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Tinker, Taper, QE, Bye?

The Effect of Quantitative Easing on Financial Flows to Developing Countries

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Abstract

This paper examines gross financial inflows to developing countries between 2000 and 2013, with a particular focus on the potential effects of quantitative easing policies in the United States and other high-income countries. The paper finds evidence for potential transmission of quantitative easing along observable liquidity, portfolio balancing, and confidence channels. Moreover, quantitative easing had an additional effect over and above these observable channels, which the paper argues cannot be attributed to either market expectations or changes in the structural relationships between inflows and observable fundamentals. The baseline estimates place the lower bound of the effect of quantitative easing at around 5 percent of gross inflows (for the average developing economy), which suggests that of the 62 percent increase in inflows during 2009–13 related to changing global monetary conditions, at least 13 percent of this was attributable to quantitative easing. The paper also finds evidence of heterogeneity among different types of flows; portfolio (especially bond) flows tend to be more sensitive than foreign direct investment to our measured effects from quantitative easing. Finally, the paper performs simulations that explore the potential effects of the withdrawal of quantitative easing on financial flows to developing countries.

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Tinker, Taper, QE, Bye? The Effect of Quantitative Easing on Financial Flows to Developing Countries

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1 Introduction

In late November 2008, the United States Federal Reserve announced an hitherto unprecedented policy of unconventional monetary intervention, involving a \$600 billion purchase of mortgage-backed securities. This policy—which has come to be known as quantitative easing (QE)—was designed with the explicit purpose of bolstering weak asset markets, as well as stimulating real activity, given the perceived constraints of the zero lower bound on short-term interest rates. Over the course of the succeeding five years, the Fed engaged in a total of three separate QE episodes, so that by the beginning of the Fed's gradual unwinding in January 2014, its balance sheet had more than doubled, to \$4 trillion.

Although QE was meant to be an expansionary monetary policy for the U.S. economy, the program had profound implications for developing countries. Faced with near-zero returns in the U.S. and other high-income countries—many of which were implementing unconventional monetary policies of their own—financial capital began to seek alternative sources of yield. Emerging economies, which had enjoyed heady growth rates and stable political-economic environments over the past decade, appeared to be an ideal investment alternative.

However, cross-border financial flows respond to a host of standard "fundamental" factors—such as interest rates and growth differentials—and although inflows did recover from crisis lows during the period when QE was in place, that fact alone is insufficient for establishing whether the postcrisis recovery can be attributed to QE, since global economic and monetary conditions were also changing during that time. Moreover, since unconventional monetary policies were *designed* to operate along the same fundamental variables associated with capital flows, it is difficult to definitively answer the question of precisely what effect QE may have had on financial flows between 2009 and 2013.

Our approach to answering this question is therefore modest. Rather than ascribe a specific, quantitative estimate to the total effect of QE—which would require us to first ascertain the impact of QE on a host of secondary variables—our strategy is to begin by accounting for potential QE spillover effects through standard transmission channels—namely via liquidity, portfolio balancing, and confidence—and then seek to establish whether QE episodes saw any additional effects on financial inflows attributable to *unobservables*. Although such an estimate is likely to underestimate the total effects of QE (since the *total* effect of QE has to account for its effect via standard channels as well), it sidesteps the challenging problem of disentangling the relative contributions of QE versus other factors (such as overall economic activity) on fundamental measures, such as the interest rate. Nevertheless, our approach is biased toward a negative outcome, so if indeed we *do* find an independent effect during QE episodes, we can be fairly certain that QE played some role in influencing the movement of cross-border financial flows.

We rely on data for gross capital inflows across as many as 60 developing countries, using quarterly data for the period between 2000Q1 and 2013Q2. Our focus on gross flows is motivated, in part, by their greater volatility in developing countries; this is especially pertinent in the context of seeking to understand how financial flows move in a post-crisis environment (Broner, Didier, Erce & Schmukler 2013; Janus & Riera-Crichton 2013). We pair these gross flows data with global and country-specific variables that are selected to capture transmission along standard channels, and complement these observable measures with an indicator corresponding to the different episodes of QE. Our baseline estimation also takes into account (time-invariant) country-specific unobservables, a time trend, and the discrete fall in capital flows following the financial crisis of 2008.

Our analysis indicates that financial inflows to developing economies operate along all three potential channels of transmission for QE. More importantly, we find evidence that episodes of QE were also accompanied by increases in inflows *over and above* these observable channels. An average developing country experienced, during episodes of QE, increases in inflows of close to 5 percent, a magnitude comparable to a one standard deviation change along the traditional channels, such as changes in yield curve spreads (the portfolio channel) or the short-term interest rate (the liquidity channel). Overall, our estimates suggest that of the 62 percent of the increase in overall inflows to developing countries between 2009 and 2013 related to changing in global monetary conditions, at least 13 percent is attributable to this additional QE effect.

This unmeasured QE effect cannot be ascribed to the unprecedented nature of economic conditions during and after the financial crisis. We find relatively little evidence that the sensitivity of our observable measures for the different transmission channels changed during the QE period. Our results also point to heterogeneity in the response of different types of inflows during the period. When we decompose aggregate gross flows into their constituent components, we find that foreign direct investment (FDI) does not vary along either observable transmission channels or our QE indicator, whereas portfolio (and in particular bond) flows do, especially along global "push" factors associated with economic conditions in high-income countries.

We then use our results to perform a simulation that explores the effect of QE withdrawal on inflows to emerging markets, relative to a no change *status quo*. This is a central concern for developing economies, which have struggled to cope with the surge in financial inflows that they have experienced over the past several years, and are fearful that the renormalization of high-income monetary policies will be accompanied by a disorderly sudden stop in capital inflows. In the baseline tapering scenario we consider, we find that inflows to developing countries decline by a cumulative amount of between 10 to 12 percent (approximately 0.6 percent of GDP).

Our work speaks to several literatures. The general nature of the questions we pose has been examined by a vast theoretical (Betts & Devereux 2000, 2004; Fukuda 1993; Obstfeld & Rogoff 1995; Turnovsky 1986) and empirical (Ammer, Vega & Wongswan 2010; Ehrmann & Fratzscher 2009; Jannsen & Klein 2011; Kazi, Wagan & Akbar 2013; Kim 2001; Xiao 2011) literature on cross-border spillover effects of monetary policies. The vast majority of the papers in this vein are concerned with interest rates; more precisely, the effect of changes in the interest rate (or monetary base) on other macroeconomic and financial market variables. In contrast to these papers, we are concerned primarily with unconventional monetary policies in the form of quantitative easing, which is particularly relevant in the zero-lower bound environment of the past few years.

There has also been a small literature that emerged following the implementation of QE, which has sought to quantify the effects of QE on a range of macroeconomic phenomena, especially interest rates (Christensen & Rudebusch 2012; Gagnon, Raskin, Remache & Sack 2011; Krishnamurthy & Vissing-Jørgensen 2011; Pesaran & Smith 2012) and term premia in financial markets more generally (Bauer & Rudebusch 2013; Breedon, Chadha & Waters 2012; Joyce, Lasaosa, Stevens & Tong 2011), but also output and inflation (Chen, Cúrdia & Ferrero 2012; Kapetanios, Mumtaz, Stevens & Theodoridis 2012). By and large, this family of papers find somewhat modest but nontrivial effects, consistent with a 75–100 basis point reduction in the policy rate (although evidence on real effects are more ambiguous). However, these papers are uniformly concerned with the effects of QE on the *home* economy (in particular the United States), while we are interested more in the spillover effects as they play out in other countries, especially those in the developing world.

Of course, there is a massive literature that examines the determinants of financial inflows, including those that explore the conditions where capital flows may experience surges (Agosin & Huaita 2012; Forbes & Warnock 2012a,b; Reinhart & Reinhart 2008) and where developing countries may be disproportionately affected (Brana & Lahet 2010; Chuhan, Claessens & Mamingi 1998; Hutchison & Noy 2006; Sarno & Taylor 1999). Our modeling approach takes after these papers, but our explicit goal is to capture the effects of QE on financial flows, rather than exploring the role of a broader set of determinants. Moreover, given the relatively brief windows in which QE operations have been in effect, we emphasize slightly higher-frequency (quarterly) movements in capital flows.

Probably the papers closest in spirit to our own are those by Ahmed & Zlate (2013), International Monetary Fund (2013), Bauer & Neely (2014), Chinn (2013), Eichengreen & Gupta (2013), and Fratzscher, Lo Duca & Straub (2013). While these papers all consider the international dimensions of QE, the latter four are not primarily concerned with *gross* financial inflows, nor do they seek to break down heterogeneous effects among the distinct constituents of gross flows. As explained above, our attention to gross inflows is motivated by their greater responsiveness to monetary phenomena, which we regard as especially important in understanding potential cross-border spillover effects, and especially important for developing economies. International Monetary Fund (2013) does consider gross flows in some detail, but they limit their analysis to inflows into equity and bond funds only (as opposed to our broader mix of flows). Finally, while the paper by Ahmed & Zlate (2013) does deal substantially with a broad range of gross capital flows and QE, the focus is not on the different transmission channels involved. Furthermore, none of these papers engage with our substantive question regarding the implications of QE tapering.

The rest of this paper is organized as follows. In the following section, we provide some background on the unconventional monetary policies pursued by the Federal Reserve following the financial crisis of 2008. Section 3 reviews the theoretical literature on transmission channels for monetary policy in general, and quantitative easing in particular. We describe our empirical methodology, data sources, and key variable definitions in Section 4. Sections 5 and 6 report our baseline results and an array of robustness tests, including the addition of explanatory variables, alternative measures of our main variables, and alternative estimation techniques. The latter section also considers, in detail, differences between the behavior of different types of financial flows. Our penultimate section performs a number simulations for the withdrawal of QE, before a final section concludes with some policy reflections.

2 Unconventional monetary policies in the aftermath of the 2008 financial crisis

In the months leading up to and following the Lehman crisis in the United States in August 2008, the US Federal Reserve—along with central banks in a number of other high income economies (the Bank of England, the European Central Bank, and the Bank of Japan)—sharply cut policy interest rates, in an effort to support demand in the face of weakening output and employment. However, with interest rates already fairly low, the perceived constraints from a zero lower bound on nominal interest rates prompted the US Federal Reserve and other central banks to subsequently implement unconventional monetary policies in the form of quantitative easing.

QE involved large-scale purchases of financial assets (LSAPs), such as long-dated government bonds and mortgage-backed securities. These unorthodox measures—which were eventually realized over three episodes between 2008 and 2013 (see Table A.1 in the appendix)—were initially undertaken to repair financial market functioning and intermediation during the crisis, but subsequently evolved to support weak post-crisis recovery in growth and employment.

This extended period of highly accommodative monetary policies in high income countries has been a source of significant concern among many developing countries, who fear potential policy spillovers, primarily through an uncontrolled increase in cross-border financial flows.[1]

These fears were not unfounded. Over the four-year period between mid-2009 and the first quarter of 2013, cumulative gross financial inflows into the developing world rose from $192 billion

[1]Emerging markets have, since the beginning, voiced their concern over unmitigated financial flows due to QE. Foreign exchange intervention by developing countries to arrest exchange rate appreciation due to capital inflows sparked talk of "currency wars" (Mackintosh 2010) and what many regarded as a forced buildup of foreign exchange reserves (Beckner 2013).

to \$598 billion, more than twice the pace compared to the far more modest increase of \$185 billion between mid-2002 and the first quarter of 2006 (Figure 1(a)).[2] When expressed as a share of developing country GDP, they more than doubled (Figure 1(b)). Developing world equity markets also experienced substantial gains, and the many emerging economies that received substantial volumes of inflows relative to their GDP also saw significant appreciation of their real effective exchange rates.

The initial concerns of developing countries over unmanageable financial inflows have since been compounded by the possibility of disorderly capital flow reversals. In the middle of 2013, the Fed's anticipated exit from QE sparked substantial outflows from a number of emerging market economies. The specter of further tapering of asset market purchases by advanced-economy central banks could mean increases in borrowing costs, as well as other financial market disruptions due to the unwinding of speculative positions.[3] In January 2014, the Fed began the long-awaited taper of asset market purchases, which marked the beginning of the end to the period of unconventional monetary policy.

3 Channels of transmission for unconventional monetary policy

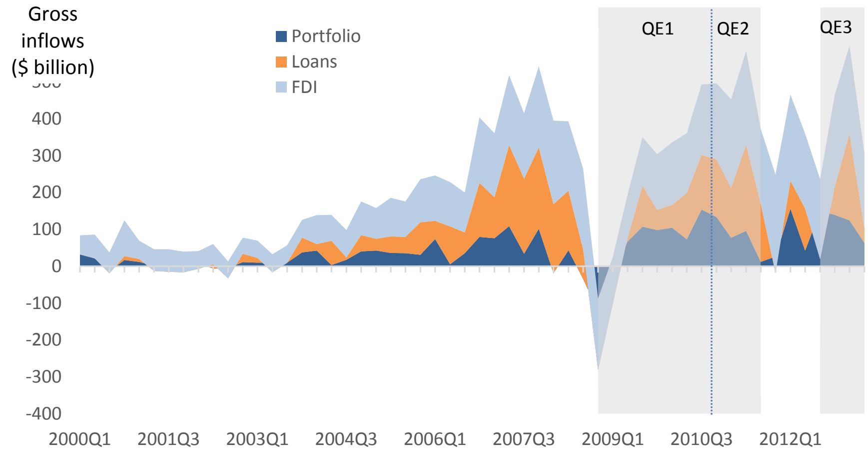
Traditional monetary policy operates along the interest rate and other asset price channels—including exchange rates and equity prices—as well as the credit channel, which includes bank lending and balance sheet mechanisms (Mishkin 1996). In contrast, the premise for unconventional monetary policies is that these traditional channels are either ineffective, unavailable, or weak, which justifies large-scale asset market interventions by the central bank.

A central transmission channel by which such asset purchases affect cross-border capital flows is via the *portfolio balance* channel (Gagnon *et al.* 2011; Hamilton & Wu 2012). QE involves the purchases of longer-duration assets—typically mortgage-backed and long-dated government bonds—which in turn reduces the available stock of privately-held risk assets. Unmet risk appetite will thus be met by increasing demand for other risky investments. Thus, we would expect the portfolio balance channel to be expressed both in terms of heightened demand for *temporal* (longer duration) and *spatial* (developing country) assets, which comes about as investors rebalance their portfolios.

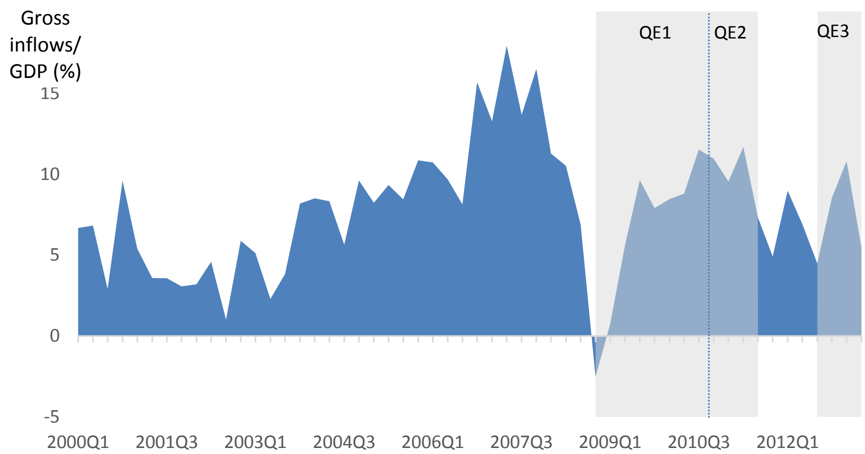
Another key transmission channel for QE is the *liquidity* channel (Gagnon *et al.* 2011; Joyce *et al.* 2011; Krishnamurthy & Vissing-Jørgensen 2011). The long-term assets purchased through

[2]This comparison deliberately excludes the pre-crisis boom in inflows between 2006 and 2008. An alternative way to express the same sentiment is that cumulative inflows since the beginning of QE has paralleled the increases in the immediate pre-crisis "bubble" period.

[3]This anticipated tapering of QE has resulted in depreciations in a large number of developing-country currencies (Geddes 2013), and developing economies have also expressed concern over additional spillover effects due to the QE exit (Wigglesworth 2013).



(a) Gross inflows to developing countries, cumulative value



(b) Gross inflows to developing countries, as share of GDP

Figure 1: Gross financial inflows to developing countries, by different constituent flows, in cumulative U.S. dollars (left panel) and as share of developing country GDP (right panel). The three quantitative easing episodes are shaded. The sharp contraction in flows following the financial crisis in 2008 is evident. Increases in portfolio and loan flows over the period appear to be equiproportional, but faster than the increase in FDI (left panel). The variations in gross flows as a share of GDP mimic those in absolute terms, although the post-crisis recovery in flows remains below pre-crisis peaks when measured in this manner (right panel).

QE operations are credited as increased reserves on the balance sheets of private banks. Since such reserves are more easily traded in secondary markets than long-term securities, there is a decline in the liquidity premium, which in turn enables previously liquidity-constrained banks to extend credit to investors. This results in an decline in borrowing costs and increases overall bank lending, including lending to developing countries.

Finally, QE can also play a signaling role. Large-scale asset purchases serve as as a credible commitment to keep interest rates low even after the recovery of the economy, since a premature increase in interest rates would imply a loss on assets held by the central bank (Bauer & Rudebusch 2013; Clouse, Henderson, Orphanides, Small & Tinsley 2003). Moreover, such signaling can also improve household and business sentiment by diminishing concerns about deflation risk (Hendrickson & Beckworth 2013); steady central bank asset market interventions can also reduce volatility and hence economic uncertainty. The sum total of these *confidence* channel effects is to bolster investment activity, and is the final channel of QE transmission to developing country financial flows that we consider.[4]

4 Measuring and estimating the effects of QE on financial flows

4.1 Econometric model and estimation methodology

Our baseline regression specification is a lagged-dependent model of the form

$$\begin{aligned} GFI_{it} = GFI_{i,t-1} + \lambda L_{it} + \pi PB_{it} + \chi C_{it} + \theta QE_{it} + \boldsymbol{\beta}'\mathbf{X}_{it} \\ + CRISIS_t + POSTCRISIS_t + \alpha_i + \tau_t + \epsilon_{it}, \end{aligned} \tag{1}$$

where the effects of unconventional monetary policy on gross financial inflows to country i at time t, GFI_{it}, may be transmitted via (observable) liquidity (L_{it}), portfolio balance (PB_{it}), and confidence (C_{it}) channels, but may also encompass additional effects due to unobservables, which we proxy with the indicator variable QE_{it}. We further include dummies to account for the sharp drop in crisis ($CRISIS_t$) flows and the possibility of a post-crisis ($POSTCRISIS_t$) "secular stagnation" (Figure 1).[5] We also include a vector $\mathbf{X}_{it}$ of additional time-varying idiosyncratic controls (such as the countrys GDP, growth rate, and its risk rating) controls, country-specific fixed effects (α_i), and a time trend (τ_t). $\epsilon \sim NID\left(0, \sigma_\epsilon^2\right)$ is the residual. Our coefficients of interest correspond

[4] While we recognize that these channels that we describe do not constitute an exhaustive list, our decision to focus on the liquidity, portfolio balance, and confidence channels is due to three reasons. First, there is a substantial degree of overlap between some of the more esoteric channels that have been explored in the literature, and what we identify here. For instance, Vayanos & Vila (2009) identify a duration risk channel where central bank asset purchases are able to alter investors' preferred duration risk, and hence compress the yield curve. But when interpreted more broadly a mechanism that alters term premia and hence the shape of the yield curve, this channel—along with others, such as the safety channel (Krishnamurthy & Vissing-Jørgensen 2012)—arguably falls within the broader rubric of portfolio rebalancing. Second (and relatedly), we have chosen to subsume channels that may be distinct but are likely to be measured in a similar fashion. For example, given the difficulty of identifying proxies for sentiment, we have chosen to fold expectational and signaling effects into a single channel, confidence. Third, while it is clear to us what the cross-border spillover effects are of the channels that we identify, other possible channels may have more ambiguous cross-border implications, which justifies our exclusion.

[5] These variables take on the value of unity for all quarters between 2008Q3 and 2009Q2 (inclusive), and 2009Q3 and 2013Q2 (inclusive), respectively.

to the vector $[\lambda\ \pi\ \chi\ \theta]$ of estimated coefficients that correspond to the different observable and unobservable transmission channels.

Since (1) is a dynamic model with fixed effects, these estimates may be biased for finite T (Nickell 1981). Since Given the time coverage of the dataset is relatively long (54 quarters), we suspect that the inconsistency of estimates should not pose a major problem (since the bias is of $O\left(\frac{1}{T}\right)$). Nevertheless, our coefficients are estimated using bias-corrected Least Squares Dummy Variables (LSDV) (Bruno 2005), under the strictest condition for bias approximation (up to $O\left(\frac{1}{NT^2}\right)$), with bootstrapped standard errors.[6]

In our simulations where we examine possible tapering scenarios (Section 7), we discipline our conditioning variables by implementing a vector autoregressive (VAR) specification comprising the various transmission channels. We thus modify our baseline specification 1 to

$$\mathbf{TC}_{it} = \boldsymbol{\alpha} + \sum_{k=1}^{K} \boldsymbol{\beta}_k \mathbf{TC}_{i,t-k} + \boldsymbol{\epsilon}_{it}, \tag{2}$$

where the matrix $\mathbf{TC}_{it} = [\mathbf{L}_{it}\ \mathbf{PB}_{it}\ \mathbf{C}_{it}\ \mathbf{X}_{it}\ \mathbf{GFI}_{it}]$ is composed of the (global) transmission channels, along with controls ($\mathbf{X}_{it}$) and aggregate developing-country gross inflows ($\mathbf{GFI}_{it}$), $\boldsymbol{\beta}_k$ is a vector of coefficients, and $\boldsymbol{\epsilon}_{it}$ is a vector of disturbances.[7] Since this application is designed to capture the effect of the movements in primarily global variables, i in this case applies either to the developing or high-income aggregate.

To estimate (2), we impose additional assumptions. Our (structural) identification strategy imposes a Cholesky decomposition of the covariance matrix, with an ordering such that the first variable cannot respond to contemporaneous shocks (within the same quarter) from any other variables, the second one responds to contemporaneous shocks affecting only the first variable but no others, and so on.[8] Since the system given by (2) produces independent estimates of aggregate gross inflows, we use these as a useful cross-check for our scenario projections which are based on (1).

4.2 Data sources and definitions of key variables

Our analysis draws primarily on balance of payments data from the International Monetary Fund's International Financial Statistics (IFS) for gross portfolio and FDI inflows. We supplement these two flows with bank lending data from the Bank of International Settlements' Locational Banking

[6]The correction is initialized by the Anderson & Hsiao (1982) consistent estimator for β_0, and the bootstrapped asymptotic variance-covariance matrix is constructed with 100 replications.

[7]We rule against a panel VAR specification, which would allow for country-specific controls, because the channel variables we include in **TC** are not country specific; introducing country-level controls would also further reduce the degrees of freedom in an already small sample.

[8]The specificities of our VAR identification assumptions are discussed in Subection 7.1.

Statistics (LBS).[9] We define our main dependent variable of interest, aggregate *gross financial inflows*, as the sum of changes in foreign holdings of these three categories of assets (portfolio, FDI, and loans) in the developing economy, net of their own disinvestment in each of these three flows. In our robustness checks, we also draw on EPFR Global's Global Fund Flows and Allocations Data—which compiles secondary market transactions of bond and equity purchases in emerging market mutual funds—to obtain a complementary gross inflow measure; we define this alternative measure as *gross fund inflows*.[10] Other additional control variables were obtained from the IFS and the World Bank's World Development Indicators, supplemented by data from Haver Analytics and Datastream where gaps exist.

Our main independent variables of interest is a suite of variables designed to capture the effects that occurred during QE episodes accruing to unobservables. We consider three alternative primary measures, all of which are global in nature: an indicator variable that corresponds to any of the three distinct periods for which a QE program was implemented, separate indicator variables for each of the three episodes, and a continuous measure of QE interventions based on expansions in the size of the central bank's balance sheet.[11] For the indicator variables, our coding scheme for the start/end quarters defines a quarter as belonging to the implementation window if the total number of implementation days exceeded half the days in any given quarter (e.g. QE1 operations, which began on December 16, 2008, is coded as starting 2009Q1, while QE2, which came into effect on November 3, 2010, is coded as beginning 2010Q4) (precise details of this coding scheme are provided in the appendix). In our baseline, we consider only QE operations by the U.S. Federal Reserve (which we subsequently expand in robustness checks to allow for QE operations in other major advanced-economy central banks).

We use a number of distinct measures to capture each of the potential transmission channels for QE. For each channel, we include a primary indicator (or set of indicators), which we use in our more parsimonious specification, and additional secondary indicators, which are distinct but related alternative measures that we introduce in an extended specification.

[9]The IFS data do include a residual category, "other investments," that includes loans as a subcomponent. However, this category also includes other forms of cross-border finance (such as trade credit and cash) that are of a fundamentally different nature from bank loans, which make it harder to draw inferences when we disaggregate by flow type. The main advantage of using the "other investments" data is that they aggregate consistently with outflows to yield the balance of payments. Since ensuring this consistency is not important for our application, we use the more clearly-delineated LBS data instead.

[10]Since only relatively few countries report this breakdown to the IMF, the IFS data provide relatively scant country coverage. While our alternative measure of gross inflows represents only a relatively small segment of the total market for financial assets, it tends to closely track actual balance of payments flows remarkably well (Miao & Pant 2012), and serves as a useful robustness check for our main dependent variable.

[11]It is conceivable that these indicators are capturing unobservable effects that are nevertheless directly attributable to the observable channels, and merely reflect a change in the structural relationship along these channels during the QE period. We explore this possibility by examining interaction effects of the QE episode indicator with our other channel measures in Subsection 5.2.

For the *liquidity* channel, our primary indicator is the 3-month Treasury bill rate. This measures the effect of changes in short-term rates resulting from QE operations.[12] Our secondary liquidity measure is the (lagged) money supply (M2), which serves as a quantity-based measure of available liquidity.[13] While analogous, these two variables capture slightly different notions of liquidity: the former is a price signal that may or may not translate into actual changes to the stock of outstanding money. Note, as well, that our use of M2 as the measure of the money supply ensures that it overlaps only minimally with changes in the monetary base that result from QE operations.[14]

Our primary measures for the *portfolio balance* channel are the yield curve (the difference between the long-term interest rate and short-term policy rates) and the interest rate differential between the developing country vis-à-vis the United States. The first is a global variable, and captures the effect that QE can have on long-term yields, and hence temporal rebalancing toward higher-risk asset classes, of which developing-country investments are one. The second is a country-specific variable, and captures the more traditional spatial rebalancing that arbitrages cross-country differences in yields that result from QE. Since these are sufficiently distinct aspects of portfolio rebalancing due to QE, we include them both as primary indicators. The secondary measures that we consider supplement our primary return differentials with their growth analogues: the country-specific lagged growth differential (relative to the United States), and the global composite purchasing managers' index (PMI). These proxy spatial rebalancing toward asset classes that are more sensitive to short-term growth expectations and longer-term expectations of overall global growth, respectively.

Finally, our primary *confidence* channel indicator is a global variable, the VIX index. This measure is designed to capture market sentiment for investing in risk assets, in particular, although it has been used in other applications as a measure for broader financial market uncertainty.

The other controls that we include, such as GDP, are standard and detailed definitions and source information are relegated to the appendix. Here we highlight the inclusion of the Institutional Investor risk rating in our baseline specification; although not a channel for QE transmission, this country-specific measure captures the important aspect of the attractiveness of a given developing country as an investment destination. The data periodicity is quarterly, spanning 2000Q1 through 2013Q2 (inclusive), and constitutes an unbalanced panel comprising as many as 60 developing

[12]Note that reductions in the liquidity premium that result from QE will tend to lower the price of short-term Treasuries, which is reflected in *higher* yields. Increased Treasury yields raise the opportunity cost of alternative investments—including that of developing world assets—such that, *ceteris paribus*, inflows can be expected to fall (implying a negative coefficient).

[13]This variable is lagged since quantity signals are generally regarded as slower to disseminate than price signals. Although its interpretation is more indirect, *a priori*, we expect this coefficient to be negative: an increase in M2 indicates an increase in available financing, which lowers the liquidity premium (raises yields on liquid assets), and substitutes away from financial investments in developing countries.

[14]Pairwise correlations are also relatively low: more precisely, $\rho\left(r_{US,t}, ms_{US,t}\right) = -0.49$ and $\rho\left(ms_{US,t}, mb_{US,t}\right) = 0.X$.

countries. To maximize coverage, we impute quarterly observations using a cubic spline for a small number of low-volatility control variables which were only available at an annual frequency. Additional details, including country coverage, summary statistics, and cross-correlations, are in the appendix.

4.3 Identifying the potential effect of QE

It is important to raise two important caveats to the discussion above. First, while the variables we select are meant to proxy for the observable transmission channels of QE, these measures may well be relevant for capital flows even in the *absence* of unconventional monetary policy. For instance, while the flattening of the yield curve is one of the primary goals of QE, changes in the long-term cost of capital will also alter the shape of the yield curve, which can in turn affect financial flows even in periods of unexceptional monetary policy.

Second, these variables may also vary for reasons *unrelated* to QE. For example, exogenous improvements in productivity can alter the growth differential between economies, even without monetary stimulus in one country versus another. Indeed, the growth differential is a fairly standard feature of most models of cross-border financial flows, as is the interest rate differential.

Consequently, we do not make claims that point estimates corresponding to these variables necessarily represent the full effects of QE spillovers on financial inflows. Nor do we seek to pin down the marginal contribution of QE via the standard channels, which would require us to first determine the precise impact of QE on these fundamentals. Rather, as discussed in the introduction, our goal is to establish whether there are any additional, unobserved effects of QE, after taking into account changes in the observable channels. This allows us to sidestep the issue of identifying a causal influence of QE on the fundamentals, as long as we treat any estimated effect from the unobserved component as representing a *lower bound* to the potential effects of QE.

That said, it is useful to note that since the global variables represent changes in financial and economic conditions in high-income (in particular the U.S.) countries, changes in these variables are plausibly exogenous from the point of view of our dependent variable (gross inflows). Of course, one could argue that endogeneity may still arise from unobserved, common factors that affect both high-income and developing countries equally. We recognize this possibility—indeed, our empirical strategy embodied in (1) is to account for the effects of as many distinct common unobservables as possible—but in our robustness checks, we also consider using only a single global factor, which aims to fully account for global unobservables in a systematic fashion.

Finally, note that in our VAR specification in (2), we do *not* include an explicit QE measure. Our goal in implementing a VAR is not so much to directly model the effect of QE in a system, but rather to discipline the coevolution of the fundamentals in a standard normalization scenario. Consequently, we capture the role of QE during the normalization process explicitly (and solely) through our estimates of the unobservable QE effect.

5 Baseline results

5.1 Regression results and main findings

As alluded to in the previous section, our baseline estimates of (1) include two alternative specifications: a parsimonious model that includes only our primary indicators for each channel, and an extended specification that includes our secondary indicators. These are reported in Table 1, where the first three columns (*B1*)–(*B3*) correspond to the parsimonious specification for each of the three alternative channel measures, and the next three columns (*B4*)–(*B6*) to the extended specification, again for each of the three channels.

The lagged dependent variable is highly significant across all the specifications, suggesting a certain degree of partial adjustment, which is not unexpected for quarterly data. While this might suggest the need to incorporate a deeper lag structure, model selection criteria point to retaining just a single lag.[15] Summary statistics suggest that much of the variation from the sample is, as to be expected, between economies, although within variation (on which our estimates depend) is reasonably high (explaining slightly more than a third of variation in the data).

There are several broad conclusions to be drawn from this set of baseline results.

First, the QE episode indicators enter with statistically and economically significant coefficients: the combined QE episode indicator, for instance, suggests that the QE period saw an increase in gross financial inflows to developing countries of $0.03/(1-0.47) \approx 5$ percent, *over and above* the effects that QE may have had on observable channels, such as a reduction in the VIX due to improved confidence, or the flattening of the yield curve as investors rebalanced their portfolios. This is nontrivial, and comparable to a one standard-deviation change in these other traditional channels (such as changes in yield curve spreads or the short-term interest rate). If we concentrate on the period between 2009H1 and 2013H1, about 13 percent of the total change in inflows are directly attributable to this effect of QE on unobservables, compared to around 50 percent of the change accruing to observable monetary conditions (this decomposition is graphically depicted in Figure A.1 in the annex).

It is also notable that when we break down the measure into the three separate variables, these measures of QE display a diminishing effect for each episode: the magnitude of the coefficient decreases from the first and second QE interventions, and is actually insignificant for QE3 in the extended specification (*B4*). This possibility—that LSAPs were more efficacious in the earlier QE episodes than the most recent one—is in fact consistent with what the literature has found for the

[15] We considered lag depths of up to 2 years (8 lags). Both the Akaike and Bayesian information criteria select the model with only one lag. Results for these additional regressions are available on request.

Table 1: Baseline regressions for gross financial inflows, unbalanced quarterly panel, 2000Q1–2013Q2†

	B1	**B2**	**B3**	**B4**	**B5**	**B6**
Lagged inflows	0.469	0.477	0.476	0.466	0.473	0.473
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
All QE episodes	0.027			0.026		
	(0.01)***			(0.01)***		
QE1 episode		0.047			0.049	
		(0.01)***			(0.01)***	
QE2 episode		0.033			0.035	
		(0.01)***			(0.01)***	
QE3 episode		0.008			0.006	
		(0.01)			(0.01)	
QE-related expansion			0.003			0.002
			(0.00)***			(0.00)***
			Liquidity channel			
3M T-bill rate	-0.013	-0.020	-0.003	-0.016	-0.017	-0.006
	(0.00)***	(0.00)***	(0.00)	(0.01)*	(0.01)**	(0.01)
Money supply (M2)				-0.106	0.144	-0.098
				(0.22)	(0.26)	(0.22)
			Portfolio balance channel			
Yield curve	-0.018	-0.027	-0.007	-0.018	-0.024	-0.007
	(0.00)***	(0.01)***	(0.00)	(0.01)**	(0.01)***	(0.01)
Interest rate differential	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Global PMI				-0.001	-0.001	-0.002
				(0.00)	(0.00)	(0.00)
Growth differential				0.001	0.001	0.001
				(0.00)*	(0.00)*	(0.00)
			Confidence channel			
VIX	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
			Basic controls			
GDP	0.139	0.134	0.137	0.129	0.125	0.128
	(0.03)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***
Developing GDP growth	0.003	0.000	0.002	0.004	-0.000	0.004
	(0.00)*	(0.00)	(0.00)	(0.00)**	(0.00)	(0.00)**
High-income GDP growth	-0.001	-0.000	-0.001	-0.000	0.001	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Country rating	0.002	0.002	0.002	0.002	0.002	0.002
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Crisis period	-0.019	-0.028	-0.023	-0.021	-0.026	-0.026
	(0.01)	(0.01)**	(0.01)*	(0.01)	(0.01)*	(0.01)*
Post-crisis period	0.002	-0.011	-0.028	0.002	-0.010	-0.026
	(0.01)	(0.01)	(0.02)*	(0.01)	(0.01)	(0.02)
Adj. R^2	0.368	0.371	0.366	0.368	0.371	0.367
R^2 (within)	0.372	0.376	0.370	0.374	0.377	0.372
R^2 (between)	0.522	0.525	0.525	0.526	0.529	0.528
N (countries)	1,938 (60)	1,938 (60)	1,938 (60)	1,925 (60)	1,925 (60)	1,925 (60)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses. A time trend, country fixed effects, and constant term were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

U.S. economy (Cúrdia & Ferrero 2013; Krishnamurthy & Vissing-Jørgensen 2013).

Second, to the extent that QE affected the fundamentals, there is evidence that its transmission occurred along all three channels. The rate on 3-month Treasury bills is generally negative and significant; this is consistent with how reductions in the liquidity premium due to QE increased yields on short-term bills, which in turn served as a substitute for developing country asset, hence reducing financial inflows[16] (the money supply, in contrast, tends to be indistinguishable from zero). The coefficient on the U.S. yield curve also typically enters with a significant, negative coefficient, consistent with temporal portfolio rebalancing. The evidence on spatial rebalancing, however, is more mixed; while the coefficient on the (lagged) growth differential is statistically significant, it is small in magnitude, and the coefficient on the interest rate differential is indistinguishable from zero across all specifications.[17] There is also evidence that confidence effects are relevant: the coefficient on the VIX is highly significant, and is in fact the most robust covariate among the different transmission channel proxies.

Third, these significant fundamental variables all appear to operate at a global level: the measures tend to be global "push" factors of abundant liquidity (falling 3-month bill rates), portfolio rebalancing away from long bonds (a flattening yield curve), and improved confidence for investing in risky assets (a shrinking VIX). Our results in this regard are consistent with the broader literature on financial flows, which has found that global "push" factors tend to dominate country-specific "pull" factors (Baker, Wurgler & Yuan 2012; Fratzscher 2012; Fratzscher *et al.* 2013).

Finally, we note that a number of the controls, in particular GDP and country risk, consistently enter with significant coefficients that are in accordance with theory. For example, the coefficient on GDP is generally positive (an increase in GDP is associated with more financial inflows), although the small size of the coefficient (significantly less than one) suggests a diminishing effect.[18] The crisis dummy is also negative and significant, a result consistent with the substantial reduction in global capital flows following the crisis (recall Figure 1).

What would be the total effect of QE in this case? Given our estimates in Table 1, the lower bound of QE effects would likely be, for the average country, around 5 percent of gross financial

[16]To the extent that the T-bill rate was *falling* during the early part of QE, this would suggest that inflows into developing countries would have increased as short-term Treasuries became less attractive.

[17]The insensitivity of financial flows to interest rate differentials, while disappointing, has been fairly widely replicated in the literature on gross flows; see, for example, Bruno & Shin (2013) and Forbes & Warnock (2012a). One reason for this may be the *counter*cyclical relationship of capital flows to the real interest rate (Contessi, De Pace & Francis 2013), which would obviate any portfolio rebalancing effect due to changes in interest rate differentials.

[18]The total effect of this coefficient is (for a lagged dependent coefficient of 0.47) equal to $0.13/(1-0.47) \approx 0.25$. Since the model includes country fixed effects, this amounts to a *within* estimate of a concave relationship between inflows and GDP. However, this estimate likely underestimates the total effect (i.e. when *between* differentials are taken into account). For example, the standardized coefficient—which implicitly captures between-country variation in GDP since it draws on the pooled sample to compute standard deviations—is significantly larger (in excess of one), which strongly suggests that the inflow/GDP ratio is not diminishing when examined at the cross-country level (estimates with standardized coefficients for the baseline are reported in the appendix).

inflows. Thus, even if one assumes no transmission via the observable channels, this unobservable component of the effect of QE still accounts for an increase in inflows in the order of several percent. If one is willing to make the additional assumption that changes in the observable fundamentals are entirely attributable to QE, the effects would be even greater. For example, including the portfolio balance effect from a 129 basis point decrease in yield curve spreads (one standard deviation in our data) would yield an increase in gross inflows of between 3 and 5 percent. If changes along all the three channels were assumed to be fully due to QE, the total effects could be as large as 15 to 22 percent.[19]

5.2 Understanding the effects of unobservables due to QE

It is tempting to assign a specific interpretation to the unobservable effect of QE. In this subsection, we consider two possible candidate explanations that may potentially explain the significance of the QE episode variable.

The first explanation we probe is whether the unmeasured effects are implicit measures of expectations. Although difficult to precisely measure, *market* expectations are, in principle, recoverable from data on futures and forwards. We draw on two market-based measures in this regard: the yield implied by the 3-year futures contract for the 3-month T-bill, and an "implied" yield curve, calculated as the difference between the 3-year implied forward rate for the 10-year Treasury note and 3-year futures of the 3-month bill.[20] Since the VIX already embodies an expectations component, we do not introduce any additional controls for expectations via the confidence channel.

The most straightforward way to incorporate expectations is to take the difference between a future/forward-implied rate and the prevailing rate; for example, the difference between the *current* 3-month T-bill futures rate and the 3-month T-bill rate. This captures the manner by which differences between market expectations of future short rates and contemporaneous short rates can affect financial flows; put another way, these are *anticipated* rate changes. We introduce additional "expectation" measures along these lines for the 3-month rate only, the yield curve only, and both, in columns (*E1*)–(*E3*) of Table 2, respectively.

Another way to think about expectations is to consider how expectational *errors* may come into play. Computation such errors amounts to taking the difference between current realizations of a yield and the *3-year lagged* implied yield from futures/forwards; a positive value of the deviation between the T-bill rate and lagged 3-year forecasts of the same rate would suggest that market

[19]These are computed from the minima and maxima among the significant coefficients across all specifications in Table 1, assuming a one standard deviation change for all measures with the exception of the QE episode indicator, which is assumed to hold at unity.

[20]We use a 3-year time frame to maintain consistency with our forward-looking exercise in Section 7, which has a 3-year projection window. Since equivalent price data for futures on the 10-year note are not generally available (and even if they were would likely embed a nontrivial liquidity premium), we instead rely on computed implied forwards to capture expectations of yields for the 10-year note.

participants systematically underpredicted yields. We include these "error" measures—which we can treat as *unanticipated* rate changes—in columns (*E4*)–(*E6*).

Table 2: Regressions for gross financial inflows with expectational measures, unbalanced quarterly panel, 2000Q1–2013Q2†

	E1	**E2**	**E3**	**E4**	**E5**	**E6**
Lagged inflows	0.462	0.462	0.462	0.461	0.463	0.463
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
All QE	0.031	0.031	0.031	0.028	0.029	0.030
episodes	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
3M T-bill	-0.001		0.019			
(expectation)	(0.02)		(0.06)			
Yield curve		0.002	0.012			
(expectation)		(0.01)	(0.03)			
3M T-bill				-0.005		0.003
(error)				(0.01)		(0.01)
Yield curve					0.013	0.017
(error)					(0.01)	(0.01)
Channel variables	Yes	Yes	Yes	Yes	Yes	Yes
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.367	0.367	0.366	0.367	0.368	0.367
R^2 (within)	0.372	0.372	0.372	0.373	0.373	0.373
R^2 (between)	0.527	0.527	0.527	0.527	0.527	0.527
N (countries)	1,938 (60)	1,938 (60)	1,938 (60)	1,925 (60)	1,925 (60)	1,925 (60)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses. A time trend, country fixed effects, and constant term were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

On the basis of these results, we see no basis for attributing the QE episode effect to unmeasured expectations. Both classes of expectational measures enter with small, and statistically insignificant, signs. In some ways, this should not be entirely surprising; market-implied forecasts of interest rates generally perform rather poorly, especially at longer horizons (Campbell & Shiller 1991; Lange, Sack & Whitesell 2003). We are thus inclined to discount the possibility that the QE effect due to unobservables is due to either anticipated or unanticipated expectations of future interest rates changes.

The second explanation that we explore is whether the QE episode indicator is indirectly capturing structural shifts in the observable factors, due to the unprecedented nature of QE. Framed another way, the magnitude of monetary policy intervention in asset markets may have led to a change in the elasticity of response of gross inflows to the conventional, observable channels.

We operationalize this hypothesis by interacting our measures of the liquidity, portfolio balance, and confidence channels with the QE episode indicator. For each channel, we consider both the parsimonious (first four columns) and the extended specifications (latter four columns). In the initial three columns of each set—(*I1*)–(*I3*) and (*I5*)–(*I7*), respectively—we interact the measures separately by channel; while in the final ones—(*I4*) and (*I8*), respectively—we consider them all in tandem. These results are reported in Table 3.

The main message one receives from this set of results is that there is little evidence that supports the argument that the sensitivity of transmission channels for unconventional monetary policy changed as a result of QE (with the exception of the interaction with the money supply). By and large, the coefficients on most of the uninteracted variables in Table 3 remain significant (if they were before in Table 1), whereas the coefficients on the interaction terms are generally statistically indistinguishable from zero.[21]

The significant, negative coefficient on the interaction of QE and the money supply deserves some comment. First, we note that it enters with a negative sign, which is consistent with the relevance of a liquidity channel being operative, since the rapid expansion of M2 since the financial crisis[22] would have lowered liquidity premia, in turn raising yields on liquid assets that served as substitutes for developing country assets.

That said, we are inclined to somewhat discount this particular result, for a number of reasons. First, we do not observe a similar significance in the interaction effect for the 3-month T-bill rate, which would corroborate the potential importance of elasticity changes along this channel. Second, this coefficient is significant in specifications where the coefficients on the 3-month T-bill rate (interacted and uninteracted) fall out of significance, which raises the concern that the significance of the coefficient could be an artifact of possible multicollinearity, rather than a genuine interaction effect.[23] Finally, although the magnitude of the effect appears fairly large (and would therefore argue for taking this effect into account), this is because of scaling differences; the standardized coefficient for M2 (reported in Table A.7) reveals that it exerts an effect of a similar magnitude the short-term interest rate, which *is* taken into account for in the uninteracted model.

As a final point, we do note that the coefficient on the (lagged) growth differential and yield curve in (*I6*) is marginally significant, as is the interaction of VIX and QE in (*I3*). However, these enter with the *opposite* sign. Since our goal is, in any case, not to identify the effects of QE via the

[21]Note also that the insignificant coefficient on the uninteracted QE episode variable in most of the specifications need not be a real cause for concern. For proper inference, the total effect of any given channel has to be inferred from the sum of both the uninteracted and interaction terms, and a weighted standard error computed from the variance-covariance matrix. For example, the marginal effect of the QE episode in specification (I1), computed at the means, is 0.167, with a standard error of 0.02 ($p = 0.00$).

[22]A small but vocal minority of economists have argued that monetary policy following the crisis was actually *contractionary*, rather than expansionary (Sumner 2009). Our money supply data, which (like the rest of our model) is measured in real terms, actually shows an acceleration of real M2 since mid-2008, although admittedly M2 has lagged its linear trend, mainly because there was a substantial slowdown in M2 expansion between 2004 and 2008.

[23]And as discussed earlier, we favor the T-bill rate since, as a price signal, it offers a potentially faster-reacting measure of effects via the liquidity channel.

Table 3: Regressions for gross financial inflows with interacted channels, unbalanced quarterly panel, 2000Q1–2013Q2†

	I1	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**	**I8**
Lagged inflows	0.474	0.471	0.474	0.474	0.474	0.470	0.471	0.473
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
All QE	0.002	-0.004	-0.005	-0.031	5.086	0.102	-0.003	10.201
episodes	(0.01)	(0.02)	(0.01)	(0.02)	(2.37)**	(0.07)	(0.02)	(5.07)**
					Liquidity channel			
3M T-bill	-0.009	-0.022	-0.011	-0.018	-0.012	-0.018	-0.011	-0.008
rate	(0.00)**	(0.01)***	(0.00)***	(0.01)***	(0.01)	(0.01)*	(0.01)	(0.01)
3M T-bill	0.065			0.072	0.003			0.059
× QE	(0.03)**			(0.09)	(0.04)			(0.09)
Money supply					0.268	0.012	-0.006	0.403
					(0.27)	(0.23)	(0.23)	(0.29)
Money supply					-0.316			-0.630
× QE					(0.15)**			(0.31)**
					Portfolio balance channel			
Yield curve	-0.014	-0.029	-0.016	-0.026	-0.021	-0.025	-0.015	-0.019
	(0.00)***	(0.01)***	(0.00)***	(0.01)***	(0.01)**	(0.01)**	(0.01)	(0.01)
Yield curve		0.015		0.017		0.017		-0.011
× QE		(0.01)		(0.01)		(0.01)*		(0.02)
Interest rate	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
differential	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Interest rate		-0.001		-0.000		-0.000		-0.000
diff. × QE		(0.00)		(0.00)		(0.00)		(0.00)
Global PMI					-0.001	-0.000	-0.001	-0.000
					(0.00)	(0.00)	(0.00)	(0.00)
Global PMI						-0.002		-0.000
× QE						(0.00)		(0.00)
Growth					0.001	0.001	0.001	0.001
differential					(0.00)*	(0.00)	(0.00)*	(0.00)
Growth diff.						0.001		0.001
× QE						(0.00)		(0.00)
					Confidence channel			
VIX	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.002	-0.001
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
VIX × QE			0.001	-0.000			0.001	-0.003
			(0.00)**	(0.00)			(0.00)*	(0.00)
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.369	0.369	0.369	0.370	0.371	0.370	0.369	0.371
R^2 (within)	0.374	0.374	0.374	0.375	0.377	0.376	0.375	0.379
R^2 (between)	0.524	0.522	0.524	0.524	0.530	0.532	0.528	0.534
N (countries)	1,938 (60)	1,938 (60)	1,938 (60)	1,938 (60)	1,925 (60)	1,925 (60)	1,925 (60)	1,925 (60)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses. A time trend, country fixed effects, constant term, and basic controls from the extended specification were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

observable fundamentals, we simply recognize that this result would tend to downward bias our estimates of the uninteracted effects.

6 Robustness of the baseline

6.1 Additional and alternative controls and estimators

We test the sensitivity of our baseline by several ways. Our first set of tests incrementally introduces additional controls that correspond to: (*R1*) the global level of saving (to account for the quantity of investable funds); (*R2*) the (lagged) ratio of trade to output (to account for economic openness); (*R3*) the (lagged) ratio of private credit to output (to account for variations in the level of financial development); (*R4*) the (lagged) ratio of debt to GDP (to control for the existing debt burden); (*R5*) the inflation differential (to allow for possibility excess inflation may reduce the value of investment in any given economy);[24] (*R6*) the (lagged) real exchange rate (which allows for exchange rate differentials to affect inflows).

The left panel of Table 4 presents the results from these tests, using the extended specification with a single QE episode indicator (specification (*B4*) of Table 1).

Note that the inclusion of additional variables does not alter the qualitative message from our baseline results. Moreover, the additional controls do not generally improve the fit of the model substantially, nor do the coefficients for these controls generally enter with significant coefficients.[25] They do, however, erode the size of the sample (dramatically so in the case where the real exchange rate is included).

The second suite of tests allows for alternative measures for a number of our variables of interest, which comprise the middle panel of Table 4. As in the first set of checks, we apply the alternative measures to our original extended specification (*B4*).

The first alternative, reported in column (*R7*), considers a measure of the third QE episode that includes not just a single indicator that corresponds to the three quarters from 2012Q4 through 2013Q2, but also includes an additional indicator for the period where there were anticipations of a tapering of QE (due to interpretations of forward guidance issued by the Federal Reserve).[26] Interestingly, expectations of tapering were associated with a significant *reduction* in inflows. This

[24]Note that since the variables in our baseline are measured in real terms, this only captures the residual effect that large inflation differentials may exert on inflows, rather than a standard adjustment for variables expressed in nominal terms.

[25]The domestic credit/GDP ratio does enter with a marginally significant coefficient in the final specification, but the sample size is substantially smaller. For this reason, we play down these results, but note that the sign of the coefficient does comport with *a priori* expectations (higher levels of financial development are associated with larger inflows).

[26]Given our quarterly frequency, this effectively amounts to including an additional fixed effect for the period 2013Q2.

Table 4: Robustness regressions for gross financial inflows, unbalanced quarterly panel, 2000Q1–2013Q2†

	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**R11**	**R12**
	Additional controls						*Alternative measures*				*Alternative estimators*	
Lagged inflows	0.466	0.462	0.446	0.465	0.464	0.344	0.472	0.461	0.479	0.464	0.421	0.421
	(0.02)***	(0.02)***	(0.03)***	(0.03)***	(0.03)***	(0.03)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.05)***	(0.06)***
All QE episodes	0.029	0.030	0.028	0.032	0.033	0.044	0.031	0.026	0.038	0.021	0.027	0.027
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.02)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)**	(0.01)***
QE tapering							-0.063					
							(0.02)***					
Liquidity channel												
Short-term rate	-0.017	-0.016	-0.016	-0.018	-0.018	-0.023	-0.007	-0.013	-0.008		-0.016	-0.016
	(0.01)**	(0.01)*	(0.01)**	(0.01)*	(0.01)*	(0.02)	(0.01)	(0.01)*	(0.01)		(0.00)***	(0.01)*
Money supply	-0.009	0.077	-0.056	0.080	0.067	0.090	0.226	0.007	0.078		-0.099	-0.099
	(0.24)	(0.24)	(0.20)	(0.29)	(0.29)	(0.45)	(0.22)	(0.25)	(0.06)		(0.10)	(0.26)
Portfolio balance channel												
Yield curve	-0.021	-0.021	-0.018	-0.021	-0.022	-0.027	-0.012	-0.015	-0.013		-0.018	-0.018
	(0.01)**	(0.01)**	(0.01)**	(0.01)*	(0.01)*	(0.02)	(0.01)	(0.01)*	(0.01)		(0.01)***	(0.01)**
Interest rate differential	-0.000	-0.000	-0.000	-0.000	0.000	-0.000	-0.000		-0.001	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Interest rate spread								-0.000				
								(0.00)				
Global PMI	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002		-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
Growth differential	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
	(0.00)*	(0.00)*	(0.00)**	(0.00)**	(0.00)**	(0.00)	(0.00)**	(0.00)**	(0.00)	(0.00)	(0.00)*	(0.00)*
Confidence channel												
VIX	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.002		-0.002	-0.002
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)**	(0.00)***	(0.00)**	(0.00)***		(0.00)***	(0.00)***
Additional controls												
Global saving	0.055	0.064		0.081	0.085	0.116						
	(0.06)	(0.06)		(0.08)	(0.08)	(0.10)						
Trade/GDP		0.000	-0.000	-0.000	-0.000	-0.000						
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)						
Credit/GDP			0.000	0.000	0.000	0.002						
			(0.00)	(0.00)	(0.00)	(0.00)*						
Debt/GDP				0.011	0.010	-0.056						
				(0.02)	(0.02)	(0.07)						
Inflation differential					0.000	0.002						
					(0.00)	(0.00)						
Real exchange rate						0.000						
						(0.00)						
Global factor										0.009		
										(0.00)***		
Basic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimator	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	FE	SCC-FE
Adj. R^2	0.369	0.374	0.373	0.379	0.379	0.423	0.374	0.347	0.373	0.362	0.368	
R^2 (within)	0.374	0.381	0.380	0.388	0.388	0.437	0.380	0.351	0.378	0.365	0.374	0.374
R^2 (between)	0.526	0.529	0.549	0.550	0.551	0.559	0.530	0.523	0.530	0.526	0.526	
N (countries)	1,925 (60)	1,838 (57)	1,665 (53)	1,435 (47)	1,435 (47)	947 (27)	1,925 (60)	2,286 (61)	1,926 (60)	1,925 (60)	1,925 (60)	1,925 (60)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses, with the exception of the final two specifications, where heteroskedasticity and autocorrelation-robust and Driscoll-Kraay standard errors are reported, respectively. A time trend, country fixed effects, constant term, and basic controls from the extended specification were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

reduction was not just statistically but economically important: indeed, the coefficient on the variable is almost twice as large as average effects over all prior QE episodes.

One reservation with regard to the interest rate differential we rely on in our baseline is that our reliance on interest rate *differentials* may not reflect true fluctuations in cross-country costs of capital, since the country-specific nominal interest rate we rely on to compute our interest rate differential is only one possible measure of the average cost of capital. To establish whether such measurement issues may explain the insignificance of the interest rate differential in the baseline, column (*R8*) substitutes the baseline interest rate differential with the interest rate spread computed from a richer array of fixed income instruments. The coefficient on this measure is still negligibly small and statistically insignificant, which suggests that mismeasurement is not at the heart of the insignificant coefficient for the interest rate differential in our baseline.

A third alternative set of measures that we explore allows for the fact that unconventional monetary policies were not the sole domain of the Federal Reserve, but were more or less simultaneously pursued by the Bank of England (via the Asset Purchase Facility), the Bank of Japan (via its Asset Purchase Program), and the European Central Bank (through its Securities Market Program and Outright Monetary Transactions[27]). Consequently, we substitute all our U.S.-centric controls with their weighted-average equivalents from these countries (which we collectively refer to as the G4).[28] As is clear from the results in column (*R9*), our main qualitative conclusions are unaffected by this change.

A final alternative measure we consider collapses all global variables into a single global factor, and substitutes this for all the global variables in (1).[29] This approach has some precedence in the international macroeconomics literature (Albuquerque, Loayza & Servén 2005; Köse, Otrok & Whiteman 2003). The principle is that global variables are driven by some underlying, unobservable common factor, and that controlling only for observables may still omit some time-varying global component. The tradeoff—and the reason why we choose not to employ this method for our baseline—is that, given our interest in transmission channels, it is difficult to establish the precise contribution of each global variable using a single global factor. Moreover, the Kaiser-Meyer-Olkin test of sampling adequacy indicate that the underlying variables are sufficiently distinct that partial

[27] There is some dispute as to whether the ECB's Long-Term Refinancing Operations constitute a form of quantitative easing; we stay with the convention here and exclude this program as a form of QE. Note as well that while the SMP has resulted in a substantial expansion of the ECB balance sheet, the OMT has in fact never been used, despite widespread acknowledgment that the program engendered confidence effects.

[28] For the episode indicator, we drew on qualitative information in Neely (2013) concerning G4 central bank unconventional monetary policy actions, and coded additional quarters as QE periods if at least two additional central banks engaged in QE.

[29] We construct this factor from the varimax orthogonal rotation of the first principal component of the vector of global variables. We also considered an alternative, the proportion-weighted sum of the first three principal components (all possessed eigenvalues greater than unity). Both methods produced qualitatively similar results, which are available on request.

correlations between them are low, and hence are not particularly well-suited for factor analysis. Keeping these caveats in mind, introducing a global measure nevertheless serves as a useful counter-check for the importance of the sum total of global effects.

This is reported in column (*R10*). The global factor is statistically significant and fairly large—a one standard deviation increase in the measure is associated with an increase in inflows of approximately 0.01 percent—but relying on the global factor alone is likely to underestimate the total effect of QE on inflows. To see this, note that a one standard deviation increase in each of the three significant channels in the simplest parsimonious specification (*B1*) in Table 1 yields an increase of inflows of 0.07 percent, an estimate seven times larger.

The rightmost panel of Table 4 offers two alternative estimation methods for (1). Column (*R11*) provides estimates using naïve OLS with fixed effects and heteroskedasticity- and autocorrelation-robust clustered errors, to determine the importance of our correction for Nickell (1981) bias. As is clear, our quantitative results are substantially unchanged even when the bias remains uncorrected; most coefficient estimates obtained using OLS differ only from the third decimal place onward.[30] Finally, one may be concerned about the possibility that cross-sectional dependency may contaminate our estimates; this is especially pertinent given how the response of portfolio capital to QE may be subject to herding behavior. Column (*R12*) corrects for this possibility by estimating spatial correlation-consistent standard errors using the methodology suggested by Driscoll & Kraay (1998). As before, our qualitative findings are substantially unaffected.

6.2 Decomposition of aggregate flows

Not all flows are created equal, and different forms of financial flows can be expected to respond differently to the effects of QE. The theoretical literature has long recognized that the determinants of portfolio flows are fundamentally distinct from those of FDI (Kraay, Loayza, Servén & Ventura 2005; Smith & Valderrama 2009), and empirical work has corroborated the importance of accounting for global drivers for the former (Fratzscher 2012) and country-specific factors for the latter (Alfaro, Kalemli-Ozcan & Volosovych 2008; Bénassy-Quéré, Coupet & Mayer 2007; Busse & Hefeker 2007; Dailami, Kurlat & Lim 2012).

Here we break down our dependent variable—aggregate gross inflows—to obtain greater insight into whether specific channels may be more operative then others, depending on the financial flow. Inflows are decomposed into portfolio, loans, and FDI. By relying on an alternative measure—gross fund inflows—we are further able to separate portfolio flows into equity and bond purchases.

Our estimates are reported in Table 5, again relying on the extended specification with a single QE episode indicator—specification (*B4*)—for each constituent flow: (*D1*) portfolio; (*D2*) loans; and (*D3*) FDI. In column (*D4*), we first report—for comparison purposes—total gross fund

[30]Estimates for all specifications in the baseline are provided in the appendix.

inflows, before this is separated into portfolio bond and equity flows, in columns (*D5*) and (*D6*), respectively.[31]

We draw several conclusions from this exercise.

First, and most remarkable, is the distinction between FDI and both portfolio and loan flows. For FDI inflows, exempting the lagged dependent variable, only the institutional investor variable and GDP enter with a (marginally) significant coefficient.[32] This result underscores the importance of political and institutional risk as determinants of FDI, which has ample support in the literature (Alfaro *et al.* 2008; Bénassy-Quéré *et al.* 2007; Busse & Hefeker 2007; Dailami *et al.* 2012). This result also corroborates with evidence from gravity-type models of FDI (which finds larger FDI flows between bilateral pairs with larger pairwise GDP), and the more general stylized fact that gross FDI inflows tend to be countercyclical and the least volatile among different financial flows (Contessi *et al.* 2013). It is nevertheless useful for us to recognize that the insensitivity of FDI inflows to global variables applies even when considering gross (rather than net) flows, and that QE has had little impact on this large and stable source of developing country cross-border finance. In contrast, both portfolio capital and bank lending respond more to both global drivers. A related observation is that portfolio and loan flows react mainly to the global "push" factors (due to economic conditions in high-income countries), as opposed to country-specific "pull" variables.

Second, comparing portfolio with loan flows, the latter clearly responds more to the unobservable effect of QE (the coefficient on the indicator variable is 0.021 versus 0.018), suggesting that more so than for the other flows, QE operated through channels other than the modeled channels to boost bank lending. In contrast, measurable transmission channels for QE are routinely larger for portfolio flows. For example, the coefficient on the yield curve (corresponding to the portfolio rebalancing channel) is an order of magnitude as large as that for loans; an analogous argument can be made for the short-term interest rate (for the liquidity channel). The number of statistically significant coefficients is also larger for portfolio flows.[33]

Taken together, these first two findings strongly suggest that it is portfolio flows, and especially bond capital, that are most sensitive to QE. In contrast, FDI—which is the most stable compo-

[31]Since the decomposed series are generally less persistent than the aggregate flows data (with comparable average time periods), the magnitude of bias between the different approximations is virtually identical (Bruno 2005). Accordingly, we relax the bias correction to just $O\left(\frac{1}{T}\right)$ for the estimates in Table 5. Since the panels in the decomposed series also include smaller samples and can be more unbalanced, we also increase the number of bootstrap replications to 200.

[32]Both variables consistently enter with a positive and significant across our baseline and robustness specifications.

[33]The relative insensitivity of bank lending to observable fundmentals in specification (*D2*) may strike some as contrary to findings, especially from the crisis literature, that loans appear to respond to key global factors during crisis events (Adams-Kane, Lim & Jia 2012; Broner *et al.* 2013). We do not see an inconsistency here, since loan flows may well respond strongly to fundamentals in a crisis environment (which we control for), but not under non-crisis conditions. Moreover, it is important to recognize that our results pertain to *post-2000 data only*, which is our period of interest. Consequently, studies that rely on a longer span of bank lending data may well uncover somewhat ifferent relationships.

Table 5: Regressions for financial inflows, by type, unbalanced quarterly panel, 2000Q1–2013Q2†

	D1 *Portfolio*	**D2** *Loans*	**D3** *FDI*	**D4** *Gross fund*	**D5** *Bonds*	**D6** *Equity*
Lagged inflows	0.261	0.307	0.597	-0.088	0.294	-0.011
	(0.02)***	(0.02)***	(0.02)***	(0.04)**	(0.03)***	(0.03)
All QE	0.018	0.021	-0.003	0.061	0.015	0.044
episodes	(0.01)***	(0.01)***	(0.01)	(0.02)***	(0.02)	(0.03)*
			Liquidity channel			
3M T-bill	-0.015	-0.008	0.004	-0.080	-0.089	-0.053
rate	(0.01)**	(0.01)*	(0.01)	(0.02)***	(0.02)***	(0.03)**
Money supply	0.015	-0.071	0.056	-1.110	-2.120	-0.589
	(0.19)	(0.16)	(0.26)	(0.65)*	(0.45)***	(0.66)
			Portfolio balance channel			
Yield curve	-0.020	-0.002	0.005	-0.090	-0.065	-0.064
	(0.01)***	(0.01)	(0.01)	(0.03)***	(0.02)***	(0.03)**
Interest rate	-0.000	-0.000	-0.000	-0.001	-0.002	-0.000
differential	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)*	(0.00)
Global PMI	-0.001	-0.001	-0.001	0.008	0.003	0.004
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
Growth	0.001	0.001	0.000	0.001	-0.000	-0.001
differential	(0.00)*	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
			Confidence channel			
VIX	-0.002	-0.000	-0.000	-0.002	-0.006	-0.000
	(0.00)***	(0.00)	(0.00)	(0.00)	(0.00)***	(0.00)
			Basic controls			
GDP	0.009	0.110	0.070	-0.060	0.020	0.039
	(0.03)	(0.02)***	(0.04)*	(0.09)	(0.07)	(0.08)
Developing	0.004	0.000	-0.001	0.014	0.023	0.007
GDP growth	(0.00)***	(0.00)	(0.00)	(0.01)***	(0.00)***	(0.01)
High-income	-0.001	0.002	0.004	-0.011	-0.017	-0.007
GDP growth	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)***	(0.01)
Country	0.001	0.001	0.002	0.002	0.001	0.000
rating	(0.00)***	(0.00)***	(0.00)**	(0.00)	(0.00)	(0.00)
Crisis period	-0.002	-0.043	-0.005	0.024	-0.043	0.032
	(0.01)	(0.01)***	(0.02)	(0.04)	(0.03)	(0.05)
Post-crisis	0.024	-0.025	-0.010	0.038	-0.061	0.050
period	(0.01)*	(0.01)**	(0.02)	(0.05)	(0.04)	(0.05)
Adj. R^2	0.157	0.032	0.399	0.054	0.193	0.005
R^2 (within)	0.164	0.037	0.403	0.070	0.203	0.018
R^2 (between)	0.572	0.209	0.854	0.450	0.562	0.042
N (countries)	1,925 (60)	3,460 (85)	2,419 (63)	974 (31)	1,220 (39)	1,185 (37)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses. A time trend, country fixed effects, and constant term were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

nent of cross-border financial flows—tends to respond to structural, long-term determinants, such as the institutional rating of the economy. This is consistent with our understanding that portfolio flows react most to the various effects of *conventional* monetary policy—after all, monetary policy is generally effective only in the short run, and portfolio flows are by definition the most easily reassigned—and this bias toward shorter-term flows evidently carries over to unconventional monetary policy as well.

Turning to the portfolio flow decompositions, we first note that the statistically significant coefficients in columns (*D1*) and (*D4*) are broadly comparable, which lends credibility to our use of the fund inflows data. In terms of the decomposition, it is notable that while bond flows appear to react to more transmission channels than equity flows—debt is associated with changes in the VIX as well as the global PMI,[34] while equity is not—the *magnitude* (and standard errors) of the coefficients on equity are generally larger than those for debt. Alternatively, although bond flows are liable to react to a wider range of possible QE transmission channels, equities react more strongly to the few channels to which they do react to.

6.3 Accounting for commonality in gross inflows

Given the strong representation of global factors our baseline specification, it is natural to question whether how pervasive this source of commonality is in our data. In this subsection, we probe the relative importance of our global factors using a principal components approach inspired by Longstaff, Pan, Pedersen & Singleton (2011).[35]

We construct two alternative global factors from our gross inflows data: a factor constructed from the varimax orthogonal rotation of the first principal component of the vector of gross inflows (which we term *PC1*), and a proportion-weighted sum of the first three principal components (which we term *PC3*).[36] We then use the global factor—which by construction captures the common elements among cross-country gross inflows—as a dependent variable in regressions where we include our global variables as regressors.

Table 6 reports our results from this exercise. The first two columns report (OLS) regressions for, respectively, the first and weighted principal components, using only global variables as covariates. Since our goal is to ascertain the relative importance of these global variables in gross inflows, this

[34]This coefficient is negative, which indicates that inflows into debt decrease when global growth prospects improve. This outcome is consistent with substitution into riskier assets when growth outlooks turn upward.

[35]In contrast to Longstaff *et al.* (2011), we extract principal components directly from actual gross inflows, rather than its correlation matrix. We then use this extracted factor *directly* as our dependent variable in the analyses that follow (as an aggregate time series), rather than perform country-specific or panel regressions.

[36]The first three components had eigenvalues in the excess of 3, and cumulatively explain slightly more than half of the cross-country variation. Including the next 7 components (all components that have eigenvalues greater than unity) increases the explained variation to 87 percent, but at the cost of the weighted-sum component being comprised of a very large number of (linearly uncorrelated) subcomponents, none of which singularly contribute much to the overall variance in the data.

pair of specifications represent our main results of interest.[37]

We find that all global variables included in our extended baseline specification contribute substantially to the common variation across cross-country gross inflows. The adjusted R^2 is extremely high—0.92 and 0.91—and the point estimates of coefficients are both statistically significant, economically large, and carry signs consistent with our earlier findings. As before, there is evidence that these global variables operate along all three channels we consider in this paper. Overall, these results echo the findings in the literature that global macroeconomic variables dominate movements in international financial markets, as verified for international equity market returns (Baker *et al.* 2012), portfolio capital flows (Fratzscher 2012), and sovereign credit default swap spreads (Longstaff *et al.* 2011).

For robustness, we also consider, using the *PC3* factor,[38] the incremental inclusion of several country-specific controls: the cross-country averaged interest rate differential (*C3*), the average growth differential (*C4*), both differentials (*C5*), and with both differentials as well as additional basic controls from the extended specification (*C6*).[39] We regard these results as mainly of supplementary value—in the sense that they help us better understand the relative importance of the global factors—since it is difficult to interpret the contribution of an "average" interest rate or growth differential to the common global factor in gross inflows.

With this caveat in mind, we make a two additional points with regard to these latter specifications. First, and most important, there is little additional gain from including country-specific explanatory variables: the improvement in the adjusted R^2 from including these variables is miniscule, which is also verified in the final row of Table 6, where we report the gain in the fit from including these additional country-specific regressors.[40] Second, most of the global variables from the different channel retain their significance, which corroborates their inclusion in our baseline analysis.

[37]In contrast to the baseline, these specifications omit a lagged dependent variable, which enter with an insignificant coefficient.

[38]Results with the *PC1* factor were qualitatively similar, although standard errors were slightly larger. These are available on request.

[39]These are total developing country GDP, the growth rate for the developing world, and average institutional risk rating.

[40]This is computed from taking one minus the ratio of the adjusted R^2 of specification in question and specification (*C2*).

Table 6: Regressions for principal components of gross financial inflows, balanced quarterly panel, 2000Q1–2013Q2†

	C1	**C2**	**C3**	**C4**	**C5**	**C6**
	1PC	*3PC*	*3PC*	*3PC*	*3PC*	*3PC*
All QE episodes	0.902	1.534	0.594	1.012	0.588	0.862
	(0.34)**	(0.71)**	(0.24)**	(0.40)**	(0.29)*	(0.39)*
			Liquidity channel			
3M T-bill rate	-1.727	-2.329	-1.289	-1.838	-1.283	-0.702
	(0.52)***	(1.16)*	(0.56)**	(0.52)***	(0.61)*	(0.61)
Money supply	-16.740	-29.119	-5.165	-19.694	-5.014	15.830
	(6.29)**	(13.29)**	(8.47)	(7.65)**	(10.57)	(14.47)
			Portfolio balance channel			
Yield curve	-1.869	-2.680	-1.174	-2.017	-1.166	-0.605
	(0.46)***	(1.17)**	(0.50)**	(0.48)***	(0.56)*	(0.76)
Interest rate differential			0.125		0.126	0.197
			(0.04)**		(0.05)**	(0.09)*
Global PMI	0.257	0.395	0.188	0.280	0.187	0.146
	(0.07)***	(0.16)**	(0.06)***	(0.08)***	(0.08)**	(0.10)
Growth differential				0.086	-0.003	0.086
				(0.13)	(0.11)	(0.26)
			Confidence channel			
VIX	-0.085	-0.161	-0.082	-0.086	-0.082	-0.062
	(0.02)***	(0.04)***	(0.02)***	(0.02)***	(0.02)***	(0.03)**
Crisis dummies	Yes	Yes	Yes	Yes	Yes	Yes
Basic controls	No	No	No	No	No	Yes
Adj. R^2	0.924	0.906	0.945	0.921	0.940	0.936
Gain in fit (%)			4.3	1.7	3.8	3.3
N	24	24	24	24	24	24

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. The dependent variable is either the varimax orthogonal rotation of the first principal component (1PC) or proportion-weighted sum of the first three principal components (3PC). Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. A time trend, constant term, and crisis-related dummies (crisis period and post-crisis) were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

7 The effects of tapering and monetary policy renormalization on developing economies

7.1 Normalization scenarios for unconventional monetary policy

We estimate (2) by populating $\mathbf{TC}_{it} = [\mathbf{L}_{it}\ \mathbf{PB}_{it}\ \mathbf{C}_{it}\ \mathbf{X}_{it}\ \mathbf{GFI}_{it}]$ with the (weighted average) G4 short-term interest rate ($\mathbf{L}_{it}$), the G4 yield curve ($\mathbf{PB}_{it}$), the VIX ($\mathbf{C}_{it}$), real GDP growth in the G4 and developing world ($\mathbf{X}_{it}$), and aggregate gross capital inflows in developing economies ($\mathbf{GFI}_{it}$)

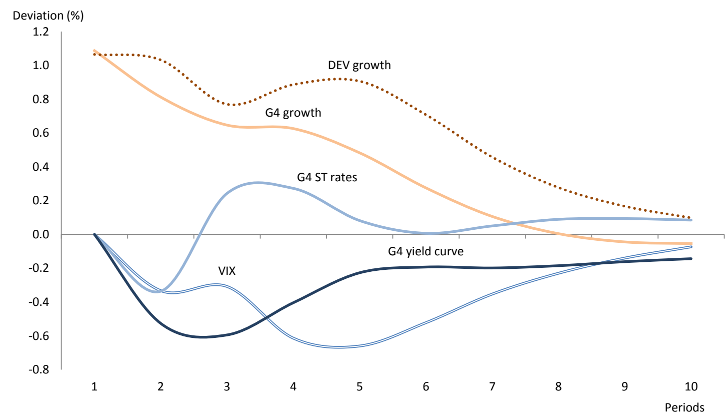


Figure 2: Impulse response function for aggregate developing country gross inflows for a positive one standard deviation shock in the transmission channels and endogenous controls (GDP). Increases in interest rates and the VIX are associated with lower gross inflows, while increases in growth are associated with higher inflows. Shocks appear to die out after around 10 quarters.

(so the final VAR specification is six-dimensional).

Standard model selection metrics suggest between one and four lags; we adopt two ($k = 2$) as a middle-ground compromise.[41] Formal Johansen tests reject the presence of cointegrating relationships in the system, which supports the estimation of the model as an unrestricted VAR. Our Cholesky ordering assumes the following: G4 GDP growth, developing GDP growth, developing capital inflows, the VIX, G4 short-term interest rates, and the yield curve (which potentially responds to all other variables in real time).

To provide some sense of the overall performance of the VAR, Figure 2 presents the impulse response functions for gross inflows (as a share of GDP) for a positive one standard deviation shock in the transmission channels and endogenous controls in (2). The predicted deviations appear to be consistent with what one would intuitively expect; for example, a shock to the yield curve or VIX is associated with declines in inflows, while GDP growth is associated with increases. In general, the shocks appear to die out after about 10 quarters.

Our benchmark is a no-change scenario that maintains the *status quo*. We use the VAR to generate a scenario where unconventional monetary policy normalizes over the course of the following three years. The paths are detailed in the upper panel of Table 7. Our policy normalization scenario seeks to match growth paths for high-income and developing economies consistent with the World Bank's *Global Economic Prospects* forecast for the global economy (World Bank 2014). This involves three assumptions for the 2014–16 period: a gradual start to normalization of long-term

[41]Specifically, Hannan and Quinn Information Criterion and the Bayesian Information Criterion suggest one lag, Final Prediction Error and Likelihood Ratio statistics recommend two, and the Akaike Information Criterion points to four. In the two-lag model, all significant eigenvalues are less than one.

interest rates, with rates rising by 66 basis points (bps) over the course of 2014, and continuing to increase gradually over the next two years, so that cumulatively there is a 166 bps by the end of 2016. Short-term rates are also assumed to begin normalization during this period, rising by a cumulative 170 bps over the three years. Additional unobserved effects of QE—as captured by the QE episode indicator—are assumed to gradually decline and taper off fully by 2016.

Table 7: Deviation in cumulative changes in gross financial inflows, by normalization scenario relative to *status quo* benchmark, 2014–2016†

	History		**Baseline**		
	2012	2013	2014	2015	2016
Developing GDP growth	5.0	5.4	5.5	5.8	5.9
High-income GDP growth	1.4	1.1	2.2	2.4	2.4
High-income yield curve	1.7	2.1	2.5	2.6	2.3
High-income 10Y rates	2.2	2.4	2.9	3.2	3.6
High-income 3M rates	0.4	0.2	0.3	0.6	1.2
VIX index	18.0	15.0	16.9	18.2	18.9
			Deviation of inflows from status quo *baseline*		
Share of flows			-3.7	-7.4	-10.0
Share of developing GDP			-0.2	-0.4	-0.6

† Upper panel: all variables, with the exception of the VIX, are given in percentage points; the VIX is given as an index. GDP growth rates are annualized rates for the respective quarter. Lower panel: all values are in percentage deviations relative to *status quo* baseline, and are computed from gross inflows measured in constant 2010 U.S. dollars.

The results are reported in the lower panel of Table 7, with numbers computed as deviations relative to the *status quo* benchmark. The model suggests that gross capital flows to developing countries would fall by some 4 percentage points in constant dollar terms in 2014, and cumulatively by 10 percent by 2016, compared to the *status quo*with no change in unconventional monetary policies. In terms of developing-country GDP, gross capital flows would be lower by about 0.6 percent, again relative to the *status quo*.[42,43]

The results of the panel analysis provide some sense of the potential impacts of changes in finan-

[42]Since the VAR model includes inflows as an input, it also produces alternative paths for gross inflows, which we can use as a consistency check. As it turns out, the VAR generates a very comparable outcome: a decline of 0.5 percent of GDP over the projection horizon.

[43]We also considered the possibility of a more rapid normalization outcome, where long-rates rise by around 100 basis points in 2014 itself, and QE effects taper off fully by end of 2014. In this case, the decline in gross inflows is front-loaded—falling by 7.5 percent in 2014—but the final decrease of about 10 percent by the end of 2016 is comparable across the two scenarios. Full results for this alternative scenario are available on request.

cial market conditions on gross capital flows, but need to be interpreted with caution. The dynamic adjustments of flows to changes in financial market variables are likely to be underestimated, or not fully accounted for, in this framework. Given the data-dependence of monetary policy and market uncertainty regarding the path of macroeconomic variables, expectations channels for tapering are likely to play an outsized role during the unwinding of QE. To the extent that these are not fully captured in the panel analysis, the unwinding of QE could have effects on financial flows that are significantly larger than those estimated above.

Of course, the presence of such expectations channels could result in significantly larger decline in flows within a relatively short period and subsequent adjustment to a more stable equilibrium (as was illustrated by the behavior of portfolio capital flows during mid-2013 in response to anticipations of tapering of QE), so that the bulk of the adjustments are attained by the end of 2014.

8 Conclusion

In this paper, we have engaged in two exercises: first, to document the effect of quantitative easing policies in the United States (and to a lesser extent, the high-income G4) on gross financial inflows in developing economies; and second, to use the model to examine the effect of monetary policy normalization ("tapering") on inflows, in accordance to more gradual and rapid tapering scenarios.

We find that the transmission of quantitative easing to gross inflows to developing countries include liquidity, portfolio rebalancing, and confidence channels, and that these effects average 0.08 and 0.09 percent (half a standard deviation) for a one standard-deviation change in QE-related variables, for the average country, per quarter. We also find heterogeneous effects, especially with regard to type of flow: portfolio flows appear to drive many of our results in the panel, with FDI remaining largely insensitive to QE-related channels.

Our simulations of tapering suggest that, relative to a *status quo* of no change in quantitative easing, capital inflows contract by a cumulative 10 percent (or 0.6 percent of developing country GDP) by the end of 2016, regardless of whether monetary policy normalization occurs more gradually or more rapidly (although in the latter scenario around three-quarters of the effects of tapering are front-loaded to 2014).

We regard our paper as a preliminary attempt at quantifying the potential implications of quantitative easing policies—and their withdrawal—on gross financial flows to developing countries. Future research in this vein can expand the scope of the impact of QE on developing nations (to factors such as the real exchange rate and their financial markets), and to perform counterfactuals based on actual realizations of QE tapering, following its implementation.

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Appendix

A.1 Additional tables

Table A.1: Timeline and magnitude of quantitative easing operations in the US, UK, Euro Area, and Japan, and coding scheme

Episode	**Coding**	**Description**
QE1	2009Q1–2010Q3	Major purchases by the US Fed of mortgage-backed securities and other "toxic assets" in the early stages of the crisis beginning in late 2008. By March 2009, the Fed had announced intentions to purchase financial assets totaling nearly \$1.7 trillion.
QE2	2010Q4–2011Q2	A program of Fed purchases of US Treasury securities in the second half of 2010, with announced purchases of \$600 billion.
QE3[*]	2012Q4–2013Q2 (2011Q4–2012Q1, 2012Q3–2013Q2)	A renewed program of Fed purchases of private mortgage-backed securities (MBS) beginning in late 2012. These included monthly purchases of \$40 billion of MBS, later expanded in December 2012 with additional \$45 billion of monthly treasury security purchases. Together, these would expand the Fed's balance sheet by some \$1 trillion by the third quarter of 2013.[†] During the same period, the BoE expands its asset purchases to £375, the ECB purchases €40 billion in covered bonds and begins OMT in 2012Q3, and the BoJ expands asset purchases by a total of ¥20 trillion.

[*] For the G4, QE3 included additional periods that did not coincide with formal QE3 operations of the Federal Reserve, and the coding is provided in parentheses.

[†] During this period, the US Federal Reserve also implemented a program of purchases of long-term bonds ("Operation Twist") and corresponding sales of short-term bonds starting in late 2011. Although involving no new net purchases of assets or quantitative expansion, this operation was aimed at reducing the demand for long-term bonds and lowering their yields relative to short-term bonds.

Table A.2: Definitions and sources of variables

Variable	Definition and construction	Data source(s)[†]
Gross financial inflows	Sum of changes in foreign holdings of direct investment, portfolio, and bank lending, net of disinvestment	BOP, LBS; Datastream, Haver
Gross fund inflows	Sum of bond and equity purchases in emerging market mutual funds	EPFR Global
QE episode	Indicator variable for all, QE1/QE2/QE3 episodes, with timing given by Table A.1	Authors
Central bank balance sheet expansion	Balance sheet expansion for Federal Reserve, Bank of England, Bank of Japan, and European Central Bank	FRB, ECB, BOJ, BoE; FRED
	Channels	
3-month Treasury bill	Rate on the 3-month U.S. Treasury bill	FRB; Datastream
Money supply	Level of U.S. M2	FRB, FRED
Yield curve	Difference between yields on 10-year U.S. bonds and 3-month bills	FRB; Datastream
Global PMI	Purchasing Managers Index for manufacturing sector worldwide	JP Morgan; Markit
Interest rate differential	Difference between real interest rates of the developing country and the U.S.	IFS, Datastream
Growth differential	Difference between the real GDP growth rate of the developing country and the U.S.	Datastream, Haver, WDI
VIX	Index of implied volatility of S&P 500 index	CBOE, Datastream
	Controls	
GDP	Gross domestic product (GDP) in nominal U.S. dollars	JP Morgan; Markit
Country rating	Rating of sovereign default risk, based on financial market analyst perceptions	Institutional Investor
DEV & HIC growth	Aggregate developing and high-income growth rate	WDI, Datastream, BIS
Global saving	Aggregate world saving	WDI
Trade/GDP	Sum of imports and exports as a share of GDP	Haver, Datastream, IFS, WDI
External debt/GDP[‡]	Total external public debt as a share of GDP	WDI, Datastream, BIS
Credit/GDP ratio[‡]	Domestic credit to the private sector as a share of GDP	IFS
Real exchange rate	Nominal exchange rate of one currency relative to another, adjusted by price differentials	IFS, WDI
	Alternatives	
3-month bill futures	Rate on 3-year futures of the 3-month Treasury bill	Datastream
10-year note forwards	Implied forward computed from the 3-year forward of the 10-year Treasury note	Datastream, Bloomberg
QE tapering	Indicator variable for QE tapering announcement (2013Q2)	Authors
Interest rate spread	Difference between average yields on fixed income in the developing country and the U.S.	Datastream
G4 variables	Weighted-average of G4 3-month rate, money supply, and yield curve	FRB, FRED, Datastream
Global factor	Orthogonal rotation of the first principal component of vector of global variables	Authors

[†] BOP = IMF Balance of Payments Statistics; DS = Datastream; FRB = Board of Governors of Federal Reserve Statistical Releases; FRED = Federal Reserve Bank of St Louis Economic Data; IFS = IMF Interantional Financial Statistics; LBS = BIS Locational Banking Statistics; WDI = World Bank World Development Indicators.

[‡] Where available at the quarterly frequency, reported values were used; where unavailable, quarterly values were imputed by applying a cubic spline to the annual data.

Table A.3: Baseline sample of developing economies[†]

Albania	Honduras	Nicaragua
Argentina	India	Nigeria
Armenia	Indonesia	Pakistan
Azerbaijan	Jordan	Panama
Bangladesh	Kazakhstan	Paraguay
Belarus	Kyrgyz Republic	Peru
Belize	Lao PDR	Philippines
Brazil	Latvia	Romania
Bulgaria	Lebanon	Russian Federation
Cape Verde	Lesotho	Seychelles
Chile	Lithuania	South Africa
China	Macedonia, FYR	Sri Lanka
Colombia	Malaysia	Suriname
Costa Rica	Mauritius	Thailand
Dominican Republic	Mexico	Turkey
Ecuador	Moldova	Uganda
Egypt, Arab Rep.	Mongolia	Ukraine
El Salvador	Morocco	Uruguay
Georgia	Mozambique	Venezuela, RB
Guatemala	Namibia	Vietnam

[†] The baseline sample is the largest available sample for the parsimonious and extended specifications in Table A.1.

Table A.4: Summary statistics for main variables in baseline, QE and non-QE periods[†]

	N	Mean	Std. Dev.	Min	Max
			QE periods		
Gross financial inflows	1,346	10.965	0.125	10.428	11.958
3M T-bill rate	1,346	2.705	1.788	0.275	5.550
Money supply (M2)	1,346	15.841	0.111	15.639	16.075
Yield curve	1,346	1.237	1.286	-0.904	3.343
Interest rate differential	1,346	0.348	6.506	-65.311	49.048
Global PMI	1,346	54.103	4.413	39.100	61.000
Growth differential	1,337	3.773	3.978	-16.635	32.293
VIX	1,346	21.049	9.291	11.026	58.322
Central bank balance sheet	1,346	3.758	8.153	0.000	21.458
GDP	1,346	11.181	1.748	6.597	15.728
Developing GDP growth	1,346	6.253	1.975	2.669	9.048
High-income GDP growth	1,346	1.855	1.302	-3.225	3.862
Country rating	1,346	44.461	15.061	12.500	82.600
			Non-QE periods		
Gross financial inflows	592	10.989	0.169	10.609	12.290
3M T-bill rate	592	0.375	0.180	0.220	0.851
Money supply (M2)	592	15.992	0.054	15.952	16.111
Yield curve	592	2.593	0.640	1.404	3.462
Interest rate differential	592	-0.522	4.645	-16.975	21.943
Global PMI	592	52.189	4.364	39.800	56.400
Growth differential	592	2.792	4.692	-15.986	17.492
VIX	592	23.235	8.040	13.551	44.907
Central bank balance sheet	592	20.886	0.853	18.227	21.611
GDP	592	11.282	1.803	7.210	15.781
Developing GDP growth	592	6.616	0.949	5.216	7.833
High-income GDP growth	592	0.267	3.094	-5.376	3.720
Country rating	592	47.025	14.532	20.300	81.050

[†] Summary statistics are provided for the sample between 2000Q1 and 2013Q2. QE periods are defined in Table A.1.

Table A.5: Correlation matrix for main variables of interest

	Gross inflows	3M T-bill	Money supply	Yield curve	Int. diff.	PMI	Growth diff.	VIX	Bal. sheet exp.	GDP	Dev. growth	H-inc. growth	Rating
Gross inflows	1.000												
3M T-bill	-0.005	1.000											
M2	0.122	-0.603	1.000										
Yield curve	-0.053	-0.844	0.147	1.000									
Int. diff.	-0.017	-0.047	-0.045	0.057	1.000								
PMI	0.092	0.191	-0.228	-0.004	0.067	1.000							
Growth diff.	0.159	0.235	-0.073	-0.228	-0.155	-0.081	1.000						
VIX	-0.147	-0.232	0.071	0.171	-0.063	-0.818	0.060	1.000					
Bal. sheet exp.	0.097	-0.770	0.879	0.452	-0.013	-0.219	-0.173	0.119	1.000				
GDP	0.536	-0.039	0.060	0.006	-0.058	-0.030	0.015	0.002	0.057	1.000			
Dev. growth	0.074	0.261	-0.021	-0.177	-0.030	0.583	0.045	-0.412	-0.043	-0.039	1.000		
H-inc. growth	0.096	0.188	-0.176	-0.137	0.088	0.791	-0.108	-0.659	-0.211	-0.005	0.300	1.000	
Rating	0.467	-0.012	0.215	-0.103	-0.079	-0.035	0.021	-0.017	0.135	0.506	0.034	-0.019	1.000

Table A.6: Alternative baseline regressions for gross financial inflows, unbalanced quarterly panel, 2000Q1–2013Q2 (FE estimator)†

	A.B1	**A.B2**	**A.B3**	**A.B4**	**A.B5**	**A.B6**
Lagged inflows	0.425	0.431	0.431	0.421	0.427	0.428
	(0.05)***	(0.04)***	(0.04)***	(0.05)***	(0.05)***	(0.05)***
All QE	0.027			0.026		
episodes	(0.01)***			(0.01)**		
QE1 episode		0.046			0.048	
		(0.01)***			(0.01)***	
QE2 episode		0.033			0.035	
		(0.01)***			(0.01)***	
QE3 episode		0.009			0.008	
		(0.01)			(0.01)	
QE-related			0.003			0.002
expansion			(0.00)***			(0.00)***
			Liquidity channel			
3M T-bill	-0.014	-0.019	-0.004	-0.016	-0.017	-0.006
rate	(0.00)***	(0.00)***	(0.00)**	(0.00)***	(0.00)***	(0.00)
Money supply				-0.100	0.118	-0.079
(M2)				(0.10)	(0.14)	(0.11)
			Portfolio balance channel			
Yield curve	-0.018	-0.026	-0.007	-0.018	-0.024	-0.007
	(0.00)***	(0.01)***	(0.00)***	(0.01)***	(0.01)***	(0.00)*
Interest rate	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
differential	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Global PMI				-0.001	-0.000	-0.002
				(0.00)	(0.00)	(0.00)
Growth				0.001	0.001	0.001
differential				(0.00)*	(0.00)*	(0.00)
			Confidence channel			
VIX	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
			Basic controls			
GDP	0.158	0.154	0.156	0.149	0.146	0.148
	(0.09)*	(0.09)*	(0.09)*	(0.09)	(0.09)	(0.09)
Developing	0.002	0.000	0.002	0.004	0.000	0.004
GDP growth	(0.00)***	(0.00)	(0.00)**	(0.00)***	(0.00)	(0.00)***
High-income	-0.001	-0.000	-0.000	-0.000	0.001	0.000
GDP growth	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Country	0.002	0.002	0.002	0.002	0.002	0.002
rating	(0.00)**	(0.00)*	(0.00)**	(0.00)*	(0.00)*	(0.00)*
Crisis period	-0.019	-0.027	-0.022	-0.021	-0.025	-0.025
	(0.01)*	(0.01)**	(0.01)*	(0.01)*	(0.01)**	(0.01)**
Post-crisis	0.001	-0.011	-0.026	0.001	-0.009	-0.024
period	(0.01)	(0.01)	(0.01)**	(0.01)	(0.01)	(0.01)*
Adj. R^2	0.368	0.371	0.366	0.368	0.371	0.367
R^2 (within)	0.372	0.376	0.370	0.374	0.377	0.372
R^2 (between)	0.522	0.525	0.525	0.526	0.529	0.528
N (countries)	1,938 (60)	1,938 (60)	1,938 (60)	1,925 (60)	1,925 (60)	1,925 (60)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses. A time trend, country fixed effects, and a constant term were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

Table A.7: Alternative baseline regressions for gross financial inflows, unbalanced quarterly panel, 2000Q1–2013Q2 (standardized coefficients)†

	A.SB1	A.SB2	A.SB3	A.SB4	A.SB5	A.SB6
Lagged inflows	0.463	0.471	0.470	0.460	0.467	0.467
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
All QE episodes	0.149			0.142		
	(0.03)***			(0.04)***		
QE1 episode		0.257			0.264	
		(0.05)***			(0.06)***	
QE2 episode		0.179			0.191	
		(0.05)***			(0.06)***	
QE3 episode		0.042			0.034	
		(0.05)			(0.06)	
QE-related expansion			0.144			0.131
			(0.04)***			(0.04)***
			Liquidity channel			
3M T-bill rate	-0.132	-0.194	-0.036	-0.154	-0.165	-0.058
	(0.04)***	(0.04)***	(0.04)	(0.08)*	(0.08)**	(0.07)
Money supply (M2)				-0.077	0.103	-0.070
				(0.16)	(0.19)	(0.16)
			Portfolio balance channel			
Yield curve	-0.128	-0.187	-0.049	-0.129	-0.172	-0.046
	(0.03)***	(0.04)***	(0.03)	(0.06)**	(0.06)***	(0.05)
Interest rate differential	-0.066	-0.053	-0.077	-0.067	-0.056	-0.077
	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)
Global PMI				-0.028	-0.012	-0.039
				(0.04)	(0.04)	(0.04)
Growth differential				0.024	0.025	0.022
				(0.01)*	(0.01)*	(0.01)
			Confidence channel			
VIX	-0.062	-0.079	-0.062	-0.080	-0.077	-0.084
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
			Basic controls			
GDP	1.513	1.467	1.494	1.407	1.365	1.396
	(0.31)***	(0.31)***	(0.31)***	(0.34)***	(0.33)***	(0.34)***
Developing GDP growth	0.024	0.003	0.018	0.036	-0.000	0.034
	(0.01)*	(0.01)	(0.01)	(0.02)**	(0.02)	(0.02)**
High-income GDP growth	-0.011	-0.005	-0.006	-0.004	0.011	0.004
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Country rating	0.147	0.131	0.145	0.142	0.131	0.141
	(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***	(0.04)***
Crisis period	-0.103	-0.149	-0.125	-0.116	-0.140	-0.141
	(0.07)	(0.07)**	(0.07)*	(0.08)	(0.08)*	(0.08)*
Post-crisis period	0.011	-0.062	-0.152	0.011	-0.054	-0.140
	(0.07)	(0.07)	(0.09)*	(0.08)	(0.08)	(0.09)
Adj. R^2	0.368	0.371	0.366	0.368	0.371	0.367
R^2 (within)	0.372	0.376	0.370	0.374	0.377	0.372
R^2 (between)	0.522	0.525	0.525	0.526	0.529	0.528
N (countries)	1,938 (60)	1,938 (60)	1,938 (60)	1,925 (60)	1,925 (60)	1,925 (60)

† All level variables are in logarithmic form, but rates, indices, and indicator variables are untransformed. Bootstrapped standard errors (with 100 replications) are reported in parentheses. A time trend, country fixed effects, and constant term were included in the regressions, but not reported. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

A.2 Additional figures

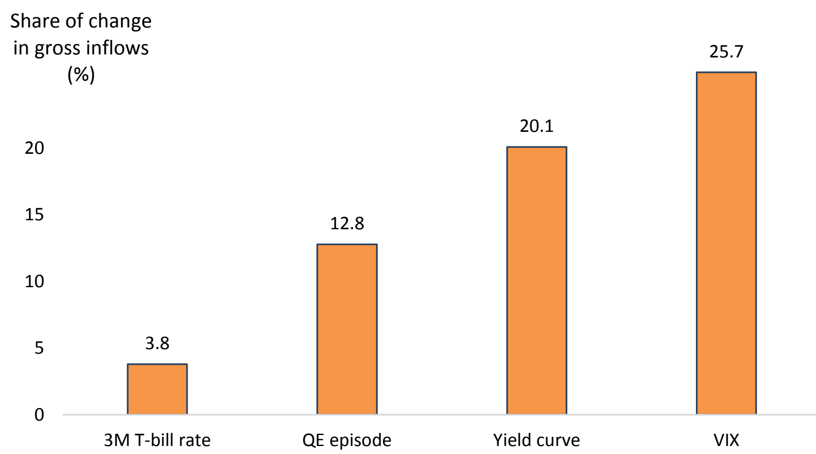

Figure A.1: Increase in gross inflows to developing economies between 2009H1 and 2013H1 attributable to changes in global monetary conditions, in shares of the total change. The remaining 38 percent were due to changes in domestic factors.