standard deviation higher than its long-term Hodrick-Prescott filtered trend. Similarly, episodes of investment slowdown are defined as years in which the investment-to-GDP ratio is at least one standard deviation below its Hodrick-Prescott filtered trend.2

Investment surges in AEs occurred with credit booms more often than in EMDEs, with a more rapid rise in investment. In EMDEs, about 40 percent of credit booms were accompanied by investment surges around the peak year of a credit boom (Figure 3.1.2). 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 3.1.2). By 2007, about half of the EMDEs in a credit boom were also in an investment surge. However, from 2010 onwards, there is virtually no EMDE that was both in a credit boom and in an investment surge. The number of EMDEs in a credit boom increased from two in 2010 to ten in 2015 (Azerbaijan, Bolivia, China, Cote d’Ivoire, Kenya, Kuwait, Oman, the Philippines, Qatar, and Turkey) while the number of EMDEs in investment surges dropped from eight to four.3 In AEs, both the number of countries in a credit boom and the number of countries in an investment surge fell from around five to almost zero.

In several countries, rapid credit growth fueled above-average consumption growth (Bangladesh, Bolivia, India, and Ghana) but no investment surge. During the period

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2The results are similar when investment growth, instead of the investment-to-GDP ratio, is used.

3The four countries are Colombia, Namibia, the Philippines, and Saudi Arabia. The identification of Saudi Arabia is not supported by investment growth data.
In EMDEs, output on average grew above its trend by 2 percent during credit booms and fell below trend by 2 percent during deleveraging episodes. Output growth during credit booms tended to be stronger when accompanied by investment surges. During deleveraging episodes, declines were deeper when accompanied by investment slowdowns.

Sources: Bank for International Settlements; Haver Analytics; International Financial Statistics, International Monetary Fund; World Development Indicators, World Bank.

Notes. Credit booms and deleveraging episodes are defined as in Figure 3.1.1. Investment surges and slowdowns are defined as in Figure 3.1.2. Data availability as in Figure 3.1.1.

A. GDP during credit booms

B. GDP during deleveraging episodes

Since 2010, several EMDEs have experienced rapid private sector credit growth. In contrast to many pre-crisis episodes, however, these credit surges have typically not been accompanied by investment surges. Output growth during the most recent credit surges has also been lower than in previous episodes. While output has contracted as credit booms have unwound, it has contracted more when credit booms have occurred without investment surges.