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Stock returns' sensitivities to crisis shocks: Evidence from developed and emerging markets

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A B S T R A C T

We consider three "crisis shocks" related to key features of the 2007–2008 crisis, for emerging and developed economies: (1) the collapse of global trade, (2) the contraction of credit supply, and (3) selling pressure on firms' equity. Using an international cross-section of firms, we find that returns' sensitivities to these shocks imply large and statistically significant influences on residual equity returns during the crisis period (after controlling for normal risk factors that are associated with expected returns). Similar analysis for several placebo periods shows that these effects are generally less severe or absent in non-crisis periods. Relative to developed economies, emerging markets are more responsive to global trade conditions (in crisis and in placebo periods), but less responsive to selling pressures. An analysis of portfolios of firms during various placebo periods indicates that investors are not compensated for the risks associated with the crisis shocks. Finally, a month-by-month analysis of returns during the crisis period shows that the time variation of the importance of each of the sensitivities to shocks tracks related changes in the global economic environment.

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1. Introduction

The financial crisis of 2007–2008, which started in the US mortgage market, was characterized by three types of global shocks: a sharp contraction in the supply of credit, distressed sales of risky assets as banks and investors scrambled to shore up their liquidity and capital ratios, and a significant contraction in global trade. In this paper, we examine the extent to which the sensitivities of firms to these shocks explain the behavior of firm-level stock returns during the crisis.

Stock returns are a unique measure of performance that is comparable across firms and countries, forward-looking, comprehensive in scope, and insensitive to differences in accounting rules. In normal times, a firm's stock returns reflect a combination of expected returns (its loadings on risk factors) and residual returns that are associated with firm-specific news. At times of significant economy-wide shocks, however, the cross-section of residual returns can be understood as reflecting the exposure or sensitivity of firms to unexpected shocks.

Our strategy is to construct measures of firm-level sensitivity to each of the three categories of "crisis shocks" described above and then identify their relative contribution to the observed declines in equity returns. As a measure of sensitivity to global product demand shocks, we employ a measure of global trade exposure. The sensitivity to selling pressure is captured by the amount of trading in each stock prior to the crisis. We measure firms' sensitivity to credit supply shocks through a combination of variables relating to the capital structure (leverage ratio), its dividend behavior (dividend to sales ratio), and the ability of the firm to cover its debt obligations (interest coverage).

We collect data on over 16,000 firms in 44 countries around the world to study whether cross-sectional stock returns over the period of August 2007 to December 2008 can be explained by firms' sensitivities to the "crisis shocks" described above.[1] We use a methodology similar to Tong and Wei (2011) which employs a cross-sectional model of stock returns and captures expected returns with a standard set of control variables.[2] In this framework, our sensitivities to shocks capture unexpected influences of crisis-related shocks on residual stock returns. Empirically, we use values from 2006 to construct our measures of sensitivities, which are based on firm characteristics observed prior to the crisis. We then compare our results for the crisis period with a similarly structured model of the "placebo" period that runs from August 2005 to December 2006 as well as with two longer placebo periods spanning 5 and 10 years each, going back as far as 1997.

To complement the regression analysis, we also build portfolios of "crisis-shock exposed" and "crisis-shock robust" firms (which are defined later in the paper) and test whether returns before and during the 2007–2008 crisis, as well as the different placebo periods, have differed across these two types of firms.

To preview our results, we find that firms sensitive to credit supply shocks, global demand shocks, and selling pressures in the equity market had lower returns during the crisis. On the other hand, sensitivity to these shocks had generally less severe effects during the placebo periods. Our results are robust to different measures of beta, momentum, and weighting.

Because the crisis originated in the developed countries (largely in the US and UK), and later spread to emerging markets, we also investigate whether there are major differences in the impact of these sensitivities in the developed countries and emerging markets samples. We find meaningful differences. Global demand sensitivity is higher in the emerging markets sample, likely because trade is more important for firms in emerging economies. On the other hand, the sensitivity to selling pressures is higher in the sample of developed countries, reflecting the fact that stock markets in developed countries tend to be more liquid than in emerging markets. Both developed and emerging markets display similar sensitivity of returns to credit supply shocks, but the magnitudes differ.

Confirming the conclusions of our placebo period analysis, our portfolio analysis during the pre-crisis period (1997–2006) reveals that the influences we identify do not appear to be "priced." Mean

[1] In our baseline estimations, we exclude US firms in order to focus on factors that were associated with the global spread of the crisis. However, for comparison, we also report separate results for US firms.

[2] Tong and Wei (2011) follow Whited and Wu (2006) in incorporating Fama and French (1992) factors directly in cross-sectional regressions of returns.

returns are higher for firms with low leverage, high interest coverage, and high dividends. This is the opposite of what we would expect if the market was generally compensating investors for risk associated with higher leverage. This pattern conforms with the negative effects of financial distress on returns identified in prior work (Campbell et al., 2008). At the same time, we find no difference in mean returns for firms with high and low foreign sales or liquidity, which indicates that the market is not compensating investors for the risks associated with holding liquid stocks and stocks from firms with high foreign sales. Finally, consistent with the regression results for the crisis and placebo periods, we find that during the crisis period stock returns are lower for "crisis-shock exposed" firms, namely those with high leverage, low dividend to sales, low interest coverage, high foreign sales, and high liquidity.

A month-by-month analysis of returns' sensitivities shows that the time variation of the importance of each of the sensitivities to "crisis shocks" tracks related changes in the global economic environment. The magnitude of the negative coefficient associated with the sensitivity to a global demand shock rises during times of greatest decline in exports. Time variation in the coefficients associated with the sensitivity to a credit supply shock is similar to that observed in credit risk spreads that reflect the timing of credit supply shocks. The variation over time in the coefficient that measures sensitivity to a stock market selling pressure shock closely tracks the variation in the returns to the stock market. Developed countries and emerging markets have similar patterns across time, with two exceptions: the credit supply shock more significantly affects developed countries in the periods of March 2008 (Bear Stearns collapse) and the summer and fall of 2008 (Lehman Brother's collapse); the liquidity shock is larger and more variable in developed countries than it is in the emerging markets sample.

While our regression methodology builds on Tong and Wei (2011), our focus is different. Tong and Wei explore the role of country level exposure to financial globalization, specifically through the composition of capital flows. They also find an important firm-specific factor in cross-sectional returns related to financial dependence (specifically, working capital financing needs). Our focus is entirely on firm-specific sensitivities to shocks, which arise as a result of an unexpected crisis event. We abstract from the effect of country characteristics by using country fixed effects. Didier et al. (forthcoming) provides a detailed analysis of country-specific factors in aggregate equity returns during the crisis. In considering the significance of firm-specific variables, we explore a broader range of firm characteristics, both relating to financing structure and other characteristics of firms than did Tong and Wei.

This paper is related to the growing literature on the origin and consequences of the crisis. Most of the existing papers have focused on the causes and consequences of the crisis and, thus, have mostly analyzed its epicenter, the United States.[3] A few others have studied the global transmission of this crisis. For instance, Fratzscher (2009) and Obstfeld et al. (2009) focus on the transmission via exchange rates. Dooley and Hutchison (2009) provide evidence of transmission to credit default swap spreads in emerging markets. Rose and Spiegel (2010, 2012) conduct an analysis of the international propagation of the crisis based on a measure of crisis incidence and severity which combines changes in real GDP, stock markets, credit ratings, and exchange rates. However, these papers use macro data to analyze the incidence and determinants of the propagation of the crisis. Ehrmann et al. (2009) study the transmission of the US 2007–2008 crisis to stock markets around the world by focusing on the performance of about 450 industry-equity portfolios across 64 countries. That paper primarily emphasizes the role of macro factors on the performance of industry portfolios rather than the role of the micro sensitivities to crisis shocks we consider here.

The rest of our paper is organized as follows. Section 2 explains our approach to identifying firms' sensitivities to crisis shocks. Section 3 describes the data and the empirical model used in our regression analysis. Section 4 presents our main empirical results for the global cross-section of stock returns during the crisis, and shows that our identified sensitivities to crisis shocks played a uniquely important role in explaining equity returns during the crisis, as compared with several pre-crisis "placebo" periods. Section 5 presents our results separately for developed countries and emerging markets. Section 6 presents an alternative approach to examine the behavior of firms' stock returns during crisis and non-crisis periods using portfolio analysis. Section 7 examines the cross-section of

[3] See Brunnermeier (2009), Calomiris (2009), Cecchetti (2009), Caprio et al. (2010), Reinhart and Rogoff (2008), and Taylor (2009), among many others.

returns during the crisis period in more detail, performing a month-by-month analysis of the changing importance of firms' sensitivities to crisis shocks over time. Section 8 concludes.

2. Identifying firms' sensitivities to crisis shocks

2.1. Global demand shock

The financial crisis was associated with a remarkable decline in global trade. World exports fell by 9 percent between July 2007 and December 2008. That decline reflected a variety of potential influences, including the sensitivity of export financing to credit supply contraction (Amiti and Weinstein, 2011; Chor and Manova, forthcoming). Our interest is not in explaining export decline, but rather examining firms' differing sensitivity to the decline in global demand during the crisis. In particular, we want to assess whether firms that had positioned themselves prior to the crisis to be more dependent on trade were relatively more vulnerable to global demand shocks during the financial crisis. We, therefore, measure global demand shock sensitivity using a firm-specific measure that captures the exposure of a firm to global trade. Our measure is the firm's pre-crisis proportion of sales outside the company's home country (i.e., the ratio of foreign to total sales).

2.2. Stock market selling pressure shock

There have been numerous studies of the effects of the crisis and the role of credit contraction and illiquidity crisis-induced selling on the redemptions of money market debts and the widening of bond spreads. These studies identify important effects of correlated selling pressure traceable to illiquidity problems in generating the contraction of quantities and the declines in prices in different debt markets.[4]

In publicly traded equity markets, crisis-related shocks could have even greater effects than in debt markets, given the consequences of the crisis for firms' immediate and future incomes and their debt financing options. Just as in debt markets, problems of "funding illiquidity" for investors in publicly traded firms (due to declines in investor equity, rising market volatility, and the decline in available credit), could have been transformed into "market illiquidity" as owners of publicly traded shares were forced to liquidate their shares. Billio et al. (2010) examine correlations in returns across different equity investors and document apparent crisis-specific linkages in returns that they argue reflect this selling pressure.[5] Additionally, publicly traded firms' expected performance was itself affected by declining expected sales and by contraction in the supply of credit. Equity selling pressure, therefore, could have magnified declines in share prices that reflected the influences of declining demand and tight credit in reducing the discounted expected future cash flows of firms.

We measure the sensitivity of a firm's equity to selling pressures in the stock market using pre-crisis stock turnover (the volume of trading relative to outstanding market value of equity).[6] This measure is intended to capture the relative liquidity of a stock prior to the crisis.[7]

In theory, the effect of stock liquidity on returns is ambiguous. On the one hand, greater liquidity may be associated with steeper declines in equity prices, as investors select their most liquid risky assets to sell during a liquidity squeeze. On the other hand, liquidity becomes more valuable during a crisis, implying that relatively illiquid stocks may experience relative price declines. The interpretation of any

[4] See Schwarz (2009) on the Libor market, Heider et al. (2009) on the Euribor market, Gorton and Metrick (forthcoming) on the repo market, Covitz et al. (2009) on the asset-backed commercial paper market, Duca (2009) on the commercial paper market, and Mitchell and Pulvino (2010) on the bond market.

[5] Cella et al. (2010) find that investors with short trading horizons are inclined or forced to sell their holdings to a larger extent than investors with longer trading horizons, amplifying the effects of market-wide shocks on stock prices.

[6] In a prior draft of this paper, we included the amount of free float as a second measure of sensitivity to selling pressure. In examining further the data for free float, we encountered some anomalies that led us to exclude it. Namely, for some firms, free float was measured as one hundred percent. Given our doubts about those data, we excluded the variable from our analysis. However, none of our results change significantly whether we include or exclude this variable.

[7] Bekaert et al. (2007) find that, in emerging markets, expected returns vary with the liquidity of stocks, which they measure as the proportion of trading days for which stock returns are zero.

observed liquidity effects on returns is also controversial. For example, if liquid stocks decline more during the crisis, one could argue that relatively illiquid stocks also experienced similar or even larger "shadow" declines in value during the crisis that were masked by the lack of sales of these illiquid stocks. In other words, had someone tried to sell a large amount of an illiquid stock, its price would have been much lower. Selectivity bias related to endogenous decisions to sell, therefore, complicates the interpretation of the meaning of the effects of liquidity on stock returns during the crisis.

2.3. Credit supply shock

Several studies show dramatic declines in credit supply during the crisis. Ivashina and Scharfstein (2010) find that banks curtailed new lines of credit, and thus, that credit supply contracted much faster than would be apparent by only examining outstanding aggregates amounts of commercial and industrial lending. Campello et al. (2010) survey chief financial officers (CFOs) of 1050 firms in 40 countries after the September 2008 market collapse and find that a substantial proportion of those surveyed report that they were forgoing positive net present value investments due to financing constraints.[8] Almeida et al. (2010) find that firms that are more exposed to debt rollover risk experienced much greater investment decline during the financial crisis.[9]

Although the contraction of credit supply affects all firms, either directly (through reduced credit) or indirectly (through reduced demand by customers who face reduced credit), some companies could be harder hit by a contraction in credit supply than others. Companies with intrinsically high costs of external finance – for example, small, growing firms, specializing in new products, or with short histories of public trading – could find their prospects of attracting financing reduced relative to other firms during times of general economic contraction, or credit supply stringency.[10]

For a given degree of exogenous difference in the costs of external finance, a company with higher leverage and lower cash flows relative to debt service requirements (i.e., interest coverage) prior to the crisis may experience greater vulnerability to credit supply shocks associated with a financial crisis. All firms experience reductions in their "debt capacities" during a crisis (the maximum degree of leveraging that their cash flow prospects will permit); therefore, companies with high leverage and lower interest coverage prior to the onset of a credit crunch could be more adversely affected than other firms, as credit supply constraints will be more likely to bind on them.[11]

Thus, vulnerability to credit supply shocks should reflect both the exogenous external finance costs of the firm and its endogenous financial choices. To capture both sorts of sensitivities to financial

[8] "[T]he inability to borrow externally caused many firms to bypass attractive investment opportunities, with 86% of constrained U.S. CFOs saying their investment in attractive projects was restricted during the credit crisis of 2008. More than half of the respondents said they canceled or postponed their planned investments".

[9] Almeida et al. (2010) use long-term debt maturing in the near term as a particularly exogenous indicator of firms' exposures to rollover risk. They argue that while a reliance on short-term contractual debt may proxy for other firm attributes, long-term debt maturing in the near term is a purer measure of exposure to rollover risk.

[10] There is a long literature examining indicators of firms' costs of external finance. Fazzari et al. (1988) used dividend payout as their key indicator. Dividend payout may reflect other differences, and has been criticized in some studies (Kaplan and Zingales, 1997; but see the response by Fazzari et al., 2000; and the further evidence in Almeida et al., 2004 and Campello and Chen, 2010).

[11] A large body of empirical and theoretical research supports the view that "corporate finance vulnerability" should matter for the cross-section of stock returns (Anginer and Yildizhan, 2010 is an exception), and that it should matter more for the cross-section of returns in adverse states of the world (i.e., recessions, credit crunches, or financial panics). The theoretical foundations of "corporate finance vulnerability" for stock returns dates back to the seminal work of Brock and Lebaron (1990), who showed that financing constraints (i.e., differences in the marginal cost of external finance across firms and across time) could explain variation in stock returns above and beyond those predicted by standard risk models. Brock and Lebaron (1990) showed that an adverse macroeconomic shock should cause a larger decline in the stock returns of financially constrained firms (those with relatively high costs of external finance) than other firms. With respect to the effects of leverage in magnifying financial constraints, Calomiris et al. (1994) and Sharpe (1994) found that although high leverage tends not to be useful for explaining cross-sectional differences in investment and employment decisions during expansions, during recessions US firms that had chosen to increase their debt to high levels during the preceding booms suffered larger contractions of employment, fixed investment, and inventory accumulation in reaction to declines in their sales growth during the recession. In other words, highly levered firms experience relatively large declines in expected cash flows in adverse economic states, but not in other economic states.

fragility, we considered a variety of measures that had been identified in the literature, and settled on a subset of indicators that capture endogenous leverage choices as well as exogenous characteristics related to external financing costs.[12]

Previous research on the effects of financial constraints on stock returns confirms that the effects are relatively pronounced during macroeconomic downturns. Lamont et al. (2001) surprisingly found "no evidence that the relative performance of constrained firms reflects monetary policy, credit conditions, or business cycles". Subsequent research by Campello and Chen (2010), however, shows that macroeconomic conditions do affect the magnitude of the financial constraint factor, once one properly identifies cross-sectional variation in the extent of financing constraints, which they show Lamont et al. (2001) did not do.

In light of these theoretical and empirical findings, we chose four indicators to capture the sensitivity of firms to the credit supply shock aspect of the crisis: (1) dividends to sales, (2) total debt to assets, (3) a dummy variable that is a threshold measure of potential financial distress, which distinguishes whether firms' debt service payments are very high relative to their cash flows – firms that have debt service coverage greater than one are defined as "good coverage" firms, and (4) an interaction effect of leverage with good coverage.

Dividend payout is a useful indicator of the exogenous cost of external finance; firms with high dividend payout tend to have high cash flows relative to investment, and are relatively mature. Our three leverage measures allow us to distinguish between the effects of financial distress, per se, and the effect of the financial crisis in reducing the effective debt capacity of non-distressed firms with significant pre-crisis leverage ratios. In particular, the interaction of leverage and good coverage highlights this potential effect of the crisis.

2.4. Limits to identifying firms' sensitivities to crisis shocks

We believe that our six observable measures (the ratio of foreign sales, the share of firms traded, the dividend to sales ratio, the leverage ratio, the good coverage dummy, and the interaction of leverage with good coverage) can be used to capture firms' sensitivities to the three categories of shocks reasonably well. Our identification assumptions linking each of these six observable variables primarily to one of the three crisis shocks (global product demand shocks, market sell-off pressure shocks, and credit supply shocks) are plausible, but we recognize that all three shocks probably affect each of the six observable variables to some extent. For example, firms with high pre-crisis costs of external finance will be more sensitive to reductions in cash flow (related to contractions in product demand) than other firms, even if credit supply were not declining. Nevertheless, we believe that the three sets of variables are naturally divisible into three groups based on our priors about the shock to which one would expect them to be most closely related.

3. Regression analysis methodology and data

To explore the role of firms' sensitivities to crisis-related shocks in driving the performance of firms' stocks, we estimate a cross-section model of returns represented by Eq. (1)

[12] Unlike Tong and Wei (2011), we do not confine our investigation to exogenous influences on external finance dependence related to working capital. We consider financial structure characteristics more broadly for two reasons. We note that working capital use, like other financial structure characteristics is endogenous to firm-specific costs of external finance. Calomiris et al. (1995) show that, ceteris paribus, firms that face greater external financing constraints tend to choose combinations of productive factors that make greater use of working capital. While that finding supports Tong and Wei's emphasis on working capital to measure financing constraints, it also indicates that their measure is endogenous to choices that reflect financing constraints, which are related more broadly to age, opacity, and other firm characteristics. We do not regard endogeneity as a problem; on the contrary, we believe that it makes sense to consider the ways in which endogenous choices of firms' financing structure make them differentially vulnerable to crisis-related credit supply shocks. We consider a wide range of such measures. In particular, we show that endogenous decisions by firms – for example, the decision to increase leverage – mattered for firms' sensitivity to the crisis.

$$y_{f,i,c} = \alpha_1 Standard\,Risk\,Factors_{f,i,c} + \alpha_2 Firm\,Sensitivities\,to\,Crisis\,Shocks_{f,i,c} + \mu_i + \gamma_c + \varepsilon_{f,i,c} \quad (1)$$

where *f* represents the firm, *i* the industry, and *c* the country where each firm operates. The dependent variable in our study, $y_{f,i,c}$, is the return of each firm f, in each industry *i*, and each country *c*. *Standard Risk Factors* refer to a set of variables which the asset pricing literature have shown to drive expected results (Ang et al., 2006, 2009; Fama and French, 1992; Lakonishok et al., 1994; Sharpe, 1964). The *Firm Sensitivities to Crisis Shocks* are our proxies for firms' credit supply sensitivity, global demand sensitivity, and stock market selling pressure sensitivity. Following Tong and Wei (2011) and Whited and Wu (2006), we incorporate the standard risk factors and the sensitivities to crisis shocks by entering the relevant firm characteristics directly into the regression, rather than entering them indirectly first going through a factor model.[13] μ_i and γ_c are industry and country fixed effects, respectively, and $\varepsilon_{f,i,c}$ is the firm-level error term.

We estimate Eq. (1) over the crisis period and several placebo (i.e. non-crisis) periods. Crisis period returns are measured over the period August 2007 through December 2008. The control variables capturing firm characteristics are measured as of December 2006, the latest available financial data prior to the start of the crisis.

We use several placebo periods to verify whether our crisis results are specific to this period or capture influences present in the data in other periods. The first placebo period includes annual returns for 1997–2006, with all the control variables measured at the end of the preceding calendar year. For example, the returns for year 1997 are measured as the return from the end of December 1996 to the end of December 1997, while the controls are measured as of end of December 1996. This is the longest period for which all our variables were available spanning 10 years of returns data. Because of its length, this period inevitably captures several other "crisis periods", such as the Asian crisis of 1997–1998, the Russian and Brazilian crises of 1998–1999, and the Long Term Capital Management (LTCM) collapse of 1998–1999. We also employ a second, shorter placebo period, which runs from 2002 to 2006 for returns (with controls measured at the end of each preceding year). This is a relatively "calm" period in the global financial markets, although some crises are still present (e.g., in Argentina), they were not as global in reach as crises in the longer period. This second placebo period contains 5 years of data. Finally, we construct a third placebo period that is the most similar to our crisis period in terms of the length of time for returns and the timing of control variables. This placebo period encompasses returns from August 2005 through December 2006, with controls measured in December 2004. Similar to our crisis period, this placebo contains returns for 17 months – i.e. from August to December of the following year.

The first and second placebo periods contain multiple years of data in a panel structure with returns measured over each calendar year, while the third placebo and the crisis period represent cross-sections of firms (as returns are measured over the whole 17 months period). We estimate our crisis and third placebo regressions in the same way using OLS with country and industry dummies and standard errors clustered at the country level to allow for within-country across–firms correlation of error terms. To make our results for the first and second placebo periods comparable to our crisis results, we estimate these regressions in a similar way: with country and industry fixed effects, with a minor difference of adding time fixed effects to the panel regressions to capture common global macroeconomic influences.[14]

Table 1 lists the countries along with the number of firms included in each sample (Developed vs. Emerging) and each of the four periods (the crisis period and three placebo periods). We only consider countries with at least 20 firms. The crisis period includes 11,677 firms operating in 44 countries, while the three placebo periods include varying number of firms. During the longest placebo period our sample consists of 16,434 firms operating in 44 countries.

[13] Daniel and Titman (1997) were early advocates of this approach to capturing Fama-French risk factors, arguing that firm characteristics rather than the covariance structure of returns appear to explain the cross-sectional variation in stock returns.

[14] We do not introduce firm fixed effects in our panel regressions to keep our results most comparable to crisis period results, which capture cross-sectional variation between the firms. We have also run our regressions with standard errors clustered at the firm-level (instead of country level) and obtained similar results as those reported.

Table 1
Number of firms by country.

Country	Crisis	Placebo		
	2007–08	1997–2006	2002–2006	2005–2006
	Developed countries			
Australia	677	968	872	596
Austria	58	106	87	56
Belgium	82	124	98	75
Canada	756	1158	957	684
Denmark	81	167	129	92
Finland	106	132	121	101
France	504	867	704	521
Germany	519	750	678	518
Greece	234	286	263	150
Ireland	41	64	59	41
Italy	197	255	214	180
Japan	967	1166	1094	948
Luxembourg	21	29	27	23
Netherlands	123	212	157	124
New Zealand	87	122	105	86
Norway	124	196	144	115
Portugal	38	87	59	42
Spain	90	138	115	86
Sweden	244	354	283	230
Switzerland	167	209	192	166
United Kingdom	1158	1866	1432	1050
	Emerging markets			
Argentina	46	68	58	49
Brazil	178	285	253	179
Chile	114	142	135	115
China	314	1128	945	518
Czech Republic	9	66	31	14
Egypt	28	31	27	23
Hong Kong	551	729	706	570
Hungary	20	35	31	24
India	736	555	522	417
Indonesia	184	243	231	189
Israel	105	137	126	104
Korea, Rep.	769	933	859	662
Malaysia	760	778	750	677
Mexico	75	125	109	83
Pakistan	84	82	76	63
Peru	52	71	61	33
Philippines	77	111	98	58
Poland	137	135	126	78
Russian	65	58	58	36
Singapore	461	501	471	425
South Africa	175	446	310	196
Thailand	333	348	312	277
Turkey	130	171	158	141
Total	**11,677**	**16,434**	**14,243**	**10,815**

Table 2 presents descriptive statistics for returns, standard risk factors, and firms' sensitivities to crisis shocks during the crisis and placebo periods. We present statistics separately for the developed countries and emerging markets samples. To save space, in Table 2 we present descriptive statistics only for the longest placebo period – i.e. from 1997 to 2006. Data on returns come from Datastream. Table 2 shows that firm returns averaged −46 percent over the crisis period for both developed and emerging countries. The standard deviation of returns over the crisis period is 33 percent in developed countries and 30 percent in emerging markets. During the longest placebo period, returns average 12

Table 2
Summary statistics. This table presents the average and standard deviation (sd.) for the variables over the crisis and placebo periods for the overall sample and for the samples of developed countries and emerging markets, respectively. The crisis period is defined as the period between August 2007 and December 2008 for returns. All other variables are defined as of 2006 for the crisis period. The placebo period encompasses annual returns over the period December 1997 through December 2006. During the placebo, other variables are measured as of December of each year between 1996 and 2005.

	Crisis period						Placebo period [1997–2006]					
	All sample		Developed		Emerging		All sample		Developed		Emerging	
	Mean	Sd.	Mean	Sd.	Mean	Sd.	Mean	Sd.	Mean	Sd.	Mean	Sd.
Return	−0.46	0.32	−0.46	0.33	−0.46	0.30	0.12	0.53	0.13	0.50	0.11	0.56
Beta	0.79	0.59	0.80	0.59	0.77	0.59	0.62	0.73	0.60	0.72	0.65	0.75
Momentum	0.24	0.43	0.14	0.33	0.36	0.50	−0.01	0.37	−0.01	0.34	0.00	0.41
Market to book value ratio	2.38	3.21	2.65	3.49	2.07	2.82	1.98	2.93	2.18	3.14	1.72	2.62
Log of total asset	12.02	1.94	12.10	2.11	11.93	1.71	11.93	1.94	11.98	2.18	11.88	1.58
Sd. of beta residuals	12.13	4.55	11.43	4.63	12.94	4.32	13.04	5.45	11.80	5.33	14.67	5.17
Dividend to sales ratio	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.03	0.02	0.03	0.02	0.04
Good coverage	0.77	0.42	0.74	0.44	0.81	0.39	0.75	0.43	0.74	0.44	0.76	0.43
Leverage	0.23	0.21	0.22	0.21	0.24	0.21	0.26	0.21	0.24	0.19	0.28	0.23
Leverage(Good coverage = 1)	0.22	0.17	0.21	0.17	0.22	0.18	0.23	0.17	0.23	0.17	0.24	0.18
Leverage(Good coverage = 0)	0.29	0.31	0.25	0.30	0.35	0.31	0.33	0.28	0.28	0.25	0.41	0.30
Liquidity	0.09	0.16	0.07	0.10	0.11	0.20	0.11	0.28	0.07	0.16	0.16	0.38
Ratio of foreign to total sales	0.32	0.27	0.37	0.26	0.26	0.27	0.26	0.21	0.32	0.19	0.19	0.22
Construction Industry dummy	0.11	0.31	0.08	0.27	0.13	0.34	0.12	0.32	0.11	0.31	0.13	0.34
Mining Industry dummy	0.09	0.29	0.11	0.31	0.08	0.27	0.09	0.28	0.09	0.29	0.08	0.28
Retail trade Industry dummy	0.05	0.22	0.06	0.25	0.04	0.19	0.06	0.24	0.07	0.26	0.05	0.21
Services Industry dummy	0.25	0.44	0.32	0.46	0.18	0.39	0.23	0.42	0.29	0.45	0.16	0.37
Transport and utilities dummy	0.12	0.32	0.13	0.33	0.11	0.31	0.11	0.32	0.12	0.32	0.11	0.31
N	11,677	11,677	6,274	6,274	5,403	5,403	77,981	77,981	44,296	44,296	33,685	33,685

percent in the combined sample (13 percent in developed and 11 percent among emerging markets) and the standard deviation is about 50 percent in both samples.

The independent variables used in our analysis come from Worldscope, a commercial database produced by Thomson Reuters, which provides financial statement data for most listed firms around the world. *Standard Risk Factors* follow Tong and Wei (2011) and include: the *beta* of each firm vis-a-vis the global market, the *standard deviation of the beta residual* (i.e., the standard deviation of the error from the estimation of the beta vis-a-vis the global market), the *log of firm assets*, a measure of *momentum*, and the *market to book value ratio*. The beta of each firm vis-a-vis the global market is the coefficient from regressing each firm's stock returns on the returns from a global portfolio as captured by the FTSE World Index. The capital asset pricing model of Sharpe (1964) predicts that individual stock returns will be driven by the correlation of each firm with the market's return. Because stock markets around the world have become increasingly integrated (see, for example, Bekaert et al., 2011), we consider the correlation or beta vis-a-vis a world portfolio as opposed to the local market. For the crisis period beta is measured over the period December 2001 and December 2006 and averages 0.79 in the overall sample (0.80 and 0.77 in the developed countries and emerging markets samples, respectively). For the placebo periods beta is re-calculated annually using monthly returns for 5 years preceding the start of each calendar year. The average beta over the placebo period is 0.62 for the overall sample (0.60 and 0.65 in the developed countries and emerging markets samples, respectively). The standard deviation of beta is 0.59 (in both samples) during the crisis and 0.72–0.75 during the placebo period.

Following Ang et al. (2006, 2009), we also include the standard deviation of the error term from the regressions used to calculate beta. The average of this variable during the crisis period is 12.13 in the overall sample and it is slightly higher for emerging markets (11.43 in developed countries vs. 12.94 in emerging markets sample), while it averages 13.04 during the placebo period and again it is larger for the emerging markets sample (14.67 vs. 11.80).

Fama and French (1992) have shown that aside from beta, firms' expected returns are driven by firms' size and market to book value ratios. We measure firm size by the log of assets measured in dollars. The average for this variable during the crisis period is 12.10 for developed countries and 11.93 for emerging markets. For the placebo, the log of assets averages 11.98 in the developed countries sample and 11.88 in the emerging markets. The standard deviation of size is smaller in the emerging markets sample (1.58 vs. 2.18), indicating that firms in that sample are more similar to each other.

The market to book value ratio is equivalent to the number of shares outstanding multiplied by the price of the shares, divided by the book value of equity. For the crisis period, the mean market to book value ratio is 2.65 in the developed and 2.07 in the emerging markets samples and the standard deviations are 3.49 and 2.82, respectively. This variable averages 2.18 and 1.72 during the placebo period.

Following Lakonishok et al. (1994), we also include among the standard risk factors a measure of momentum, defined as each firm's return over the six month period prior. For the crisis period, this refers to January 2007 through June 2007. For the placebo period, momentum is re-calculated every year using 6-months prior to the start of the year for the first (1997–2006) and second (2002–2006) placebo periods and it is measured over the period January 2005 through June 2005 for the third placebo period. The mean of momentum is 24 percent during the crisis, but with a significant difference between developed countries and emerging markets: 14 percent in developed countries and 36 percent in emerging economies, indicating that stock markets were experiencing a significant boom in emerging economies prior to the start of the crisis. The momentum is near zero percent during the placebo period in both samples.

We include a number of variables to measure firms' sensitivity to credit supply shocks, namely: the ratio of *dividends to sales*, the *leverage ratio*, *good coverage* – a dummy equal to 1 for firms with interest coverage ratios above 1 – and the interaction between leverage and good coverage, which we label *good coverage* × *leverage*. The interest coverage ratio is defined as the ratio of earnings to interest expenses. It measures the ability of firms to meet their debt obligations. Hence, the mean of the indicator variable we use captures the share of firms for which earnings exceed debt service obligations. Table 2 shows that 77 percent of firms have interest coverage ratios above 1 during the crisis and 75 percent during the placebo period. Emerging markets have a higher proportion of firms with good coverage in both crisis and placebo periods. The average leverage ratio is 0.23 during the crisis and 0.26 during the placebo period, without significant differences between developed and emerging markets. We also report average leverage for groups of firms with the good coverage dummy equal to one or

zero. Firms with the good coverage dummy equal to zero have much higher leverage in both samples (the difference is more dramatic in the emerging markets sample – 0.22 vs. 0.35 during the crisis and 0.24 vs. 0.41 in the placebo period).

We capture firms' sensitivity to stock selling pressures through the inclusion of the *ratio of shares traded,* defined as the number of shares traded per month divided by the number of shares outstanding.[15] Holding constant country-specific factors (e.g., different regulations) relating to equity trading (which our country fixed effects capture in our regressions), this variable is an indicator of cross-sectional differences within a country in the ease with which firms' stocks can be traded. The average for the volume traded is about 0.10 during the crisis and the placebo period.

We capture firms' sensitivity to global demand shocks by including the *share of foreign (overseas) sales* to total sales. For both the crisis period, the share of foreign sales averages 0.37 in developed and 0.26 in developing sample.

4. Regression results

In Table 3, we begin by reporting results for five regressions, estimated for the entire global sample over the crisis period August 2007–December 2008, in which each of the six variables (including the interaction of leverage with good coverage) that we use to capture firms' sensitivities to crisis shocks enter separately in the regressions. In addition, we report results for the three placebo periods discussed above, encompassing returns over the periods: 1997–2006, 2002–2006, and 2005–2006.

The first two columns in Table 3 consider regressions in which all three types of sensitivities to crisis shocks are present. The second column adds the interaction of the good coverage and leverage. The third through fifth columns of Table 3 include the three sets of sensitivities to crisis shocks one at a time as a robustness check. All regressions include controls for standard risk factors relating to expected returns, as mentioned in Section 3, which are not discussed here.[16] We focus our discussion on the sensitivities to crisis shocks.

For the crisis period, the measured coefficients on variables associated with the sensitivity to each of the three sets of shocks (global trade demand, selling pressure, and credit supply) do not change much as a result of including or excluding variables associated with the other two sets of crisis shocks. We find statistically significant and economically important effects for all three categories of sensitivities to shocks. With respect to selling pressure effects, the share of stocks traded consistently enters negatively and statistically significantly in the regressions. The measure of sensitivity to the global demand shock, the coefficient on the proportion of foreign sales, is also consistently negative and statistically significant.

The effects of leverage must be interpreted through the combined estimates of the three leverage-related variables (good coverage, leverage, and their interaction). Leverage enters negatively and good coverage enters positively in model (1). The interaction between the two also enters negatively and significantly in model (2). Including the interaction eliminates the significance of the simple leverage effect, indicating that variation in leverage among the set of firms that do not have good coverage ratios adds relatively little to the explanatory power of the regression during the crisis. In other words, investors do not differentiate among bad-coverage firms (i.e., those with good coverage = 0) based on their leverage. This might be due to the fact that bad-coverage firms as a group tend to display high leverage. Because the interaction of leverage and good coverage is important in crisis times, we use model (2) as the baseline for all our subsequent tests.

Another way to summarize the effects of the three leverage-related variables is by measuring their combined effects on the differences in residual returns for good coverage firms (*good coverage* = 1) and bad-coverage firms (*good coverage* = 0). During the crisis, the returns difference between these two groups is decreasing as leverage is increasing. For example, at leverage values of 0.10, good coverage

[15] Amihud (2002) uses a different measure of liquidity which is based on daily trading data. We prefer our measure as it allows us to include firms with missing daily trading data.

[16] All regressions also include country level and industry level fixed effects. Furthermore, standard errors are clustered by country. Placebo I and II also include time fixed effects.

Table 3
Estimations using individual indicators of sensitivity to "crisis shocks" for all countries. Table shows estimations for returns over the crisis period (August 2007–December 2008) and for several placebo periods. For placebo periods 1997–2006 and 2002–2006, returns are measured annually for each year, while the regressors are measured as of December of the previous year (e.g., for the year 1997, the return is the return between end of 1997 and end of 1996, while leverage, liquidity etc are as of end 1996). For the period 2005–2006, returns are measured between August 2005 and December 2006, while regressors are measured as of end of 2004. Robust standard errors, clustered by country, are in parentheses. *, **, *** denote statistical significance at 10, 5 and 1 percent respectively.

	Crisis period					Placebo periods		
	(1)	(2)	(3)	(4)	(5)	1997–2006	2002–2006	2005–2006
Beta	−0.021***	−0.021***	−0.022***	−0.020***	−0.021***	0.002	0.022***	0.017
	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.010)
Momentum	−0.026***	−0.025***	−0.026***	−0.026***	−0.026***	0.083***	0.091***	0.126***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.019)	(0.017)	(0.032)
Market to book value ratio	−0.002**	−0.002**	−0.002**	−0.001	−0.001	−0.015***	−0.017***	−0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)
Logarithm of total assets	−0.001	−0.000	−0.002	−0.001	−0.001	0.002	0.015***	0.033***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.007)
Standard dev. beta residuals	−0.012***	−0.012***	−0.012***	−0.014***	−0.014***	−0.003	−0.004**	−0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Dividends to sales	0.376***	0.359***	0.370***			−0.049	−0.036	−0.222
	(0.081)	(0.079)	(0.076)			(0.117)	(0.096)	(0.170)
Good coverage dummy	0.029***	0.053***	0.055***			0.106***	0.090***	0.039
	(0.008)	(0.008)	(0.007)			(0.014)	(0.016)	(0.026)
Leverage ratio	−0.059***	−0.011	−0.008			−0.073**	−0.100***	−0.068
	(0.016)	(0.018)	(0.019)			(0.028)	(0.031)	(0.049)
Good coverage *Leverage		−0.096***	−0.097***			0.001	0.055*	0.094*
		(0.024)	(0.023)			(0.028)	(0.030)	(0.048)
Ratio of shares traded	−0.099***	−0.097***		−0.101***		−0.004	−0.022	0.026
	(0.034)	(0.035)		(0.033)		(0.021)	(0.029)	(0.048)
Ratio of foreign to total sales	−0.070***	−0.070***			−0.072***	−0.006	−0.008	−0.013
	(0.026)	(0.025)			(0.026)	(0.015)	(0.022)	(0.033)
Constant	−0.267***	−0.290***	−0.290***	−0.252***	−0.231***	−0.207**	−0.145**	−0.050
	(0.074)	(0.074)	(0.071)	(0.073)	(0.076)	(0.081)	(0.054)	(0.086)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	No	No	No	No	Yes	Yes	No
Observations	11,677	11,677	11,677	11,677	11,677	77,981	45,665	10,815
R-squared	0.184	0.185	0.181	0.176	0.177	0.162	0.157	0.137
Number of countries	44	44	44	44	44	44	44	44

firms exhibit returns implied by the three leverage-related variables in column (2) of Table 3 that are 4.2% higher than bad-coverage firms; but at a leverage value of 0.50, there is no difference in returns between the good coverage and bad-coverage firms.

The effects of the three leverage-related variables during the placebo periods are different from the pattern during the crisis. The main difference comes from the interaction term – while it is negative and significant in the crisis, it is either not significant or positive in the placebo. Unlike the crisis period, there is no convergence of returns between good coverage and bad-coverage firms as leverage rises. Thus, during non-crisis periods, firms with *good coverage* = 0 experience negative returns relative to firms with *good coverage* = 1 irrespective of their leverage levels. Finally, firms with high dividend payout also display different patterns of residual returns during crisis and placebo periods. High dividend paying firms display higher returns during the crisis, but not during any of the placebo periods.

To summarize our results so far, it is useful to make a distinction between firms that are "distressed" (i.e., have bad-coverage and high leverage) and firms that are in a "vulnerable" financial position (i.e., those with good coverage but high leverage and high shadow costs of external finance, as indicated by dividend payout). Our results suggest that during the crisis (and not during placebo periods),

"vulnerable" firms with good coverage are differentiated from other good coverage firms by the market.

With respect to the sensitivities to the other two crisis shocks, we find that the variables capturing the sensitivity to the global demand shock or the market liquidity shock are insignificant during the placebo periods, confirming that these variables also capture shocks that are crisis-specific.

We conduct a number of additional estimations to verify the robustness of our global sample results. We use as the baseline results those reported in model (2) of Table 3. First, instead of calculating the beta vis-à-vis the global market index, we compute the beta for each firm vis-à-vis its local stock market index. Second, because the number of firms varies by country, to reduce the potentially excessive influence of countries with a large number of firms, we conduct weighted least squares with weights proportional to the inverse of the square root of the number of firms in each country. Third, we change our definition of momentum to measure it as stock return over the preceding 12-month, rather than 6-month period.

Table 4 presents results for the crisis period and Table 5 shows the estimations for the placebo periods. Using the local beta rather than the global beta does not change our results in any significant way (see model (1) in Tables 4 and 5). Running our estimations with weights proportional to the inverse of the square root of the number of firms or using a different momentum definition does not lead to changes in results either.

Finally, we present our results estimated separately for the sample of US firms, which are excluded from all the rest of our analysis. While the results for U.S. firms are broadly similar, they differ in two respects: First, the coefficient on the ratio of shares traded is insignificant during the crisis period.[17] Second, for U.S. firms, during one of the placebo periods, the coefficient on the ratio of foreign sales is positive and significant and during two of the placebo periods the ratio of shares traded is positive and significant. In both cases the results are different from what is observed during the crisis.

5. Developed countries vs. emerging markets

The global crisis that took place during 2007–2008 originated in developed countries (largely US and UK), but soon spread to most countries around the globe. Unlike many other crises, emerging economies could largely be seen as "innocent by-standers" of the crisis. It is thus plausible to expect that the effect of the crisis might be different in developed countries and emerging markets. In this section, we consider these differences using the same crisis and placebo periods as above.

Table 6 presents a comparison of results for the crisis period for developed countries and emerging economies. The last column reports the results of the Chi-square value for the test comparing coefficients between the two samples (with the corresponding *p*-value in the squared brackets). As before, we do not discuss the results for our control variables and focus on our variables of interest. With respect to the variables capturing the exposure to credit supply shock, we observe similar impact on dividend to sales (both are positive and not statistically different from one another). The results for the three leverage-related variables are broadly similar between the two samples when their effects are considered together, but the magnitudes differ. For developed economies, the implied returns difference between good coverage and bad-coverage firms with 0.25 leverage is 5%, and that difference falls to 2.6% at a 0.50 leverage value and to near zero for about 0.8 leverage value. For emerging markets, the returns difference between good coverage and bad-coverage firms with 0.25 leverage is 1%, and at a leverage value of 0.35 it is zero.

We observe a negative impact of liquidity in both samples, however, it is more pronounced in the developed country sample with a coefficient that is three times larger (i.e. of −0.18 vs. −0.06) and the difference between the coefficients is statistically significant at 5%. In other words, cross-sectional differences in the extent of liquidity are more relevant for developed countries during the crisis.

[17] In results not reported here, we investigated whether similar results held for U.K. firms (the country in our sample most similar to the U.S.) and we found that results for the U.K., in particular with respect to the coefficients on the two selling pressure variables, were broadly similar to those of other developed countries and different from those of the U.S.

Table 4
Robustness checks for the crisis period. This table reports results of estimation of model (2) in Table 3 for the crisis period (with returns measured for August 2007–December 2008), with the following variations: in column (1) local beta (calculated using local market returns) substitutes global beta, in model (2) regressions are weighted by the number of observations in each country, column (3) reports the results for US only and model (4) uses alternative definition of momentum defined over preceding 12-months period, i.e., stock returns over the period July 2006–July 2007. Robust standard errors, clustered by country, are in parentheses. *, **, *** denote statistical significance at 10, 5 and 1 percent respectively.

	Local beta	Weighted	US	New momentum
	(1)	(2)	(3)	(4)
Beta	−0.031***	−0.029***	−0.028***	−0.021***
	(0.011)	(0.007)	(0.008)	(0.006)
Momentum	−0.025***	−0.029***	0.030*	−0.020***
	(0.008)	(0.009)	(0.018)	(0.005)
Market to book value ratio	−0.002**	−0.002**	0.001	−0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Logarithm of total assets	0.001	−0.004	0.004	−0.000
	(0.004)	(0.004)	(0.004)	(0.004)
Standard dev. beta residuals	−0.010***	−0.012***	−0.012***	−0.011***
	(0.002)	(0.001)	(0.002)	(0.002)
Dividends to sales	0.375***	0.402***	0.503**	0.333***
	(0.076)	(0.081)	(0.197)	(0.077)
Good coverage dummy	0.055***	0.052***	0.150***	0.058***
	(0.008)	(0.012)	(0.019)	(0.007)
Leverage ratio	−0.008	−0.009	−0.015	−0.007
	(0.017)	(0.024)	(0.022)	(0.019)
Good coverage*Leverage	−0.098***	−0.102***	−0.130***	−0.098***
	(0.023)	(0.029)	(0.044)	(0.024)
Ratio of shares traded	−0.102***	−0.107***	0.040	−0.092**
	(0.035)	(0.032)	(0.037)	(0.034)
Ratio of foreign to total sales	−0.070***	−0.071***	−0.075***	−0.070***
	(0.026)	(0.020)	(0.024)	(0.025)
Constant	−0.318***	0.003	−0.435***	−0.289***
	(0.075)	(0.065)	(0.060)	(0.072)
Country fixed effects	Yes	Yes	No	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	No	No	No	No
Observations	11,770	11,677	2,867	11,657
R-squared	0.182	0.181	0.155	0.186
Number of countries	44	44	1	44

The impact of the global demand shock is also different between developed and emerging market countries, but the difference goes in the opposite direction – i.e. the shock sensitivity is significantly more pronounced in emerging countries: the coefficient is significant at 1% in this sample and not significant at conventional levels (but approaching significance) in the developed countries sample. It is not too surprising that global demand shock would have more influence on emerging countries, which are traditionally more vulnerable to fluctuations in trade.

Table 7 reports the sample splits for developed vs. emerging countries for our three placebo periods. We focus on the differences between the coefficients for developed and emerging countries. The differences are never significant for dividend to sales.

For all three placebo periods, the combined effects of the three leverage-related variables are not significantly different for developed and emerging economies.[18] The interaction of leverage and coverage is never significantly negative as it is during the crisis, which means that there is no returns convergence between good coverage and bad-coverage firms as leverage rises.

[18] Out of 9 sets of coefficients (i.e. three leverage-related variables in three periods), only one set exhibits significant difference between the two samples.

Table 5

Robustness checks for the placebo periods. This table reports results of estimation of model (2) in Table 3 for the placebo periods, with the following variations: in column (1) local beta (calculated using local market return) substitutes global beta, in model (2) regressions are weighted by the number of observations in each country, column (3) reports the results for US only and model (4) uses alternative definition of momentum defined over 12-month period prior to the start of each year. Robust standard errors, clustered by country, are in parentheses. *, **, *** denote statistical significance at 10, 5 and 1 percent respectively.

	Local beta			Weighted			US			New momentum		
	1997–2006	2002–2006	2005–2006	1997–2006	2002–2006	2005–2006	1997–2006	2002–2006	2005–2006	1997–2006	2002–2006	2005–2006
Beta	−0.002	−0.008	0.018	0.006	0.024***	0.009	−0.006	0.011	0.050***	0.000	0.018***	0.014
	(0.010)	(0.014)	(0.019)	(0.006)	(0.007)	(0.012)	(0.005)	(0.009)	(0.017)	(0.007)	(0.007)	(0.010)
Momentum	0.072***	0.079***	0.130***	0.084***	0.088***	0.131***	0.032***	0.041***	0.058	0.008	0.048***	0.039***
	(0.018)	(0.016)	(0.032)	(0.017)	(0.016)	(0.033)	(0.011)	(0.013)	(0.036)	(0.009)	(0.011)	(0.012)
Market to book value ratio	−0.015***	−0.016***	−0.004	−0.015***	−0.017***	−0.006*	−0.007***	−0.006***	−0.000	−0.014***	−0.017***	−0.005
	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)	(0.004)
Logarithm of total assets	0.002	0.016***	0.032***	−0.003	0.013***	0.031***	0.005**	0.006**	0.023***	0.002	0.015***	0.031***
	(0.005)	(0.005)	(0.007)	(0.004)	(0.004)	(0.006)	(0.002)	(0.003)	(0.006)	(0.005)	(0.004)	(0.007)
Standard dev. beta residuals	−0.003	−0.003	−0.009***	−0.003**	−0.003***	−0.008***	−0.005***	−0.005***	−0.008***	−0.003	−0.004**	−0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)
Dividends to sales	−0.071	−0.041	−0.193	−0.030	−0.112	−0.058	−0.202	−0.890***	−0.677**	−0.035	−0.025	−0.213
	(0.108)	(0.102)	(0.171)	(0.095)	(0.100)	(0.178)	(0.131)	(0.161)	(0.308)	(0.121)	(0.099)	(0.173)
Good coverage dummy	0.108***	0.095***	0.040	0.118***	0.103***	0.062**	0.056***	0.056***	0.125***	0.120***	0.092***	0.043
	(0.014)	(0.016)	(0.026)	(0.014)	(0.015)	(0.028)	(0.014)	(0.016)	(0.031)	(0.016)	(0.016)	(0.027)
Leverage ratio	−0.071**	−0.092***	−0.065	−0.058**	−0.090***	−0.081	−0.079***	−0.079***	0.031	−0.067**	−0.102***	−0.047
	(0.028)	(0.027)	(0.048)	(0.028)	(0.031)	(0.059)	(0.025)	(0.022)	(0.038)	(0.028)	(0.030)	(0.050)
Good coverage*Leverage	0.001	0.046	0.090*	−0.008	0.040	0.090	0.075**	0.087**	−0.066	−0.008	0.052*	0.070
	(0.028)	(0.028)	(0.047)	(0.032)	(0.037)	(0.065)	(0.034)	(0.036)	(0.071)	(0.028)	(0.029)	(0.051)
Ratio of shares traded	−0.010	−0.033	0.015	0.002	−0.001	0.036	0.133***	0.072***	0.046	−0.001	−0.023	0.028
	(0.020)	(0.027)	(0.046)	(0.019)	(0.030)	(0.053)	(0.017)	(0.024)	(0.044)	(0.020)	(0.026)	(0.056)
Ratio of foreign to total sales	−0.012	−0.014	−0.013	−0.007	−0.010	−0.038	−0.018	−0.022	0.111**	−0.009	−0.007	−0.003
	(0.014)	(0.021)	(0.032)	(0.014)	(0.021)	(0.035)	(0.023)	(0.029)	(0.046)	(0.016)	(0.022)	(0.032)
Constant	−0.185**	−0.169***	−0.054	−0.081	0.032	−0.214**	0.145***	−0.172***	−0.213**	−0.220**	−0.163***	−0.026
	(0.088)	(0.060)	(0.086)	(0.084)	(0.053)	(0.095)	(0.036)	(0.046)	(0.102)	(0.084)	(0.054)	(0.085)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	
Observations	80,113	49,505	10,856	77,981	45,665	10,815	19,043	10,382	2,603	78,090	45,977	10,681
R-squared	0.155	0.151	0.136	0.177	0.160	0.139	0.114	0.158	0.084	0.159	0.159	0.139
Number of countries	44	44	44	44	44	44	1	1	1	44	44	44

Table 6
Separate estimations for developed and emerging countries – Crisis period. Regressions are estimated on the separate samples of developed and emerging economies, defined in Table 1. Estimation procedure is the same as for model 2, Table 3. Column labeled "Test" contains Chi-squared values (*p*-values in brackets below) for test of the difference of coefficients across equations. Robust standard errors, clustered by country, are in parentheses. *, **, *** denote statistical significance at 10, 5 and 1 percent respectively.

Variables	Crisis period		
	Developed	Emerging	Test
Beta	−0.011	−0.033***	4.08**
	(0.009)	(0.007)	[0.043]
Momentum	−0.009	−0.033***	2.51
	(0.012)	(0.010)	[0.113]
Market to book value ratio	−0.001	−0.002	0.12
	(0.001)	(0.001)	[0.730]
Logarithm of total asset	0.002	−0.002	0.33
	(0.006)	(0.005)	[0.568]
Sd. of beta residual	−0.009***	−0.015***	3.70**
	(0.003)	(0.001)	[0.054]
Dividend to sales	0.462***	0.291***	1.22
	(0.129)	(0.090)	[0.269]
Good coverage	0.064***	0.043***	1.65
	(0.009)	(0.014)	[0.198]
Leverage	−0.048**	0.038	5.86**
	(0.023)	(0.028)	[0.016]
Good coverage*Leverage	−0.068**	−0.129***	2.05
	(0.029)	(0.032)	[0.152]
Liquidity	−0.184***	−0.066*	5.38**
	(0.039)	(0.035)	[0.020]
Foreign sales	−0.054	−0.093***	1.03
	(0.033)	(0.020)	[0.310]
Constant	−0.394***	−0.193**	
	(0.112)	(0.072)	
Industry fixed effect	Yes	Yes	
Country fixed effect	Yes	Yes	
Time fixed effects	No	No	
Observations	6,274	5,403	
R-squared	0.176	0.209	
Number of countries	21	23	

The coefficients on liquidity differ between the two samples in the first placebo period but not in the second and third periods. In the first placebo period, for developed economies, we observe the opposite effect of liquidity than in the crisis period – i.e., positive in the placebo, while negative in the crisis. Interestingly, during the turbulent period of emerging market crises of the 1990s, relatively liquid stocks in developed economies may have enjoyed positive residual returns, while selling pressure in emerging markets produced negative returns for relatively liquid stocks in emerging markets, similar to what is observed in the 2007–2008 crisis period.

The coefficients on foreign sales are different in every placebo period, with emerging countries exhibiting negative coefficients that are statistically significant in two of the three placebo periods. In contrast, there are no significant coefficients for the developed countries sample in any of the three periods. For emerging markets, the differences in the magnitudes of coefficients on foreign sales are not significantly larger in the crisis than they are during the placebo periods.

6. Portfolio analysis of firm returns' sensitivities to crisis shocks

To complement the regression analysis presented in Section 4, we use portfolio analysis to investigate two questions: (a) do stocks that are exposed to crisis shocks have higher expected returns in non-crisis periods to compensate for the higher downside risks that investors in these stocks bear?;

Table 7
Separate estimations for developed and emerging countries – Placebo periods. Regressions are estimated on the separate samples of developed and emerging economies, defined in Table 1. Estimation procedure is the same as for model 2, Table 3. Column labeled "Test" contains Chi-squared values (*p*-values in brackets below) for test of the difference of coefficients across equations. Robust standard errors, clustered by country, are in parentheses. *, **, *** denote statistical significance at 10, 5 and 1 percent respectively.

Variables	1997–2006			2002–2006			2005–2006		
	Developed	Emerging	Test	Developed	Emerging	Test	Developed	Emerging	Test
Beta	−0.009	0.015	4.25**	0.018**	0.028**	0.52	0.009	0.022*	0.38
	(0.008)	(0.009)	[0.039]	(0.007)	(0.012)	[0.470]	(0.018)	(0.013)	[0.535]
Momentum	0.079**	0.064**	0.16	0.105***	0.070***	0.98	0.117**	0.124***	0.01
	(0.029)	(0.023)	[0.686]	(0.034)	(0.012)	[0.322]	(0.048)	(0.042)	[0.915]
Market to book value ratio	−0.012***	−0.019***	4.26**	−0.012***	−0.025***	7.59***	−0.001	−0.011*	2.07
	(0.002)	(0.003)	[0.039]	(0.002)	(0.005)	[0.006]	(0.004)	(0.006)	[0.151]
Logarithm of total asset	−0.003	0.014***	7.00***	0.005	0.028***	9.50***	0.029***	0.034***	0.11
	(0.005)	(0.004)	[0.008]	(0.004)	(0.006)	[0.002]	(0.010)	(0.010)	[0.740]
Sd. of beta residual	−0.006***	−0.000	2.03	−0.005***	−0.002	1.45	−0.011***	−0.010**	0.05
	(0.001)	(0.004)	[0.154]	(0.001)	(0.003)	[0.229]	(0.002)	(0.004)	[0.829]
Dividend to sales	0.036	−0.128	0.64	−0.074	−0.033	0.05	−0.438***	−0.036	1.50
	(0.140)	(0.154)	[0.423]	(0.149)	(0.127)	[0.832]	(0.119)	(0.311)	[0.220]
Good coverage	0.094***	0.103***	0.19	0.087***	0.094***	0.06	0.058	0.006	1.36
	(0.015)	(0.018)	[0.665]	(0.020)	(0.020)	[0.802]	(0.034)	(0.030)	[0.244]
Leverage	−0.095***	−0.095*	0.00	−0.107***	−0.101*	0.01	−0.032	−0.119	0.90
	(0.026)	(0.055)	[0.998]	(0.032)	(0.054)	[0.919]	(0.044)	(0.082)	[0.342]
Good coverage *Leverage	0.076**	−0.028	4.07**	0.098**	0.021	1.89	0.104	0.126*	0.06
	(0.029)	(0.044)	[0.044]	(0.037)	(0.043)	[0.169]	(0.061)	(0.062)	[0.803]
Liquidity	0.070***	−0.029*	16.42***	0.028	−0.023	0.57	0.087	0.008	0.32
	(0.020)	(0.015)	[0.000]	(0.064)	(0.026)	[0.451]	(0.134)	(0.048)	[0.571]
Foreign sales	0.017	−0.062**	6.54***	0.013	−0.060	2.77*	0.039	−0.100*	3.84**
	(0.013)	(0.028)	[0.010]	(0.021)	(0.040)	[0.096]	(0.045)	(0.056)	[0.050]
Constant	0.000	−0.591***		−0.063	−0.248**		−0.091	0.041	
	(0.083)	(0.084)		(0.054)	(0.105)		(0.106)	(0.128)	
Industry fixed effect	Yes	Yes		Yes	Yes		Yes	Yes	
Country fixed effect	Yes	Yes		Yes	Yes		Yes	Yes	
Time fixed effects	Yes	Yes		Yes	Yes		No	No	
Observations	44,296	33,685		25,481	20,184		5,884	4,931	
R-squared	0.191	0.160		0.173	0.157		0.143	0.128	
Number of countries	21	23		21	23		21	23	

and (b) do we observe a differential return among "crisis-shocks exposed" stocks and "crisis-shocks robust" stocks during the crisis period consistent with the results that we find in our regression analysis?

We address the first question by constructing portfolios of stocks that are "exposed to" and, separately, stocks that are "robust to" crisis shocks each year between 1997 and 2006, which matches our longest placebo period. Following the results presented earlier, we classify as stocks exposed to crisis shocks those whose leverage, foreign to total sales, and, separately, liquidity (as measured by the stock turnover ratio) rank in the top 20th percentile, as well as those whose interest coverage and dividend to sales ratios rank in the bottom 20th percentile.[19] Stocks classified as robust to crisis shocks are those whose leverage, foreign sales to total sales, or liquidity rank in the bottom 20th percentile, as well as those whose interest coverage and dividend to sales rank in the top 20th percentile. Subsequently, for each of these characteristics, we calculate the average of monthly stock returns for firms in

[19] In order to control for cross-country differences in these firm characteristics, we take out the country average before sorting firms. For example, before sorting out firms in 1996 based on leverage, we first deduct from each firms' leverage, the leverage ratio for the country where the firm operates.

Table 8
Test of differences in the mean returns for "crisis exposed" and "crisis robust" portfolios during placebo periods. Crisis exposed portfolios include firms in the highest 20th percentile for leverage, liquidity, and foreign sales and in the lowest 20th percentile for interest coverage and dividend to sales, for each year between 1996–2005 and 2001–2005. The mean returns refer to average of monthly returns over the periods 1997–2006 and 2002–2006, respectively.

Variable	Mean returns		T-value	Alternative Hypotheses		
	Crisis exposed portfolio	Crisis robust portfolio		Mean returns crisis exposed portfolio < mean returns crisis robust portfolio	Mean returns crisis exposed portfolio ≠ mean returns crisis robust portfolio	Mean returns crisis exposed portfolio > mean returns crisis robust portfolio
				Pr(T < t)	Pr(|T| > |t|)	Pr(T > t)
1997–2006						
Leverage	0.007	0.010	−3.174	0.001	0.002	0.999
Liquidity	0.010	0.009	0.457	0.676	0.648	0.324
Foreign sales	0.008	0.008	−0.008	0.497	0.994	0.503
Interest coverage	0.005	0.012	−4.274	0.000	0.000	1.000
Good coverage (dummy)	0.004	0.011	−3.356	0.001	0.001	0.999
Dividend to sales	0.007	0.012	−3.316	0.001	0.001	0.999
2002–2006						
Leverage	0.016	0.017	−1.765	0.041	0.083	0.959
Liquidity	0.017	0.017	−0.225	0.412	0.823	0.588
Foreign sales	0.016	0.017	−0.673	0.252	0.504	0.748
Interest coverage	0.015	0.019	−2.310	0.012	0.024	0.988
Good coverage (dummy)	0.011	0.014	−1.925	0.029	0.059	0.971
Dividend to sales	0.014	0.019	−2.732	0.004	0.008	0.996

the "crisis-shock exposed" and in the "crisis-shock robust" categories for each year between 1997 and 2006.[20]

Table 8 compares average returns across "crisis-shock exposed" and "crisis-shock robust" categories according to each of the firm characteristics discussed, namely, leverage, interest coverage, dividend to sales, foreign sales, and liquidity during the period 1997–2006 for our global sample. We find that mean returns are higher for firms with low leverage, high interest coverage, and high dividends. This is the opposite of what we would expect if the market was compensating investors for the risks associated with credit supply shocks. At the same time, we find no difference in mean returns for firms with high and low foreign sales or liquidity, which indicates that the market is not compensating investors for the risks associated with holding liquid stocks and stocks from firms with high foreign sales.

To examine whether there are differential returns among "crisis-shock exposed" stocks and "crisis-shock robust" stocks during the crisis period, we repeat the exercise of sorting firms based on leverage, interest coverage, dividends to sales, foreign to total sales, and stock liquidity for December 2006 and we examine the returns over the crisis period August 2007–December 2008. Consistent with the regression results discussed in Section 4 (see Table 3), Table 9 shows that stock returns are lower for "crisis-shock exposed" firms, namely those with high leverage, low dividend to sales, low interest coverage, high foreign sales, and high liquidity.

7. A month-by-month analysis of the cross-section of returns during the crisis

Having shown that residual returns for the crisis period as a whole varied importantly as a result of firms' sensitivities to each of the three crisis shocks, we now turn to a more detailed analysis of the

[20] In other words, we sort by firm characteristics at the end of each year between 1996 and 2005 and examine returns over the subsequent year over the period 1997–2006.

Table 9
Test of differences in the mean returns for "crisis exposed" and "crisis robust" portfolios during the crisis period. Crisis exposed portfolios include firms in the highest 20th percentile for leverage, liquidity, and foreign sales and in the lowest 20th percentile for interest coverage and dividend to sales, for the year 2006. The mean returns refer to the returns over the period August 2007–December 2008.

Variable	Mean		T-value	Alternative Hypotheses		
	Crisis exposed portfolio	Crisis robust portfolio		Crisis exposed portfolio < Crisis robust portfolio	Crisis exposed portfolio ≠ crisis robust portfolio	Crisis exposed portfolio > crisis robust portfolio
				Pr(T < t)	Pr(|T| > |t|)	Pr(T > t)
Leverage	−0.491	−0.399	−13.287	0.000	0.000	1.000
Liquidity	−0.515	−0.383	−19.759	0.000	0.000	1.000
Foreign sales	−0.523	−0.511	−1.726	0.042	0.084	0.959
Interest coverage	−0.478	−0.448	−3.881	0.000	0.000	0.999
Good coverage(dummy)	−0.474	−0.414	−9.818	0.000	0.000	1.000
Dividend to sales	−0.534	−0.404	−17.397	0.000	0.000	1.000

crisis period on a month-by-month basis. To do so, we ran separate monthly regressions for each month from August 2007 through December 2008, using a specification based on model 2 in Table 3 in which standardized measures for crisis shocks replace original variables. We use standardized measures for ease of comparison across the three different categories of shocks. In particular, the *Standardized Selling Pressure Sensitivity* is a standardized measure of the ratio of shares traded over total shares, while the *Standardized Global Demand Sensitivity* is the comparably standardized measure of the share of foreign sales to total sales. We obtain these standardized measures by subtracting the mean and dividing by the standard deviation. To generate the *Standardized Credit Supply Sensitivity* we compute the first principal component of three variables – leverage ratio, good coverage, and the dividend to sales ratio – and include the standardized principal component in our regression for ease of comparisons with the other standardized measures of sensitivity.[21]

Figs. 1–3 plot the coefficients for the three standardized sensitivities estimated separately for developed and emerging markets using monthly regressions. In addition we plot the aggregate series that most closely matches each of the shocks: the spread between Baa and US Treasury as a proxy for credit supply shock, total exports to GDP as a proxy for global demand shock, and the return on the S&P 500 as a proxy for the timing of the market liquidity shock.

We find that the effects of the firms' sensitivities to crisis shocks vary in intensity during the crisis in a manner that is correlated with the aggregate environment. Time variation in the coefficients associated with the credit supply sensitivity (Fig. 1) is related to those found in credit risk spreads that reflect the timing of credit supply shocks. Coefficients on the credit supply sensitivity tend to be more positive during the early part of the period when the Baa spread is low, and more negative in the latter part of the period when the Baa spread is high. There are some interesting timing differences between developed countries and emerging markets countries. For example, developed countries are more negatively affected in the summer and fall of 2008 (starting in July and August of 2008), while the emerging countries drop sharply in December 2008, after it became clear that the US crisis had become a global crisis. Also, in March 2008 the effect of the collapse of the Bear Stearns shock is more pronounced in the developed countries sample.

The coefficients associated with the sensitivity to a global demand shock tend to vary with the timing of the declines in exports (see Fig. 2). Both show a drop in August 2007, a subsequent recovery, then another drop in late 2007, followed by a rising trend through the Spring of 2008, after which the trend is negative, culminating in a steep drop around November 2008. In general, the emerging

[21] The regression coefficients (standard errors) results for standardized variables during the crisis period are as follows: Credit Supply Shock: −0.029 (0.004), Selling Pressure: −0.016 (0.006), Global Demand: −0.0.17 (0.006). All three shocks are significant at 1% level.

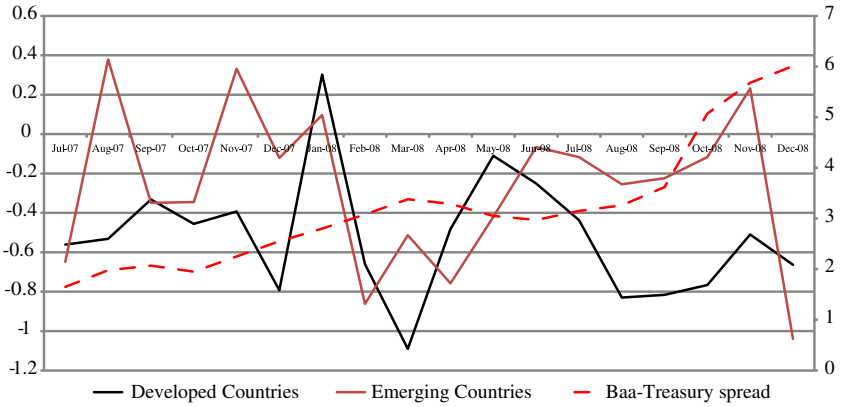

Fig. 1. Coefficient of standardized credit supply shock.

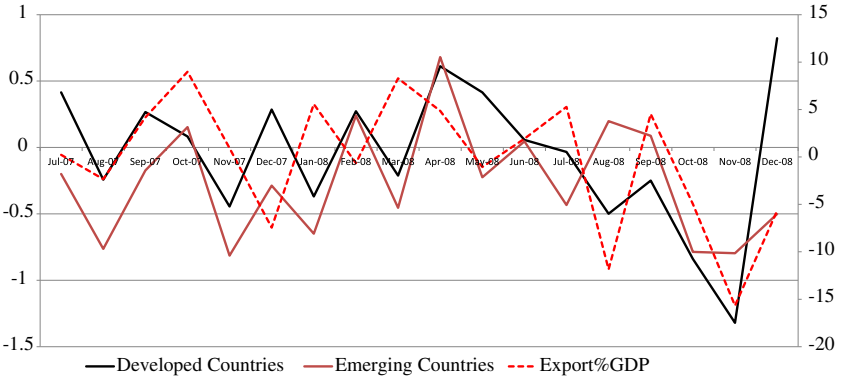

Fig. 2. Coefficient of standardized global demand shock.

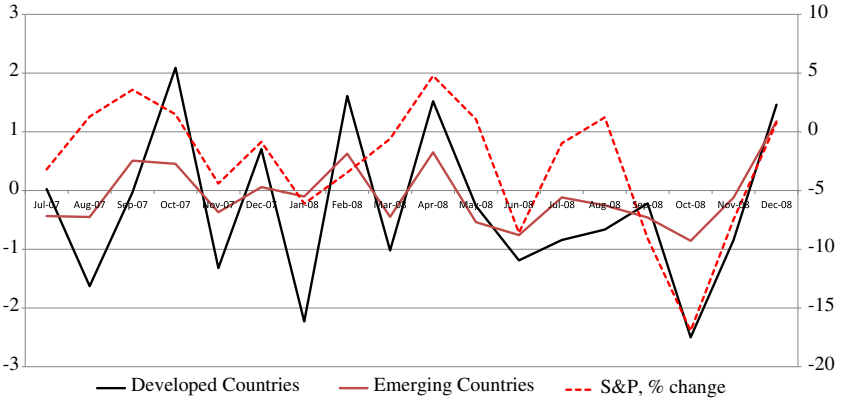

Fig. 3. Coefficient of standardized liquidity shock.

countries match fairly closely the behavior of developed countries, except in December 2008 when developed sample shows a sudden and sharp recovery, while emerging markets do not.

The variation over time in the coefficients that measure the sensitivity to selling pressure tracks the variation in the returns to the stock market. Peaks and troughs of returns are related to peaks and troughs in the coefficients of the selling pressure indicators (see Fig. 3).

To summarize, the time variation in these three sets of coefficients confirms our interpretation of the coefficients relating to the sensitivities to the three shocks. While the behavior of the emerging markets sample in general matches that of the developed countries sample, it is clear that the developed countries sample shows much more variability in liquidity sensitivity month-to-month than the emerging markets sample, consistent with the earlier suggestion that liquidity matters more in developed markets.

8. Conclusion

Equity returns provide a uniquely comparable window through which to examine the performance of firms throughout the world, and their responses to financial crises. The global financial crisis of 2007–2008 was characterized by three types of shocks: (1) a collapse of global trade, which caused a major shock to demand for firms that had positioned themselves to benefit from participating in expanding global trade and production; (2) a credit supply contraction which curtailed the access of firms to funding and reduced their effective debt capacity, and (3) selling pressures in equity markets as investors scrambled to meet margin calls and made redemptions to make up for losses in the US market. This paper showed that firms' sensitivities to all three of these crisis "shocks" – exposure to the collapse in global trade demand, vulnerability to credit supply shocks, sensitivity to stock market selling pressures – are reflected in the large and statistically significant observed patterns in residual equity returns (after controlling for normal risk factors that are associated with expected returns).

We constructed a vector of six variables that measure the effects of the three crisis-related shock factors from August 2007–December 2008 – four variables that measure vulnerability to credit supply shocks, one that measures exposure to global trade demand shocks, and one that measures sensitivity to stock market selling pressure. These six variables were statistically significant in the crisis period.

Similar analysis for several placebo periods showed that the influences identified during the 2007–2008 sample period were not present to the same extent in non-crisis periods. While in the crisis, returns for good coverage and bad-coverage firms converge as leverage rises, during placebo periods this does not happen. Also, returns are not influenced by the sensitivity to selling pressures or global trade during the placebo periods when we consider all countries together.

Conducting separate estimations for developed and emerging countries we find that, relative to developed economies, emerging markets are more responsive to global trade conditions (in crisis and in placebo periods), but less responsive to selling pressures.

We used portfolio analysis to verify some of the results we obtained in our estimated regressions. Sorting firms into portfolios of "crisis-shock exposed" and "crisis-shock robust" firms, we find that the mean returns of crisis exposed firms were lower than those for crisis robust firms during the crisis period. Furthermore, we do not find that mean returns of exposed firms were larger than those of robust firms during the placebo periods, which suggests that investors were not compensated for the risks they bore during the pre-crisis period.

A month-by-month analysis of the magnitude of the sensitivity to each of the three shocks during the 2007–2008 crisis showed that the time variation of the sensitivities tracked related changes in the global economic environment. The time variation in the coefficients associated with sensitivity to the global trade demand shock factor varied with the timing of the declines in exports. Time variation in the coefficients associated with the sensitivity to the credit supply shock was related to credit risk spreads that reflected the timing of credit supply shocks. The variation over time in the coefficients that measure sensitivity to the market liquidity shock closely tracked the variation in the returns to the stock market. Developed countries and emerging markets have similar patterns across time, with two exceptions: the credit supply shock more significantly affected developed countries in the periods of March 2008 (Bear Stearns collapse) and the summer and fall of 2008 (Lehman Brother's collapse); the liquidity shock was larger and more variable in developed countries than it was in the emerging markets sample.

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