Does the FED's QE program alleviate firms' financial constraints in emerging economies?

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Abstract
This paper investigates whether the Quantitative Easing (QE) program implemented by the Federal Reserve Board after the 2007–2008 global financial crisis affects firms in emerging economies by improving their access to external financing. Our hypothesis relies on the idea that the excess of liquidity induced by the QE program in the aftermath of the crisis motivates global investors to reallocate their funds to emerging markets in search of higher expected returns. Consequently, more funds are available for local firms, thus alleviating their financial constraints. We empirically test this hypothesis using a sample of 1,000 nonfinancial firms in 12 emerging economies for the period from 2000 to 2014 from the Compustat Global database. By measuring the extent of firms' financial constraint with Fazzari et al.'s (1988) investment–cash flow sensitivity coefficient, we find support for our hypothesis only in the second QE episode where ex-ante financially restricted firms become less sensitive to cash flows. For the first and third analyzed QE episodes, we find the opposite; that is, firms become more financially constrained. The results for the first and third periods are thus consistent with flight-to-quality and tapering mechanisms, respectively. Our evidence resembles prior evidence using capital flows data and highlights the significant role of the QE program on emerging economies.

Keywords: Quantitative Easing, Financial Constraints, Investment–Cash Flow Sensitivity, Emerging Markets.
JEL Classification: G31, G32, D92 , E52, E58

The authors thank Ryan Chacon for his excellent research assistance.

1. Introduction

The unconventional monetary policy program implemented by the Federal Reserve Board (FED) in the aftermath of the recent 2007–2008 global financial crisis, known as the Quantitative Easing (QE) program, has garnered the attention of policy makers and researchers interested in understanding and quantifying the effects of this program on US financial markets and, later, international financial markets due to spillover effects. Thus far, the effects of the QE program on the US economy are better understood and well documented. The literature agrees that the program reduced medium- and long-term US bond yields, increased asset prices, and reduced the value of dollar (Gagnon et al. 2011; Krishnamurthy & Vissing-Jorgensen 2011). In all, the FED succeed in reactivating the aggregate demand and spurring growth in the United States.

More debate exists, however, of the effects of the QE program on international financial markets, especially in emerging economies. On the one hand, some argue that emerging markets were more vulnerable to sudden reversals in capital inflows that followed the implementation of the QE program. On the other hand, others were more skeptical about these negative externalities. The Reserve Bank of India Governor Raghumaran Rajan, for example, called for better international policy coordination as the US conventional monetary policy may produce more damage in emerging economies than benefits on the US economy. Former FED chairman, Ben Bernanke, defending unconventional monetary policy, argued that no empirical evidence shows that emerging markets would have been better off if the QE program had not been implemented.[1]

In this article we provide additional empirical evidence of the consequences of this US unconventional monetary policy on emerging markets by looking at changes in financial conditions faced by firms operating in these economies rather than at aggregate macroeconomic

[1] "Bernanke, Rajan face-off over US QE spillover," *Indian Express*, April 11, 2014.

variables such as portfolio flows and sovereign bond yields (Fratzschser et al. 2013; Bauer & Neely 2014; Lim et al. 2014; Neely 2015). More specifically, we investigate whether these liquidity shocks, exogenous for firms operating in emerging economies, had any impact on the financial restrictions faced by these companies. Two potential offsetting effects can operate in emerging markets. On the one hand, an excess of available funds can improve access to external funds for a large group of previously constrained firms. On the other hand, investors can increase their demand for high-quality assets due to the higher uncertainty surrounding the QE episodes and therefore take their money out of these economies, thus contracting the supply of available funds. Which effect dominates is the empirical question that we address.

We use a sample of around 1,000 nonfinancial firms in 12 emerging markets during the period from 2004 to 2014 to test which, if either, mechanism dominates. Our empirical test uses investment–cash flow sensitivity as the proxy of firms' financial constraints. The literature has used this variable extensively since the seminal work of Fazzari et al. (1988).[2] Some discussion, however, exists in the literature regarding the extent to which this variable proxies for financial restrictions (Kaplan & Zingales 1997; Erickson & Whited 2000; Gomes 2001; Chen & Chen 2012)

We report evidence of a heterogeneous effect of the QE program across the three studied episodes. In particular, we show that the QE program has significant and sizeable effects on firms in emerging economies. During the second episode, firms become less financially restricted because investors bring investments into emerging economies to take advantage of higher returns. However, during the first and the third episodes, firms become more financially restricted, which is consistent with prior evidence of capital out-flows from emerging economies during these

[2] See, for example, Almeida and Campello (2007), Pindado et al. (2011), Ratti et al. (2008), Tsai et al. (2014) and Andrén and Jankensgård (2015) for recent applications.

periods. These results are consistent with flight-to-quality and tapering effects being in place during the first and third episodes, respectively. Thus, using firms' investment–cash flow sensitivity to account for financial constraints, our evidence indicates that the QE program produced large and statistically significant spillover effects on ex-ante financially constraints firms.

We obtain our baseline results using a panel estimator with firms fixed effects; however, to check that these results are not driven by endogeneity in the investment–cash flow sensitivity equation, we re-estimate the models using the Blundell and Bond (1998) system generalized method of moments (GMM) estimator and find similar results.

The remainder of this article is organized as follows. Section 2 discusses the relevant literature. Section 3 briefly describes the theoretical transmission channels of the US FED's QE program and states the tested hypothesis. Section 4 describes our data set of nonfinancial firms, the main variables of interest, and the econometric method. Section 5 presents our baseline results. Section 5 provides some robustness checks. Finally, Section 6 offers some concluding remarks.

2. Related Literature

Fratzschser et al. (2013) investigates the international effects of the QE program using aggregate macroeconomic data from a sample of 65 countries and finds a drop in sovereign yields and an increase in equity markets associated with the QE program. They also show that capital flows increase the volatility of capital flows to emerging markets. Using a sample of five developed countries (United States, Canada, Germany, Australia, and Japan), Neely (2015) reports a significant drop in long-term bond yields. Bauer and Neely (2014) use the same five developed countries and apply a dynamic term structure model to explore the transmission channel through

which the QE program reduced international bond yields. The authors find that signaling effects were more intense in the United States and Canada. Both the signaling channel and the portfolio channel were relevant for Australia and Germany. Finally, in Japan, most of the reduction in yields was through the portfolio channel, and the signaling channel was negligible.

The literature so far has identified significant spillover effects to emerging economies through changes in capital flows beyond the average flows observed during the years preceding the crisis. This spillover effect is not surprising considering that in the aftermath of the crisis interest rates in the United States were close to zero. For example, Burns et al. (2014) and Lim et al. (2014) show that the stock of capital inflows to emerging economies increased by approximately 5%. Barroso et al. (2013) report an increase of 13.9 % of gross capital inflows to Brazil, relative to the stock of net external liabilities, during the first QE episode in 2009. Lavigne et al. (2014) survey a set of recent papers looking at the impact of QE on emerging market economies and conclude that the QE likely increased capital flows to emerging market economies, especially to those economies with strong fundamentals.

Tapering announcements starting on 22 May 2013 by FED Chairman Ben Bernake also may affect capital flows to emerging market economies. Aizenman et al. (2014) evaluate the impact of tapering news announcement on emerging market economies using a daily panel data set and a quasi-event methodology. Surprisingly, they find that tapering coming from Bernanke produced a large drop in the stock market and an increase in bond yields in those economies with strong fundamentals. However, countries with weak fundamental were insignificantly affected. Also, the exchange rate depreciated in both group of countries but was three times larger in the stronger group. Eichengreen and Gupta (2014) also study the impact of the tapering announcement on emerging markets, specifically on exchange rates, foreign reserves, and equity prices between

April and August 2013. Similar to Aizenman et al. (2014), Eichengreen and Gupta (2014) find that countries with solid fundamentals are more affected by tapering announcements; in other words, better fundamentals do not provide insulation. Large markets experience large foreign exchange rate depreciation and a large drop in the stock market and accumulate more foreign reserves. Finally, Lavigne et al. (2014) point out that the tapering announcement had an initial negative but short-lived impact on capital inflows to emerging market economies. Later on, markets appeared to discriminate among countries according to fundamentals.

3. Theoretical Transmission Channels and Hypothesis

3.1 Theoretical transmission channels

The literature thus far has identified several theoretical channels through which the (un)conventional monetary policy in the United States may affect international markets in general and emerging markets in particular. In the specific context of the QE program, Fratzschser et al. (2013) identify four potential transmission channels: the portfolio balance channel, the signaling channel, the confidence channel, and the liquidity channel. Lavigne et al. (2014) add the exchange rate and the trade-flow channels to this list.

The portfolio balance channel refers to the changes in the composition of investors' portfolios associated to changes in risk premia across assets in the market. For example, the buying of long-term US securities by the FED during the QE program reduces the offer of these securities and therefore induces a change in risk premia for all the securities in the market. This rebalancing involves an increasing demand for all substitute assets, including those in emerging markets. The signaling channel suggests that FED interventions may be interpreted by economic agents as a signal of the future stance of the economy, in particular, as a signal of lower future monetary rate

than previously expected. The confidence channel refers to changes in the perception of the current state of the economy that may alter investors' risk appetites and, consequently, modify their portfolio holdings. If investors interpret FED announcements as bad news for the economy, they may overweight relatively safer assets in their portfolios. The liquidity channel refers to the fact that FED operations may improve the functioning of the markets and reduce the liquidity premia for some assets. The exchange rate channel refers to the impact of US dollar depreciation against domestic currencies associated with an increase in portfolio inflows to emerging economies. This depreciation may reduce the US demand for foreign-produced goods and services, affecting emerging markets exports negatively. Finally, the trade-flow channel refers to the increasing demand for emerging markets exports due to the boosting effect of the QE on the US domestic demand. Note that the exchange rate channel and the trade flow channel have opposite effects, and therefore their individual effects may be offsetting.

Empirical studies to date attempt to identify through which of these channels QE affect emerging market economies. However, the literature provides no clear-cut answer because all channels operate simultaneously, making identification a difficult task. Bauer and Neely (2014) report that the signaling and portfolio channels explain the drop in government bond yields in Australia, Canada, Germany, Japan, and the United States. Using a sample of 60 developing countries, Lim et al. (2014) find evidence that QE operated through portfolio balancing, signaling, and liquidity channels. Fratzschser et al. (2013) also support a portfolio balance channel. Lavigne et al. (2014) argue that the overall impact of QE on emerging markets was likely positive because of the beneficial trade effects. Ahmed and Zlate (2014) do not find a significant impact of QE on net private capital inflows but report a positive and significant effect of QE on gross portfolio

inflows. Bowman et al. (2015) find no effect of QE on asset prices in emerging markets after taken into account country-specific fundamentals.

2.2. Hypothesis

Although theory identifies numerous transmission channels of the QE program as previously discussed, our empirical work is guided primarily by the potential effects produced by the portfolio and signaling channels. On the one hand, the portfolio channel implies that the excess of liquidity in the US economy associated with the QE program induces investors to place their money in emerging economies because they provide higher expected returns. This mechanism suggests the existence of a spillover effect due to the newly available funds in emerging economies, which benefit financially constraint firms. On the other hand, the signaling channel predicts a net outflow of funds from emerging markets because investors may interpret the QE program as signal of weak global economic conditions. Investors then put their funds in safe high-quality assets, suggesting a flight-to-quality mechanism. A signaling mechanism may be in place due to tapering. Here, investor may also take their money out of emerging economies if they interpret tapering as a signal that the end of the QE program is near. Considering these theoretical mechanisms with opposite effects on the flows into and out of emerging markets as well as previous empirical evidence, we define the following hypothesis:

> **Hypothesis 1a:** During the first QE episode, a net outflow of capital flows from emerging economies due to a flight-to-quality, reduce the available supply the funds, and therefore, the investment–cash flow sensitivity of firms in these economies increases.

Hypothesis 1b: During the second QE episode, a net inflow of capital flows to emerging economies, increase the available supply of funds, and therefore, the investment–cash flow sensitivity of firms in these economies decreases.

Hypothesis 1c: During the third QE episode, a net outflow of capital flows from emerging economies due to a tapering effect, reduce the available supply the funds, and therefore, the investment–cash flow sensitivity of firms in these economies increases.

4. **The Empirical Model**

4.1. Data

Our data set contains quarterly balance sheet data and stock price information for a sample of nonfinancial firms retrieved from the Compustat Global Vantage data set. Our starting data set contains information for 2,269 firms for the period from 2004 to 2014 with 40,604 firm-quarter observations. We apply several filters to the original data set. First, we exclude financial firms, that is, those firms with a SIC above 6000. Second, we exclude firms with less than 12 quarters of financial information. Third, we exclude firms with missing observation values for capital expenditures, sales, total assets, total debt, cash flow, or stock prices. We incorporate firm ownership information from Thomson One. We also add industry-level information. In particular, we obtain a measure of industry tangibility from Braun and Larrain (2005). We winsorize the top and bottom 1% of each of the variables.

Our final data set is an unbalanced panel with 17,721 firm-quarters observations from 957 quoted nonfinancial firms from the following 12 emerging countries: Brazil, Chile, Greece, Hungary, Indonesia, South Korea, Malaysia, Mexico, Peru, Philippines, Poland, and Turkey. We analyze three QE episodes: the first episode (QE1) starts the first quarter of 2009 and ends the first

quarter of 2010; the second episode (QE2) covers the first and second quarters of 2011; finally, the third episode (QE3) starts the last quarter of 2012 and it is still operating at the end of our sample, the second quarter of 2014. Details of the timing and characteristics of each of the QE episodes can be found in (Fawley and Neely (2013)) and Bauer and Neely (2014). Table 1 reports the number of observations at the two-digit SIC code industry classification. Table 2 provides descriptive statistics of the main variables. See the appendix for definitions of the variables used in this study.

[TABLE 1 ABOUT HERE]

[TABLE 2 ABOUT HERE]

4.2. Methodology

The explanatory analysis is implemented through panel data estimations. Following prior studies (Almeida & Campello, 2007; Ratti *et al.*, 2008; Pindado *et al.*, 2011; Tsai *et al*., 2014; Andren & Jankensgard, 2015, among others), our baseline model of equation (1) and (2) is based on an extended version of the investment–cash flow sensitivity specification of Fazzari et al. (1988). This model assumes the existence of a wedge of financing cost between internal and external sources of funds. The higher this wedge is, the more financially constrained and more dependent on internal cash flows to satisfy their investment opportunities firms are. Therefore, the internal dependence of internal funds can lead firms to invest inefficiently.[3]

[3] Kaplan and Zingales (1997) doubt the usefulness of the investment–cash flow sensitivity regressions. They re-estimating Fazzari's et al. (1988) model for a dividend payout' financially constrained subsample. In contradiction with the original paper, their findings suggest the nonexistence of a monotonically relation. This result opened an ongoing discussion regarding the useful of some metrics to capture financial constraints (Cleary 1999; Fazzari *et al.* 2000; Kaplan & Zingales 2000; Huang 2002; Allayannis & Mozumdar 2004; Cleary *et al.* 2007; Lyandres 2007; Hadlock & Pierce 2010). However, corporate finance literature widely uses the investment‐cash flow sensitivity specification (Pindado *et al.* 2011).

To capture the differential effect of the QE program on the investment–cash flow sensitivity coefficient, we add an interaction variable between cash flow and a QE dummy variable, which equals 1 in those quarters in which the QE operated, and zero otherwise. This interaction variable is our main variable of interest. The literature reports that a higher dependence on internal funds to finance investment projects translates in higher sensitivity of firm investment to cash flows; therefore, we expect to find a positive estimated β_2 coefficient in equations (1) and (2). The estimated coefficient β_3 captures the differential effect on the investment–cash flow sensitivity observed during the QE episodes. If this coefficient is negative, the firm is relatively less sensible to internal funds and therefore less financially constrained. However, if the interaction coefficient is positive, firms are relatively more sensible to internal funds and therefore more financially constrained. We expect that the former effect dominates the latter if investors move their funds to safety markets, and the opposite if investors mover their funds to emerging markets in search of profitable investment opportunities. If both effects cancel out, we may observe a zero effect.

Equation (2) examines the individual QE episodes separately. This specification is motivated by the fact that the QE program in each of the episodes is characterized by alternative policy instruments, different amounts of money, and different intervention length. Thus, we include three QE interacted dummies (Q1, Q2, and Q3), one for each of the three episodes under study. In this specification, coefficientsβ_3, β_4, and β_5 in equation (2) capture the differential effect of each of the QE episodes on the investment–cash flow sensitivity. The baseline specifications are

$$Inv_{i,c,t} = \beta_1\, Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3\, Cashflow_{i,c,t} * \mathrm{QE}_t + \beta_4\, QE_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (1)$$

$$Inv_{i,c,t} = \beta_1\, Inv_{i,c,t-1} + \beta_2\, Cashflow_{i,c,t} + \beta_3\, Cashflow_{i,c,t} * \mathrm{QE1}_t + \beta_4\, Cashflow_{i,c,t} * \mathrm{QE2}_t + \beta_5\, Cashflow_{i,c,t} * QE3_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t}, \quad (2)$$

where Inv_{it} is the capital investment of firm *i* at year *t*. $Cash\ Flow_{it}$ is the cash flow of firm *i* at year *t*. $QE_{c,t}$ is a dummy variable for the total period of QE program, and Q1, Q2, and Q3 are dummies that represent each program, respectively. $CV_{i,t}$ is a set of control variables including Tobin's Q, size, leverage, long-term debt ratio, cash ratio, sales ratio, a cash flow rights variable, and a crisis dummy. Our baseline specification includes firms' fixed effect to control for unobservable time-invariant effects. Finally, we also include quarter dummies (q_{ct}) and country dymmies (c_t).

We also estimate equations (1) and (2) using the Blundell and Bond's (1998) system GMM estimator. The use of the system GMM estimator deals with the potential biases associated to right-hand side endogeneous variables in the specific context of investment–cash flow sensitivity equations (Pindado *et al.* 2011). Also, the inclusion of the lagged dependent variable and fixed effect introduces endogeneity. Recently, Flannery and Hankins (2013) report that system GMM estimators has good properties when compared with a set of alternative dynamic panel models commonly used in corporate finance research.

As is well-known, the consistency of the estimates depends critically on the absence of second-order serial autocorrelation in the residuals and on the validity of the internal instruments (Arellano & Bond 1991). Accordingly, we report the *p*-value of autocorrelation test of second order (*p*-value Auto (2)) and the Hansen test of overidentifying constraints. Finally, as a robustness check, we compare both estimation methods, the ordinary least squares–fixed effects and system GMM estimators.

5. Results

5.1. Basic results

We begin our explanatory analysis with the results of the baseline estimations in Table 3. We report estimation results for the full sample (columns 1 and 4), a sample considering the three (out of five) fragile countries in our sample (columns 2 and 4), and a sample only including manufacturing firms (columns 3 and 6). In the first three columns we use the single dummy QE that consider the three episodes altogether, and in the last three columns we include individual QE dummies. Each model includes a set of control variables; robust standard errors are in parenthesis.

[TABLE 3 ABOUT HERE]

Table 3 provides several findings of interest. First, the estimated investment–cash flow sensitivity coefficient is positive and highly significant across models. For example, the estimated coefficient is 0.110 in column 1 and 0.108 in column 4. Second, the lagged dependent variable is also positive and significant across models indicating a persistence in the dynamic of investment in our sample. Third, the coefficient of our main variable of interest, the interaction variable, is positive (0.026) but only significant in the column 1. This result indicates that, on average, firms become more financially constrained during QE episodes. This evidence contradicts the hypothesis that the excess of liquidity due to the QE program increases the available funds in emerging markets and alleviates their financial constraints.

We obtain a clearer view of the potential effects of the QE program when we look at each of the episodes in isolation. As expected, this evidence highlights a heterogeneous effect across

episodes. The interacted coefficient for the first QE episode is positive (0.037) and significant in column 4 of Table 3. In line with the aggregated results in column 1, this result indicates that during the first QE episode firms in emerging markets face higher financial constraints. This finding suggests that investors interpret the initial QE movements as a signal of higher uncertainty in global markets and therefore a flight-to-quality episode that moves capital out of emerging economies. For the second episode (QE2), the positive coefficient of the interacted term becomes negative (–0.053) and significant. This estimated coefficient indicates that the average firm in our sample is relatively less constrained. Interestingly, this second episode supports the existence of a spillover effect from the QE program to emerging economies by lessening financial constraints. Finally, for the last episode, the estimated coefficient for the interacted variable is positive (0.037) and significant, suggesting that the average firm in our sample is relatively more financially restricted than in quarters without QE. The literature provides a straightforward interpretation of this positive coefficient that stresses the role of tapering during this period. Investors interpret tapering as increasing the probability of reversing the liquidity injection associated with the QE program and therefore improving the prospects of the future stance of the US economy. This stance may produce a reallocation of funds to the United States, thus reducing the funds to emerging economies.

The results for the subsamples in columns 2, 3, 5, and 6 of Table 3 are slightly weaker. Fragile five economies is a group of five emerging economies that, according to policymakers, are particularly vulnerable to sudden changes in global liquidity due to their large current account deficits. The original fragile five countries are Brazil, India, Indonesia, South Africa, and Turkey. Due to data restrictions, we only include in our sample three of these countries: Brazil, Turkey, and Indonesia. We consider the subsample of manufacturing firms because the finance literature

commonly takes this sector as a representative sector in the economy. Braun and Larrain (2005) and Cowan and Raddatz (2013), for example, study how business cycles and sudden stops affect firm performance in the manufacturing sector. In particular, we define as manufacturing firms as those firms with a two-digit SIC code between 20 and 39.

The investment–cash flow sensitivity estimated coefficient is positive and highly significant for both the fragile countries and manufacturing firm subsamples. Similarly, the lagged dependent variable is positive and highly significant. The interaction effect is positive but not significant in columns 2 and 3 of Table 3. Looking at the episodes separately, we observe that the interaction coefficient is significant only for QE2. The estimated coefficient is –0.066 and –0.068 in columns 5 and 6, respectively. These results indicates that the effect of the QE program on firms' financial constraints, if any, is attenuating, supporting the idea of a positive spillover effect to emerging economies.

5.2. Endogeneity: System GMM estimates

As previously mentioned, our specification may be subject to the potential biases that arise due to endogeneity. To cope with this problem, in Table 5 we estimate equations (1) and (2) using the Blundell and Bond's (1998) system GMM estimator. In particular, we use as instruments the right-hand side variables that are supposed to be endogenous in the models lagged from t–1 to t–3.

[TABLE 4 ABOUT HERE]

Similar to the ordinary least squares–fixed effects estimates reported in Table 3, the lagged dependent variable are positive and significant across specifications in Table 4. The investment–

cash flow sensitivity estimates are also positive and highly significant across specifications. As in Table 3, the estimated interaction coefficient in column 1 is positive and significant ($\beta_3 = 0.028$), indicating a relatively higher dependence on internal funds for the average firm in our sample. For the cases of the fragile and the manufacturing samples in columns 2 and 3, respectively, the interaction variables are not significant. Column 4 reports the GMM estimates for the full sample and for the individual episodes. The interaction variable for the second and the third QE episodes are statistically significant. The interaction estimate is negative (–0.044) for the second episode and positive (0.053) for the third episode. As before, these results support an attenuation effect associated with QE2 over firms' financial constraints and therefore the existence of a spillover effect. Furthermore, the positive and significant interaction effect supports a tapering effect. As before, the interaction estimated coefficient is positive for the first QE episode, but it is not significant. Whereas the manufacturing firms subsample shows similar results (i.e., significant effects for the second and third episodes); we do not identify any effects for fragile countries.

For each of our estimated models, the Hansen test of overidentifying restrictions is as expected and accepts the null hypothesis of validity of the instruments in our estimations. In addition, the autocorrelation test proves the lack of second-order serial correlation. Based on these tests, we are confident that our GMM estimation approach provides reliable estimates of the investment–cash flow models.

5.3. The differential effect on ex-ante financially restricted and unrestricted firms

The corporate finance literature argues that some firms are more likely to be financially constrained (Fazzari *et al.* 1988; Almeida *et al.* 2004; Almeida & Campello 2007; Hovakimian 2009; Lima-Crisóstomo *et al.* 2014). In this section, we investigate a potential differential effect of the QE

program on restricted and unrestricted firms. Prior research uses commonly several criteria to identify a restricted firm, including firm size (Devereux & Schiantarelli 1990; Kadapakkam *et al.* 1998; Arslan *et al.* 2006), leverage (Whited 1992), dividends payout (Arslan *et al.* 2006), business groups affiliation (Hoshi *et al.* 1991; George *et al.* 2011), firm age (Oliner & Rudebusch 1992), and assets tangibility (Almeida & Campello 2007; Ratti *et al.* 2008).

We use three criteria to split our sample: firm size, firm asset tangibility, and the two-digit SIC code US industry asset tangibility. Hadlock and Pierce (2010) suggest the use of firm size as a splitting criteria. The use of the other two measures of tangibility is motived by the idea of capturing the degree of investment intensity and opaqueness. In particular, a firm is classified as size-restricted if its size is below the median size of the sample in its country-year. In a similar way, we define asset tangibility-restricted firms. Finally, US asset tangibility restricted firms are those whose industry is below the median of tangibility across US industries.

Tables 5, 6, and 7 present our results for system GMM regression estimates of equations (1) and (2) for restricted and unrestricted firms according to the alternative criteria for the full sample, fragile economies sample, and manufacturing sample, respectively.

[TABLE 5 ABOUT HERE]

[TABLE 6 ABOUT HERE]

[TABLE 7 ABOUT HERE]

As before, both the lagged dependent variable and the investment cash–flow sensitivity coefficient are positive and significant across all the models. In Table 5, when we compare models in columns 1 and 3 for restricted and unrestricted firms to examine the interaction variable of

interest, we find that the estimated coefficient is positive and significant only for restricted firms. This finding indicates that the overall effect of the QE total affects ex-ante financially restricted firms more severely. When we look at the individual QE episodes separately, we find that only the first and the third episodes are significant for restricted firms. For unrestricted firms, the second and third QE episodes are statistically significant. This evidence shows that the QE program has different effects on ex-ante restricted and unrestricted firms. Unrestricted firms are more affected than restricted firms, as unrestricted firms are relatively more sensitive to internal funds during QE episodes. However, unrestricted firms benefit from a spillover effect captured by a lower investment–cash flow sensitivity during the second QE episode (the estimated coefficient is –0.047).

When we use firm tangibility as the splitting criteria, the QE episodes do not significantly affect the investment–cash flow sensitivities (the interaction effect is positive but not significant). Regarding the individual episodes, the interaction effect is positive and significant during the third episode (0.045 and 0.059, respectively) for both restricted and unrestricted firms. The results using US tangibility as splitting criteria are similar to those using firm size. In column 9 of Table 5, the interaction effect is positive (0.033) and significant for restricted firms, indicating that this subsample of firms is particularly affected by the change in global liquidity conditions. We do not find this effect in the sample of unrestricted firms. The second and third QE episodes appear significant only for restricted firms, not for unrestricted firms.

In Table 6, we repeat the analysis in Table 6 but only consider the sample of firms in the three fragile economies. In general, we find that the interaction variable is not significant across specifications. The interaction variable is negative (–0.066) and significant only in column 3. These results contradict the common wisdom established among investment banking regarding the

fragility of these particular economies. In Table 7, we repeat our previous analysis for the sample of manufacturing firms. In general, the results are similar to those reported with the full sample in Table 5. When we use size as splitting criteria, restricted firms become more sensitive to the use of internal funds. The interaction variable is positive (0.043) and significant in column 1 and not significant for unrestricted firms in column 3. Looking at the individual QE episodes, the evidence shows that ex-ante financially restricted firms are relatively more affected than unrestricted firms. For example, the interaction variables for the first and second QE episodes for unrestricted firms in column 4 are negative (–0.057 and –0.065, respectively) and significant, indicating that these firms experienced fewer financial restrictions. Conversely, for restricted firms, the interaction is positive and significant in column 2. When we use firm tangibility the results are mixed. On the one hand, the aggregate QE interaction variable is positive and significant for both restricted and unrestricted firms in columns 5 and 7. On the other hand, when we look at the individual episodes, the interactions are not significant except for restricted firms during the second QE episode in column 6. Finally, when we use US industries tangibility, we do not identify any effects using the aggregate QE dummy in columns 9 and 11, but we do find instead evidence that restricted firms are positively affected by a spillover effect during the second episode and negatively affected by a tapering effect during the third QE episode. Interactions for unrestricted firms are not significant.

6. Conclusion

We study the potential effect of the FED's QE program on emerging economies. In particular, we investigate the effects, if any, that this program had on the current conditions to access to credit for nonfinancial firms operating in these economies. Our approach consists of testing whether firms' financial constraints are alleviated in periods in which the QE program was in place. For a

sample of around 1,000 firms in 12 emerging economies for the period from 2004 to 2014, we report a heterogeneous effect of the QE program across three analyzed episodes. We find that during the first and the third QE episodes, firms became more financially constrained in emerging economies, which is consistent with a flight-to-quality and a tapering mechanism, respectively. During the second QE episode, however, firms became less financially constrained. In other words, the evidence suggests that during this period only global investors take advantage of the excess of liquidity and put their money in emerging markets to take advantage of the higher rate of returns.

Our empirical approach assumes that the QE policy represent an exogenous shock to firms located in emerging economies. In addition, we verify that our main results are not driven by the endogeneity of the measure of investment–cash flow sensitivity by using the Blundell and Bond's (1998) system GMM estimator as a robustness check. Our results contribute at least in two ways to the literature that investigates the spillover effects of the QE program into emerging economies. First, different from most previous literature, we study the potential spillover effect by looking at firm-level data instead of using aggregate capital flows data. Second, we make use of the investment–cash flow literature framework to test the financial constraints in the specific context of the QE program. As a result, we shed light on a particular financial channel through which QE monetary was propagated to emerging economies.

Our evidence has policy implication as it supports the view that the US unconventional monetary policy had nonneutral effects on emerging economies by affecting firms' access to finance. In this context the call for coordination between monetary authorities in these economies is important to avoid hurting firms by suddenly cutting their access to credit.

7. Conclusion

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Table 1. Industry-Country sample composition

SIC Two-Digit Code	Brazil	Chile	Greece	Hungary	Indonesia	South Korea	Malaysia	Mexico	Peru	Philippines	Poland	Turkey	**Total**
01	–	–	–	–	193	–	42	–	25	–	–	–	**260**
02	–	–	103	–	28	13	–	45	–	–	–	–	**189**
07	64	–	–	–	–	–	–	–	–	–	42	32	**138**
10	–	–	–	–	94	–	–	88	49	52	41	–	**324**
12	–	–	–	–	229	–	–	–	–	–	27	–	**256**
13	10	–	–	–	161	–	–	–	–	–	–	–	**171**
15	19	20	56	–	21	90	7	40	–	14	192	50	**509**
16	–	45	163	–	62	31	5	166	–	32	165	32	**701**
20	54	194	199	–	396	135	9	359	77	135	187	191	**1,936**
21	–	18	–	–	68	–	–	–	–	–	–	–	**86**
22	10	–	88	–	127	39	–	39	39	–	21	128	**491**
23	40	–	38	–	76	134	–	22	–	–	30	–	**340**
24	23	43	46	–	27	30	–	–	–	–	104	–	**273**
25	–	–	20	–	–	20	–	–	–	–	39	–	**79**
26	45	79	92	–	164	151	22	78	–	–	53	28	**712**
27	–	–	52	10	39	–	–	–	–	17	48	32	**198**
28	24	153	130	14	254	242	24	134	–	26	214	161	**1,376**
29	–	–	34	30	–	5	–	–	–	68	78	36	**251**
30	–	–	57	–	135	70	16	–	45	–	62	27	**412**
31	–	–	–	–	–	–	–	–	–	–	43	–	**43**
32	66	163	35	–	163	97	9	83	57	34	75	270	**1,052**
33	66	111	260	–	200	176	–	117	43	24	266	166	**1,429**
34	46	–	–	–	113	107	25	–	–	–	113	36	**440**
35	103	–	129	–	–	317	27	–	–	–	149	–	**725**
36	–	–	–	–	1	473	30	–	–	–	45	98	**647**
37	113	41	–	27	150	294	–	34	–	7	17	45	**728**
38	–	–	–	–	–	181	–	–	–	–	31	28	**240**
39	14	–	29	–	–	35	–	–	–	–	–	–	**78**
40	–	–	–	–	–	–	–	43	–	–	–	–	**43**
41	–	–	–	–	–	–	57	–	–	–	–	17	**74**
42	86	–	–	–	64	35	–	34	–	–	–	–	**219**
44	24	43	159	–	219	1	16	–	–	69	–	–	**531**
45	27	43	11	–	49	26	31	67	–	35	–	–	**289**
47	–	–	–	–	105	17	23	–	–	32	28	–	**205**
48	19	122	130	44	248	6	18	192	–	130	92	–	**1,001**
49	453	435	55	12	–	16	–	–	32	132	128	12	**1,275**
Total	**1,306**	**1,510**	**1,886**	**137**	**3,386**	**2,741**	**361**	**1,541**	**367**	**807**	**2,290**	**1,389**	**17,721**

Table 2: Descriptive statistics

Country		Inv	$Cashflow$	Qtob	Lev	Size	Sales	Longdebt	P1
Brazil	Mean	0.040	0.058	1.250	0.606	21.41	0.178	0.664	0.253
	SD	0.039	0.062	0.626	0.166	1.31	0.098	0.219	0.220
Chile	Mean	0.040	0.050	1.345	0.512	20.19	0.151	0.679	0.426
	SD	0.042	0.067	0.552	0.170	1.73	0.080	0.270	0.212
Greece	Mean	0.022	0.011	0.965	0.640	19.57	0.151	0.440	0.269
	SD	0.028	0.049	0.343	0.162	1.52	0.078	0.278	0.254
Hungary	Mean	0.048	0.079	1.160	0.523	21.31	0.234	0.602	0.381
	SD	0.032	0.062	0.297	0.144	1.90	0.102	0.282	0.205
Indonesia	Mean	0.042	0.037	1.359	0.577	19.24	0.248	0.536	0.384
	SD	0.051	0.072	0.736	0.190	1.50	0.155	0.320	0.273
South Korea	Mean	0.044	0.017	1.085	0.565	19.13	0.241	0.342	0.261
	SD	0.051	0.062	0.492	0.167	1.30	0.116	0.236	0.152
Malaysia	Mean	0.046	0.036	1.287	0.466	19.02	0.179	0.478	0.308
	SD	0.049	0.064	0.730	0.150	2.16	0.100	0.290	0.213
Mexico	Mean	0.035	0.052	1.272	0.550	21.00	0.197	0.745	0.244
	SD	0.041	0.062	0.570	0.178	1.60	0.096	0.254	0.249
Peru	Mean	0.037	0.061	1.206	0.418	18.70	0.207	0.486	0.329
	SD	0.043	0.078	0.921	0.115	1.14	0.142	0.300	0.299
Philippines	Mean	0.046	0.064	1.302	0.560	20.45	0.161	0.622	0.336
	SD	0.048	0.072	0.568	0.157	1.56	0.101	0.275	0.280
Poland	Mean	0.035	0.031	1.281	0.502	19.30	0.261	0.452	0.352
	SD	0.039	0.071	0.629	0.164	1.64	0.122	0.315	0.222
Turkey	Mean	0.039	0.030	1.259	0.532	20.05	0.215	0.425	0.138
	SD	0.042	0.073	0.428	0.182	1.63	0.105	0.259	0.243
Total	Mean	0.038	0.036	1.231	0.556	19.78	0.211	0.518	0.307
	SD	0.044	0.068	0.601	0.178	1.71	0.122	0.305	0.245

Table 3. QE and Financial Constraints

	Fed's QE			Episodes of Fed's QE		
	Full Sample	Fragile 3	Manufacturers	Full Sample	Fragile 3	Manufacturers
	(1)	(2)	(3)	(4)	(5)	(6)
$Inv_{i,c,t-1}$	0.376***	0.387***	0.408***	0.375***	0.386***	0.407***
	(0.019)	(0.028)	(0.027)	(0.019)	(0.028)	(0.027)
$Cashflow_{i,c,t}$	0.110***	0.066***	0.076***	0.108***	0.064***	0.074***
	(0.014)	(0.018)	(0.016)	(0.014)	(0.018)	(0.016)
$Cashflow_{i,c,t} * QE_t$	0.026**	0.017	0.019			
	(0.013)	(0.021)	(0.017)			
$Cashflow_{i,c,t} * QE1_t$				0.037*	0.030	0.038
				(0.019)	(0.032)	(0.026)
$Cashflow_{i,c,t} * QE2_t$				–0.053***	–0.066**	–0.068***
				(0.020)	(0.029)	(0.024)
$Cashflow_{i,c,t} * QE3_t$				0.037**	0.029	0.021
				(0.016)	(0.024)	(0.018)
Observations	12,321	4,119	7,521	12,321	4,119	7,521
R-squared	0.434	0.451	0.440	0.435	0.453	0.442
N° Firms	1,428	424	995	1,428	424	995
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

$$Inv_{i,c,t} = \beta_1 Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3 Cashflow_{i,c,t} * \mathrm{QE}_t + \beta_4 QE_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (1)$$

$$Inv_{i,c,t} = \beta_1 Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3 Cashflow_{i,c,t} * \mathrm{QE1}_t + \beta_4 Cashflow_{i,c,t} * \mathrm{QE2}_t + \beta_5 Cashflow_{i,c,t} * QE3_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (2)$$

This table provides the estimated coefficients (robust standard errors) from the two-way fixed effect regressions of equation (1) and (2). $\mathrm{Inv}_{i,t}$ is capital expenditures scaled by lagged total assets. $\mathrm{Cashflow}_{i,c,t}$ is the income-based cash flow over lagged total assets. QE_t, $\mathrm{QE1}_t$, $\mathrm{QE2}_t$, and $\mathrm{QE3}_t$ represent the Federal Reserve Quantitative Easing program for the entire period, stage one, stage two, and stage three, respectively. $\mathrm{CV}_{i,c,t}$ is a set of control variables defined in Table 2. We include fixed effects at the firm level (f_i), country level (c_c), and quarterly level (q_t). ***, **, and * represent a level of significance lower than 1%, 5%, and 10%, respectively.

Table 4. QE and Financial Constraints (GMM)

	Fed's QE			Episodes of Fed's QE		
	Total Sample	Fragile 3	Manufacturers	Total Sample	Fragile 3	Manufacturers
	(1)	(2)	(3)	(4)	(5)	(6)
$Inv_{i,c,t-1}$	0.500***	0.628***	0.534***	0.498***	0.612***	0.531***
	(0.024)	(0.042)	(0.029)	(0.024)	(0.041)	(0.030)
$Cashflow_{i,c,t}$	0.131***	0.174***	0.091***	0.129***	0.132***	0.089***
	(0.014)	(0.032)	(0.017)	(0.014)	(0.022)	(0.017)
$Cashflow_{i,c,t} * QE_t$	0.028**	–0.008	0.021			
	(0.013)	(0.020)	(0.016)			
$Cashflow_{i,c,t} * QE1_t$				0.024	0.005	0.024
				(0.019)	( )	(0.024)
$Cashflow_{i,c,t} * QE2_t$				–0.044**	–0.039	–0.056**
				(0.020)	(0.035)	(0.024)
$Cashflow_{i,c,t} * QE3_t$				0.053***	0.006	0.042**
				(0.018)	(0.027)	(0.021)
Observations	13,945	4,906	8,753	13,945	4,913	8,753
Number of id	1,560	499	1,095	1,560	499	1,095
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	89.86	40.25	67.70	89.72	44.36	67.02
Auto(2)	0.129	0.765	0.822	0.144	0.874	0.810
Hansen p-value	0.713	0.402	0.907	0.720	0.871	0.878

$$Inv_{i,c,t} = \beta_1 Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3 Cashflow_{i,c,t} * \mathrm{QE}_t + \beta_4 QE_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (1)$$

$$Inv_{i,c,t} = \beta_1 Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3 Cashflow_{i,c,t} * \mathrm{QE1}_t + \beta_4 Cashflow_{i,c,t} * \mathrm{QE2}_t + \beta_5 Cashflow_{i,c,t} * QE3_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (2)$$

This table provides estimated coefficients (robust standard errors) from the GMM system estimator regressions of equation (1) and (2). $\mathrm{Inv}_{i,t}$ is capital expenditures scaled by lagged total assets. $\mathrm{Cashflow}_{i,c,t}$ is the income based cash flow over lagged total assets. QE_t, $\mathrm{QE1}_t$, $\mathrm{QE2}_t$, and $\mathrm{QE3}_t$ represent the Federal Reserve Quantitative Easing program for the entire period, stage one, stage two, and stage three, respectively. $\mathrm{CV}_{i,c,t}$ is a set of control variables defined in Appendix .We include fixed effects at the firm level (f_i), country level (c_c), and quarterly level (q_t). ***, **, and * represent a level of significance lower than 1%, 5%, and 10%, respectively.

Table 5. QE, Restricted/Unrestricted Firms and Financial Constraints (GMM)

	Medsize				Medtangf				Ustang			
	Low		High		Low		High		Low		High	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Inv_{i,c,t-1}$	0.513***	0.504***	0.573***	0.566***	0.597***	0.593***	0.582***	0.581***	0.530***	0.531***	0.541***	0.556***
	(0.038)	(0.039)	(0.038)	(0.039)	(0.040)	(0.039)	(0.037)	(0.038)	(0.041)	(0.041)	(0.034)	(0.088)
$Cashflow_{i,c,t}$	0.149***	0.145***	0.176***	0.173***	0.110***	0.106***	0.187***	0.180***	0.100***	0.097***	0.219***	0.218***
	(0.020)	(0.020)	(0.025)	(0.025)	(0.020)	(0.020)	(0.025)	(0.026)	(0.021)	(0.021)	(0.023)	(0.066)
$Cashflow_{i,c,t} * QE_t$	0.043**		0.000		0.027		0.034		0.033*		0.004	
	(0.018)		(0.017)		(0.017)		(0.021)		(0.019)		(0.022)	
$Cashflow_{i,c,t} * QE1_t$		0.076***		–0.033		0.029		0.034		0.028		0.002
		(0.026)		(0.026)		(0.023)		(0.036)		(0.025)		(0.100)
$Cashflow_{i,c,t} * QE2_t$		–0.013		–0.047*		–0.037		0.004		–0.047*		0.001
		(0.032)		(0.025)		(0.023)		(0.042)		(0.024)		(0.094)
$Cashflow_{i,c,t} * Q31_t$		0.033*		0.042*		0.045*		0.059**		0.054**		0.003
		(0.020)		(0.025)		(0.024)		(0.027)		(0.025)		(0.115)
Observations	6,431	6,431	7,514	7,514	7,105	7,105	6,840	6,840	6,787	6,787	7,158	7,158
N° Firms	900	900	802	802	785	785	775	775	845	845	715	715
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	47.62	46.23	61.81	62.38	60.53	54.21	66.54	64.95	42.20	40.12	74.17	197.1
Auto(2)	0.465	0.448	0.389	0.394	0.640	0.642	0.0919	0.0925	0.695	0.683	0.173	0.218
Hansen *p*-value	0.286	0.288	0.750	0.667	0.553	0.533	0.360	0.365	0.645	0.741	0.459	0.445

$$Inv_{i,c,t} = \beta_1\, Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3\, Cashflow_{i,c,t} * \mathrm{QE}_t + \beta_4\, QE_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (1)$$

$$Inv_{i,c,t} = \beta_1\, Inv_{i,c,t-1} + \beta_2\, Cashflow_{i,c,t} + \beta_3\, Cashflow_{i,c,t} * \mathrm{QE1}_t + \beta_4\, Cashflow_{i,c,t} * \mathrm{QE2}_t + \beta_5\, Cashflow_{i,c,t} * QE3_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (2)$$

This table provides estimated coefficients (robust standard errors) from the GMM system estimator regressions of equation (1) and (2). $\mathrm{Inv}_{i,t}$ is capital expenditures scaled by lagged total assets. $\mathrm{Cashflow}_{i,c,t}$ is the income based cash flow over lagged total assets. QE_t, $\mathrm{QE1}_t$, $\mathrm{QE2}_t$, and $\mathrm{QE3}_t$ represent the Federal Reserve Quantitative Easing program for the entire period, stage one, stage two, and stage three, respectevily. $\mathrm{CV}_{i,c,t}$ is a set of control variables defined in Appedix. We include fixed effects at the firm level (f_i), country level (c_c), and quarterly level (q_t). ***, **, and * represent a level of significance lower than 1%, 5%, and n 10%, respectively.

Table 6. QE, Restricted/Unrestricted Firms and Financial Constraints (GMM): Fragile Economies Subsample

	Medsize				Medtangf				Ustang			
	Low		High		Low		High		Low		High	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Inv_{i,c,t-1}$	0.597***	0.587***	0.558***	0.633***	0.589***	0.587***	0.529***	0.663	0.585***	0.568***	0.438***	0.627***
	(0.058)	(0.058)	(0.106)	(0.069)	(0.054)	(0.075)	(0.078)	(0.879)	(0.060)	(0.057)	(0.081)	(0.052)
$Cashflow_{i,c,t}$	0.161***	0.159***	0.097**	0.102**	0.136***	0.134***	0.083*	0.094	0.093**	0.092**	0.130***	0.163***
	(0.038)	(0.037)	(0.045)	(0.044)	(0.042)	(0.051)	(0.044)	(0.406)	(0.044)	(0.046)	(0.045)	(0.041)
$Cashflow_{i,c,t} * QE_t$	0.010		–0.066**		–0.006		0.017		–0.009		0.027	
	(0.027)		(0.032)		(0.032)		(0.026)		(0.026)		(0.040)	
$Cashflow_{i,c,t} * QE1_t$		0.037		–0.058		–0.010		0.035		–0.007		0.015
		(0.043)		(0.036)		(0.060)		(0.815)		(0.042)		(0.052)
$Cashflow_{i,c,t} * QE2_t$		–0.046		–0.030		–0.040		–0.032		–0.053		0.028
		(0.054)		(0.047)		(0.048)		(0.531)		(0.035)		(0.079)
$Cashflow_{i,c,t} * Q31_t$		0.010		–0.016		0.011		0.010		0.014		–0.004
		(0.031)		(0.055)		(0.044)		(0.455)		(0.030)		(0.052)
Observations	2,264	2,264	2,642	2,642	2,525	2,525	2,381	2,381	2,108	2,108	2,798	2,798
N° Firms	316	316	237	237	241	241	258	258	214	214	285	285
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	27.30	25.95	28.96	46.37	45.64	39.53	32.88	298.3	33.60	32.69	41.81	53.05
Auto(2)	0.700	0.725	0.476	0.539	0.316	0.337	0.228	0.645	0.541	0.594	0.214	0.578
Hansen *p*-value	0.893	0.845	0.575	0.831	0.893	0.952	0.396	0.716	0.715	0.842	0.426	0.255

$$Inv_{i,c,t} = \beta_1 Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3 Cashflow_{i,c,t} * \mathrm{QE}_t + \beta_4 QE_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (1)$$

$$Inv_{i,c,t} = \beta_1 Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3 Cashflow_{i,c,t} * \mathrm{QE1}_t + \beta_4 Cashflow_{i,c,t} * \mathrm{QE2}_t + \beta_5 Cashflow_{i,c,t} * QE3_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (2)$$

This table provides estimated coefficients (robust standard errors) from the GMM system estimator regressions of equation (1) and (2). $\mathrm{Inv}_{i,t}$ is capital expenditures scaled by lagged total assets. $\mathrm{Cashflow}_{i,c,t}$ is the income based cash flow over lagged total assets. QE_t, $\mathrm{QE1}_t$, $\mathrm{QE2}_t$, and $\mathrm{QE3}_t$ represent the Federal Reserve Quantitative Easing program for the entire period, stage one, stage two, and stage three, respectively. $\mathrm{CV}_{i,c,t}$ is a set of control variables defined in Appendix. We include fixed effects at the firm level (f_i), country level (c_c), and quarterly level (q_t). ***, **, and * represent a level of significance lower than 1%, 5%, and 10%, respectively.

Table 7. QE, Restricted/Unrestricted Firms and Financial Constraints (GMM): Manufactures Firms Subsample

	Medsize				Medtangf				Ustang			
	Low		High		Low		High		Low		High	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Inv_{i,c,t-1}$	0.513***	0.540***	0.573***	0.537***	0.593***	0.577***	0.583***	0.520***	0.536***	0.539***	0.556***	0.606***
	(0.038)	(0.040)	(0.038)	(0.060)	(0.039)	(0.043)	(0.038)	(0.057)	(0.041)	(0.043)	(0.044)	(0.059)
$Cashflow_{i,c,t}$	0.149***	0.098***	0.176***	0.102***	0.108***	0.070***	0.183***	0.115***	0.100***	0.076***	0.218***	0.156***
	(0.020)	(0.021)	(0.025)	(0.035)	(0.020)	(0.024)	(0.025)	(0.029)	(0.021)	(0.025)	(0.030)	(0.029)
$Cashflow_{i,c,t} * QE_t$	0.043**		0.000		0.028*		0.038*		0.030		0.001	
	(0.018)		(0.017)		(0.017)		(0.021)		(0.019)		(0.029)	
$Cashflow_{i,c,t} * QE1_t$		0.084***		–0.057**		0.046		–0.008		0.045		–0.021
		(0.029)		(0.025)		(0.030)		(0.034)		(0.029)		(0.030)
$Cashflow_{i,c,t} * QE2_t$		–0.034		–0.065*		–0.062**		–0.028		–0.062**		–0.016
		(0.035)		(0.037)		(0.030)		(0.038)		(0.031)		(0.044)
$Cashflow_{i,c,t} * Q31_t$		0.006		0.028		0.019		0.045		0.050**		0.003
		(0.026)		(0.042)		(0.026)		(0.035)		(0.025)		(0.044)
Observations	6,431	4,800	7,514	3,953	7,105	4,536	6,840	4,217	6,787	5,138	7,158	3,615
N° Firms	900	701	802	480	785	529	775	566	845	678	715	417
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-Test	47.62	34.00	61.81	39.41	55.64	56.37	68.22	37.54	41.52	48.35	106.2	42.98
Auto(2)	0.465	0.796	0.389	0.752	0.648	0.364	0.0891	0.169	0.710	0.448	0.205	0.349
Hansen *p*-value	0.286	0.772	0.750	0.984	0.530	1.000	0.339	0.743	0.663	0.998	0.450	0.980

$$Inv_{i,c,t} = \beta_1\, Inv_{i,c,t-1} + \beta_2 Cashflow_{i,c,t} + \beta_3\, Cashflow_{i,c,t} * \mathrm{QE}_t + \beta_4\, QE_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (1)$$

$$Inv_{i,c,t} = \beta_1\, Inv_{i,c,t-1} + \beta_2\, Cashflow_{i,c,t} + \beta_3\, Cashflow_{i,c,t} * \mathrm{QE1}_t + \beta_4\, Cashflow_{i,c,t} * \mathrm{QE2}_t + \beta_5\, Cashflow_{i,c,t} * QE3_t + CV_{i,c,t} + f_i + q_t + c_c + u_{i,c,t} \quad (2)$$

This table provides estimated coefficients (robust standard errors) from the GMM system estimator regressions of equation (1) and (2). $\mathrm{Inv}_{i,t}$ is capital expenditures scaled by lagged total assets. $\mathrm{Cashflow}_{i,c,t}$ is the income based cash flow over lagged total assets. QE_t, $\mathrm{QE1}_t$, $\mathrm{QE2}_t$, and $\mathrm{QE3}_t$ represent the Federal Reserve Quantitative Easing program for the entire period, stage one, stage two, and stage three, respectively. $\mathrm{CV}_{i,c,t}$ is a set of control variables defined in Appendix. We include fixed effects at the firm level (f_i), country level (c_c), and quarterly level (q_t). ***, **, and * represent a level of significance lower than 1%, 5%, and n 10%, respectively.

Appendix**:** Variable Definition

Abbreviation	Variable	Definition
	Investment Variable	
Inv	Investment	Capital expenditures of the year t over total assets at the beginning of the period (t–1).
	Hypothesis explanatory variables	
$Cashflow$	Cash flow	Operating cash flow from the year t over total assets at the beginning of the period (t–1)
QE	QE total period dummy	1 for FED's Quantitative Easing period, and zero otherwise
$QE1$	QE first stage dummy (2009:01 -2010:01)	1 for FED's Quantitative Easing first stage period, and zero otherwise
$QE2$	QE second stage Dummy (2011:01-2011:02)	1 for FED's Quantitative Easing second stage period, and zero otherwise
$QE3$	QE third stage dummy (2012:04-2014:02)	1 for FED's Quantitative Easing third stage period, and zero otherwise
	Moderating variables	
$Tangibility$	Assets tangibility	Ratio of property, plants, and equipment over total assets
$Medtangf$	Dummy firm-country asset tangibility	1 if firm tangibility is over the year-country median (unrestricted), and zero otherwise (opaque)
$Ustang$	Dummy US industry assets tangibility	1 if SIC2 US industry level's median of the tangibility ratio is over the median, and zero otherwise
$Medsize$	Dummy size	1 if firm size is over the year-country median (unrestricted), and zero otherwise (restricted)
	Firm-level control variables	
Qtob	Tobin's Q	(Market capitalization + Total debt)/Total asset's replacement value
CF P1	Cash flow rights	Cash flow rights of the main shareholder
Size	Size	Natural logarithm of total assets
Lev	Debt ratio	Total debt to total assets
Longdebt	Long-term debt	Long-term debt to total debt
Sales	Sales ratio	Net sales to total assets
Crisis	Financial crisis periods	1 for 2008 and 2009, and zero otherwise
	Country, Industry and year	
Year-country	Year-country fixed effects	Set of year-country dummies
SIC2	Industrial code	Set of SIC two level digits industrial dummies