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Corporate Investment in Emerging Markets: The Role of Commodity Prices

ABSTRACT We examine how firm-level and country-specific macroeconomic variables determine corporate investment in emerging markets. In particular, we investigate how investment decisions are affected by changes in country-specific commodity export prices, using firm-level data from 38 emerging markets for the period 1990–2013. We show that in addition to the standard firm-level variables (such as expected future profitability, cash flows, leverage, and new debt flows), commodity export prices play a significant role in driving corporate investment. Moreover, we show that the sharp decline in commodity prices since 2011 has been a key factor explaining the sizable slowdown in private investment growth during this period, especially in regions with large net commodity exporters.

JEL Codes: E2, E3, F3, F4

Keywords: Investment, emerging markets, commodity prices, capital inflows

Commodity prices have fluctuated widely over the past two decades. The macroeconomic impact of commodity price swings has been studied extensively in the literature, both empirically and theoretically. However, empirical studies on the link between commodity prices and corporate investment in emerging markets are relatively scant, particularly those based on firm-level data. This paper empirically investigates the determinants of investment at the firm level in emerging markets, with a special focus on the role of commodity export prices. As a by-product, the paper examines the factors behind the post-2011 weakening of private investment in emerging markets (in particular, commodity export prices) and the differences across emerging regions.

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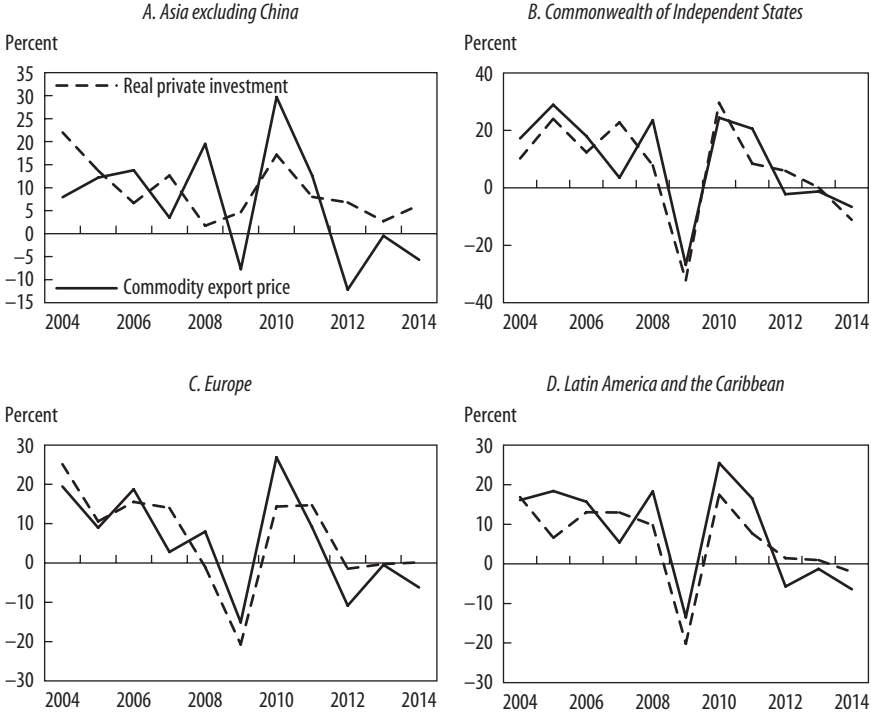
FIGURE 1. Real Private Investment and Commodity Export Price Growth, 2004–14

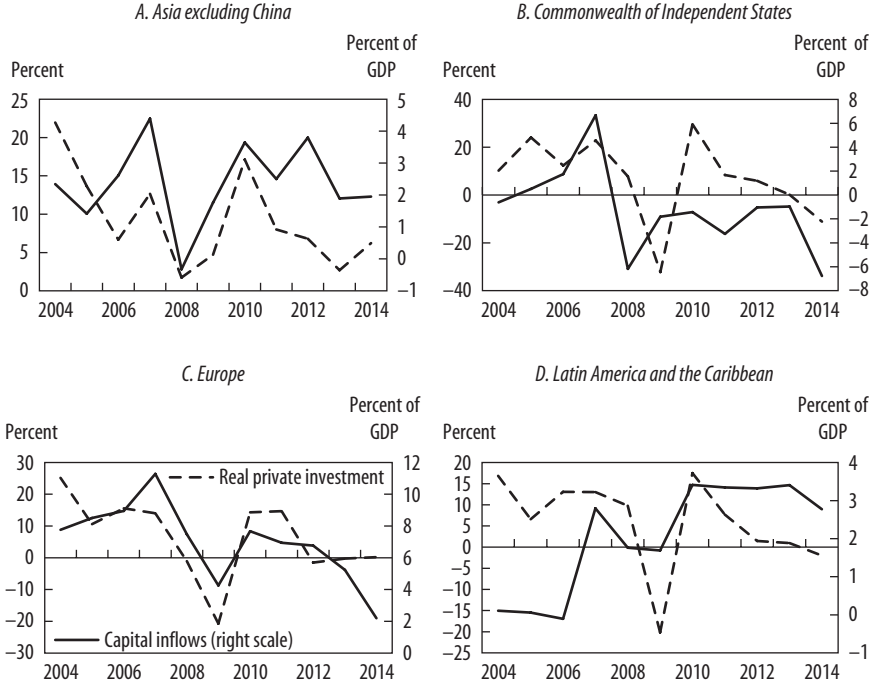


Source: International Monetary Fund (IMF), World Economic Outlook database; Gruss (2014); and IMF staff calculations.

Private investment in emerging markets is highly correlated with (country-specific) commodity export prices (figure 1). The comovement of private investment and commodity export prices is especially high in the case of Latin America and the Caribbean and the Commonwealth of Independent States, with correlation coefficients of 0.84. This reflects the fact that these regions include many of the largest commodity exporters. For emerging Europe, the correlation is also strong (0.82), while it is much lower for emerging Asia excluding China (0.36). Private investment in emerging markets has also been highly correlated with capital inflows (figure 2).

We study the determinants of investment in panel regressions that combine firm-level data for about 16,000 listed firms with country-specific macroeconomic variables—notably, commodity export prices and capital

FIGURE 2. Real Private Investment Growth and Net Capital Inflows, 2004–14[a]



Source: IMF, World Economic Outlook database; and IMF staff calculations.

a. PPP-weighted average. Capital inflows are defined as the balance of the external financial account, in percent of GDP.

inflows—for thirty-eight emerging markets over the period 1990–2013.[1] After identifying the key factors driving firms' investment decisions in emerging markets, we shed light on which of these factors have been the main drivers of the sharp deceleration in corporate investment growth since 2011.

Our study generates four main results. First, we confirm the importance of what can be dubbed *the usual suspects.* In line with previous studies in the literature, we find that emerging market firms' capital expenditure is positively associated with expected profitability (proxied by Tobin's *q*), cash flows (suggesting the existence of borrowing constraints), and debt flows. It is negatively

1. Table A1 in appendix A presents the list of countries in the sample and the number of firms in each country.

associated with leverage. Second, and the key contribution of the paper, *commodity prices matter.* Conditional on the usual suspects, investment is positively associated with changes in country-specific commodity export prices, and the link is statistically and economically significant. Third, investment by emerging market firms is also influenced by *the availability of foreign (international) financing.*

Finally, based on the first three results, we put the magnifying glass on the most recent event of a fall in commodity prices. Thus, as an extension to our main contribution, we look into *whom to blame for the post-2011 investment slowdown.* Factors vary across emerging market regions, with the sharp adjustment in commodity prices playing a substantial role in commodity exporter regions (such as Latin America). Another factor was lower expected profitability of firms, which partly reflects the downward revisions to potential growth in many emerging markets. The moderation in capital inflows to emerging markets and increased leverage (particularly in Asia) also played a significant role.

Our paper is related to the extensive empirical literature on the determinants of corporate investment in emerging markets. It relates to a strand that studies financing constraints, typically relying on Tobin's *q* investment models or Euler investment equations. Most of these studies document the importance of internal financing for firms' investment owing to capital markets' imperfections. Based on this framework, for example, Fazzari, Hubbard, and Petersen examine the case of U.S. manufacturing firms, while Love and Zicchino study emerging market companies.[2] The sensitivity of investment to cash flows is particularly strong for smaller firms and for firms in less financially developed economies.[3] The use of cash flow as a measure of financial frictions has been criticized, however.[4] This has been addressed by Gilchrist and Himmelberg, who establish the existence of financial constraints by testing the significance of investment-to-cash-flow sensitivities beyond the effect of the so-called fundamental *q.*[5] The latter is essentially a vector autoregression (VAR) of forecasting equations out of which the expected value of marginal *q,* conditional on observed fundamentals (including cash flow), is constructed. This implies that any additional effect picked up by cash flows should reflect financial constraints.

2. Fazzari, Hubbard, and Petersen (1988); Love and Zicchino (2006). Hubbard (1998) provides a thorough survey of this literature.
3. Fazzari, Hubbard, and Petersen (2000); Carpenter and Guariglia (2008); (Love, 2003).
4. For example, Kaplan and Zingales (1997); Gomes (2001); Abel and Eberly (2011).
5. Gilchrist and Himmelberg (1995, 1999).

We follow this *q* literature, aware of its possible shortcomings. We use the *q* as one important explanatory variable of firm-level investment, but we also control for other variables to mitigate, to the extent possible, other investment opportunities that could be misinterpreted as captured by the *q*.

Harrison, Love, and McMillan document that foreign direct investment (FDI) flows to emerging markets are associated with a reduction in firms' financing constraints.[6] They examine whether—and to what extent—the availability of foreign capital helps relax financing constraints in emerging market firms by combining firm-level data on cash flows with country-specific capital flows. Forbes also finds that financing constraints relax when capital account restrictions are eased, as do Gelos and Werner.[7] These studies focus on macroeconomic variables, but only on capital flows and their role in the relaxation of financial constraints. In contrast, we want to better understand another key driver of corporate investment in emerging markets: namely, commodity export prices.

In another related paper, though from a macroeconomic perspective, Fernández, Gonzales, and Rodríguez show that in emerging markets, business cycles are strongly influenced by country-specific commodity prices, which are procyclical.[8] Finally, Fornero, Kirchner, and Yany, and Ross and Tashu, study the link between the terms of trade and investment.[9]

We contribute to this literature in several ways. First, we analyze the determinants of firms' investment decisions for a large sample of emerging markets covering a period of over two decades. This contrasts with previous studies on investment in emerging markets using firm-level data, which mostly focused on one country or a small group of countries. Our approach allows us not only to work with an extensive database, but also to explore (and exploit) the potential heterogeneity across emerging market regions. Second, in addition to firm-level data, we include some country-specific macroeconomic variables in the analysis—notably, commodity export prices. The latter is our main contribution. Finally, as a by-product, we examine the drivers of the post-2011 investment growth slowdown and how the main factors varied across emerging market regions.

The rest of the paper proceeds as follows. The next section presents a theoretical framework to motivate the empirical exercise that follows. Subsequent

6. Harrison, Love, and McMillan (2004).
7. Forbes (2007); Gelos and Werner (2002).
8. Fernández, Gonzales, and Rodríguez (2014).
9. Fornero, Kirchner, and Yany (2014); Ross and Tashu (2015).

sections describe the empirical approach and present the results, while the final section provides concluding remarks.

Theoretical Framework

This section presents an augmented *q* model of investment for a small open economy, which we use as a framework for the empirical analysis below. We develop a basic frictionless model to illustrate how commodity prices can affect investment decisions. Adding frictions to this model is unlikely to result in different firm-level decisions; however, we test for their impact in the empirical section below.

The problem of firm i in period t over an infinite horizon is to maximize the present discounted value of the flow of dividends, D_t, given by

$$E_t\left[\sum_{i=1}^{\infty}\frac{D_{t+1}}{R^i}\right], \tag{1}$$

where R represents the gross interest rate. In turn, the firm's dividend flow is given by

$$D_t = \pi\left(K_t, \theta_t\right) - p_t I_t - c\left(I_t, K_t\right), \tag{2}$$

where π is the firm's profit function, K_t the stock of capital, θ_t the level of technology, and p_t the price of capital in units of domestic goods. I_t denotes investment, and $c(I_t, K_t)$ is a function that captures the adjustment cost of investment. The profit function is assumed to be increasing in capital and level of technology, and concave. The adjustment cost of installing new capital is an increasing and convex function in the value of (I_t/K_t), defined below, and θ_t is a stationary first-order Markov process. Given a constant rate of depreciation, δ, the stock of capital equation changes over time, as

$$K_{t+1} = I_t + \left(1-\delta\right)K_t. \tag{3}$$

Assume that firms in this small open economy purchase their capital abroad.[10] Since capital is imported, the domestic price of investment depends on the real exchange rate. In turn, the real exchange rate increases with the

10. Assuming that only a share of the capital stock is imported does not alter the results.

country's terms of trade, that is, the relative price of exports to imports (p_X/p_M). We normalize the real exchange rate, *e,* to the unit circle, taking a value of zero when the terms of trade equal their long-run value. Thus, the domestic price of importing capital is given by

$$p_t = 1 - e_t; e_t = \begin{cases} \in(-1,0) & \text{if} \quad \dfrac{p_X}{p_M} < \overline{\left(\dfrac{p_X}{p_M}\right)} \\ 0 & \text{if} \quad \dfrac{p_X}{p_M} = \overline{\left(\dfrac{p_X}{p_M}\right)} \\ \in(0,1) & \text{if} \quad \dfrac{p_X}{p_M} > \overline{\left(\dfrac{p_X}{p_M}\right)} \end{cases} \tag{4}$$

If the terms of trade are at their long-run value (denoted by an overbar), so is the real exchange rate (equaling zero). In this case we have the typical closed economy example, in which the domestic price of capital equals one. When the economy's terms of trade are above their long-run value, the economy is richer, so the real exchange appreciates (that is, it increases), and the price of new capital in terms of domestic goods decreases. Likewise, for terms of trade lower than their long-term value, the economy is poorer, the real exchange rate depreciates, and the price of investment is higher.

Therefore, the firm's problem is to maximize equation 1 subject to equations 2–4. The Bellman equation for the firm's problem is given by

$$V(K_t, \theta_t, e_t) = \max_{I_t, K_{t+1}} \left\{ \begin{array}{c} \pi(K_t, \theta_t) - \left[1 - e_t\left(\dfrac{p_X}{p_M}\right)\right] I_t \\ -c(I_t, K_t) + \dfrac{1}{R} E_t\left[V(K_{t+1}, \theta_{t+1}, e_{t+1})\right] \end{array} \right\}. \tag{5}$$

Equivalently,

$$V(K_t, \theta_t, e_t) = \max_{I_t} \left\langle \begin{array}{c} \pi(K_t, \theta_t) - \left[1 - e_t\left(\dfrac{p_X}{p_M}\right)\right] I_t - c(I_t, K_t) \\ + \dfrac{1}{R} E_t\left\{V\left[I_t + (1-\delta)K_t, \theta_{t+1}, e_{t+1}\right]\right\} \end{array} \right\rangle. \tag{6}$$

Optimizing over the control variable I_t, while K_t is the state variable, implies the following first-order condition:

$$(7) \qquad \left[1 - e_t\left(\frac{p_X}{p_M}\right)\right] + c_I(I_t, K_t) = \frac{1}{R}E_t\left[V(K_{t+1}, \theta_{t+1}, e_{t+1})\right] = \frac{1}{R}E_t q_{t+1}.$$

On the right-hand side of equation 7, as usual in the literature, we define Tobin's q as the discounted shadow price of capital—marginal q—which equals the replacement cost of capital plus the adjustment cost of installing new capital, that is, the effective price of new capital. Assume that a constant-returns-to-scale adjustment cost of capital is given by

$$(8) \qquad c(I_t, K_t) = \frac{1}{2}b\left(\frac{I_t}{K_t} - \mu\right)^2 K_t,$$

in which μ denotes the investment-to-capital ratio in steady state, which is associated with no adjustment costs. Intuitively, μK is the level of investment necessary to maintain a constant stock of capital in the steady state. Substituting equation 8 in equation 7, we get

$$(9) \qquad \left[1 - e_t\left(\frac{p_X}{p_M}\right)\right] + b\left(\frac{I_t}{K_t} - \mu\right) = \frac{1}{R}E_t\left[V(K_{t+1}, \theta_{t+1}, e_{t+1})\right] = \frac{1}{R}E_t q_{t+1}.$$

Rearranging equation 9 yields

$$(10) \qquad \frac{I_t}{K_t} = \frac{1}{b}\left[\frac{1}{R}E_t q_{t+1} + e_t\left(\frac{p_X}{p_M}\right) - 1\right] + \mu,$$

which shows the standard positive association between Tobin's q and investment. As shown in the literature, an increase in marginal q (that is, a higher shadow price of capital, which implies a larger present discounted value of the flow of dividends, as shown below), causes the firm to optimally increase investment. The latter can be shown by using the envelope condition out of equation 6:

$$(11) \qquad q_t = \left[\pi_K(K_t, \theta_t) - c_K(I_t, K_t)\right] + \frac{1}{R}(1 - \delta)E_t\left[q_{t+1}\right].$$

Updating (11) one period, forwarding it, taking expectations as of period *t,* applying the law of iterated expectations and substituting back in (11), and finally iterating forward and using the transversality condition yields

$$V_K(K_t, \theta_t) = E_t\left\{\sum_{i=0}^{\infty}\left(\frac{1-\delta}{R}\right)^i\left[\pi_K(K_{t+i}, \theta_{t+i}) - c_K(I_{t+i}, K_{t+i})\right]\right\}, \tag{12}$$

which shows that the marginal value of an additional unit of capital should equal the discounted flow of marginal profits, net of adjustment costs.

Crucially for our empirical analysis, equation 10 also shows that, all else equal, an improvement in the terms of trade (that is, the relative price of exports to imports) results in real appreciation, which increases investment—consistent with the lower costs of importing capital—and vice versa. Appendix B presents the phase diagram corresponding to the saddle-path equilibrium and the effects of (transitory and permanent) terms-of-trade shocks.

Econometric Approach

Based on the model presented in the previous section, we estimate a panel regression model of investment with time and firm-level fixed effects, combining firm-level data and country-specific macroeconomic variables to identify the main determinants of corporate investment in emerging markets. The analysis focuses on factors that, for theoretical reasons, are thought to affect firms' investment decisions. These factors include firm-specific variables such as expected future profitability, cash flows, cost of debt, leverage, and debt flows. We also include country-specific macroeconomic variables—notably commodity export prices, but also net capital inflows and uncertainty. We then look at the recent deceleration of private investment growth in emerging markets to examine the key factors explaining the slowdown and the main differences across emerging market regions.

Empirical Model

Our empirical specification is a variation of the traditional Tobin's *q* investment model, augmented to include other possible determinants identified in the literature on corporate investment. In a neoclassical model, the marginal benefit from an extra unit of investment and the cost of capital should be

sufficient statistics to explain investment behavior. The *q* theory of investment basically reformulates the neoclassical theory, such that firms' investment decisions are based on the ratio between the market value of the firm's capital stock and its replacement cost.[11] Much of the literature on corporate investment published over the last decades, however, highlights the importance of financing constraints. In the presence of financial frictions, access to external financing for investment projects that would in principle be profitable may be limited. Therefore, firms' investment decisions would be determined not only by investment opportunities, but also by the availability of internal funds.

Evidence of financial constraints is largely based on the sensitivity of investment to different measures of internal funds—typically cash flow or cash stock. A firm's higher dependence on internal funding is interpreted as a sign of tighter financial constraints.[12] However, this interpretation of the correlation between cash flow and investment as evidence of financial constraints is far from uncontroversial. A strand of the literature argues that rather than financing constraints, the relationship between cash flows and investment may reflect the correlation between cash flow and investment opportunities that are not captured well by traditional measures of investment opportunities, in particular Tobin's *q*. Nevertheless, a number of studies address these criticisms, and most empirical studies continue to use the investment-to-cash-flow sensitivity as a measure of financial frictions.[13] We also follow this approach, using both cash flow measures and Tobin's *q*.

Beyond corporate financial indicators, we also include key country-specific macroeconomic variables that may affect corporate investment. Specifically, we consider commodity export prices (which drive the terms of trade), capital inflows, and uncertainty. We estimate linear panel regressions allowing for both time and firm-level fixed effects.[14] Given that our specification contains both firm-level and country-level data, we use clustered (by country) robust standard errors to address the risk of standard-error bias. As is common in the literature, we use the lagged dependent variable as an additional explanatory

11. Tobin (1969); Hayashi (1982). For instance, investment would increase whenever the value of *q* is larger than one, an indicator that the present discounted value of the flow of expected dividends outweighs the replacement cost of capital.

12. See, for example, Fazzari, Hubbard, and Petersen (1988); Blanchard, Rhee, and Summers (1993); and Fazzari, Hubbard, and Petersen (2000).

13. For example, Gilchrist and Himmelberg (1995, 1999); Carpenter and Guariglia (2008).

14. As discussed later, the results are robust to also allowing for country fixed effects.

variable. Thus, the baseline specification, consistent with equation 10 above, is as follows:

$$\frac{I_{ic,t}}{K_{ic,t-1}} = \alpha + \lambda \frac{I_{ic,t-1}}{K_{ic,t-2}} + \beta_1 Q_{ic,t} + \beta_2 \frac{\mathrm{CF}_{ic,t}}{K_{ic,t-1}} + \beta_3 \mathrm{LEV}_{ic,t-1} + \beta_4 \frac{\Delta \mathrm{DEBT}_{ic,t}}{K_{ic,t-1}} + \beta_5 \mathrm{INT}_{ic,t} + \beta_6 P^x_{ic,t-1} + \beta_7 \mathrm{KI}_{c,t} + \beta_8 \mathrm{UNC}_{c,t} + d_i + d_t + \varepsilon_{ic,t}, \tag{13}$$

where the subscripts (*ic,t*) stand for firm *i* in country *c* during period *t*. *I* is fixed investment (excluding inventories) and *K* the stock of capital. The variable *q* represents the standard Tobin's *q,* where average *q,* measured as the firm's price-to-book-value ratio, is used as a proxy for (unobservable) marginal *q*.[15] CF denotes the firm's cash flow; LEV is leverage; ΔDEBT is the change in total debt since the previous period; and INT is a measure of the firm's cost of capital, to account for the opportunity cost of funds. KI denotes (net) capital inflows; P^x, (the log difference of) the commodity export price index; and UNC, aggregate uncertainty. The variables d_i and d_t represent firm and trend (or alternatively time, see discussion below) fixed effects. Finally, ε is the error term.

Intuitively, this specification is based on the idea that investment is determined by the flow of (discounted) future dividends. As shown in equation 10 above, we should expect a positive coefficient associated with *q,* indicating that firms that expect to be more profitable should invest more, which is a common finding in the literature. As also discussed above, the cash flow coefficient should exhibit a positive sign if firms face financial constraints, since firms would need to rely on internal funds to finance investment projects. Debt stock and debt flows, in turn, are expected to have opposite effects on corporate investment. While higher leverage is expected to be negatively associated with investment, the flow of debt would be positively related to capital expenditure because financing investment is one of the main reasons to incur new debt. A higher cost of debt, in turn, is expected to be associated with lower investment. Regarding the country-level variables, commodity export prices are expected to be positively related to capital spending. Net capital inflows should also be positively related to corporate investment, because

15. See Hayashi (1982) for a discussion of the conditions under which the two measures are equivalent.

they may play a role in relaxing firms' financing constraints in emerging markets.[16] Finally, economic theory predicts that higher uncertainty should be associated with lower investment as firms enter a wait-and-see mode, especially to the extent that investment decisions are irreversible.[17]

Data

We use annual firm-level data from Worldscope. The sample includes 16,000 publicly traded firms from thirty-eight emerging markets, covering the period 1990–2013. Table A1 in appendix A presents the list of countries in the sample and the number of firms per country.[18] The number of firms varies significantly across countries as well as across time, with a smaller number in most countries during the first half of the 1990s.[19]

FIRM-LEVEL DATA. Investment (I) is measured as the purchase of fixed assets by the firm. The stock of capital (K) is measured as the total net value of property, plant, and equipment. Tobin's q is given by average q. Cash flow (CF) is computed as the firm's net profits from operating activities; leverage (LEV) is measured as the ratio of total debt obligations to total assets; new debt (ΔDEBT) is defined as the change in total debt obligations since the previous period; and the cost of funds (INT) is defined as the firm's effective interest rate paid on total debt obligations.

To avoid the presence of outliers and coding errors that would bias the estimation, observations with inconsistent data are dropped from the sample.[20] The country-specific distribution is then calculated for each of the variables, and

16. Harrison, Love, and McMillan (2004).

17. See, for instance, Bloom, Bond, and van Reenen (2001); Magud (2008); Baum, Caglayan, and Talavera (2008); and Dixit and Pindyck (1994). More recently, Li, Magud, and Valencia (2015) document how firm heterogeneity matters in the response of investment to interest rate versus uncertainty shocks, as the balance sheet dimension can identity if either a financial channel or a wait-and-see channel dominates the firm's investment reaction to the shock.

18. We consider countries that were classified as emerging markets at the start of the sample.

19. The share of total private investment accounted for by corporate investment ranges, for example, between 70 and 75 percent across countries in Latin America and the Caribbean (although disaggregated data are not available for many countries). Moreover, the recent downturn has mainly been driven by corporate investment (although residential investment has also been trending downward in some countries). The firm-level data in the sample represent about 12 percent of aggregate private investment (in the national accounts), with correlation coefficients varying by country but averaging over 30 percent.

20. For example, negative book values for the capital stock, debt, or the price-to-book value of equity.

TABLE 1. Summary Statistics

Variable	*No. observations*	*Mean*	*Standard deviation*
Investment/capital stock ($t-1$)	389,977	0.25	1.46
q	435,454	1.81	1.59
Cash flow/capital stock ($t-1$)	410,693	0.06	4.67
Leverage	493,919	0.68	1.05
Interest expense ratio	355,256	0.08	0.08
Change in debt/capital stock ($t-1$)	357,397	0.27	6.69
Commodity export price growth	367,748	4.32	13.18
Capital inflows/GDP	497,058	−0.49	5.39

Source: Authors' calculations.

the bottom and top 5 percent of each variable's observations are excluded from the analysis. Table 1 reports the summary statistics for the firm-level data.[21]

MACROECONOMIC DATA. We use the country-specific gross commodity export price indexes constructed by Gruss.[22] Capital inflows (measured using the financial account balance, in percent of GDP) and real GDP series come from *International Financial Statistics* and *World Economic Outlook,* both published by the International Monetary Fund (IMF). Finally, we use data from Bloomberg to construct our measure of country-specific uncertainty based on the average monthly volatility of stock market returns, computed as the standard deviation of daily stock market returns over a month.

Results

Table 2 reports the results of the baseline specification (equation 13). Columns 1–3 show that all the coefficients for the firm-level variables have the expected sign and are statistically significant at the one percent level. Following the theoretical model above, the dependent variable is the investment-to-capital ratio (ICR), with the stock of capital lagged one period. Consistent with the theory and findings in previous empirical studies, Tobin's q is positively related to investment. Also in line with previous studies, we find robust evidence of financial constraints, reflected in a positive relationship between a firm's cash flow and capital spending. Moreover, more leveraged firms tend

21. Using only listed firms restricts the sample of firms, imposing some limitations to the data.

22. Gruss (2014).

TABLE 2. Baseline Results[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
ICR (*t*–1)	0.0967***	0.0966***	0.1070***	0.0949***	0.0929***	0.0905***
	(0.0126)	(0.0124)	(0.0154)	(0.0188)	(0.0187)	(0.0191)
q	0.0207***	0.0200***	0.0190***	0.0182***	0.0178***	0.0176***
	(0.0045)	(0.0044)	(0.0045)	(0.0045)	(0.0043)	(0.0042)
Cash flow		0.0069***	0.0125***	0.0117***	0.0117***	0.0115***
		(0.0019)	(0.0023)	(0.0022)	(0.0022)	(0.0021)
Leverage (*t*–1)			–0.0337***	–0.0324***	–0.0318***	–0.0318***
			(0.0035)	(0.0029)	(0.0030)	(0.0031)
Interest expense ratio			–0.0793***	–0.0712**	–0.0685**	–0.0663**
(*t*–1)			(0.0273)	(0.0283)	(0.0292)	(0.0298)
Change in debt			0.0033***	0.0029***	0.0029***	0.0029***
			(0.0009)	(0.0010)	(0.0010)	(0.0010)
Commodity export				0.0004***	0.0005***	0.0005***
price (*t*–1)				(0.0001)	(0.0001)	(0.0001)
Net capital inflows					0.0023***	0.0024***
					(0.0007)	(0.0007)
Uncertainty						–1.39e–06
						(1.31e–06)
Constant	8.8320***	8.8720***	9.8130***	9.3580***	9.1640***	8.7850***
	(1.0170)	(0.9980)	(0.9630)	(0.8300)	(0.8540)	(0.9890)
Summary statistic						
No. observations	94,183	94,157	83,327	63,799	63,799	62,632
R^2	0.030	0.036	0.059	0.051	0.053	0.052
No. firms	16,512	16,511	15,102	12,262	12,262	12,190
No. countries	38	38	38	36	36	36

** Statistically significant at the 5 percent level.

*** Statistically significant at the 1 percent level.

a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

to exhibit lower investment in the following period, while an increase in debt is associated with higher capital expenditure. Finally, the coefficient on the cost of debt is negative, as expected.

We then introduce the country-specific macroeconomic variables (table 2, columns 4–6). The magnitude and significance of the coefficients of Tobin's *q,* cash flow, leverage, cost of debt, and change in debt do not change. We find robust evidence that an increase in a country's commodity export prices is associated with higher investment in firms in that country. This result is consistent with previous studies that document the positive impact of improving terms of trade on investment even beyond firms in the export sector.[23] It also is

23. For example, Fornero, Kirchner, and Yany (2014) for Chile; Ross and Tashu (2015) for Peru.

consistent with Fernández, Gonzales, and Rodríguez, who document that, on average, emerging markets are commodity exporters and country-specific commodity prices are procyclical.[24] The impact of commodity export prices could be transmitted through direct channels affecting commodity sectors (and other sectors, such as manufacturing and services, related to commodities) or indirectly through income effects affecting aggregate demand and activity in other sectors, as well.[25]

Investment in emerging market firms is also influenced by the availability of foreign (cross-border) financing. The larger the net capital flows an emerging market economy receives, the larger its firms' capital expenditure. Both coefficients (on commodity export prices and capital inflows) are positive and strongly statistically significant. Interestingly, we do not find market uncertainty to be a significant determinant of capital expenditure at the firm level. This result is consistent with previous studies showing that although uncertainty has a negative effect on investment, the effect generally disappears when Tobin's q is introduced.[26]

The estimated coefficients are not only statistically but also economically significant in most cases. A one-standard-deviation change in each of the main independent variables would be associated with the following changes in the investment-to-capital ratio (in percentage points): Tobin's q: 2.9; cash flow: 5.3; leverage: 3.3; change in debt: 1.9; commodity export growth: 0.63; and capital inflows: 1.4 (see figure 3). As indicated in table 1, the investment-to-capital ratio has a mean of 0.25 and a standard deviation of 1.46.

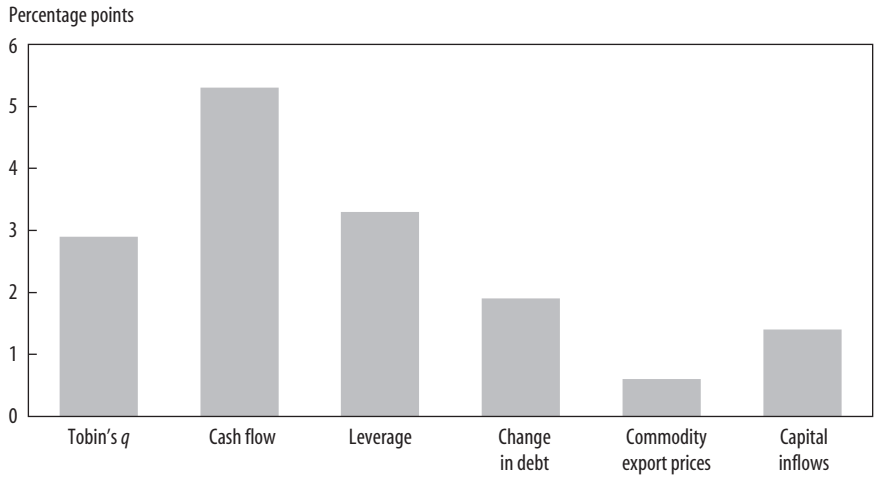
We then explore whether the overall results are mostly explained by one emerging market region or if they hold across regions. Table 3 reports the results of splitting the sample by regions. The results for the main explanatory variables hold for most regions.[27] In particular, the coefficient on commodity export prices is positive and statistically significant for all regions.

Extension: The Post-2011 Private Investment Weakening

Private investment exhibited strong growth in emerging markets in the period 2003–11, except in 2009, when the global financial crisis hit. After peaking

24. Fernández, Gonzales, and Rodríguez (2014).
25. See Druck, Magud, and Mariscal (2015).
26. For example, Leahy and Whited (1996).
27. An exception is emerging Europe, where a few regressors (such as cash flow, leverage, and cost of debt) show the correct sign but are not statistically significant.

FIGURE 3. Investment-Capital Ratio Response to One-Standard-Deviation Shock to Independent Variables



Source: IMF staff calculations.

in 2011, however, investment growth has gradually slowed (figure 4). Most emerging market regions have shared a similar pattern of investment dynamics, with strong growth in the precrisis period, a sharp contraction in 2009 followed by a rapid and strong recovery, and a sustained deceleration since 2011. The latter was particularly pronounced in emerging Europe, where growth has stalled, and "Other" economies, where it actually turned negative in 2014.

But, which of the factors identified above play the biggest role in explaining the recent investment deceleration? Have the key factors varied across emerging market region? To answer these questions, we add to the equation a dummy variable (RECENT) that takes the value of one for all observations during the post-2011 period. Here, we control for time effects through a time trend rather than year dummy variables (to mitigate multicolinearity problems).[28] We also add interaction terms, interacting the RECENT dummy variable with the main factors determining investment, in order to assess whether the marginal effect of any of the latter changed in the most recent period—both in the full sample and for each region. Specifically, we estimate the following specification:

28. Analysis of time effects through year dummy variables points to a clear downward trend, which supports the substitution for a time trend in the regression.

TABLE 3. Regional Decomposition[a]

Explanatory variable	*Full sample* (1)	*LAC* (2)	*Asia* (3)	*Europe* (4)	*Other* (5)
ICR (*t*–1)	0.0905***	0.1900***	0.0787***	0.0776**	0.1520***
	(0.0191)	(0.0353)	(0.0221)	(0.0310)	(0.0357)
q	0.0176***	0.0129***	0.0162**	0.0230***	0.0268***
	(0.0042)	(0.0030)	(0.0051)	(0.0059)	(0.0020)
Cash flow	0.0115***	0.0136**	0.0191***	0.00137	0.00839***
	(0.0021)	(0.0051)	(0.0039)	(0.0012)	(0.0011)
Leverage (*t*–1)	–0.0318***	–0.0450***	–0.0329***	–0.0133	–0.0291*
	(0.0031)	(0.0089)	(0.0035)	(0.0089)	(0.0119)
Interest expense ratio (*t*–1)	–0.0663**	–0.0114	–0.0803*	0.0026	–0.1330*
	(0.0298)	(0.0214)	(0.0402)	(0.0768)	(0.0604)
Change in debt	0.0029***	0.0026*	0.0027*	0.0008	0.0075**
	(0.0010)	(0.0013)	(0.0014)	(0.0016)	(0.0021)
Commodity export price (*t*–1)	0.0005***	0.0006**	0.0005***	0.0004***	–5.00e–05
	(0.0001)	(0.0002)	(0.0001)	(6.81e–05)	(0.0004)
Net capital inflows	0.0024***	0.0019	0.0024**	0.0040***	0.0012
	(0.0007)	(0.00104)	(0.0009)	(0.0012)	(0.0012)
Uncertainty	–1.39e–06	–9.01e–07**	–4.66e–06**	–2.90e–06	7.98e–06
	(1.31e–06)	(3.39e–07)	(1.61e–06)	(2.29e–06)	(5.47e–06)
Constant	8.785***	1.844	9.360***	9.094*	14.04***
	(0.989)	(1.349)	(1.119)	(5.046)	(2.912)
Summary statistic					
No. observations	62,632	4,622	47,506	6,404	4,100
R^2	0.052	0.085	0.049	0.044	0.142
No. firms	12,190	775	8,894	1,615	906
No. countries	36	7	10	13	6

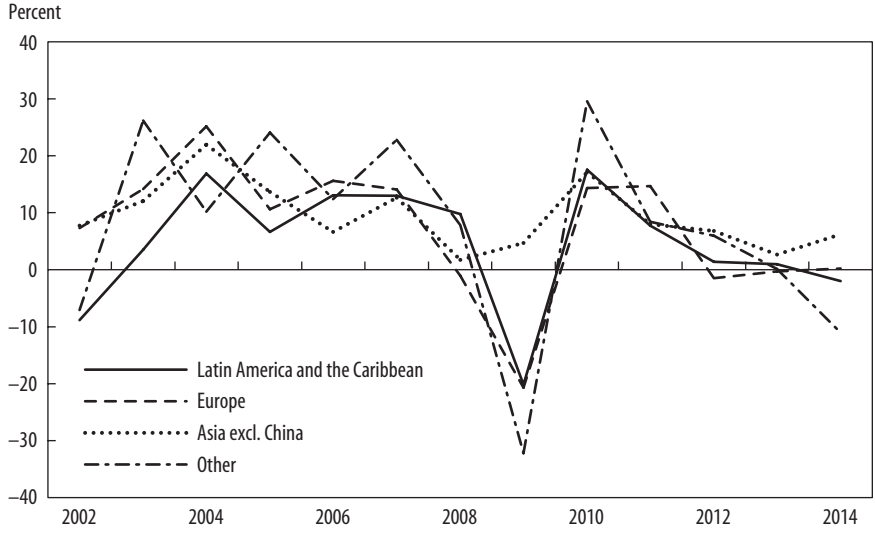
* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.

a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

$$\frac{I_{ic,t}}{K_{ic,t-1}} = \alpha + \lambda \frac{I_{ic,t-1}}{K_{ic,t-2}} + \beta_1 Q_{ic,t} + \beta_2 \frac{CF_{ic,t}}{K_{ic,t-1}} + \beta_3 \text{LEV}_{ic,t-1} + \beta_4 \frac{\Delta \text{DEBT}_{ic,t}}{K_{ic,t-1}} + \beta_5 \text{INT}_{ic,t-1} + \beta_6 P^x_{ic,t-1} + \beta_7 KI_{c,t} + \delta \text{RECENT} + \eta_h \text{RECENT} \times X^h_t + d_i + d_t + \varepsilon_{ic,t}, \tag{14}$$

$$\text{for } X^h_t = \left\{ \frac{CF_{ic,t}}{K_{ic,t-1}}, \text{LEV}_{ic,t-1}, \frac{\Delta \text{DEBT}_{ic,t}}{K_{ic,t-1}}, P^x_{ic,t-1}, KI_{c,t} \right\}, \text{ respectively.}$$

FIGURE 4. Real Private Investment Growth, 2001–14



Source: IMF, World Economic Outlook database; and IMF staff calculations.

Table 4 presents the results for the full sample. The coefficient on the RECENT dummy variable is negative and statistically significant, pointing to weaker corporate investment during this period (column 1), while all the regressors (both firm-level and country-specific macroeconomic variables) retain their sign and statistical significance. Regarding the interaction terms, financial constraints relaxed in the recent slowdown (column 3), while the negative relationship between leverage and firm-level investment became stronger (column 4). At the same time, firms' investment sensitivity to changes in capital inflows and debt flows weakened in the post-2011 period (columns 5–6).

To focus on the contribution of each factor in each emerging market region during the recent slowdown we run specification 14 for each region's firms separately. The results are shown in the appendix (tables A2–A4). Notably, corporate investment has become more sensitive to commodity export prices in Latin America and less so in emerging Asia (columns 5–6 in table A2), while leverage's role in explaining investment increased in emerging Asia and dropped in Latin America (columns 1–2 in table A3). Finally, the sensitivity to q increased in emerging Europe (column 7 in table A3), while in Asia the relationship between capital inflows and firm-level investment weakened (column 6 in table A4).

TABLE 4. The Role of the Main Factors in the Post–2011 Slowdown[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
ICR (*t*–1)	0.0907***	0.0905***	0.0911***	0.0906***	0.0904***	0.0909***	0.0906***
	(0.0191)	(0.0191)	(0.0191)	(0.0191)	(0.0191)	(0.0189)	(0.0191)
q	0.0175***	0.0170***	0.0174***	0.0174***	0.0174***	0.0174***	0.0175***
	(0.0043)	(0.0045)	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)
Cash flow	0.0114***	0.0114***	0.0130***	0.0115***	0.0114***	0.0116***	0.0114***
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
Leverage (*t*–1)	–0.0316***	–0.0317***	–0.0315***	–0.0313***	–0.0315***	–0.0312***	–0.0316***
	(0.0031)	(0.0031)	(0.0031)	(0.0031)	(0.0031)	(0.0032)	(0.0031)
Interest expense ratio (*t*–1)	–0.0638**	–0.0644**	–0.0639**	–0.0638**	–0.0641**	–0.0638**	–0.0637**
	(0.0293)	(0.0299)	(0.0294)	(0.0292)	(0.0294)	(0.0293)	(0.0291)
Change in debt	0.0029***	0.0029***	0.0029***	0.0029***	0.0029***	0.0033***	0.0029***
	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0009)	(0.0010)
Commodity export price (*t*–1)	0.0004***	0.0004***	0.0004***	0.0004***	0.0004***	0.0004***	0.00037***
	(9.46e–05)	(9.39e–05)	(9.42e–05)	(9.94e–05)	(9.40e–05)	(9.41e–05)	(9.65e–05)
Net capital inflows	0.0025***	0.0025***	0.0025***	0.0025***	0.0026***	0.0025***	0.0025***
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Uncertainty	–2.11e–06	–2.02e–06	–2.13e–06	–2.24e–06	–2.09e–06	–2.09e–06	–2.29e–06
	(1.39e–06)	(1.34e–06)	(1.37e–06)	(1.46e–06)	(1.36e–06)	(1.39e–06)	(1.63e–06)
Recent	–0.0084*	–0.0136*	–0.0065	–0.0072	–0.0097**	–0.0076*	–0.0069
	(0.0042)	(0.0069)	(0.0040)	(0.0044)	(0.0039)	(0.0042)	(0.0046)

(*continued*)

TABLE 4. The Role of the Main Factors in the Post–2011 Slowdown[a] (*Continued*)

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Recent * *q*		0.0038					
		(0.0026)					
Recent * cash flow			−0.0075**				
			(0.0036)				
Recent * leverage (*t*−1)				−0.0045*			
				(0.0025)			
Recent * capital inflows					−0.0013***		
					(0.0004)		
Recent * change in debt						−0.0023*	
						(0.0012)	
Recent * commodity export prices							0.0004
							(0.0005)
Constant	7.809***	7.868***	7.799***	7.710***	7.862***	7.809***	7.691***
	(0.960)	(0.966)	(0.959)	(0.941)	(0.978)	(0.968)	(0.936)
Summary statistic							
No. observations	62,632	62,632	62,632	62,632	62,632	62,632	62,632
R^2	0.052	0.052	0.053	0.052	0.052	0.052	0.052
No. firms	12,190	12,190	12,190	12,190	12,190	12,190	12,190
No. countries	36	36	36	36	36	36	36

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.

a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

The contribution of each of the determinants to the post-2011 downturn in the investment-to-capital ratio in the average firm is computed by multiplying this period's change in each factor by its corresponding estimated marginal effect. Based on these regional regressions, the marginal effect of each variable in the post-2011 period is computed as the sum of the coefficient associated with that variable and the coefficient on the interaction term (of that variable with the RECENT dummy), if the latter is statistically significant. Then, this marginal effect is multiplied by the change in the explanatory variable since 2011 to compute the overall contribution of the latter to the recent slowdown.

Formally, the contribution of each factor X in region j (conditional on being statistically significant) is given by

$$\left(\beta_j^h + \eta_j^h\right)\Delta X_j\Big|_{2011-13} \quad \text{for } X_j = \left\{\frac{CF_{j,t}}{K_{j,t-1}}, \text{LEV}_{j,t-1}, \frac{\Delta\text{DEBT}_{j,t}}{K_{j,t-1}}, P^x_{j,t-1}, KI_{j,t}\right\},$$

$$j = \text{LAC, ASIA, EUR, Other.}$$

The recent weakening in business investment in the average firm can largely be explained by the evolution of its main explanatory factors (figure 5).[29] However, our results suggest that the relative contribution of each of the determinants has varied across regions. Lower commodity export prices emerge as the largest contributor to the slowdown in Latin American and Caribbean economies. The substantial contributions of weaker commodity prices to the decline in private investment growth observed since 2011 is not surprising given the large share of commodity sectors in private investment in this region.

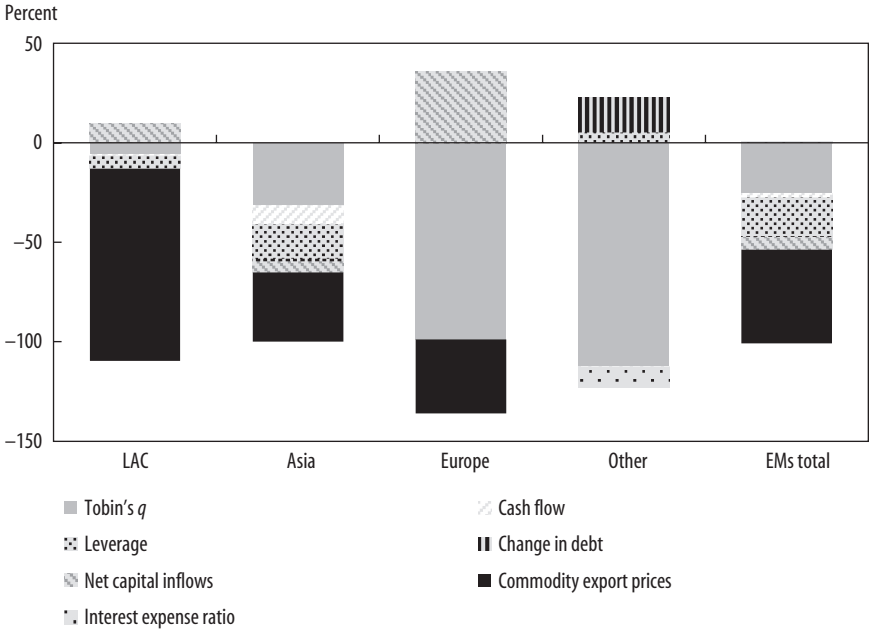
Lower expectations of firms' future profitability (as measured by Tobin's q) were the primary factor behind the weakening of investment in emerging Europe, other emerging markets, and emerging Asia. This is likely to reflect, at least partly, the downward revisions to potential growth observed in many emerging markets during this period, as well as a general sense of leaner times associated with weaker external demand and tighter global financial conditions.[30]

Corporate investment has also been influenced by the declining availability of international financing in recent years, particularly in emerging Asia. A

29. The sum of the contributions of each variable adds to the fitted value presented in the figure. Thus, the illustrated fitted value does not include the impact of fixed effects.

30. Potential GDP growth has slowed considerably in emerging markets as a whole, by about 1.2 percentage points since 2011. See IMF (2015, chap. 3).

FIGURE 5. Contributions to the Post–2011 Slowdown[a]



Source: Authors' calculations.
a. Relative contribution of each factor to the 2011–13 investment slowdown.

number of economies have seen a moderation in capital inflows since 2012.[31] Our firm-level regressions suggest that this explains a nonnegligible share of the investment slowdown. Higher corporate leverage (presumably increasing the external finance premium) and lower internal cash flow have also played a role, especially in Asian emerging markets.[32]

Robustness

We check the robustness of our results in several ways. First, we estimate the model using the Arellano-Bond difference-in-differences approach. The results for the baseline specification remain broadly unchanged (table 5).

Second, we use cash stock rather than cash flow to measure the availability of internal funds. Some previous studies use the cash stock because they assume it is less likely to be associated with future growth opportunities

31. See IMF (2013, chap. 4; 2014b).
32. The result for leverage is in line with IMF (2014a, chap. 2).

TABLE 5. Robustness: Arellano–Bond Specifcation[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
ICR (*t*–1)	–0.2330***	–0.2310***	–0.2330***	–0.2280***	–0.2280***	–0.2610***	–0.2620***	–0.2620***
	(0.0075)	(0.0075)	(0.0075)	(0.0080)	(0.0080)	(0.0094)	(0.0094)	(0.0095)
q	0.0155***	0.0151***	0.0151***	0.0139***	0.0137***	0.0132***	0.0132***	0.0126***
	(0.0013)	(0.0013)	(0.0013)	(0.0014)	(0.0014)	(0.0016)	(0.0016)	(0.0016)
Cash flow		0.00649***	0.00653***	0.0140***	0.0140***	0.0132***	0.0131***	0.0127***
		(0.0015)	(0.0015)	(0.0026)	(0.0025)	(0.0030)	(0.0030)	(0.0030)
Leverage (*t*–1)			–0.0801***	–0.0800***	–0.0737***	–0.0714***	–0.0704***	–0.0701***
			(0.0058)	(0.0062)	(0.0062)	(0.0074)	(0.0073)	(0.0073)
Interest expense ratio (*t*–1)				–0.0245	–0.0233	–0.0274	–0.0240	–0.0289
				(0.0254)	(0.0255)	(0.0280)	(0.0280)	(0.0285)
Change in debt					0.0026***	0.0021***	0.0021***	0.0021***
					(0.00077)	(0.0008)	(0.0008)	(0.0008)
Commodity export price (*t*–1)						0.0005***	0.0005***	0.0004***
						(5.09e–05)	(5.08e–05)	(5.10e–05)
Net capital inflows							0.0023***	0.0025***
							(0.0003)	(0.0003)
Uncertainty								7.57e–06***
								(1.74e–06)
Constant	23.2300***	23.1700***	23.6700***	22.4900***	22.3400***	17.4000***	17.3900***	17.1300***
	(1.0790)	(1.0710)	(1.0860)	(1.1000)	(1.0960)	(1.2710)	(1.2710)	(1.2820)
Summary statistic								
No. observations	72,049	72,016	72,001	63,098	63,090	48,459	48,459	47,742

*** Statistically significant at the 1 percent level.

a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

TABLE 6. Cash Stock[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
ICR (*t*–1)	0.0967***	0.0934***	0.1060***	0.0933***	0.0916***	0.0889***
	(0.0126)	(0.0134)	(0.0164)	(0.0198)	(0.0198)	(0.0201)
q	0.0207***	0.0201***	0.0196***	0.0186***	0.0183***	0.0181***
	(0.0045)	(0.0046)	(0.0048)	(0.0047)	(0.0045)	(0.0044)
Cash stock		0.00065***	0.0027**	0.0024**	0.0024**	0.0023**
		(0.0002)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Leverage (*t*–1)			–0.0390***	–0.0374***	–0.0368***	–0.0369***
			(0.0035)	(0.0030)	(0.0032)	(0.0033)
Interest expense ratio (*t*–1)			–0.0662**	–0.0585*	–0.0568*	–0.0541*
			(0.0282)	(0.0289)	(0.0300)	(0.0304)
Change in debt			0.0036***	0.0033***	0.0033***	0.0033***
			(0.0010)	(0.0012)	(0.0012)	(0.0012)
Commodity export price (*t*–1)				0.0005***	0.0005***	0.0005***
				(0.0001)	(0.0001)	(0.0001)
Net capital inflows					0.0021***	0.0022***
					(0.0007)	(0.0007)
Uncertainty						–1.71e–06
						(1.52e–06)
Constant	8.8320***	8.7800***	9.7000***	9.0860***	8.9470***	8.5010***
	(1.0170)	(1.0700)	(1.0890)	(0.9670)	(0.9730)	(1.1110)
Summary statistic						
No. observations	94,183	88,273	79,319	60,541	60,541	59,398
R^2	0.030	0.032	0.056	0.048	0.050	0.048
No. firms	16,512	15,281	14,126	11,414	11,414	11,344
No. countries	38	36	36	34	34	34

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.
a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

than the cash flow measure.[33] The results are reported in table 6. Using cash stock rather than cash flow does not alter the results. Specifically, Tobin's *q,* lagged leverage, the change in debt, commodity export prices, and the availability of foreign financing all have similar coefficients as before, in terms of both magnitude and statistical significance. Cash stock is also a significant explanatory variable of firms' capital spending, with a positive and statistically significant coefficient.

As a third test, we include additional controls (table 7). In particular, real GDP growth is added as a proxy for aggregate economic activity—with the

33. For example, Harrison, Love, and McMillan (2004). See Love (2003) for further discussion.

TABLE 7. Other Robustness Checks[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*
ICR (*t*–1)	0.0904***	0.0912***	0.0913***	0.0025***
	(0.0191)	(0.0192)	(0.0190)	(0.0004)
q	0.0177***	0.0168***	0.0180***	0.0277***
	(0.0043)	(0.0043)	(0.0043)	(0.0004)
Cash flow	0.0115***	0.0114***	0.0115***	0.0038***
	(0.0021)	(0.0021)	(0.0021)	(0.0002)
Leverage (*t*–1)	–0.0318***	–0.0315***	–0.0324***	–0.0294***
	(0.0031)	(0.0031)	(0.0029)	(0.0007)
Interest expense ratio (*t*–1)	–0.0661**	–0.0622**	–0.0691**	0.0849***
	(0.0298)	(0.0288)	(0.0291)	(0.0073)
Change in debt	0.0029***	0.0028***	0.0029***	
	(0.0010)	(0.0010)	(0.0010)	
Commodity export price (*t*–1)	0.0003**	0.0005***	0.0004***	0.0004***
	(0.0001)	(9.87e–05)	(0.0001)	(2.96e–05)
Net capital inflows	0.0024***	0.0023***		0.0020***
	(0.0007)	(0.0006)		(0.0001)
Uncertainty	–1.11e–06	–9.56e–07	–9.69e–07	–5.09e–06***
	(1.44e–06)	(1.21e–06)	(1.22e–06)	(7.43e–07)
Commodity import price (*t*–1)	0.0002			
	(0.0003)			
Real GDP growth (*t*–1)		0.0014*		
		(0.0007)		
Net capital inflows (*t*–1)			0.0010*	
			(0.0006)	
Change in debt (*t*–1)				0.0007***
				(9.60e–05)
Constant	8.8310***	8.4800***	8.7870***	5.3430***
	(1.0210)	(0.9700)	(1.006)	(0.1840)
Summary statistic				
No. observations	62,632	62,632	62,632	209,726
R^2	0.052	0.052	0.050	0.036
No. firms	12,190	12,190	12,190	35,047
No. countries	36	36	36	36

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.
a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

previous results also holding. Commodity import prices are included as additional regressors, since they may affect the firms' cost of inputs, particularly in commodity-importer economies. However, this variable is not statistically significant with all the other coefficients unchanged. We also lagged capital inflows and the change in debt to mitigate potential endogeneity problems, and the results again remain unaltered. In all these alternative specifications, the

TABLE 8. Excluding Countries with the Most Firms[a]

Explanatory variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
ICR (*t*–1)	0.0850***	0.0849***	0.0964***	0.0919***	0.0898***	0.0859***
	(0.0150)	(0.0148)	(0.0197)	(0.0232)	(0.0230)	(0.0232)
q	0.0250***	0.0243***	0.0231***	0.0238***	0.0231***	0.0230***
	(0.0020)	(0.0019)	(0.0020)	(0.0019)	(0.0021)	(0.0021)
Cash flow		0.00581***	0.0115***	0.0110***	0.0110***	0.0107***
		(0.0017)	(0.0024)	(0.0021)	(0.0021)	(0.0020)
Leverage (*t*–1)			–0.0301***	–0.0319***	–0.0312***	–0.0313***
			(0.0034)	(0.0037)	(0.0039)	(0.0040)
Interest expense ratio (*t*–1)			–0.0458*	–0.0486	–0.0438	–0.0396
			(0.0242)	(0.0289)	(0.0280)	(0.0279)
Change in debt			0.0033***	0.0029**	0.0029**	0.0029**
			(0.0011)	(0.0012)	(0.0012)	(0.0012)
Commodity export price (*t*–1)				0.0004***	0.0005***	0.0005***
				(0.0002)	(0.0001)	(0.0001)
Net capital inflows					0.0020***	0.0021***
					(0.0007)	(0.0007)
Uncertainty						–3.59e–08
						(1.15e–06)
Constant	7.1560***	7.2070***	8.2370***	8.5020***	8.2740***	7.8330***
	(0.8940)	(0.8760)	(0.9810)	(0.9300)	(0.9670)	(1.1850)
Summary statistic						
No. observations	57,851	57,837	50,580	44,416	44,416	43,249
R^2	0.029	0.035	0.061	0.059	0.061	0.059
No. firms	10,372	10,372	9,392	8,558	8,558	8,486
No. countries	35	35	35	34	34	34

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.
a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

positive relationship between commodity export prices and firms' investment remains statistically and economically significant.

Fourth, we estimate the model without the countries with the largest number of firms, such as China, Korea, and Taiwan, to rule out the possibility that these countries are driving the results (table 8). Our results hold when we exclude these countries from the sample. Although not shown here, results also hold if we add firm-specific sales as a control.

Fifth, we exclude firms in the lower decile of capital stock levels, to ensure that they are not biasing the results, and the results remain robust. We also run quantile regression, with the results again holding. Another extension to

check the performance of the model was to control for firm size and for the degree of internationalization of the firm. Once again, our main results did not change.[34]

In our last set of robustness tests, we consider a specification including country fixed effects, and the results remain unaltered. To control for time effects, we use year dummy variables, which reveal a negative trend in investment-to-capital ratios. Thus, we then use a trend variable rather than year dummy variables, and the baseline results do not change.[35] Finally, we also estimate the model including country-time dummy variables instead of the country-specific macroeconomic variables. The coefficients on the firm-level variables do not change substantially (in terms of both statistical and economic significance).[36]

To sum up, we find that beyond the standard firm-level variables used to explain investment, country-specific macroeconomic variables—notably commodity export prices—are important determinants of firms' investment decisions, and this result appears to be quite robust.

Concluding Remarks

We find that commodity export prices are key to explaining firm-level investment decisions, an aspect that appears to have been overlooked in the past. As commodity export prices rise, private sector firms increase their investment ratios. This finding is based on an analysis of business investment

34. We find that larger firms and firms that are highly integrated with international financial markets, all else equal, tend to invest more. These results are available on request.

35. In the extension incorporating the RECENT dummy variable, the trend variable is used to capture time effects, since having both year dummy variables and the RECENT dummy variable one would entail identification and interpretation issues.

36. These country-time dummy variables capture time-varying idiosyncratic domestic factors, which are positively correlated with our country-specific macroeconomic variables—particularly commodity export prices. Our baseline specification given by equation 13 does not necessarily capture all possible domestic factors that may influence firms' investment. This does not affect the interpretation of our results on commodity export prices, however, since these are mostly exogenous to the country and most likely are not affected by any other domestic variables not included in the model. That is, there may be other relevant domestic factors, such as a political cycle, but this should not be correlated with commodity export prices and therefore should not be biasing the estimated coefficient of the latter.

using standard panel regression models and firm-level data for about 16,000 firms for thirty-eight emerging markets over the period 1990–2013. We also include a simple investment model consistent with this finding.

Moreover, we find that other country-specific macroeconomic variables such as profitability, debt stocks and flows, the availability of external financing, and financial constraints also affect private-sector investment decisions, in line with the existing literature. We document which of all these factors drove the recent episode of weak investment and how the contribution of each factor varied across regions. Commodity export prices were particularly important in Latin America and the Caribbean.

Appendix A: Supplemental Tables

TABLE A1. List of Countries and Number of Firms in Sample

Country	*No. firms*	*Country*	*No. firms*
Argentina	1,073	Morocco	538
Brazil	3,100	Pakistan	2,342
Bulgaria	1,164	Peru	1,436
Chile	3,103	Philippines	2,708
China	22,799	Poland	3,602
Colombia	753	Romania	770
Croatia	545	Russian Federation	4,998
Czech Republic	511	Serbia	534
Egypt	1,227	Singapore	7,982
Hungary	563	Slovakia	237
India	17,480	Slovenia	361
Indonesia	4,355	South Africa	5,381
Israel	3,618	Sri Lanka	1,551
Jordan	1,538	Taiwan	17,997
Kazakhstan	223	Thailand	7,065
Korea (South)	17,245	Turkey	2,453
Lithuania	225	Ukraine	375
Malaysia	12,814	Venezuela	378
Mexico	2,096	Vietnam	3,515

TABLE A2. Regional Decomposition: Interaction of RECENT with Cash Flow and Commodity Export Prices[a]

	Cash flow				*Commodity export prices*			
Explanatory variable	*LAC* *(1)*	*Asia* *(2)*	*Europe* *(3)*	*Other* *(4)*	*LAC* *(5)*	*Asia* *(6)*	*Europe* *(7)*	*Other* *(8)*
ICR (*t*–1)	0.1900***	0.0790***	0.0773**	0.1500***	0.1920***	0.0784***	0.0777**	0.1500***
	(0.0362)	(0.0221)	(0.0320)	(0.0362)	(0.0351)	(0.0219)	(0.0314)	(0.0361)
q	0.0131***	0.0160**	0.0224***	0.0272***	0.0131***	0.0160**	0.0229***	0.0264***
	(0.0030)	(0.0051)	(0.0057)	(0.0020)	(0.0030)	(0.0051)	(0.0058)	(0.0021)
Cash flow	0.0133**	0.0200***	0.00654	0.00868***	0.0136**	0.0190***	0.0014	0.0084***
	(0.0049)	(0.0046)	(0.0037)	(0.0012)	(0.0051)	(0.0038)	(0.0012)	(0.0010)
Leverage (*t*–1)	–0.0444***	–0.0327***	–0.0130	–0.0285*	–0.0444***	–0.0326***	–0.0132	–0.0283*
	(0.0089)	(0.0035)	(0.0084)	(0.0118)	(0.0089)	(0.0034)	(0.0088)	(0.0119)
Interest expense ratio (*t*–1)	–0.0096	–0.0782*	0.00788	–0.134*	–0.0113	–0.0747*	0.00356	–0.1300*
	(0.0224)	(0.0391)	(0.0789)	(0.0572)	(0.0214)	(0.0376)	(0.0772)	(0.0581)
Change in debt	0.0026*	0.0027*	0.0014	0.0075**	0.0026*	0.0027*	0.0008	0.0076**
	(0.0013)	(0.0014)	(0.0012)	(0.0022)	(0.0013)	(0.0014)	(0.0016)	(0.0021)
Commodity export price (*t*–1)	0.0006**	0.0004***	0.0004***	–0.0002	0.0006**	0.0003**	0.0004***	–0.0002
	(0.0002)	(0.0001)	(0.0001)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.0004)
Net capital inflows	0.0030**	0.0025**	0.0040***	0.0019	0.0029**	0.0025**	0.0040***	0.0018
	(0.0009)	(0.0009)	(0.0012)	(0.0012)	(0.0009)	(0.0009)	(0.0012)	(0.0013)

(*continued*)

TABLE A2. Regional Decomposition: Interaction of RECENT with Cash Flow and Commodity Export Prices[a] (*Continued*)

	Cash flow				*Commodity export prices*			
Explanatory variable	*LAC* (1)	*Asia* (2)	*Europe* (3)	*Other* (4)	*LAC* (5)	*Asia* (6)	*Europe* (7)	*Other* (8)
Uncertainty	−1.91e−06**	−5.26e−06***	−3.15e−06	2.04e−06	−1.67e−06**	−7.28e−06***	−3.03e−06	2.59e−06
	(6.34e−07)	(1.49e−06)	(3.11e−06)	(4.75e−06)	(6.33e−07)	(1.44e−06)	(3.18e−06)	(5.24e−06)
Recent	−0.0228	−0.0046	−0.0006	−0.0272***	−0.0095	−0.0158**	0.00035	−0.0328***
	(0.0121)	(0.0049)	(0.0118)	(0.0042)	(0.0133)	(0.0058)	(0.0128)	(0.0060)
Recent * cash flow	0.0092	−0.0034	−0.0086	−0.0091**				
	(0.0061)	(0.0057)	(0.0051)	(0.0026)				
Recent * commodity export prices					0.0021***	−0.0012***	0.0004	−0.0003
					(0.0005)	(0.0003)	(0.0003)	(0.0008)
Constant	−0.0877	8.7240***	8.7060	10.3600***	0.16800	8.2090***	8.8400	10.4200**
	(1.9610)	(0.9790)	(6.0600)	(2.5480)	(1.8850)	(0.9830)	(6.1120)	(2.5870)
Summary statistic								
No. observations	4,622	47,506	6,404	4,100	4,622	47,506	6,404	4,100
R^2	0.087	0.049	0.047	0.145	0.087	0.050	0.044	0.144
No. firms	775	8,894	1,615	906	775	8,894	1,615	906
No. countries	7	10	13	6	7	10	13	6

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

***S tatistically significant at the 1 percent level.

a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

TABLE A3. Regional Decomposition: Interaction of RECENT with *Q* and Leverage[a]

	Q				*Leverage*			
Explanatory variable	*LAC* *(1)*	*Asia* *(2)*	*Europe* *(3)*	*Other* *(4)*	*LAC* *(5)*	*Asia* *(6)*	*Europe* *(7)*	*Other* *(8)*
ICR (*t*–1)	0.1920***	0.0788***	0.0774**	0.1500***	0.1920***	0.0787***	0.0771**	0.1500***
	(0.0350)	(0.0221)	(0.0311)	(0.0361)	(0.0346)	(0.0220)	(0.0313)	(0.0360)
q	0.0131***	0.0160**	0.0230***	0.0264***	0.0139***	0.0155**	0.0213***	0.0266***
	(0.0030)	(0.0052)	(0.0059)	(0.0022)	(0.0032)	(0.0053)	(0.0058)	(0.0017)
Cash flow	0.0135**	0.0191***	0.00138	0.00840***	0.0136**	0.0190***	0.00136	0.00840***
	(0.0050)	(0.0039)	(0.0012)	(0.0010)	(0.0051)	(0.0038)	(0.0012)	(0.0010)
Leverage (*t*–1)	–0.0454***	–0.0322***	–0.0132	–0.0282*	–0.0443***	–0.0328***	–0.0138	–0.0282*
	(0.0089)	(0.0035)	(0.0087)	(0.0117)	(0.0088)	(0.0035)	(0.0087)	(0.0118)
Interest expense ratio (*t*–1)	–0.0100	–0.0778*	0.00282	–0.1300*	–0.00996	–0.0790*	0.00298	–0.1300*
	(0.0221)	(0.0391)	(0.0773)	(0.0584)	(0.0216)	(0.0405)	(0.0775)	(0.0583)
Change in debt	0.0026*	0.0027*	0.0008	0.0076**	0.0026*	0.0027*	0.0008	0.0076**
	(0.0013)	(0.0014)	(0.0016)	(0.0021)	(0.0013)	(0.0014)	(0.0016)	(0.0022)
Commodity export price (*t*–1)	0.0006**	0.0004**	0.0004**	–0.0002	0.0005**	0.0004***	0.0004***	–0.0002
	(0.0002)	(0.0001)	(0.0001)	(0.0004)	(0.0002)	(0.0001)	(0.0001)	(0.0004)
Net capital inflows	0.0029**	0.0025**	0.0040***	0.0019	0.0030**	0.0024**	0.0040***	0.0019
	(0.0009)	(0.0009)	(0.0012)	(0.0013)	(0.0009)	(0.0009)	(0.0012)	(0.0012)

(*continued*)

TABLE A3. Regional Decomposition: Interaction of RECENT with *Q* and Leverage[a] (*Continued*)

	Q				*Leverage*			
Explanatory variable	*LAC* (1)	*Asia* (2)	*Europe* (3)	*Other* (4)	*LAC* (5)	*Asia* (6)	*Europe* (7)	*Other* (8)
Uncertainty	−1.78e−06**	−5.73e−06***	−3.31e−06	2.39e−06	−1.96e−06**	−5.11e−06***	−2.86e−06	2.31e−06
	(6.49e−07)	(1.56e−06)	(3.27e−06)	(5.18e−06)	(5.82e−07)	(1.53e−06)	(3.20e−06)	(4.84e−06)
Recent	−0.0234*	−0.0038	−0.0006	−0.0306***	−0.0126	−0.0116	−0.0144	−0.0285
	(0.0111)	(0.0053)	(0.0106)	(0.0027)	(0.0149)	(0.00824)	(0.00936)	(0.0170)
Recent * leverage (*t*−1)	0.0102*	−0.0065*	−0.0076	−0.0024				
	(0.0050)	(0.0034)	(0.0061)	(0.0098)				
Recent * *q*					−0.0047	0.0044	0.0105***	−0.0020
					(0.0057)	(0.0028)	(0.0029)	(0.0094)
Constant	0.0863	8.5680***	8.4280	10.3900***	−0.0949	8.7820***	9.0410	10.3600**
	(1.9420)	(0.9630)	(6.0420)	(2.5060)	(1.9390)	(0.9910)	(6.1760)	(2.7380)
Summary statistic								
No. observations	4,622	47,506	6,404	4,100	4,622	47,506	6,404	4,100
R^2	0.087	0.049	0.045	0.144	0.087	0.049	0.045	0.144
No. firms	775	8,894	1,615	906	775	8,894	1,615	906
No. countries	7	10	13	6	7	10	13	6

* Statistically significant at the 10 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 1 percent level.
a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

TABLE A4. Regional Decomposition: Interaction of RECENT with Capital Inflows and Change in Debt[a]

	Capital inflows				*Change in debt*			
Explanatory variable	*LAC* *(1)*	*Asia* *(2)*	*Europe* *(3)*	*Other* *(4)*	*LAC* *(5)*	*Asia* *(6)*	*Europe* *(7)*	*Other* *(8)*
ICR (*t*–1)	0.1930***	0.0790***	0.0767**	0.1510***	0.1920***	0.0786***	0.0777**	0.1500***
	(0.0348)	(0.0220)	(0.0320)	(0.0358)	(0.0348)	(0.0221)	(0.0311)	(0.0362)
q	0.0131***	0.0160**	0.0228***	0.0263***	0.0131***	0.0160**	0.0230***	0.0261***
	(0.0029)	(0.0052)	(0.0057)	(0.0021)	(0.0030)	(0.0051)	(0.0059)	(0.0023)
Cash flow	0.0139**	0.0191***	0.0023	0.0084***	0.0136**	0.0191***	0.0014	0.0084***
	(0.0053)	(0.0038)	(0.0016)	(0.0011)	(0.0051)	(0.0039)	(0.0012)	(0.0010)
Leverage (*t*–1)	–0.0444***	–0.0326***	–0.0104	–0.0283*	–0.0443***	–0.0327***	–0.0134	–0.0282*
	(0.0089)	(0.0036)	(0.0069)	(0.012)	(0.0089)	(0.0034)	(0.0087)	(0.0117)
Interest expense ratio (*t*–1)	–0.0107	–0.0780*	0.00146	–0.1300*	–0.0101	–0.0772*	0.00282	–0.1300*
	(0.0218)	(0.0394)	(0.0772)	(0.0578)	(0.0222)	(0.0394)	(0.0777)	(0.0590)
Change in debt	0.0027	0.0030**	0.0024	0.0077**	0.0026*	0.0027*	0.0008	0.0076**
	(0.0015)	(0.0011)	(0.0015)	(0.0023)	(0.0013)	(0.0014)	(0.0016)	(0.0021)
Commodity export price (*t*–1)	0.0005**	0.0004***	0.0004***	–0.0002	0.0005**	0.0004***	0.0004***	–0.0002
	(0.0002)	(0.0001)	(0.0001)	(0.0004)	(0.0002)	(0.00012)	(0.0001)	(0.0004)
Net capital inflows	0.0029**	0.0025**	0.0040***	0.0019	0.0029**	0.0026**	0.0040***	0.0022
	(0.0009)	(0.0009)	(0.0012)	(0.0012)	(0.0009)	(0.0009)	(0.0012)	(0.0019)

(*continued*)

TABLE A4. Regional Decomposition: Interaction of RECENT with Capital Inflows and Change in Debt[a] (*Continued*)

	Capital inflows				*Change in debt*			
Explanatory variable	*LAC* (1)	*Asia* (2)	*Europe* (3)	*Other* (4)	*LAC* (5)	*Asia* (6)	*Europe* (7)	*Other* (8)
Uncertainty	–1.90e–06**	–5.26e–06***	–3.13e–06	2.28e–06	–1.89e–06**	–5.11e–06***	–3.15e–06	2.02e–06
	(6.37e–07)	(1.49e–06)	(3.13e–06)	(4.88e–06)	(7.10e–07)	(1.49e–06)	(3.15e–06)	(5.04e–06)
Recent	–0.0197	–0.0048	–0.0023	–0.0311***	–0.0222	–0.0082	–0.0033	–0.0276*
	(0.0129)	(0.0051)	(0.0115)	(0.0038)	(0.0246)	(0.0051)	(0.0089)	(0.0126)
Recent * change in debt	–0.0032	–0.0015	–0.0036	–0.0022				
	(0.0067)	(0.0009)	(0.0027)	(0.0040)				
Recent * capital inflows					0.0006	–0.0014**	0.0013	–0.0008
					(0.0073)	(0.0005)	(0.0025)	(0.0020)
Constant	–0.0678	8.7290***	8.8170	10.3800***	–0.0612	8.7790***	8.6590	10.5100***
	(1.9760)	(0.9870)	(6.1700)	(2.5450)	(2.0630)	(1.0080)	(6.1320)	(2.3650)
Summary statistic								
No. observations	4,622	47,506	6,404	4,100	4,622	47,506	6,404	4,100
R^2	0.087	0.050	0.047	0.144	0.087	0.050	0.044	0.144
No. firms	775	8,894	1,615	906	775	8,894	1,615	906
No. countries	7	10	13	6	7	10	13	6

* Statistically significant at the 10 percent level.

** Statistically significant at the 5 percent level.

*** Statistically significant at the 1 percent level.

a. The dependent variable is the investment-capital ratio (ICR), with the stock of capital lagged one period. The regressions control for time and firm-level fixed effects. Robust standard errors (clustered by country) are in parentheses.

Appendix B: Effects of Terms-of-Trade Shocks

We start by replicating equation 11:

$$q_t = \left[\pi_K\left(K_t, \theta_t\right) - c_K\left(I_t, K_t\right)\right] + \frac{1}{R}\left(1-\delta\right)E_t\left[q_{t+1}\right]. \tag{A1}$$

After subtracting q_{t+1} from both sides, we can rearrange the equation as follows:

$$E_t\Delta q_{t+1} = \pi_K\left(K_t, \theta_t\right) - c_K\left(I_t, K_t\right) + \left(\frac{1-\delta+R}{R}\right)E_t\left[q_{t+1}\right], \tag{A2}$$

where $\Delta E_t q_{t+1} = q_{t+1} - q_t$. In steady state, $\Delta E_t q_{t+1} = 0$ holds for

$$E_t\left[q_{t+1}\right] = \frac{R}{1-\delta+R}\left[c_K\left(I_t, K_t\right) - \pi_K\left(K_t, \theta_t\right)\right]K_t. \tag{A3}$$

Thus, the slope of the $E_t\Delta q_{t+1} = 0$ line is given by

$$\frac{\partial E_t q_{t+1}}{\partial K_t} = \frac{R}{1-\delta+R}\left[c_{KK}\left(I_t, K_t\right) - \pi_{KK}\left(K_t, \theta_t\right)\right] > 0 \tag{A4}$$

given that $c_{KK}(I_t, K_t) > 0$ and $\pi_{KK}(K_t, \theta_t) < 0$.

From equations 10 and 3,

$$K_{t+1} - K_t = \Delta K_{t+1} = \left[\left(\mu-\delta\right) + \frac{1}{b}\left(\frac{E_t\left[q_{t+1}\right]}{R} + e_t - 1\right)\right]. \tag{A5}$$

Thus,

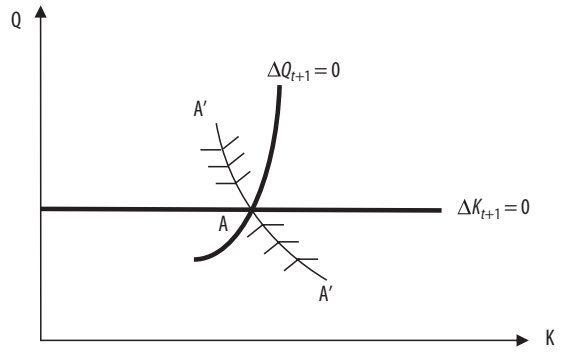
$$\Delta K_{t+1} = 0 <=> \mu - \delta = \frac{1}{b}\left(\frac{E_t\left[q_{t+1}\right]}{R} + e_t - 1\right), \tag{A6}$$

implying a zero slope.

Figure B1 shows the phase diagram, which uses the facts that

$$\left.\frac{\partial E_t\Delta q_{t+1}}{\partial K_t}\right|_{\Delta E_t q_{t+1}=0} = \pi_{KK}\left(K_t, \theta_t\right) - c_{KK}\left(I_t, K_t\right) < 0 \tag{A7}$$

FIGURE B1. Phase Diagram



and

$$\frac{\partial \Delta K_{t+1}}{\partial E_t q_{t+1}} = \frac{K_t}{bR} > 0. \tag{A8}$$

A real appreciation (that is, an increase in e_t), shifts the $E_t \Delta q_{t+1} = 0$ schedule upward, while $\Delta K_{t+1} = 0$ remains unaltered. Figures B2 and B3 present the movements in the phase diagram, together with the dynamics over time of investment and q, in response to permanent and transitory shocks, respectively.

FIGURE B2. Permanent Increase in the Terms of Trade

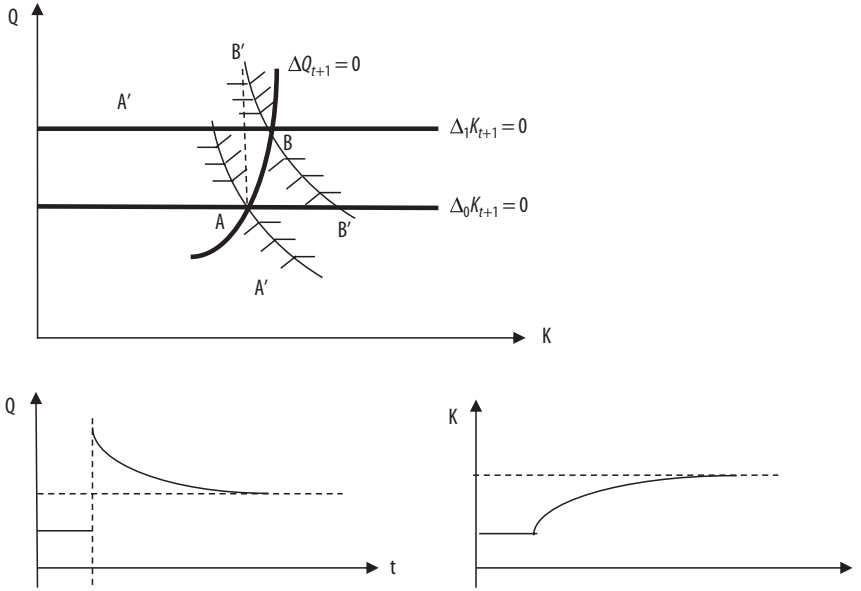
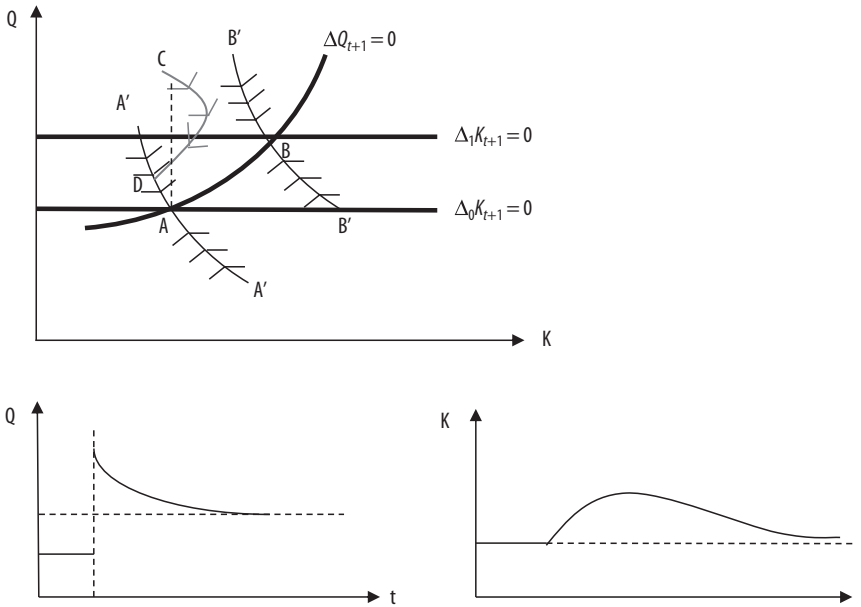


FIGURE B3. Transitory Increase in the Terms of Trade



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