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From the Financial Crisis to the Real Economy: Using Firm-level Data to Identify Transmission Channels
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ABSTRACT

Using accounting data for 7722 non-financial firms in 42 countries, we examine how the 2007-2009 crisis affected firm performance and how various linkages propagated shocks across borders. We isolate and compare effects from changes in external financing conditions, domestic demand, and international trade on firms' profits, sales and investment using both sectoral benchmarks and firm-specific sensitivities estimated prior to the crisis. We find that the crisis had a bigger negative impact on firms with greater sensitivity to demand and trade, particularly in countries more open to trade. Interestingly, financial openness appears to have made limited difference.

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1. Introduction

The 2007-2009 crisis that originated in the United States shocked the core of the global financial system. It led to a sharp drop in international trade in goods and services to a degree not seen since the end of the WWII and triggered a severe global recession, dubbed the "Great Recession," unparalleled since the Great Depression. A small literature is emerging that studies the transmission of the latest crisis across national borders and the role of cross-country differences in how countries were affected. The evidence from these studies is mixed. For example, Claessens et al (2010), Blanchard et al (2010), and Cetorelli and Goldberg (2009) document some evidence that countries more integrated with global financial markets suffered more during this crisis.[2] In contrast, Rose and Spiegel (2010a, 2010b and 2011) fail to find strong evidence that country factors, including bilateral trade and financial linkages with the U.S., are associated with how the crisis impacted individual countries.[3]

All these studies rely on aggregate data. The mixed evidence on the role of country factors and the individual contagion channels is perhaps not surprising since the macro data reflect the aggregation of multiple underlying factors. The crisis likely spread through a combination of real (e.g., trade) and financial channels, as well as by affecting expectations of consumers and firms, which in turn changing consumption and investment behaviors. The existing literature has attempted to distinguish these channels by including proxies for trade or financial integration (see Rose and Spiegel, 2010 a, b; and Milesi-Ferretti and Lane, 2010). But

[2] Cetorelli and Goldberg (2009) document a role of global banking; Milesi-Ferretti and Tille (2011) find a role for short-term debt in foreign currency; and Frankel and Saravelos (2010) find foreign reserves as important in alleviating the spillover.

[3] Rose and Spiegel (2011) find few reliable indicators in the pre-crisis data that can help explain the incidence of the Great Recession across countries, except that countries with a current account surplus seemed better insulated from slowdowns.

these proxies tend to be highly correlated with each other and hence per se do not cleanly separate the different channels. For example, both a reversal of capital flows and a reduction in demand for exports can induce a worsening of corporate sector performance or a contraction of investment. When using aggregate data as outcome variables, and because aggregate indicators for trade and financial openness are highly correlated, it is challenging to separate specific channels.

To make progress, one could employ firm-level, micro data. If different transmission channels imply different firm-level effects as a function of firm types (e.g., more finance dependent firms versus more trade dependent firms), we will have a better chance to isolate and quantify the different channels. Such information would have been lost in the aggregate data.

The first firm-level analysis to study how crises (in emerging markets) spread to other markets was conducted by Forbes (2004).[4] For the 2008-2009 crisis, micro firm-level evidence is relatively scarce, partly because firm-level investment and performance data for many countries are only released with a long lag.[5]

One substitute that has been used to date is stock market data, as Tong and Wei (2011) do. They report evidence of liquidity crunches across emerging market economies by showing that the decline in stock prices was more severe for firms that intrinsically are more dependent on

[4] Claessens, Djankov, and Xu (2000) investigate how individual East Asian corporations were affected by the 97-98 crisis, but their focus was not on spillover channels. In general though, the contagion literature has largely used price or aggregate data (see Claessens and Forbes (2001) for an early review and Pritsker (2010) for a recent review of the contagion literature).

[5] There has been more analysis of the drivers of the recent trade retrenchment, also using firm or sector level data. For example, Levchenko, Lewis and Tesar (2010), Alessandria, Kaboski and Midrigan (2010), and Bems, Johnson and Yi (2010). And Duchin, Ozbas and Sensoy (2010) have examined quarterly US investment from Q3, 2007 to Q3, 2008. International firm-level evidence is still scarce. Bricongne et al (2009) and Behrens et al (2010) use firm-level data for France and Belgium to examine the impact of crisis on firm exports.

external finance for working capital over the period from July 2007 to the end of 2008.[6] Due of lack of appropriate data at the time, they were not able to show the impact of the financial crisis on the actual investment and performance of firms. In this paper, by using actual firm level balance sheets and income variables, and investigating these effects for a large number of countries affected by the crisis, we complement and expand on this research. While the firm-level data offers richer information than the aggregate data, there are also caveats one has to bear in mind. First, we work primarily with manufacturing firms, and do not have much to say about non-manufacturing firms. Second, we work with publicly listed firms, and cannot claim that these firms are necessarily representative of the whole economy. Third, firm coverage may vary by countries. We will make an attempt to check whether the differences in country coverage do not drive our conclusion.

In the remainder of the paper, we will discuss in Section 2 the framework that guides our empirical specifications. In Section 3, we describe the sources of the data and the definitions of key variables. In Section 4, we present our empirical results. Finally, in Section 5, we offer concluding remarks.

2. The Framework

Our goal is to use firm-level data to improve our ability to distinguish different transmission channels for the financial and economic crisis in the US and other advanced countries to affect the rest of the world. We examine three possible channels: a financial channel, a domestic demand channel and a trade channel.

[6] In terms of transmission mechanisms, Tong and Wei (2011) focus on the composition of a country's pre-crisis capital inflows, and found that stock prices fell significantly more for firms in countries with a greater share of short-term capital flows, but did not explore other channels.

We employ a consistent framework to distinguish the impacts of these three channels. To isolate the transmission through the finance channel, we make use of the following idea: if a reduction in available credit (a "credit crunch") would play an important role for firms, it should be reflected in the performance of those firms that rely more on external finance for investment and working capital relative to those firms that rely less on external financing. Similarly, if the trade channel were to important, it should be reflected in a relatively worse performance of those firms that rely more heavily on exports compared to those firms that exports less. Finally, if the crisis would have triggered a negative domestic demand shock in the respective country, it should be reflected in a relatively worse performance of those firms that are more demand-sensitive compared to those firms that are less sensitive to demand.

We cannot use *ex post* data on trade and finance dependence to achieve our goal. For example, a firm may well reduce its international trade, and it may thus appear that the trade channel is important, but the reason for the reduction in trade could be a lack of working capital, rather than a trade shock. Conversely, a reduction in working capital or investment may be the logical response to a reduction in international trade or domestic demand, and not reflective of a shock to the supply of external financing.

The basic empirical strategy therefore is to check whether *ex ante* classifications of firms in terms of their intrinsic characteristics – degree of their financial dependence, demand sensitivity and exposure to trade - help to explain changes in their *ex post* "performance" (i.e., profits, sales and investments) following the crisis. We use the approach of relying on the sector characteristics of U.S. firms before the crisis, which are arguably exogenous to our sample of firms (see Rajan and Zingales, 1998), to proxy these intrinsic characteristics.

To be precise, our empirical specification is given by the following regression equation:

$$(1)\ \Delta\text{Performance}_{\text{i,j,k,t}} = \beta * \text{FinancialDependence}_j + \gamma * \text{DemandSensivity}_j + \lambda * \text{TradeSensivity}_j + \text{Control}_{\text{i,j,k,t}} + \varepsilon_{ijkt}$$

where *i* stands for company, *j* for sector, *k* for country and *t* for time. $\Delta\text{Performance}_{\text{i,j,k,t}}$ is our measure of the changes in firm-level performance due to the crisis. For example, we use the change in firms' profit ratio (profits relative to assets) as measured by the average profit ratio for 2008 and 2009 minus the profit ratio in 2007. Using differences in performance has the advantage of controlling for many firm and country characteristics, such as the differences in profitability of various firms before the crisis. As a start, we assume the same β, γ, and λ for all countries in order to estimate an average effect.

The propagation can depend on not just firm characteristics, but also country features. For example, firms in more open countries (to trade or financial markets) could be expected to see their firms suffer more from financial or trade shocks. To investigate this, we also explore cross-country heterogeneity in the key dimensions. We do so by interacting firm features with country features, such as country-level exposure to global capital flows, its overall level of financial development and trade openness, and then include these interaction terms in the regressions. For example, to see how firms in a country are affected by changes in (international) financing conditions, we consider the interaction between a country's degree of international financial integration and its manufacturing firms' dependence on external finance. We pay special attention to the following country features: financial openness, relative importance of domestic demand, the degree of trade openness, and the level of domestic financial development.

The previous specification measures a firm's dependence on external finance and its sensitivity to demand and trade by sector-level information from the United States. As an

alternative, we can measure the same set of features using a firm's own history (realized values during 2000-2006):

(2) $\Delta Performance_{i,j,k,t}$
$= \beta * \text{FinancialDependence}_i + \gamma * \text{DemandSensivity}_i + \lambda * \text{TradeSensivity}_i + \text{Control}_{\text{i},j,k,\text{t}} + \varepsilon_{ijkt}$

(The only difference between this and Equation (1) is that the subscripts for the key regressors are now firm specific.) A potential advantage of this approach is that we could incorporate information about heterogeneity across firms within a sector. A potential disadvantage is that these measures could be endogenous or reflect omitted variables. To rule out some obvious omitted variables, we include individual firm characteristics such as firm size, cash holdings, and leverage.

Between the two approaches, we place relatively more confidence in the results from the first specification.

3. Data Sources, Variables, and Basics Statistics

We obtain annual data from *Worldscope* on the balance sheet, cash flow and income statements for all listed, non-financial manufacturing companies. The data cover 42 advanced countries and emerging markets (note that the US is excluded as it was both the source of the financial crisis and the country whose data are used to define the sector characteristics). The number of listed manufacturing firms by country for the year 2009 is presented in Table 1. (Our sample period is 2007 to 2009). Key dependent variables are the changes from 2007 to 2008/2009 in three ratios: firm-level profits/assets, sales/assets and investments/assets. These dependent variables are all winsorized at the 1% level to reduce the impact of outliers. All right-hand-side variables are measured using data prior to 2007..

Figure 1 plots the density distributions of firm-level profits/assets, sales/assets and investments/assets from 2007 to 2009. The patterns in Figure 1 are intuitive. For the profit/asset ratio, the curves shift gradually to the left over the three years in the sample. Indeed both the mean and the median of the profit/asset ratio decline (reported in Table 2a). The left tail also increases over time, indicating an increase in the share of those firms with poor performance when the crisis came. For the sales/asset ratio, the curves shift to the left only in 2009, while the curves for 2007 and 2008 track each other quite closely (with the 2008 curve being slightly to the right of that for 2007). For the capital expenditure/asset ratio, we find that the curves for 2007 and 2008 to be quite similar. The 2009 curve clearly shifts to the left, however, with lower mean and median values, and, interestingly, a greater dispersion as well.

Collectively, these charts suggest that sales and investments fell somewhat later in the crisis phrase than profitability did. Figure 1 also suggests that we may find sharper impacts of our explanatory variables if we look at changes in performance from 2007 to 2009 rather than from 2007 to 2008. .

i. Sector- and firm level financial dependence indexes

We use two measures of a firm's intrinsic dependence on external finance: *Intrinsic dependence on external finance for investment* (DEF_INV_j) and *Intrinsic dependence on external finance for working capital* (DEF_WK_j). We construct a sector-level approximation of a firm's intrinsic dependence on external finance for capital investment following the methodology developed by Rajan and Zingales (1998). Specifically, we define:

$$\text{(3) Dependence on external finance for investment} = \frac{\text{capital expenditures - cash flow}}{\text{capital expenditures}}.$$

Besides capital needed for investment, working capital is required for a firm to operate and to satisfy both short-term debt payment and ongoing operational expenses, and to allow for trade finance. We follow Raddatz (2006) and construct such a measure of intrinsic need for external finance using the notion of "cash conversion cycle", which is commonly used in financial analysis to measure the liquidity position of a firm. The cycle measures the time elapsed from the moment a firm pays for its inputs to the moment it receives payment for the goods it sells. Specifically, we define:

$$\text{(4) Cash conversion cycle} = 365 * \left(\frac{\text{inventories - account payables}}{\text{cost of goods sold}} + \frac{\text{account receivables}}{\text{total sales}} \right).$$

Following Tong and Wei (2011), both sector level indexes are constructed as follows. First, for each U.S. firm during 1990-2006, we calculate its dependence on external finance and its cash conversion cycle based on the annual data from *Compustat USA Industrial Annual*. Second, we define the sector-level value of the two indexes by calculating the median across all firms in the sector (at each SIC 3 digit sector). While the original Rajan and Zingales (1998) paper covered only 40 (mainly SIC 2-digit) sectors, we expand the coverage to 111 3-digit SIC sectors. The index numbers are based on U.S. firms, which are judged to be least likely to suffer from financing constraints (during normal times) relative to firms in other countries, meaning we can reasonably assume that the same intrinsic external financing dependence applies to firms in all other countries. This assumption is common in the literature (earlier papers that have used such indexes include Claessens and Laeven, 2003; Raddatz, 2006; and Kroszner, Laeven, and Klingebiel, 2007). The literature has also confirmed that similar rank order of sectors in terms of finance dependence ratio holds for Canada. (Rajan and Zingales (1998).

Our alternative measure uses information on the history of a firm during 2000-2006. We define individual firms' actual use of external financing for working capital and investment

(*Actual firm use of external financing for investment*, ACT_INVi, and *Actual firm use of external financing for working capital*, ACT_WKi) in a similar way:

$$(5)\ \mathrm{ACT_INV}_i = \text{Actual use external finance for investment} = \frac{\text{capital expenditures - cash flow}}{\text{capital expenditures}}.$$

$$(6)\ \mathrm{ACT_WK}_i = \text{Actual use external finance for working capital} = 365*\left(\frac{\text{inventories - account payables}}{\text{cost of goods sold}} + \frac{\text{account receivables}}{\text{total sales}}\right)$$

We calculate the median of these ratios, $\mathrm{ACT_INV}_i$ or $\mathrm{ACT_WK}_i$, over the period 2000 to 2006. Using these firm-level indicators, we ask whether firms that were more dependent on external financing prior to the crisis were more affected by the global crisis. Even though the firm-level actual use of external finance may be endogenous, our measures are at least pre-determined with respect to the 2008-2009 crisis.

ii. Sector-level and firm-level demand sensitivity indexes

We next define our index for a firm's relative sensitivity to a contraction in aggregate consumer demand. As noted, the effect of a crisis on demand is likely to vary by type of product and sector. For example, consumer durables are typically more affected than consumer necessities during a recession. Tong and Wei (2008) develop such a sector-level index using the stock price reactions of US firms to the September 11, 2001 terrorist attack. To construct the index, they compute the change in log stock price for each U.S. firm between September 10 and September 28, 2001. They then calculate the mean log stock price change for all firms in each three-digit SIC sector, and use it as a measure of the sector-level demand sensitivity. Excluding financial sector firms, they do this in total for 361 three-digit level sectors. Similar to the external

financing dependence ratio, this approach assumes that the sensitivity to demand shocks is an intrinsic property of a sector, and therefore the index derived from the pre-crisis data is applicable to firms in the same sector across all countries during the crisis. Tong and Wei (2008) conduct a number of checks to make sure that this index reflects the relative sensitivity of a firm's stock price to an unexpected shock in consumer demand, and is not contaminated by a firm's sensitivity to liquidity or other shocks.[7]

We also develop an indicator for the pre-crisis, firm-specific degree of demand sensitivity. We construct this as the elasticity of firm-specific sales to the country's GDP in the six years before the crisis, i.e., 2000-2006. More specifically, we regress for each firm the change in its (log) real sales (in local currency) on the change in the (log) country's real GDP (in local currency) over the period 2000 to 2006, and then use the coefficient as the firm-level measure of demand elasticity.

iii. Sector-level and firm-level trade sensitivity indexes

We next construct a sector-level measure of exposure to trade. Specifically, we regress the change in the log global exports at the 3-digit sector level over the period 2000-2006 on the change in log global GDP (in US dollar) during the same period. We then use the coefficient on global GDP as the sector-level trade sensitivity. Note that this trade sensitivity index is neither

[7] First they verify that there was indeed a big downward shift in expected aggregate demand, as reflected by a downward adjustment in the consensus forecast of subsequent U.S. GDP growth in the aftermath of the shock at the same time. Second, they argue that because the Federal Reserve took timely and decisive actions, the relative stock price moves do not reflect effect of the 9/11 shock on firms' financial constraints since that was small or at most short lived. Indeed they show that for that episode, both the level of the real interest rate and the TED spread (risk premium), after initial spikes, quickly returned to a level only moderately higher than the pre-9/11 level, suggesting that the market regarded the Federal Reserve's actions as sufficient to restore the market's desired level of liquidity. They therefore conclude that the cumulative stock price change from September 10 to 28, 2001, is unlikely to also reflect firms' reactions to a deterioration of credit availability..

country nor firm specific, similar to the earlier sector indexes for investment, working capital and demand.

We also construct a measure of firm-level index for sensitivity to trade shocks. By regressing the annual change of a firm's real sales on the annual percentage change in its home country exports over the period 2000 to 2006, we derive a firm-specific coefficient on the exports variable that is then used as a proxy of the pre-crisis trade sensitivity of the particular firm. Because this measure is firm-specific, it varies across firms, sectors, and countries.

iv. Basic Statistics

Table 2a provides summary statistics of general firm performance before and during the 2008-09 crisis. Table 2b reports summary statistics for our dependent variables and key explanatory variables. The statistics confirm the impression gleaned from Figure 1. The dispersion across firms indicates wide variations among firms (and countries). Indeed, there are firms that actually increased their profitability in spite of the crisis. Similarly, while the sales and capital expenditure to assets ratios generally decline, there are exceptions. The variations would allow us to perform meaningful analysis.

Table 2c reports the correlations of variables, with an asterisk indicating correlations significant at the 5% level. We find that the change in profit is significantly negatively associated with more than half of the explanatory variables. This suggests that different firm types may experience different effects in the crisis. Of course, these are only pair-wise correlations, without controlling for other factors. We next address this issue formally by employing multivariate regression analyses.

4. Empirical Results

i. Baseline Results

We start with our basic regression, which examines how various sector features affect changes in firm performance during the crisis. These results are reported in Table 3. As our explanatory variables are at the sector level, we cluster standard errors by sector.

In Column 1, we look at the impact of the crisis on changes in firms' profit/asset ratios. We find that the impact on profits to be more pronounced for those sectors that are intrinsically more sensitive to demand shocks. This result suggests that there was indeed a significant global demand shock during the crisis period as consumers and firms adjusted. The impact of crisis on profits is also more pronounced for trade-sensitive sectors, consistent with the decline in global trade during the crisis period. The coefficients on DEP_WK and DEP_INV are also negative, albeit insignificant..[8]

In Column 2 of Table 3, we look at the impact of the crisis on sales over assets. Similar to profit, sales declined significantly for those sectors more sensitive to demand and trade, consistent with the presence of important demand and trade effects. Sales over assets also decreased significantly for those sectors with greater intrinsic needs for working capital. This result suggests that disruptions to the supply of working capital related to the global financial crisis reduced firm-level sales. This finding is consistent with Tong and Wei (2011), who found that the crisis reduced stock prices significantly more in those sectors with large working capital needs.

[8] Note that the trade effect could indirectly refect a financing effect if a contraction of trade is caused by a contraction of trade financing(see Amiti and Weinstein (2009); Paravisini, Rappoport, Schnabl, and Wolfenzon (2011).

In Column 3, we examine the impact on capital investment. Here we find no significant relationships. This may not be surprising, however, since investment is notoriously difficult to explain in general as it depends on (volatile) expectations of future profitability and is subject to long leads and lagsas well as lumpy behavior. The demand and the trade channels could be related especially in a country that is highly open to trade. To give the trade channel the maximum chance to reveal itself, in Columns 4 to 6, we drop the demand channel. We find that the coefficients for the trade channel for the profits, sales and investment regressions remain almost the same as in column 1-3, suggesting that our demand sensitivity index and trade sensitivity index capture different aspects of the crisis effects. (The coefficients on trade sensitivity are larger in Columns 4 and 5 than in Columns 1 and 2. This suggests that a part of the trade effect may be reflected in the demand channel, although the differences in the coefficients are not statistically significant).

To provide the economic impact of our estimates, we focus on statistically significant variables in Columns 1-3. Based on the coefficient, a one standard deviation increase in the demand sensitivity, say from a level in the sector of Surgical and Medical Instruments to one in the sector Construction Machinery, will reduce profit by 0.44%, or 14% of the average change of profit. Meanwhile, a one standard deviation increase in trade sensitivity will reduce profit by 0.64%, or 21% of the average change in profit. Finally, a one standard deviation increase in the intrinsic needs for working capital will reduce the sales by 0.70%, or equivalent to the average drop in sales (0.73%). These estimates suggest that the economic impacts are significant.

ii. Addressing Possible Sample Selection

Across the 42 countries in the sample, the number of firms is uneven. In this subsection, we wish to examine the concerns that the varying country coverage may create a bias due to the

dominance of some large countries with many firms. We address this in two ways. We first run a weighted regression using the same specifications as in Table 3, with the weights equal to the inverse of the square root of the number of firms in the sample for each country. The weighting scheme is meant to reduce the dominance of large countries in the estimation results. We find that the results become even more pronounced for the demand and the trade channels for profits and sales (Table 4, columns 1-3). For example, the coefficient of demand sensitivity is -1.2 in the profit equation with the weighted regression, while it was -0.46 in the baseline regression. Also, the coefficient for trade sensitivity is -3.3 in the sales equation with weighted regression, while it was -1.78 in the baseline regression. Moreover, dependence on external finance for capital investment (DEP_INV) is now significantly negative at the 10% level for the equation of investment. That is, the crisis tightens financial constraints and reduces available funding for capital investment.

As an alternative way to control for uneven sample coverage, we restrict our sample to the 100 largest listed manufacturing firms in each country. This ensures that all countries receive similar weight. The results are presented in columns 4 to 6 of Table 4. Here the sample size drops to about one-third of the number in Table 3. Again, we find the results for both the demand and trade channels to be larger and more significant than those reported in Table 3. For example, trade sensitivity has a coefficient of -3.42, while it was -1.78 in the baseline regression. Furthermore, dependence for working capital (DEP_WK) now becomes significant negative in the sales equation, suggesting that the crisis reduces the availability of working capital and hence decreases firms' sales.

Our sample of listed firms could have a built-in survivorship bias – those firms that experienced the most declines in profitability during the crisis may exit the sample. So the true

decline in firm performance may be greater than what our statistical tables capture[9] We control for survivorship bias by running a Heckman selection model, which has a selection equation and an outcome equation. In the selection equation, we include all the explanatory variables from the outcome equation (i.e., the explanatory variables in Table 3), as well as firm O-score measured as of 2007. The O-score is developed by Ohlson (1980) and measures the likelihood of firm bankruptcy, with higher O-score indicating higher likelihood of bankruptcy.[10] In Table 5, we report the results for the outcome model in columns 1, 3, 5 and for the one-step Heckman selection model in columns 2, 4 and 6. The selection equations confirm that firms with a higher O-score are more likely to drop out of the sample by 2009. After controlling for this selection effect (or the survivorship bias), the coefficients on demand sensitivity and trade sensitivity in the outcome equations are still negative and statistically significant, which are similar to those in Table 3. In other words, those firms that are most sensitive to a demand shock or most sensitive to a trade shock experience a greater decline in profit and sales. Moreover, the coefficient for working capital needs (DEP_WK) remains significantly negative in the sales equation.

iii. Country Features

We next investigate the role of country factors. To examine differential effects of the crisis across we include the following country characteristics: financial openness (defined as total

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[9] Worldscope drops a company if it becomes privately held, merged, liquidated, or otherwise inactive.

[10] The O-Score combines nine accounting ratios into a single statistic:

$$O\text{-Score} = -1.32 - 0.41\text{Size} + 6.03\frac{\text{Total Liability}}{\text{Total Asset}} - 1.43\frac{\text{Working Capital}}{\text{Total Asset}} + 0.08\frac{\text{Current Liabilities}}{\text{Current Asset}}$$
$$-2.37\frac{\text{Net Income}}{\text{Total Asset}} - 1.83\frac{\text{FFO}}{\text{Total Liabilities}} + 0.285F - 1.72G - 0.52H$$

where Size is the log of total asset divided by the GDP deflator; FFO means pre-tax income plus depreciation and amortization; F is a dummy equal to one if cumulative net income over the previous two years is negative; G is a dummy equal to one if owners' equity is negative; and H is the change in net income.

international assets plus liabilities over GDP), financial development (defined as credit to private sector over GDP), trade linkage (defined as exports minus imports over GDP), and the share of domestic expenditure in total demand (defined as the sum of consumer expenditures, investment and government expenditure over GDP). Note that, by definition, the last two variables, the shares of trade and domestic expenditures in GDP, sum up to one. Country-level financial openness and financial development are interacted with both DEP_WK and DEP_INV; country-level trade linkage is interacted with sector-level trade sensitivity; and country-level domestic expenditure share is interacted with sector-level demand sensitivity. These country features are all measured as of the year 2006, i.e., prior to the crisis, and hence do not vary over time.

The results are reported in Table 6. In Columns 1-3, we do not include any country or sector fixed effects, while in Columns 4-6, we include both sector and country fixed effects (and thus drop the country level variables that are not interacted).

Column 1 reports the results for the change in profits. Here we find a significantly negative coefficient for the interaction term between trade sensitivity and trade linkage, but no significant coefficient for the interaction terms between the other sector characteristics and country features. Column 2 reports the results for the change in sales. Here we again find the interaction of trade sensitivity and trade linkage to have a negative and statistically significant coefficient, but no other variable is found to be statistically significant. Column 3 reports the results for the change in capital expenditures. The only significant coefficient is the interaction between trade sensitivity and trade linkage, with trade-sensitive sectors reducing capital expenditures more in trade-open countries. The coefficient for general trade linkage is positive (0.66), but its interpretation has to consider the interaction effect as well. Overall, the net effect

for trade linkage is significantly negative for firms with average trade sensitivity (i.e.,-4.84 = 0.66-4.17*1.32).

In Columns 4-6, we include both country and sector fixed effects. The sector-level trade sensitivity interacted with country-level trade linkage always retains its significantly negative coefficient for all three performance measures. For profit, demand sensitivity interacted with domestic expenditure has again a negative coefficient, but now significant at the 10% level. For capital expenditures, dependence on external finance for investment interacted with financial openness is again negative, but now also statistically significant at the 5% level.

Collectively, these results differ from Rose and Spiegel (2010a,b), who find little systematic evidence regarding the role of cross-country linkages during the crisis on outcomes at the macro level. Here we find the openness of the country to trade and finance to have affected the impact of the crisis on firms in a material way.

To gauge the economic impact, we can use the coefficients of Columns 1-3 in Table 6. We find that, for a firm in a sector whose trade sensitivity is at the 75th percentile (which is General Industrial Machinery), an increase in the country trade linkage by one standard deviation (e.g., from France to Brazil) will reduce a firm's profit ratio by 0.53%, or about 18% of the average drop in the profit ratio over the crisis period. The same increase in trade linkage would reduce the sale/asset ratio by 2.14%, which even exceeds the average decline of sales of 0.73%. Furthermore, the same increase in trade linkage would reduce the capital expenditures to asset ratio by 0.41%, which is large compared to the average decline of capital investment, 0.57%. Overall, Table 6 suggests that exposure to international trade was a statistically and economically important channel in the global transmission of the crisis.

iv. Policy Measures

Countries took many measures aimed at mitigating the effects of the financial crisis on their economies. These measures varied from monetary easing and fiscal stimulus, to financial sector interventions, such as liquidity support, recapitalization and guarantees, and direct support to the real sectors, as for trade finance and SMEs. These policy measures could have mitigated the impact of the crisis, and thus also have led to less significant results on the importance of spillovers in our regressions. In the extreme case, if most affected countries also adopted more counter-cyclical policies, then we may not see much connection between country features and the magnitude of the effect. In any case, it is interesting to investigate the effects of these policies on firm performance considering specific channels.

In Table 7, we specifically examine whether countries' monetary and fiscal stimulus mitigated the impact of the crisis in general and affected the severity of the demand and financing channels in particular. (We do not include the trade channel here as that is not directly affected by these policy measures.) We now include country and sector fixed effects as general controls (this also means we can no longer identify the demand, trade and finance channels on their own). Our first measure of monetary stimulus is proxied by the change in nominal short-term interest rates from September 2008 to March 2009 as also used in Laeven and Valencia (2011). We interact this measure of monetary stimulus with DEP_INV and DEP_WK to examine the impact of monetary stimulus on profits, sales, and investment through the financing channel. We do not include monetary stimulus on its own as it has been captured by country fixed effects. We interact the fiscal stimulus, measured by the size of discretionary fiscal stimulus as a percent of GDP as announced between September 2008 and March 2009, with our demand sensitivities.

Both the monetary and fiscal stimulus might be endogenous as they could be driven by the severity of the shocks and the depth of the recession within the country. Since this would bias the coefficients toward zero, to the extent that we find statistically significant effects, we can reasonably argue that the stimulus indeed played a positive role.

The measure of fiscal stimulus interacted with demand sensitivity has a positive significant coefficient in the case of profits, but is insignificant for sales and investment (Table 7, columns 1-3). The interaction term of monetary stimulus with DEP_WK is positive for the changes in profits, sales and investment and significant at the 5% level in case of the profit equation. In Columns 4-6, we use another measure of monetary policy: the change in the money base over GDP from September 2008 to March 2009. We find again that monetary policy stimulus interacted with DEP_INV has a significant positive coefficient in case of profits, and now the coefficient in the sales equation is also significant, but remains insignificant in case of investment. Overall, we find some positive impacts of fiscal stimulus through the demand channel and strong positive impacts of monetary stimulus operating through the financial channel and affecting working capital.

iv. Additional robustness checks

In Table 8 we include among the set of explanatory variables a number of firm-specific control variables, such as cash holding/asset, total assets in US Dollar, Tobin's Q, short-term debt over assets, and long-term debt/assets. All these firm controls are again measured by their values in the year 2006, so they are pre-determined with respect to the crisis. In Columns 1-3 of Table 8, we replicate the first three columns of Table 3. Adding these firm variables does not weaken our results for sectoral measures and strengthens them in some cases. For example, in

Column 1, studying the change in the profit ratio, the coefficient for demand sensitivity is now larger (-0.63) compared with Table 3 (-0.46). In Columns 4-6 of Table 8, we repeat the exercise of Columns 4-6 of Table 6 regarding the interaction of country and sector features, but adding now again these firm-specific controls. The interaction terms of sector and country features become slightly more significant. For example, in the profit equation (Column 4), trade linkage interacted with trade sensitivity now has a coefficient of (-9.0) compared with (-8.0) earlier (Table 4, column 4). Of the firm controls themselves, a higher Tobin's Q is significantly associated with lower profit and lower sales, possibly reflecting the fact that firms that were valued higher because of their (perceived) greater growth opportunities suffered more in the crisis. But we need to exercise caution in interpreting these results, as they may suffer from endogeneity or omitted variables issues.

We next check whether our results are affected by the specific period over which we conduct the comparison. In Table 9, we replicate the setup of Table 3 but study separately the crisis as to its effects over the 2008 and 2009 subperiods. In Columns 1-3, we study the change between 2007 and 2008, while in Columns 4-6, we look at the change between 2007 and 2009. We largely confirm the role of the various channels and country factors. Since the change in firm performance appears to have been stronger in 2009 (as also suggested by Figure 1), we can expect to find more evidence and greater significance for the demand and trade integration channels during the second sub-period.

In case of the change in profit in 2008 compared to 2007 (Column 1), we find no significant result for the sectoral variables in terms of the demand, trade and financial channels. In contrast, for the change in profits between 2009 and 2007 (Column 4), the coefficients are all negative for all three channels and significant for the demand and trade channels. For the change

of sales in 2008 (Column 2), we find demand sensitivity to be significantly negative, but trade sensitivity to be significantly positive. One possibility for the positive result for trade sensitivity could be because we are using annual data on firm performance and may thus miss the decline of trade in the fourth quarter of 2008. (Note that on an annual basis, exports still increased rather than decreased in 2008, as shown at the global level in Figure 2.) In Column 2, we find a significant and negative coefficient for working capital needs, which suggests the presence of some financial constraints already in 2008. For sales in 2009 (Column 5), we find that trade sensitivity has a negative coefficient, significant at the 1% level. Moreover, compared to 2008, demand sensitivity has a more pronounced impact, which is also more statistically significant. Overall, this suggest that, while financing constraints may have played a role already in 2008, the trade and demand channels played a more significant role in affecting firm performance in 2009 than in 2008.

We next use another proxy for the trade channel, namely the percentage change in exports between 2007 and 2009 at the 4-digit SIC sector level for each country where the firm is located. We use this measure with the caveat that it is a measure over the same period as our dependent variables, i.e., it is not pre-determined with respect to our dependent variable, and hence is more subject to the problem of endogeneity. On the other hand, it presumably captures the trade channel more directly, as it measures the degree to which exports declined, and could hence serve as a useful check on our earlier measure of trade channel. In Table 10, we find that the country-sector decline of exports from 2007 to 2009 is associated with a decline in firm-level profits, sales and investment over the same period, with the effect being significant for profits. Moreover, we continue to find significant negative impact of the crisis through the demand

channel (measured in the normal manner), on the change in profits and sales and evidence of a negative effect through the financing channel as regards investment on the change in profits.

v. Firm-level measure of demand, trade and financial channels

In Table 11, we replace our sector-level measures of financial and real sensitivities with firm-level measures. That is, we use the actual firm-level dependence on external finance for investment, firm-level working capital usage, and firm-level demand sensitivity and trade sensitivities. These variables are measured using the pre-crisis firm-level data from 2000 to 2006. As noted, relative to sector features derived from US data, the firm-level measures could be subject to some endogeneity issues and hence could bias our estimation.

In Column 1, we report the results for the change in profits. We find that the profit rate is significantly lower for firms that are more demand-sensitive. This result is consistent with Table 3 where we used sector-level demand sensitivity. However, we find the coefficient on ACT_INV to be significantly positive, which could reflect the endogeneity in ACT_INV. In Column 2, we report the results for the change in sales over assets. Again, we find the coefficients on demand and trade sensitivity to be negative and statistically significant, similar to the findings based on sectoral measures of sensitivity. In Column 3 of Table 11, we report the results for the change in capital expenditures. Firms with high trade sensitivity or large ACT_INV prior to the crisis seem to need to adjust their capital expenditures during the crisis significantly more downwards.

These findings are intuitive, but differ from the sectoral analysis in Table 3 (where we did not find a significant impact on investment). As a robustness check, in Columns 4 to 6, we focus on the trade channel and do not include the demand channel, to avoid their possible joint codetermination affecting our regression results (the firm-level trade and demand sensitivities

have a correlation of 0.28). Now the trade channel shows a coefficient with a larger magnitude and is significantly negative for all three dependent variables. This suggests that some of the demand effects operated through the trade channel.

In Table 12, we repeat the regression of Table 11 by including the interaction terms between firm-level sensitivities and country features. Column 1 reports the result for the change in profits. The interaction between ACT_INV and financial development (proxied by private credit/GDP) is significant at the 1%. The other interaction terms are not significant, however. Columns 2 and 3 report the results for the changes in sales and capital expenditures, respectively. We do not find significant interaction effects for sales, but do find evidence of the financial channel for the changes in capital expenditures. We also find that trade sensitivities are statistically significant for both the change in sales and in capital expenditures. In Columns 4 to 6, we further include country dummies and find the patterns to be very similar, with evidence mostly for the financial channel on investment.

The lack of significant results using firm specific indicators could be due to the increased noise associated with the firm specific measures. And, as noted, these firm-specific indexes are more subject to the issues of endogeneity, e.g., firms with lower profitability have to obtain more external financing. For that reason, sector-level indexes behave much more like instruments than these firm-specific indexes do. Hence, we put more weight on our results from sector-based analysis than that using firm-level indicators. Nonetheless, the analyses with firm-specific indexes confirm the role of demand and trade sensitivity and find some evidence for a financial channel.

5. Conclusions

In this paper, we apply a simple and well-established methodological framework to study the real impacts of the 2008-09 crisis on firm-level performance and the role of global linkages in the crisis. We analyze three channels through which the crisis may have affected firms: a financial channel, a demand channel, and a trade channel. To investigate the financial channel, we asked the question: if we characterize manufacturing firms into different baskets based on their ex ante sensitivity to shocks to external financing (in terms of investment and working capital needs), does this characterization help us to explain the ex-post performance of these firms? Similarly, if we characterize these firms based on their intrinsic sensitivity to demand or trade shocks, do firms with different scores perform differently during the crisis? And to investigate the role of global linkages, we include country-level financial and trade linkages, and their interactions with the proxies for the financial/demand/trade channels, into our regression framework.

We examine changes over the crisis period in three measures of firm performance—sales, profits and capital expenditure—for 7722 manufacturing firms from 42 countries. We find that, in economic terms, the trade and demand channels were the most important, particularly in 2009. When we examine the role of country-level linkages, including financial and trade linkages, we find that trade linkages played a significant role in the spillover of crisis, while the evidence for the role of financial linkages is considerably weaker.

It is important to point out that the current paper is not meant to be a comprehensive assessment of the welfare effects of global linkages. To do that, several additional aspects need to be examined, including how different forms of global linkages affected firm external financing

constraints and growth rates during tranquil times, e.g., before the crisis. This would be a fruitful topic for future research.

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Table 1. Number of Listed Manufacturing Firms by Country

	Country	Obs #		Country	Obs #
1.	ARGENTINA	28	2.	ITALY	100
3.	AUSTRALIA	212	4.	JAPAN	1,584
5.	AUSTRIA	30	6.	KOREA (SOUTH)	643
7.	BELGIUM	48	8.	MALAYSIA	376
9.	BRAZIL	111	10.	MEXICO	40
11.	CANADA	196	12.	NETHERLANDS	49
13.	CHILE	41	14.	NEW ZEALAND	32
15.	CHINA	866	16.	NORWAY	53
17.	COLOMBIA	5	18.	PAKISTAN	66
19.	CZECH REPUBLIC	2	20.	PERU	22
21.	DENMARK	46	22.	PHILIPPINES	31
23.	EGYPT	41	24.	POLAND	114
25.	FINLAND	60	26.	PORTUGAL	11
27.	FRANCE	225	28.	RUSSIAN FEDERATION	105
29.	GERMANY	275	30.	SOUTH AFRICA	72
31.	GREECE	91	32.	SPAIN	43
33.	HUNGARY	11	34.	SWEDEN	148
35.	INDIA	995	36.	SWITZERLAND	93
37.	INDONESIA	96	38.	THAILAND	208
39.	IRELAND	12	40.	TURKEY	125
41.	ISRAEL	67	42.	UNITED KINGDOM	349
Total		7722			

Note: The table lists the number of manufacturing firms in the sample for the year 2007. Source: *Worldscope*.

Table 2a. Summary statistics of firm performance before and during the 2008-09 crisis

Variable	Year	Obs	Mean	Std	p25	Median	p75	Min	Max
Profit/asset	2007	7540	0.097	0.131	0.062	0.108	0.155	-0.555	0.395
Profit/asset	2008	7506	0.074	0.146	0.045	0.092	0.143	-0.555	0.395
Profit/asset	2009	7147	0.063	0.141	0.030	0.080	0.131	-0.555	0.395
Sales/asset	2007	7722	1.019	0.554	0.658	0.933	1.284	0.028	2.964
Sales/asset	2008	7721	1.035	0.564	0.665	0.946	1.307	0.028	2.964
Sales/asset	2009	7402	0.988	0.551	0.614	0.902	1.255	0.028	2.964
Capital expenditure/asset	2007	7606	0.059	0.059	0.019	0.041	0.078	0.000	0.301
Capital expenditure/asset	2008	7575	0.059	0.058	0.019	0.041	0.079	0.000	0.301
Capital expenditure/asset	2009	7261	0.049	0.052	0.015	0.033	0.063	0.000	0.301

Note: The data is for 7722 listed manufacturing firms from 42 countries.
Source: Worldscope.

Table 2b. Summary statistics of key dependent and explanatory variables

Variable	Obs	Mean	Std	p25	Median	p75	Min	Max
Firm level								
Change in Profit/Asset (%)	7540	-3.09	9.26	-6.27	-2.01	0.86	-38.26	26.68
Change in Sales/Asset(%)	7722	-0.73	22.56	-10.57	0.10	9.85	-82.07	70.73
Change in CapEX/asset (%)	7606	-0.57	4.90	-1.99	-0.08	1.31	-19.91	14.74
Actual firm use of working capital (ACT_WK, in days)	7257	105.60	58.01	64.50	96.84	134.40	4.40	307.86
Actual firm use of external financing for investment (ACT_INV)	6152	-0.31	2.26	-1.17	-0.22	0.51	-8.95	11.81
Firm-level demand sensitivity	5756	1.93	10.23	-1.79	1.56	5.63	-40.10	47.43
Firm-level trade sensitivity	5710	0.48	2.88	-0.47	0.26	1.44	-10.57	12.62
Sector Level								
Dependence on external finance for working capital (DEF_WK , days)	111	91.91	32.71	66.98	88.45	116.06	22.34	158.62
Dependence on external finance for investment (DEF_INV)	100	0.03	0.44	-0.26	0.04	0.33	-0.86	1.13
Demand sensitivity	123	1.56	0.96	1.02	1.43	2.07	-1.06	4.58
Trade sensitivity	132	1.32	0.60	0.99	1.29	1.57	-0.64	3.58
Country level								
Financial Openness (year 2006)	42	3.47	4.14	1.18	2.07	4.19	0.61	23.81
Trade linkage (year 2006)	42	0.02	0.07	-0.02	0.02	0.06	-0.10	0.22
Credit over GDP (year 2006)	42	0.87	0.51	0.35	0.87	1.12	0.13	1.86
Domestic expenditure (year 2006)	42	0.97	0.07	0.94	0.97	1.02	0.78	1.09

Note: The data is for 7722 listed manufacturing firms in 42 countries. Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets.
Source: Worldscope.

Table 2c.Correlation table of key dependent and explanatory variables

	ΔProfit	ΔSales	ΔCE	DEF_WK	DEF_INV	Demand sensitivity	Trade sensitivity	ACT_WK	ACT_INV	Firm demand sensitivity
ΔSales	0.18*									
ΔCapital Expenditure	0.001	-0.03*								
DEF_WK	-0.02	-0.04*	0.02							
DEF_INV	-0.05*	-0.04*	0.01	0.26*						
Demand Sensitivity	-0.04*	-0.04*	-0.01	0.03*	0.23*					
Trade sensitivity	-0.07*	-0.05*	0.02*	0.01	0.24*	0.06*				
ACT_WK	0.002	0.005	-0.003	0.20*	0.03*	0.04*	0.01			
ACT_INV	0.03*	0.03*	-0.03*	0.03*	0.06*	0.02	-0.02	0.09*		
Firm demand sensitivity	-0.03*	-0.04*	-0.03	0.01	0.01	0.04*	0.004	0.04*	-0.01	
Firm trade sensitivity	-0.03	-0.03*	-0.03*	0.01	0.01	0.01	0.02	0.01	0.04*	0.28*

Note: * is at the 5% significance level. The data is for 7722 listed manufacturing firms in 42 countries. Change in profit/asset refers to the difference between the profit/asset ratio averaged over 2008-09 and the profit/asset ratio in 2007. Similar for the changes of sales and capital expenditure (CapEX). Source: Worldscope.

Table 3. ***The Impact of Crisis on Firm Performance -sector feature***

	(1) ΔProfit	(2) ΔSales	(3) ΔCapEx	(4) ΔProfit	(5) ΔSales	(6) ΔCapEx
Demand sensitivity	-0.456**	-1.196***	-0.0835			
	[0.222]	[0.451]	[0.106]			
Trade sensitivity	-1.068***	-1.778**	0.125	-1.091***	-1.815**	0.121
	[0.266]	[0.693]	[0.0817]	[0.304]	[0.781]	[0.0839]
Dependence for working capital	-0.00406	-0.0213*	0.00183	-0.00379	-0.0206	0.00188
(DEP_WK)	[0.00509]	[0.0129]	[0.00193]	[0.00556]	[0.0140]	[0.00189]
Dependence on external finance for investment	-0.489	-0.398	0.0997	-0.666	-0.884	0.0673
(DEF_INV)	[0.392]	[0.767]	[0.165]	[0.409]	[0.866]	[0.165]
Constant	-0.391	5.750***	-0.809***	-1.057	3.959*	-0.931***
	[0.745]	[2.092]	[0.300]	[0.715]	[2.181]	[0.235]
Observations	7,540	7,722	7,606	7,547	7,729	7,613
R-squared	0.008	0.005	0.001	0.007	0.004	0.000

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Robust standard errors in brackets, clustered at the 3-digit sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 4. ***The Impact of Crisis on Firm Performance -sector feature with weighted regressions***

	Weighted regressions			Top 100 firms		
	(1)	(2)	(3)	(1)	(2)	(3)
	ΔProfit	ΔSales	ΔCapEx	ΔProfit	ΔSales	ΔCapEx
Demand Sensitivity	-1.219**	-1.479**	-0.153	-0.948***	-2.475***	-0.156
	[0.577]	[0.638]	[0.219]	[0.316]	[0.791]	[0.111]
Trade sensitivity	-1.154**	-3.250***	-0.151	-1.354***	-3.421***	0.107
	[0.516]	[0.885]	[0.296]	[0.276]	[1.127]	[0.108]
Dependence for working capital	0.00363	0.00299	0.00680	-0.00351	-0.0311*	0.00167
(DEP_WK)	[0.0133]	[0.0311]	[0.00418]	[0.00796]	[0.0172]	[0.00241]
Dependence on external finance for investment	-0.459	-2.411	-0.609*	-0.212	1.506	-0.109
(DEP_INV)	[0.967]	[2.263]	[0.355]	[0.507]	[1.339]	[0.253]
Constant	-0.761	4.695	-0.669	-0.0270	9.397***	-0.634*
	[1.263]	[3.538]	[0.550]	[1.079]	[2.917]	[0.320]
Observations	7,540	7,722	7,606	2,635	2,703	2,666
R-squared	0.015	0.014	0.006	0.018	0.016	0.001

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Robust standard errors in brackets, clustered at the 3-digit sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5. The Impact of Crisis on Firm Performance
--Heckman Selection Model

	(1) ΔProfit	(1) Selection	(2) ΔSales	(2) Selection	(3) ΔCapEx	(3) Selection
Demand Sensitivity	-0.586***	0.0748*	-1.284***	0.0714	-0.0851	0.0817**
	[0.219]	[0.0397]	[0.466]	[0.0439]	[0.124]	[0.0399]
Trade sensitivity	-1.173***	0.0242	-1.625***	0.0441	0.126	0.0423
	[0.264]	[0.0443]	[0.625]	[0.0681]	[0.0958]	[0.0598]
Dependence for working capital	-0.00374	-0.000527	-0.0221*	-0.000526	0.00255	0.000115
(DEP_WK)	[0.00530]	[0.000884]	[0.0133]	[0.00116]	[0.00201]	[0.00108]
Dependence on external finance for investment	-0.435	0.0493	-0.172	0.0790	0.0727	0.0490
(DEP_INV)	[0.370]	[0.0662]	[0.778]	[0.0749]	[0.179]	[0.0785]
O-score 2007		-0.00552***		-0.00668**		-0.0277***
		[0.00142]		[0.00280]		[0.00372]
Constant	0.508	1.498***	6.420***	1.634***	-0.914***	1.407***
	[0.764]	[0.132]	[2.080]	[0.172]	[0.316]	[0.167]
Observations	7,411	7,411	7,411	7,411	7,411	7,411

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Robust standard errors in brackets, clustered at the 3-digit sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. ***The Impact of Crisis on Firm Performance***
-Sector and Country Interaction

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔProfit	ΔSales	ΔCapEx	ΔProfit	ΔSales	ΔCapEx
Domestic expenditure*Demand sensitivity	-3.431	6.651	0.0651	-4.140*	4.208	0.439
	[2.351]	[6.562]	[1.301]	[2.160]	[6.383]	[1.198]
Trade linkage*Trade sensitivity	-9.139**	-18.05**	-4.172***	-8.049***	-13.23*	-3.874***
	[3.548]	[8.999]	[1.497]	[2.496]	[7.309]	[1.349]
Financial Openness*DEP_WK	0.00175	-0.00651	0.000668	0.000914	-0.00653	0.000954
	[0.00223]	[0.00446]	[0.000746]	[0.00234]	[0.00450]	[0.000752]
Financial Openness*DEP_INV	0.0424	0.593	-0.0963	0.0306	0.438	-0.136**
	[0.162]	[0.362]	[0.0614]	[0.166]	[0.342]	[0.0652]
Credit/GDP*DEP_WK	-0.00152	0.0357	0.000226	-0.00134	0.0201	-0.00480
	[0.0139]	[0.0347]	[0.00674]	[0.0137]	[0.0334]	[0.00639]
Credit/GDP*DEP_INV	0.353	-1.385	0.651	0.443	-1.397	0.632
	[1.139]	[2.709]	[0.611]	[1.034]	[2.525]	[0.533]
Demand sensitivity	2.883	-7.720	-0.141			
	[2.273]	[6.410]	[1.234]			
Trade sensitivity	-0.920***	-1.132	0.259**			
	[0.296]	[0.713]	[0.130]			
Dependence for working capital	-0.00670	-0.0417	-0.000740			
(DEP_WK)	[0.0110]	[0.0285]	[0.00596]			
Dependence on external finance for	-0.920	-0.795	-0.307			
investment (DEF_INV)	[0.913]	[2.223]	[0.590]			
Financial openness	-0.400**	0.155	-0.105			
	[0.192]	[0.447]	[0.0747]			
Credit /GDP	0.407	2.526	0.863			
	[1.281]	[3.431]	[0.656]			
Domestic expenditure/GDP	-3.620	-35.58	-5.656			
	[13.50]	[29.69]	[5.458]			
Trade linkage	6.764	-2.277	0.663			
	[13.69]	[30.91]	[5.601]			
Constant	3.639	37.82	4.144			
	[13.37]	[29.61]	[5.396]			
Sector fixed effects	n	n	n	y	y	Y
Country fixed effects	n	n	n	y	y	Y
Observations	7,540	7,722	7,606	7,540	7,722	7,606
R-squared	0.013	0.012	0.005	0.052	0.060	0.031

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Robust standard errors in brackets, clustered at the country-sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. The Impact of Crisis on Firm Performance
--Role of monetary and fiscal stimulus

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔProfit	ΔSales	ΔCapEx	ΔProfit	ΔSales	ΔCapEx
Fiscal stimulus*demand sensitivity	0.332***	0.252	-0.0643	0.317***	0.240	-0.0680
	[0.115]	[0.344]	[0.0551]	[0.116]	[0.354]	[0.0569]
Change in ST interest rate*DEP_WK	0.00490**	0.00440	0.000926			
	[0.00187]	[0.00523]	[0.00135]			
Change in ST interest rate*DEP_WK	0.159	0.307	-0.0138			
	[0.156]	[0.367]	[0.134]			
Change in Money base*DEP_WK				-0.004	-0.014	0.001
				[0.006]	[0.016]	[0.002]
Change in Money base*DEP_INV				0.852**	2.680***	-0.131
				[0.398]	[0.918]	[0.153]
Country fixed effects	Y	Y	Y	Y	Y	Y
Sector fixed effects	Y	Y	Y	Y	Y	Y
Observations	7,540	7,722	7,606	7,540	7,722	7,606
R-squared	0.053	0.059	0.030	0.052	0.060	0.030

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. DEP_WK is the intrinsic dependence on external finance for working capital; while DEF_INV is the intrinsic dependence on external finance for investment. Robust standard errors in brackets, clustered at the 3-digit sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. ***The Impact of Crisis on Firm Performance*-Adding firm controls**

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔProfit	ΔSales	ΔCapEx	ΔProfit	ΔSales	ΔCapEx
Demand sensitivity	-0.626***	-1.374***	-0.110			
	[0.216]	[0.462]	[0.122]			
Trade sensitivity	-1.261***	-1.533**	0.0804			
	[0.249]	[0.620]	[0.0980]			
Dependence for working capital	-0.00231	-0.0258**	0.00261			
(DEP_WK)	[0.00480]	[0.0124]	[0.00208]			
Dependence on external finance	-0.274	-0.400	0.0553			
for investment (DEF_INV)	[0.379]	[0.791]	[0.178]			
Domestic expenditure*Demand sensitivity				-4.067*	9.334	0.804
				[2.256]	[6.589]	[1.192]
Trade openness*Trade sensitivity				-9.001***	-14.87**	-3.591***
				[2.759]	[7.278]	[1.212]
Financial Openness*DEP_WK				0.000451	-0.00776*	0.000987
				[0.00247]	[0.00469]	[0.000666]
Financial Openness*DEP_INV				0.00597	0.358	-0.172***
				[0.171]	[0.358]	[0.0606]
Credit/GDP*DEP_WK				0.00123	0.0181	-0.00171
				[0.0146]	[0.0351]	[0.00619]
Credit/GDP*DEP_RZ				1.048	-0.198	0.857
				[1.092]	[2.629]	[0.536]
Tobin-Q (06)	-0.773***	-1.612***	-0.0772	-0.686***	-1.269***	-0.0785
	[0.160]	[0.365]	[0.0618]	[0.158]	[0.348]	[0.0778]
Firm size (06)	-0.184**	-0.0751	0.0984***	-0.0883	-0.398**	0.0173
	[0.0742]	[0.165]	[0.0303]	[0.0778]	[0.173]	[0.0379]
Cash holding/Assets (06)	-2.376**	14.73***	0.226	-2.778**	11.76***	-0.400
	[1.157]	[2.789]	[0.601]	[1.240]	[2.479]	[0.531]
Short-term debt/Assets (06)	-0.0461	1.442	0.404	-1.203	3.798	0.672
	[1.157]	[2.563]	[0.532]	[1.337]	[2.796]	[0.544]
Long-term debt/Assets (06)	0.0954	5.017**	-1.844***	0.285	7.498***	-1.157**
	[1.102]	[2.262]	[0.625]	[1.134]	[2.787]	[0.558]
Constant	3.578***	6.455**	-1.744***			
	[1.204]	[3.137]	[0.548]			
Sector and country fixed effects	n	n	n	y	y	y
Observations	6,954	7,094	7,008	6,954	7,094	7,008
R-squared	0.020	0.014	0.005	0.064	0.070	0.039

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Robustness standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. The Impact of Crisis on Firm Performance
--Separating Year 2008 and 2009

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔProfit 08	ΔSales 08	ΔCapEx08	ΔProfit 09	ΔSales 09	ΔCapEx09
Demand sensitivity	-0.379	-0.784*	-0.0623	-1.153***	-1.847**	-0.172
	[0.257]	[0.470]	[0.126]	[0.286]	[0.739]	[0.141]
Trade sensitivity	-0.363	1.232**	0.0561	-2.301***	-4.473***	0.141
	[0.305]	[0.546]	[0.0973]	[0.352]	[0.995]	[0.126]
Dependence for working capital	0.00678	-0.0423***	0.00178	-0.00759	-0.0118	0.00204
(DEP_WK)	[0.00519]	[0.0115]	[0.00207]	[0.00763]	[0.0195]	[0.00264]
Dependence on external finance	0.208	0.163	0.0401	-0.509	-1.363	0.0741
for investment (DEF_INV)	[0.463]	[0.730]	[0.157]	[0.561]	[1.246]	[0.226]
Tobin-Q (06)	-0.677***	-1.479***	-0.0341	-0.924***	-1.592***	-0.0916
	[0.181]	[0.391]	[0.0703]	[0.267]	[0.603]	[0.0932]
Firm size (06)	-0.179*	0.395*	0.106***	-0.311***	-0.477**	0.0832*
	[0.102]	[0.210]	[0.0325]	[0.103]	[0.218]	[0.0428]
Cash holding/Assets (06)	-4.598***	14.45***	-0.0650	-1.217	16.79***	0.178
	[1.700]	[2.821]	[0.603]	[1.413]	[4.562]	[0.771]
Short-term debt/Assets (06)	-4.273**	7.284**	0.398	3.700*	-2.360	0.279
	[1.811]	[3.406]	[0.592]	[1.871]	[3.552]	[0.639]
Long-term debt/Assets (06)	-0.617	-2.079	-1.680**	1.734	10.64***	-2.287***
	[1.460]	[2.388]	[0.664]	[1.758]	[3.996]	[0.833]
Constant	2.496*	-0.519	-1.382**	6.780***	12.53**	-1.898**
	[1.386]	[3.228]	[0.528]	[1.910]	[4.846]	[0.770]
Observations	6,923	7,093	6,979	6,619	6,827	6,715
R-squared	0.010	0.013	0.003	0.027	0.016	0.004

Note: Key dependent variables are the changes between 2007 and 2008 (or 2009) in the ratios of firm-level profits/assets, sales/assets and investments/assets. Robust standard errors in brackets, clustered at the 3-digit sector level. *** p<0.01, ** p<0.05, * p<0.1.

Table 10. The Impact of Crisis on Firm Performance
--alternative measure of trade channel

	(1) ΔProfit	(2) ΔSales	(3) ΔCapEx
Demand Sensitivity	-0.406*	-1.146**	-0.0638
	[0.246]	[0.477]	[0.107]
Trade channel (% change of country-sector exports)	1.353***	1.127	0.150
	[0.379]	[0.776]	[0.195]
Dependence for working capital	-0.00216	-0.0194	0.00181
(DEP_WK)	[0.00534]	[0.0126]	[0.00197]
Dependence on external finance for investment	-0.707*	-0.906	0.159
(DEP_INV)	[0.362]	[0.692]	[0.163]
Constant	-2.144***	2.957*	-0.644**
	[0.663]	[1.557]	[0.274]
Observations	7,552	7,735	7,619
R-squared	0.006	0.004	0.001

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 11. The Impact of Crisis on Firm Performance
-firm features

VARIABLES	(1) ΔProfit	(2) ΔSales	(3) ΔCapEx	(4) ΔProfit	(5) ΔSales	(6) ΔCapEx
Firm-level demand sensitivity	-0.0246***	-0.0511**	-0.00481			
	[0.00869]	[0.0205]	[0.00410]			
Firm-level trade sensitivity	-0.0345	-0.125*	-0.0273*	-0.0574*	-0.174**	-0.0348**
	[0.0308]	[0.0727]	[0.0145]	[0.0295]	[0.0696]	[0.0139]
Actual firm use of working capital	0.000835	-0.00513	0.000626	0.000548	-0.00569	0.000548
(ACT_WK)	[0.00183]	[0.00432]	[0.000863]	[0.00183]	[0.00432]	[0.000863]
Actual firm use of external financing	0.105***	0.210**	-0.0432**	0.108***	0.217**	-0.0430**
for investment (ACT_INV)	[0.0401]	[0.0941]	[0.0190]	[0.0401]	[0.0940]	[0.0190]
Constant	-2.891***	0.166	-0.476***	-2.892***	0.162	-0.472***
	[0.228]	[0.540]	[0.108]	[0.228]	[0.539]	[0.108]
Observations	5,808	5,915	5,868	5,812	5,919	5,872
R-squared	0.003	0.003	0.002	0.002	0.002	0.002

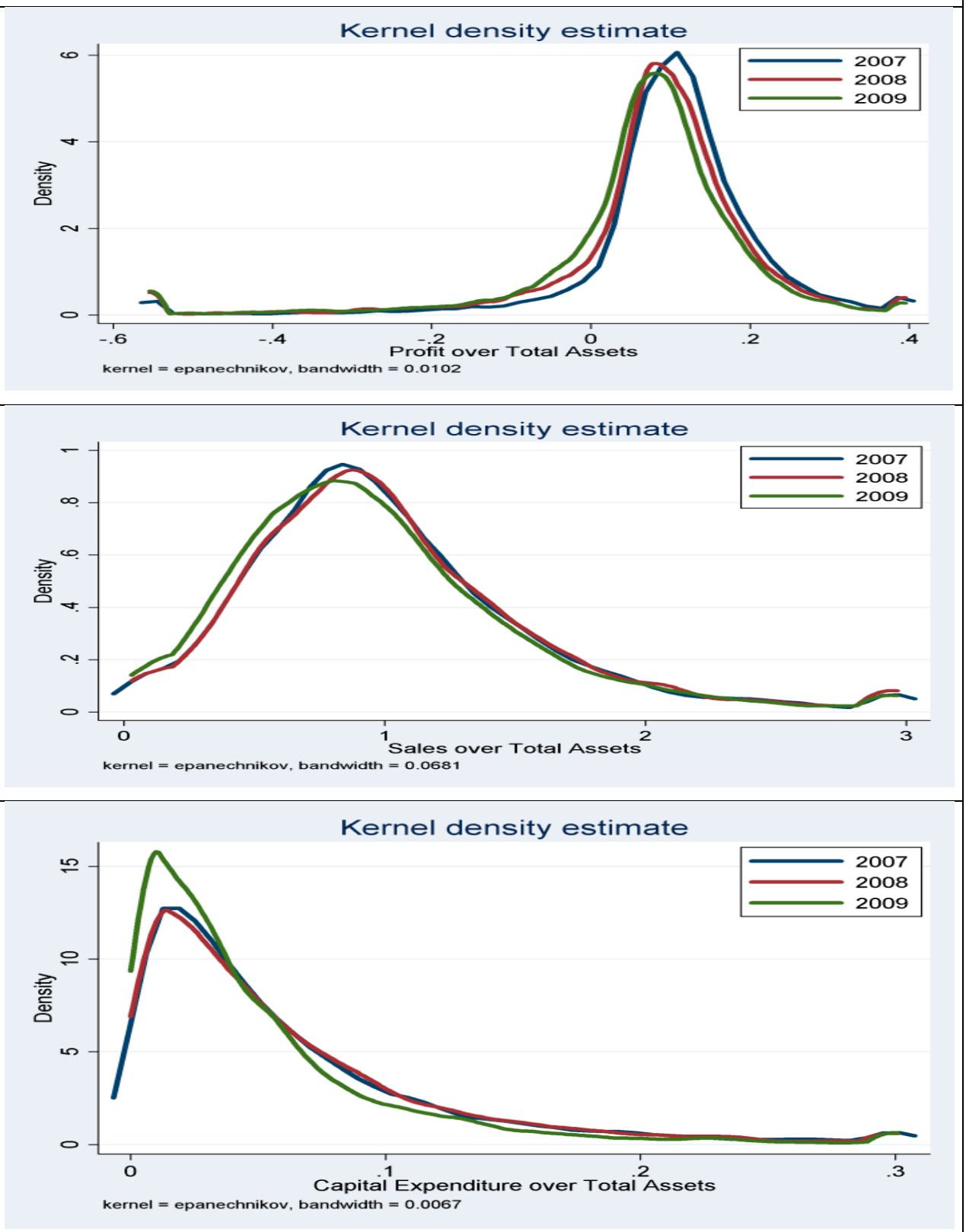
Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 12. The Impact of Financial Crisis on Firm Performance
---firm and country features

VARIABLES	(1) ΔProfit	(2) ΔSales	(3) ΔCapEx	(4) ΔProfit	(5) ΔSales	(6) ΔCapEx
Firm-level demand sensitivity	0.151	0.421	-0.0955	0.145	0.407	-0.0874
	[0.131]	[0.313]	[0.0623]	[0.131]	[0.310]	[0.0624]
Domestic expenditure	-0.179	-0.490	0.0956	-0.175	-0.500	0.0852
*Firm demand sensitivity	[0.138]	[0.329]	[0.0654]	[0.138]	[0.326]	[0.0655]
Firm-level trade sensitivity	-0.0416	-0.148*	-0.0297*	-0.0161	-0.0498	-0.0200
	[0.0370]	[0.0879]	[0.0176]	[0.0371]	[0.0873]	[0.0177]
Trade linkage*Firm trade sensitivity	0.766	2.180	0.105	0.419	0.521	-0.0127
	[0.583]	[1.384]	[0.277]	[0.585]	[1.375]	[0.279]
Actual firm use of working capital	0.00430	-0.000617	0.000509	0.00375	0.00963	0.00139
(ACT_WK)	[0.00602]	[0.0142]	[0.00284]	[0.00620]	[0.0144]	[0.00292]
Financial openness*ACT_WK	0.00167	-0.00181	0.000506	0.00160	-0.00422	0.000500
	[0.00118]	[0.00281]	[0.000568]	[0.00130]	[0.00308]	[0.000629]
Credit/GDP*ACT_WK	-0.00873	-0.00126	-0.00101	-0.00717	0.00252	-0.00145
	[0.00693]	[0.0163]	[0.00327]	[0.00721]	[0.0168]	[0.00340]
Actual firm use of external financing	-0.473***	-0.382	-0.137**	-0.426***	-0.174	-0.125**
for investment (ACT_INV)	[0.124]	[0.289]	[0.0586]	[0.126]	[0.291]	[0.0598]
Financial Openness*ACT_INV	0.0289	0.123	0.00246	0.0216	0.0941	0.00245
	[0.0317]	[0.0752]	[0.0151]	[0.0320]	[0.0753]	[0.0153]
Credit/GDP*ACT_INV	0.544***	0.345	0.0934	0.543***	0.281	0.0904
	[0.161]	[0.377]	[0.0760]	[0.163]	[0.379]	[0.0772]
Financial openness	-0.377***	-0.209	-0.104*			
	[0.128]	[0.305]	[0.0612]			
Credit/GDP	1.691**	3.777*	0.931**			
	[0.821]	[1.945]	[0.390]			
Domestic expenditure/GDP	-11.57	19.74	-5.041			
	[11.06]	[26.28]	[5.233]			
Trade linkage	-7.160	14.12	-4.709			
	[10.82]	[25.69]	[5.115]			
Constant	7.954	-22.34	3.888			
	[11.03]	[26.21]	[5.219]			
Country fixed effects	n	n	n	y	y	y
Observations	5,808	5,915	5,868	5,808	5,915	5,868
R-squared	0.014	0.008	0.006	0.034	0.045	0.023

Note: Key dependent variables are the changes between 2007 and 2008/2009 in the ratios of firm-level profits/assets, sales/assets and investments/assets. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1. Density distribution of firm performance around the 2008-09 crisis



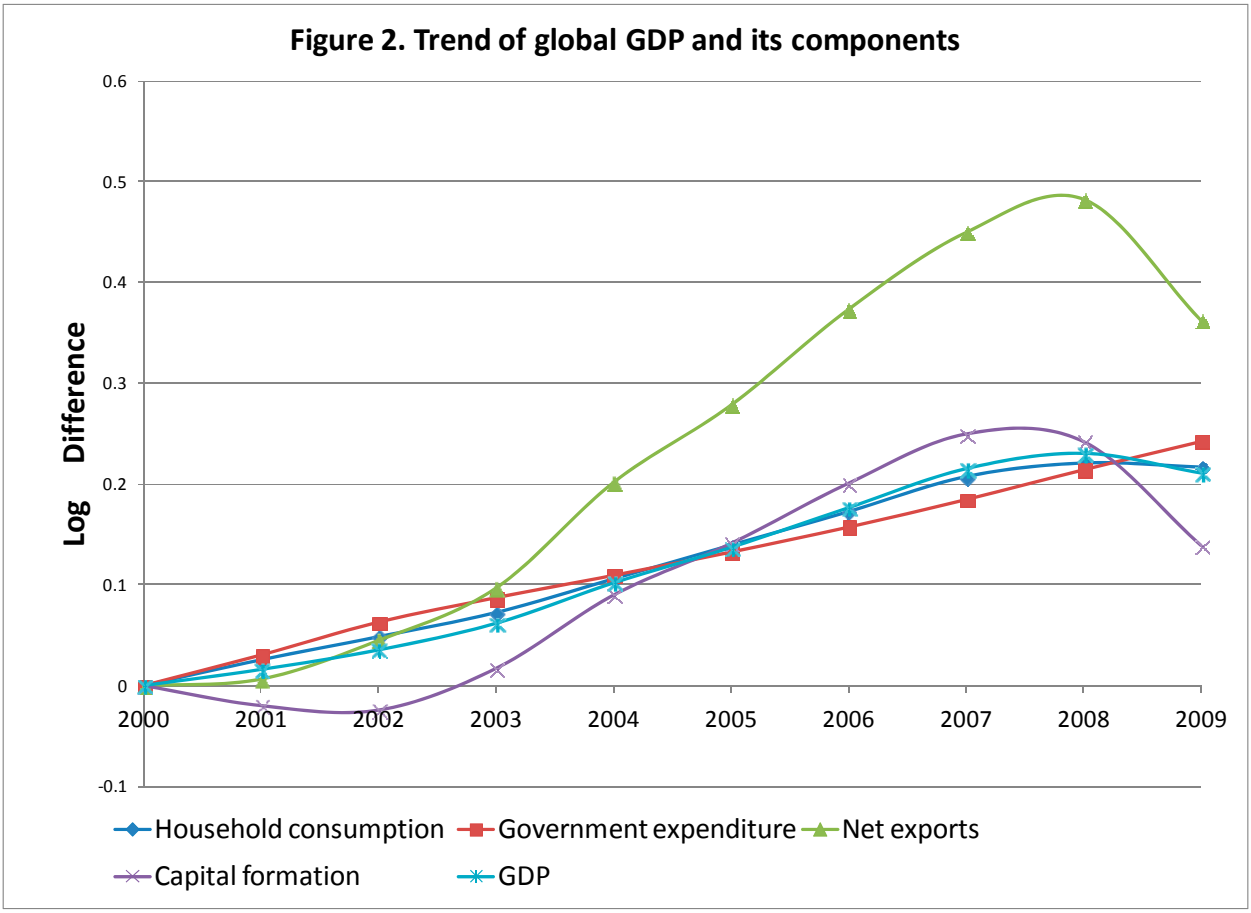


Figure 2. Trend of global GDP and its components
Log Difference
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Household consumption
Government expenditure
Net exports
Capital formation
GDP