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**THE VULNERABILITY OF  
SUB-SAHARAN AFRICA  
TO THE FINANCIAL CRISIS:  
THE CASE OF TRADE**

Nicolas Berman and Philippe Martin

***DEVELOPMENT ECONOMICS,  
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# **THE VULNERABILITY OF SUB-SAHARAN AFRICA TO THE FINANCIAL CRISIS: THE CASE OF TRADE**

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## ABSTRACT

### The vulnerability of sub-Saharan Africa to the financial crisis: the case of trade

In the early stage of the 2008-2009 financial crisis, the conventional wisdom was that financial under-development of sub-Saharan African economies may be a blessing in disguise because it insulates them from the direct effects of the crisis. This paper argues that this may also make African exporters, dangerously more dependent on the health of financial institutions in countries they export to. On past financial crises (1976-2002), we find that for the average country, the disruption effect on exports due to a financial crisis in the partner country is moderate (a deviation from the gravity predicted trade of around 2 to 8%) but long lasting (around 7 years). We find however that the disruption effect is much larger for African exporters as the fall in trade (relative to gravity) is at least 20% more than for other countries in the aftermath of a financial crisis. Part of the vulnerability of African exports comes from a composition effect because primary exports are hit more severely than manufacturing exports. We also provide evidence that African countries more dependent on trade finance are more vulnerable to financial crises.

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# 1 Introduction

In this paper, we show that African exports are particularly vulnerable to a financial crisis in the countries they export to. Our work is motivated by the financial crisis of 2008-2009. Early in the financial crisis, a common view was that Africa's low level of financial integration may be a blessing in disguise, insulating this region from the direct impact of the financial crisis. Indeed, it may be that the direct wealth effect has been less important than in other regions such as East Asia, Latin America and Central and Eastern European countries which are more open in terms of financial flows than African countries. African banks may indeed have bought less "toxic" assets than others. However, we show in this paper that African countries are more affected by the trade effect of financial crises and that the relative under-development of financial systems in sub-saharan African countries, in particular the strong dependence on trade credit may make them more vulnerable to the disruption of trade finance that comes with the financial crisis in the industrialized countries.

One indication of the vulnerability of African countries on the trade side is given by US trade statistics on the period 2008-2009. Following the crisis, the fall of US imports from Sub-Saharan African countries has been more dramatic than from the rest of the world. From September 2008 - the failure of Lehman on September 15 is often seen as the turning point of the crisis - the fall in US imports from African countries has been much stronger than from other countries. This is especially true for African manufacturing exports. This suggests that the fall in African exports is not only a composition effect due to the importance of primary goods and the fall in primary goods prices.

What is behind this sharp fall of African exports to a country that during this period has experienced an exceptional financial crisis by historical standards? What does it reveal on the vulnerability of African exporters to financial crises in partner countries? What are the mechanisms through which a financial crisis in a partner country affects African exports? We attempt to partially answer these questions by analyzing the impact of past financial crises on bilateral trade flows. Using a large sectoral database of bilateral trade and of financial crises on the period 1972-2002, and a gravity equation approach, we quantify the deviation of exports from their "natural" level. The gravity approach which is now very standard in trade and has strong theoretical underpinnings, allows us to measure the deviation of bilateral exports from the "natural" level of bilateral trade as predicted by standard determinants such as GDPs, bilateral distance, trade agreements etc... We distinguish two mechanisms through which a financial crisis in a country affects the exports of other countries. There is first an income effect as financial crisis are typically associated with sharp recessions (see Reinhart and Rogoff, 2008 and Claessens, Kose and Terrones, 2009), which lead to a fall in consumption and imports. Freund (2009) has shown that the elasticity of trade to income has increased in the past forty years. According to Irwin (2002) this elasticity was around 2 in the 1960s and 1970s and increased to 3.4 in the 1990s. In this paper, we show that African exports are more sensitive to large negative income movements in the countries they trade with. This is true both for manufacturing and primary goods exports.

Second, for a given fall in income and demand, African exports may be adversely hit by a financial crisis due to what we call a disruption effect. The disruption may take direct or more subtle forms. The most direct effect, one that has been widely discussed in policy circles is the fall in trade credit. There are however more subtle ways through which the financial crisis may negatively affect trade. In particular, although it is difficult to measure it, risk aversion increases amongst bankers and traders during a financial crisis and this may affect more severely countries or groups of countries which are viewed as more risky. We show that the disruption effect on trade is more important and longer lasting for African countries than for exporters of other regions. Compared with other countries, the disruption effect is larger for African exporters (at least -20%), aggravates over time and lasts several years after the occurrence of the event. Again, this disruption effect comes in addition to the fall of exports due to the fall of income and consumption. This sharp difference applies both for primary products and manufactured goods. We also find that for African countries, the largest disruption effect comes when the destination country which is hit by a financial crisis is industrialized. Finally, using two different proxies for dependence on trade credit, we provide evidence that this dependence may explain part of the fragility of African exports to financial crisis in trade partners.

The pre-crisis economic literature delivers few insights on the effect of such an event on international trade. Most studies consider the role of international trade on the probability of occurrence of crises (Frankel and Cavallo, 2004) or on their transmission (Kaminsky and Reinhart, 2000, Glick and Rose, 1999), showing in particular that trade linkages may explain crises contagion and their regional character. The few papers looking at the impact of crises on trade generally focus on currency crises (Berman, 2009, Campa, 2000). Until very recently, the effect of banking crises has only been studied so far by Ma and Cheng (2003), who find a negative impact of such events on imports and a positive impact on exports in the short-run in the country that experiences the crisis. We go further in this paper by studying the short and long-run effects of such events but focusing on the effect of exports to countries that are hit by a financial crisis. By so doing, we attempt to improve the understanding of the precise channels through which a financial crisis in the rest of the world is transmitted to a country's trade.

A banking crisis, by tightening financial constraints, may importantly affect the patterns of trade. The difference between African and others countries may lie in the type of financing used by exporters. While firms operating in countries with relatively developed financial markets can use the banking system to finance trading operations, African exporters rely on others sources, in particular trade finance provided by institutions in the destination country. Trade can be disrupted by a financial crisis that affects banks, risk aversion and trust in both the importing and exporting country. This is the case for letters of credit (LCs). Importers use LCs issued by their banks (the issuing bank) as a means of assuring exporters that they will be paid. If the exporter submits the required documentation (invoices, bills of lading, etc.) to its bank (the advising or confirming bank), payment is made to the exporter. Letters of credit require both confidence and liquidity to provide finance and insurance about payment to the exporter. If confidence or liquidity is

missing at any point along the chain from the importer to the exporter then the mechanism will not function. The importer creditworthiness may be undermined, the issuing bank may have insufficient funds to extend credit to the importer. The confirming bank may also lack confidence in the issuing bank. An argument made by Auboin (2009) is also that with Basel II rules, when market conditions tighten, capital requirements for trade finance instruments tend to increase more than proportionally to the risk when the counterpart is in a developing country. Inter-firm trade credit may also be deficient during a financial crisis because of the perceived increase in the risk of non-payment. Ronci (2004) indeed reports sharp falls of trade finance during the most important emerging markets financial crises of the 1990s.

In the aftermath of the financial crisis and the trade collapse, a burgeoning literature has attempted to analyze the sources of the trade collapse. Our paper is clearly part of this literature although it focuses on the case of African countries, and on the more issue of the transmission of financial crises to the developing world. Regarding the recent crisis, the role of financial conditions and of trade credit has in particular been disputed. On the one hand, the World Trade Organization (WTO) has pushed the idea that the trade collapse was partly due to the collapse in trade credit. Auboin, (2009) reports an increase in 2008 in spreads on 90 days letters of credit from 10-16 basis points in normal times to 250-500 basis points for letters issued by developing countries. The report of the African Development Bank (2009) notes that "paradoxically, although African commercial banks are ready to provide financing for trade operations, they are unable to do so because the global credit crisis has caused many international confirming banks to be forced to temporarily withdraw their credit support from the market. This has led to a growing gap between supply and demand for trade financing". Another study by the IMF (2009) that surveyed several banks in developed and emerging markets reported a sharp increase in the cost of trade finance. 70% of the banks reported that the price for letters of credit had risen. Banks also reported that intraregional trade among advanced economies seemed unaffected so far by the current crisis. One possible explanation given by the IMF for the collapse of trade from emerging and developing countries is that rising costs of trade finance and increased risk perception had a severe impact on low margin products: importers may not be able to afford letters of credit. One issue is that these contrasting views are based on surveys rather than comprehensive statistics on trade finance. As explained by Auboin (2009), the series of trade finance statistics derived from balance of payments and BIS banking statistics was discontinued in 2004.

Recent papers find evidence that the credit conditions observed during the crisis impact export performance. This is the case of Chor and Manova (2009), who use data on the evolution of trade volumes during the crisis months and find that adverse credit conditions were an important channel through which the crisis affected trade flows. Iacovone and Zavacka (2009), Amiti and Weinstein (2009) also find evidence on the negative effects of financial crises on exports. The later argue that exporters typically turn to banks and other financial firms to handle payments because international trade is typically riskier than domestic trade. Collecting payments in foreign countries is more difficult than domestically. Also, the added shipping times

associated with international trade often mean that international transactions take two months longer than domestic transactions. This imposes additional working capital requirements on exporters. Using Japanese data, they find that of the 10.5% decline in Japanese exports that occurred following the 1997 banking crisis, the direct effect of declining negotiating bank health on exports caused about a third of the decline. Bricongne et al. (2009), using French firm level data, find that firms in sectors structurally more dependent on external finance were the most affected by the crisis. Yet, model-based simulations (Eaton et al., 2009) suggest that the contagion to countries world-wide came mainly through the contraction of demand rather than through direct financial channels. Levchenko, Lewis and Tesar (2009), using American data, find no support for the hypothesis that trade credit played a role in the trade collapse.

Section 2 reports results using US import data for analyzing the 2008-2009 crisis effect on African exports. Section 3 describes the empirical strategy we choose to quantify the effect of a financial crisis in a gravity equation. Section 4 reports our main results on both the income effect and the disruption effect of past financial crises and the extent to which African countries were hit differently..

## 2 The 2008 financial crisis effect on US imports from Africa

This paper is clearly motivated by the 2008-2009 financial crisis and the trade collapse that followed. Hence, in this section we present evidence on that crisis and the way it affected African exports. Given the data constraints, we focus on the case of US bilateral imports using monthly data from the US International Trade Commission. We want to assess how African exports were hit by the crisis. The data ranges from January 2005 to August 2009. We control for a monthly index of US production, for monthly bilateral exchange rates and for two different commodity price indexes<sup>1</sup>. Our estimated equation takes the form:

$$\log(m_{jt}) = \alpha_0 \log(ER_{jt}) + \alpha_1 \log(Y_t) + \alpha_2 \log(P_t) + \alpha_3 Crisis_t + \alpha_4 Crisis_t \times SSA_j + \kappa_{jm} + \varepsilon_{us,jt} \quad (1)$$

where  $m_{jt}$  denotes US imports from country  $j$  in month  $t$ ,  $ER_{jt}$  is the (average) bilateral exchange rate between US and country  $j$  (an increase means a depreciation of the USD),  $Y_t$  is the index of US industrial production and  $P_t$  is a commodity price index for period  $t$ . The variable crisis is a binary variable which equals 1 during the period September 2008 to March 2009<sup>2</sup> (both months included), and  $SSA_j$  equals 1 when the exporter country is a Sub-Saharan African countries. We further include country×month dummies to control for country-specific variables such as distance, and for seasonality. When looking at the impact

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<sup>1</sup>The data comes from the IMF International Financial Statistics. The lack of data prevents us from controlling for importers' GDP or prices.

<sup>2</sup>We have chosen the starting date of the financial crisis in Spetember 2008 because of the Lehman collapse. Whether the financial crisis (but not the economic crisis) ended in April 2009 is more debatable (see IMF 2009b on this) but our results are the same if we assumed that the financial crisis was still going on until the end of our sample.

specific to African countries we will include a full set of time dummies which allows to control for example for changes in world prices of primary products.

[TABLE 1 ABOUT HERE]

Results are shown in Table 1 below. Columns (a) to (e) include country fixed effects, while columns (f) to (j) contain country-month dummies. Column (k) include country-month and time dummies; this is our preferred specification to assess the impact of the crisis on US imports from SSA countries. The coefficient on the financial crisis variable alone (columns a to c and f to h) is insignificant when excluding the industrial production variable, but generally positive and significant when production is included. This is in line with the recent suggestion of Eaton et al. (2009) that the trade collapse was above all due to the collapse of industrial production. On the contrary, the interaction with the African exporter dummies is strongly negative and significant in columns (j) and (k). In the next section we will show that this is not a specificity of the current financial crisis, and try to investigate the reason of this vulnerability of African exports to financial crises in their destination countries.

### 3 Empirical methodology

In this section, we use data on past financial crisis to analyze the impact of such crises on trade and the specificity of African exports. The econometric specification we present is based on the gravity equation. There is now a large literature that addresses the various difficulties to estimate a gravity equation (see for example Baldwin and Taglioni, 2006). Our aim is to understand how a financial crisis in year  $t$ , country  $i$  (the importer country) affects exports of countries  $j$ . We think about a financial crisis in the importer country as potentially affecting several of the standard determinants of the gravity equation that would typically be generated by a monopolistic competition trade model:

- the income of the importer country  $Y_{it}$ : this is the direct income effect. As the financial crisis hits the income of the importer country, it also leads to lower consumption and therefore lower imports. One question is whether the income effect has been different during the 2008-2009 crisis and whether African exports are more elastic to recessions in the trading partners. These are issues which have also partly been addressed by Freund (2009).

- the bilateral trade costs between countries  $i$  and  $j$ ,  $T_{ijht}$ : broadly speaking if a financial/banking crisis hits the importer country this may affect its imports over and above the direct effect it has on income. In particular, if importers or exporters rely heavily on credit for their trading relation the effect may be more important than the income effect. We call this the trade disruption effect.

- the price index of the importer country  $i$   $P_{it}$ : if prices fall in the importer country this has a negative impact on imports of the country.



We also want to control for the other standard gravity determinants which may or may not be affected by a financial crisis in country  $i$ , such as the income of the exporter country  $Y_{jt}$ , a country pair-sector fixed effect to control for all time independent determinants of the bilateral trade relation in the sector ( $\eta_{ijh}$ ) and a year fixed effect ( $\xi_t$ ) that controls for all determinants of trade which are common to all countries during a year, such as for example changes in commodity prices.

Hence, the first type of regressions have the following form:

$$\begin{aligned} \log(m_{ijht}) = & \alpha_1 \log(Y_{it}) + \alpha_3 \log(Y_{jt}) + \alpha_4 \log(P_{it}) + \alpha_5 \log(P_{jt}) + \sum_{k=a}^b \beta_k FC_{it-k} \\ & + \sum_{k=a}^b \gamma_k FC_{jt-k} + \sum_{k=a}^b \delta_k CC_{jt-k} + \sum_{k=a}^b \nu_k CC_{jt-k} + \eta_{ijh} + \xi_t + \varepsilon_{ijht} \end{aligned} \quad (2)$$

where  $m_{ijht}$  are the bilateral exports from  $j$  to  $i$  in sector  $h$  in year  $t$ .  $P_{jt}$  is the producer price of the exporter countries, and  $P_{it}$  is the price index of the importer country.  $FC_{it}$  is a binary variable which equals 1 when country  $i$  experienced a financial crisis at year  $t$ . The coefficients  $\beta_k$  are the coefficients of main interest in this regression. To look at the short to medium run impact of crises we will include one lead and three lags of the crises dummies (i.e.  $a = -1, b = 3$ ). We will also estimate the persistent or long-run effects of the financial crises on the trade relation by introducing more lags, i.e.  $a = -2, b = 7$ . The number of lags is mainly chosen here to keep a maximum number of crises in the sample, but inclusion of a different number of lags does not change the results. This allows us to estimate the persistence of the effect of the financial crisis on the trade relation. We also control in the same manner for the occurrence of a currency crises through the inclusion of dummy variables  $CC_{it}$  which equals 1 when country  $i$  experienced a currency crisis at year  $t$ .

We then want to assess whether the impact of a financial crisis in the importer country on the exports of the exporter country is different if the exporter country is Sub-Saharan African. To do this, we add to regression (2) interaction terms in the following way (where the currency crises dummies are included):

$$\begin{aligned} \log(m_{ijht}) = & \alpha_1 \log(Y_{it}) + \alpha_3 \log(Y_{jt}) + \alpha_4 \log(P_{it}) + \alpha_5 \log(P_{jt}) + \sum_{k=a}^b \beta_k FC_{it-k} \\ & + \sum_{k=a}^b \gamma_k FC_{jt-k} + \sum_{k=a}^b \lambda_k FC_{it-k} \times SSA_j + \dots + \eta_{ijh} + \xi_t + \varepsilon_{ijht} \end{aligned} \quad (3)$$

Here the coefficients  $\lambda_k$  inform us on the potential additional effect on African exporters of a financial crisis in the importer country.

In these regressions, the price index in particular of the importer country that may be hit by a financial crisis is proxied by the producer price index. However, in theoretical models from which the gravity equation is derived, this price index is the ideal price index which is not observable. Anderson and van Wincoop

(2004), among others, highlight the biases that can arise when omitting this term and the various solutions to the estimation problem raised by it. One solution is (see Martin et al. (2008) for example), assuming a CES demand structure, to eliminate the price index of the importer country by estimating all imports  $m_{ijht}$  imports of  $i$  from  $j$  relative to the imports of country  $i$  from a base country. Since the price index of the importer does not depend on the characteristics of the exporter, it cancels out here, which solves the mentioned issue. In this case, however, we cannot estimate the average disruption effect, since the  $FC_{it}$  terms cancel each other in the relative version of (3). However, we can still estimate whether African exports to a country hit by a financial crisis are affected differently. This estimation is then:

$$\log \frac{m_{ijht}}{m_{ibht}} = \alpha_5 \log \left( \frac{Y_{jt}}{Y_{bt}} \right) + \alpha_6 \log \left( \frac{P_{jt}}{P_{bt}} \right) + \sum_{k=a}^b \beta_k \Delta_b FC_{jt-k} \quad (4)$$

$$+ \sum_{k=a}^b \gamma_k \Delta_b FC_{it-k} \times SSA_j + \dots + \eta_{ijh} + \xi_t + \varepsilon_{ijht} \quad (5)$$

where the short cut  $\Delta_b$  designates the fact that all variables are in difference with respect to the base country  $b$ .

In the following estimations, we use USA as the benchmark country; robustness checks have been made using other benchmark countries. Finally, we also include year dummies  $\xi_t$ .

## 4 Data

**Gravity Variables.** We use a large sectoral database of bilateral trade which combines COMTRADE and CEPII data for bilateral trade, for 26 ISIC 3-digit industries between 1976 and 2002.<sup>3</sup> To study the effect of financial crises on primary goods sectors as well we complete this database using COMTRADE for five different primary good sectors. The relative prices are captured by the price levels of GDP; prices and GDP data come from the Penn World Tables v.6.1. Due to lack of data availability, we cannot use sector-specific prices. We will run robustness checks including industry×year dummies to control for sector-specific price changes.

**Financial Crises.** The data on banking crises comes from Caprio and Klingebiel (2003). Their list of banking crises is highly consistent with previous studies, and includes a sizeable number of countries and years. Moreover, they provide a description of each crisis and a distinction between small - “borderline” - and large - “systemic” - crises. Table 4 and 4 bis in appendix report the data. We concentrate on the 117 systemic crises that they define as events - possibly lasting several years - where much or all bank capital was exhausted.

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<sup>3</sup>A more detailed description of the trade, production and prices database is available on the CEPII’s website, at the following address: <http://www.cepii.fr/francgraph/bdd/TradeProd.htm>

Because currency and banking crises often happen simultaneously but may have very different effects on trade, we need to control for currency crises. We compute indexes following “foreign exchange market pressure” methodology, which is the most widely used method to deal with currency crises.<sup>4</sup> The computed index takes into account both exchange rate and international reserves variations: it is a weighted average of these two indicators with weights such that the two components have equal sample volatility. Large positive readings of this index indicate speculative attacks. Following Eichengreen and Bordo (2002), a crisis is said to occur when this index exceeds one and a half standard deviations above its mean.

Put together, our database covers 76 countries and 27 3-digits ISIC manufacturing sectors and 5 primary sectors over the period 1976-2002.

## 5 Results

### 5.1 Total effect of financial crises on trade

We first provide some evidence of the impact of financial crises on trade on the whole sample. To do so, we estimate equation (3), which is likely to be biased to some extent due to the omission of the price indexes. We will then turn to a more detailed investigation of the different transmission channels (income and disruption effects) and to the specific case of African countries. Table 2 contains the results. The standard gravity variables coefficients display the expected signs. Financial crisis are found to have a negative impact on both exports and imports, with a more immediate impact on imports of the country hit by the financial crisis. Controlling for GDP and prices, imports are found to be 2.3% lower the year of a financial crisis, and 8% lower the following year (column 2). Interestingly, this negative effect is found to be significant even controlling for changes in income and prices: when excluding these variables, the effect of the crisis is more negative, up to 8% the first year and 10% the following year, suggesting that the impact of financial crises on trade also channels through income and prices changes.

[TABLE 2 ABOUT HERE]

figure 1 is based on the estimated coefficient and confidence intervals of the specification similar to the one presented in Table 2, column (2), but with additional leads and lags. It shows the deviation of bilateral imports before and after a financial crisis that takes place in year  $t = 0$ . The x-axis represents the "natural trade" level as given by the gravity equation, and the figure can therefore be interpreted as the deviation from this level. The 5% confidence intervals are depicted by dotted lines around the estimated effect. The rest of figures in the paper are constructed similarly even though we do not report all the associated regressions.

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<sup>4</sup>See for example Kaminsky and Reinhart (2000), Hong and Tornell (2005) or Eichengreen and Bordo (2000) for details about the computation.

The estimated effect in the short-run is very close to the one presented in Table 2. We can see in figure 1 that the average disruption effect of a financial crisis is moderately negative but persistent, with trade remaining below its precrisis level for at least seven year after the event.

[FIGURE 1 ABOUT HERE]

## 5.2 The income effect

A first way through which a financial crisis can hit trade is directly through a fall in demand for all imports due to a fall of the income of the importers. This is the standard trade channel that most macroeconomists have in mind when thinking about the effect of the current financial crisis on trade. In a standard Dixit-Stiglitz model, the effect of a change of income in country  $i$  on its imports is the same for all goods and sectors. The elasticity of demand to income is simply 1. However, there may be reasons for which the income elasticity of demand of imports may be different in different sectors. Hence, a first question to address is whether Sub-Saharan African countries are specialized in sectors for which the income elasticity of demand is different from other countries. More formally, we want to estimate  $\alpha_2$ , the income elasticity of demand. Note that this means that to estimate this important elasticity, we cannot use the "relative" gravity equation (4) but (3), so that the price index potential bias cannot be eliminated.

The results are given in table 3. Regression (a) shows that the income elasticity for all countries is above unity in our sample. For African countries, this elasticity is not higher as shown by the fact that the interaction between the income of the destination country and a dummy for African Exporters is not significant. Hence, African countries seem to be more specialized in sectors which respond more to the income level of the importer countries. However, the current crisis is not a small change in income and it may be that the effect is not linear. In particular, it may be that the income elasticity of imports is even larger during large recessions than during mild ones. This is what we test in regressions (b) and (c) where we study whether large variations in GDP have a larger effect on imports and whether African countries are more vulnerable to this type of negative shock. We construct a dummy variable which we call 'slowdown', and is equal to 1 when the variation of GDP between  $t$  and  $t-1$  is lower than the first quartile of the country over the period. In both specifications, bilateral imports are found to respond more negatively to large changes in GDP: the coefficient on the slowdown variable is negative and significant even when controlling for GDP. Moreover, the impact of the slowdown variable is much higher for African exporters. The total estimated effect is quantitatively important (6% on average). Hence, the conclusion is that African exports seem particularly vulnerable to recessions in the countries to which their export. This is consistent with the large recent drop of African exports (larger than in other regions) to the US that we have documented in the introduction.

[TABLE 3 ABOUT HERE]

In regressions (d) to (g), we ran the same regression as in specification (b) and (c) but separate the manufacturing and primary sectors. We first see that for all countries, exports of the manufacturing sectors are more sensitive to a recession of the destination country. This is even more so for African countries as the interaction term between the African dummy and the drop in GDP of the destination country is negative and significant (columns d and e). However, the elasticity of African exports in the primary sector to income in the destination country is higher than for the manufacturing sector. Hence, we conclude that African exports are more vulnerable to GDP fluctuations in the countries they export to in both types of sectors. Interestingly, in unreported regressions, we found that all these results are unchanged if we control for the occurrence of a financial crisis in the destination country (as in the regressions above). This suggests that the income effect (even in the case of recessions) and the disruption effect are two distinct mechanisms that negatively affect African exports.

### 5.3 The disruption effect

We now analyze how African exports react after a financial crisis takes place in the partner country, i.e. the country of destination. The results are shown in Table 4. Remember that in these regressions, we control for the common effect that the change on the income of the importer country has on all imports, for all determinants of sectoral bilateral sectoral trade which are time invariant (through the inclusion of country pair $\times$ sector fixed effects), for yearly changes in trade which are common to all countries (through the inclusion of year fixed effects) and for the effects of currency crises in the destination countries. In columns (4) and (5) we also control for exporter $\times$ year or for sector $\times$ year dummies. This allows in particular to control for country or sector-specific price changes which are not properly captured by our relative price variable. This is important because African exports are dependent on world prices in primary goods. Whatever the specification, African exports are found to be much more negatively affected than other countries by a crisis in the destination country. The magnitude of the effect decreases slightly when including exporter $\times$ year fixed effects, but the additional drop of African exports is always above 20% during the year of the crisis. Column (1) in Table 4 reports the estimates obtained with an estimation in level of the gravity equation, i.e. without taking into account the price index issue. The results are relatively similar: the fall of exports following a crisis in partner country is dramatically higher for African countries, and very long lasting. Finally, note that these results are unchanged when modifying the number of lags. In columns (3), we study the reaction of imports as well, i.e. we ask the following question: are African imports more affected by a crisis in exporter countries? As already shown in Table 2, the results are much less insignificant. African imports are even found to react more positively after one year, but the effect is short-lived. Trade disruption following a financial crisis in a country therefore affects the exports of Sub-Saharan African countries to the crisis hit country but not their imports from this country.

[TABLE 4 ABOUT HERE]

The results are easier to see on the figure 2, where we run the same regression as in column (2), Table 4 but with more lags to study the long-run effects. It shows the deviation of African exports before and after a financial crisis that takes place in year  $t = 0$ , with respect to the average disruption effect of other exporters. The x-axis therefore represents the average disruption effect. Again, our benchmark country here is USA but similar results are obtained with other benchmarks. The disruption effect is stronger: the year the country is hit by a financial crisis, the additional effect for African exports is around 35%. This phenomenon is deepened after one year, when the effect aggravates at -45%. Note again that that this number measures the disruption of trade that comes from the financial crisis and not the fall of income of the crisis-hit country as this is controlled for. The fall is also long lasting as it disappears only four years after the crisis in the partner country or even seven years if we accept a 10% confidence interval.

[FIGURE 2 ABOUT HERE]

## 5.4 Channels of transmission

*Composition effect.* We now attempt to understand the sources of the disruption effect. The first possibility is that African countries are specialized in sectors that are particularly vulnerable to a financial crisis. In particular, African exports are more concentrated on primary goods and raw materials than on manufactured goods, and trade in these goods may be more dependent on the financial system. We test this by distinguishing between exports of primary goods and raw materials on the one hand, and manufactured goods on the other hand. We see indeed in Figure 3a and 3b that African exports of primary goods and raw materials are hit a bit more strongly by a financial crisis in the destination country than exports of manufactured goods. The short-term results are given in Table 5, column (1) (appendix).

[FIGURES 3A AND 3B ABOUT HERE]

Hence, part of the fragility of African exports to a financial crisis in the countries they export to may come from a composition effect. But clearly, the composition effect does not explain everything. The exports of African countries are much more affected by a financial crisis in the destination country, and this is true both for manufacturing and non manufacturing sectors.

*Origin of the crisis.* Motivated by the present financial crisis which, at least in its initial phase is mostly concentrated on the industrialized countries, we also estimated the effect on trade depending on whether the crisis originated in a industrialized country or not. Figures 4a and 4b shows again that African exporters are more vulnerable to a crisis in the countries to which they export whatever the country of origin, but remarkably, this vulnerability is stronger when the crisis hits an industrialized country, especially in the short-run. When the crisis comes from an industrialized market, the reaction of African exports is found to be twice more negative in the first two years. When the financial crisis hits a non-industrialized country, the

effect on its African imports is generally only significant a 10%. Again, the results of a specification with three lags are reported in Table 5, estimation (2) (appendix).

[FIGURES 4A AND 4B ABOUT HERE]

*Trade credit.* As mentioned in section 2, one of the main reasons that may explain the drop in exports of African countries when their trading partners are facing a financial crisis is related to the disruption of trade finance. If the low level of development of their financial system forces African firms to rely more heavily on trade finance from the importing country, and if this type of financing is particularly hit by financial crises (Ronci, 2004), exports of African countries may be hit harder whatever the sector considered. As a proxy for trade finance, we first follow Ronci (2004) and use the level of outstanding short-term credit in U.S. dollars as reported in the Global Development Finance (GDF), which includes short-term credit for trade in dollars as reported by the OECD and the international banks' short-term claims as reported by the BIS. As already pointed out by Ronci (2004), this variable has several limitations, in particular because it excludes trade financing associated with intra-firm trade by multinational corporations or trade related to foreign direct investment.

For each country, we construct the average ratio of trade credit over total exports over the period. As shown in Table 7 (appendix), African countries clearly display a higher level of dependence upon trade finance: the median (mean) of the ratio is 0.74 (0.95) for African countries, and only 0.47 (0.60) for the rest of the sample. This dependence of African on trade finance is also noted by Jinjarak (2007). Can dependence on trade finance explain the vulnerability of African trade to crises in partner countries? To answer this question, we generate a dummy variable equal to 1 when this average ratio for the exporter country is above the median of the whole sample, and we interact it with the interaction financial crisis\*African exporter. The coefficient on this triple interaction therefore gives the additional impact financial crises on African countries more dependent upon trade finance. The results are given in Table 5 (column 3) and represented in Figures 5a and 5b. African countries which display a higher level of trade finance clearly experience a larger drop of their exports to countries hit by a financial crisis in the first years.

[FIGURES 5A AND 5B ABOUT HERE]

We also constructed another proxy for trade finance, which comes from the World Business Environment Survey (WBES) conducted by the WorldBank during the year 2000. Firms have been asked the percentage of their total financing coming from their suppliers. We use the country average of this variable as a proxy for dependence upon trade credit, and interact our financial crisis variable with a dummy which equals 1 if the country is above the median of the whole sample. Because the data is only available for a few countries, we cannot generate the same triple interaction as before. Thus, here we do not look at African countries specifically but more generally at whether countries with different levels of dependence upon trade finance

react differently to financial crises. The results are shown in Figure 6 and in Table 5, column (4) (appendix). In Figure 6 we see that countries which display a higher dependence upon trade credit react more negatively in the short-run to a financial crisis in the destination country. Moreover, controlling for this interaction term importantly decreases the significance of the additional effect on African countries (Table 5, column (4)), which remain only significant the year following the crisis. Of course, these results should be interpreted with caution, as we use only proxies for trade finance. They however suggest that this particular type of financing may play an important role in Africa in the aftermath of financial crises, and more generally in the transmission of financial crisis through international trade linkages.

[FIGURE 6 ABOUT HERE]

## 6 Conclusion

Our paper has documented several specific features of African exports during events of financial crises. Our main conclusion is that contrary to some arguments that have been heard early in the 2008-2009 crisis, sub-Saharan African countries may be hit harder by the crisis through its effect on the exports of the region. Even though the direct effects of the crisis may be weaker due to the relative insulation and underdevelopment of the financial system in most sub-Saharan African countries, the indirect effect through trade may be stronger. We found that in the past financial crises, African exports have been hit harder and longer by recessions and financial crisis in countries they export to. This is not only due to the composition of African exports and the concentration on primary goods. Both primary and manufactured exports are hit harder in African countries than in other regions. Another finding is that African exports are hit hardest when the importer country is an industrialized country. We have also found that the higher dependence of African exports on trade finance may explain this particular fragility of African exporters to a financial crisis in importer countries. One interpretation is that during a financial crisis when uncertainty is high, trust and liquidity are low, banks and firms in the importer country first cut exposure and credit to particular countries which are seen as more risky. This would in particular affect trade finance through letters of credit where the importer pays the exporting firm in advance. It is also likely that during financial crisis, financial institutions "renationalize" their operations and reduce their exposure to foreign banks and firms. Exporters in countries with a strong financial system may be able to better resist to such retrenchment of foreign banks. Clearly, for African firms which are more dependent on foreign finance, this option may not be feasible. At this stage, these interpretations of our results are only tentative and more research needs to be done to better understand the origin of the particular fragility of African exports to financial crises in industrialized countries.

Our paper can be viewed as contradicting the implicit policy conclusion that come from the early conventional wisdom. The underdevelopment of financial systems in Africa is not a "blessing in disguise" in the current crisis. If the cost of such low development is that African exporters are very dependent on external



trade finance, then the real cost of the financial crisis on Africa may actually be higher due to the underdevelopment of financial systems. This also suggests that it is particularly important to target the \$250 billion for trade finance promised by the G20 on those countries which are more dependent on trade finance. This would entail concentrating this aid on African exporters.

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## 7 Appendix

### Tables

**Table 1: Trade in the Current Financial Crisis**

Dep. Var.	Log(Bilateral US Imports)										
	Estimation	a	b	c	d	e	f	g	h	i	j
Log(Bilateral Exchange Rate)	-0.07 (0.055)	-0.062 (0.054)	-0.06 (0.054)	-0.047 (0.055)	-0.045 (0.055)	-0.332*** (0.020)	-0.332*** (0.020)	-0.332*** (0.020)	-0.333*** (0.020)	-0.328*** (0.020)	-0.336*** (0.020)
Log(Commodity Price Index, all)		0.302*** (0.039)	-0.216 (0.252)		-0.427* (0.255)		0.284** (0.129)	0.41 (0.843)		0.288 (0.865)	
Log(Commodity Price Index, energy)			0.442** (0.212)		0.533** (0.213)			-0.108 (0.718)		-0.066 (0.727)	
Log(US Industrial Production)				1.779*** (0.196)	1.354*** (0.215)				1.406* (0.743)	0.878 (0.843)	
Financial Crisis	-0.043 (0.028)	0.013 (0.029)	0.016 (0.029)	0.051* (0.029)	0.051** (0.026)	0.05 (0.088)	0.097 (0.090)	0.096 (0.090)	0.134 (0.099)	0.423*** (0.106)	
Financial Crisis*African Exporter					0.063 (0.082)					-1.002*** (0.201)	-1.006*** (0.201)
Observations	7469	7469	7469	7351	7351	7469	7469	7469	7351	7351	7469
R-squared	0.96	0.96	0.96	0.96	0.96	0.6	0.6	0.6	0.59	0.6	0.6
Country Dummies	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Country*Month Dummies	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No	No	No	No	No	No	No	Yes

Panel (within) estimations. Robust standard errors in parentheses. Robust SE in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%  
 Financial crisis: dummy equal to 1 from Sept. 2008 to March 2009, 0 otherwise.

**Table 2: Total effect of financial crises on trade**

Dep Var. :	ln(Bilateral Trade)			
	(1)	(2)	(3)	(4)
Estimation:				
ln GDP importer	1.311*** (0.032)	1.288*** (0.032)		
ln GDP exporter	1.345*** (0.030)	1.299*** (0.030)		
ln Price importer	-0.537*** (0.020)	-0.578*** (0.021)	-0.631*** (0.022)	
ln Price exporter	0.969*** (0.018)	0.912*** (0.019)	0.852*** (0.019)	
FC importer (t)		-0.023*** (0.007)	-0.040*** (0.007)	-0.063*** (0.007)
FC importer (t-1)		-0.080*** (0.007)	-0.095*** (0.007)	-0.114*** (0.007)
FC importer (t-2)		-0.047*** (0.007)	-0.066*** (0.007)	-0.055*** (0.007)
FC importer (t-3)		-0.080*** (0.008)	-0.119*** (0.008)	-0.125*** (0.008)
FC importer (t+1)		0.021*** (0.008)	0.099*** (0.008)	0.115*** (0.008)
FC exporter		-0.022*** (0.007)	-0.034*** (0.007)	-0.024*** (0.008)
FC exporter(t-1)		0.025*** (0.008)	0.024*** (0.008)	0.032*** (0.008)
FC exporter(t-2)		0.003 (0.008)	-0.020*** (0.008)	-0.038*** (0.008)
FC exporter(t-3)		-0.108*** (0.008)	-0.159*** (0.008)	-0.160*** (0.009)
FC exporter (t+1)		0.003 (0.008)	0.070*** (0.008)	0.060*** (0.008)
Observations	868711	868711	868711	868711
R-squared	0.88	0.88	0.87	0.87

Panel, within / fixed effects estimations. All estimations include year dummies. Currency crises coefficients not reported. Robust SE clustered at the country-pair-sector level in parentheses. \*\*\*, \*\* and \* for respectively for significance at the 1%, 5% and 10% level.

**Table 3: Income Elasticities**

Dep. Var: Estimation	ln (Bilateral Trade)						
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
				Manuf. Sect.		Primary Sect.	
ln GDP Importer	1.348*** (0.030)	1.343*** (0.030)	1.345*** (0.030)	1.375*** (0.031)	1.377*** (0.033)	0.940*** (0.093)	0.943*** (0.093)
ln GDP Importer*African Exporter	-0.183*** (0.068)		-0.176*** (0.068)		-0.171** (0.070)		-0.666*** (0.192)
Slowdown in GDP Importer (1)		-0.012*** (0.004)	-0.013*** (0.004)	-0.012*** (0.004)	-0.012*** (0.004)	-0.018 (0.012)	-0.019 (0.012)
Slowdown in GDP Importer*African Exporter		-0.056** (0.023)	-0.043* (0.022)	-0.059** (0.024)	-0.046** (0.023)	-0.041 (0.056)	-0.017 (0.062)
<b>Controls</b>							
ln GDP Exporter	1.302*** (0.032)	1.311*** (0.032)	1.302*** (0.032)	1.363*** (0.033)	0.250** (0.100)	1.354*** (0.033)	0.249** (0.100)
ln Price destination	-0.547*** (0.020)	-0.537*** (0.020)	-0.547*** (0.020)	-0.557*** (0.020)	0.004 (0.058)	-0.567*** (0.021)	-0.032 (0.059)
ln Price Importer	0.970*** (0.018)	0.972*** (0.018)	0.973*** (0.018)	1.013*** (0.019)	0.525*** (0.054)	1.014*** (0.019)	0.526*** (0.054)
Obs.		868711		791593	77118	791593	77118
Adj. R-squared	0.88	0.88	0.88	0.88	0.86	0.88	0.86

(1): Dummy equal to 1 when variation gdp from t-1 to t lower than first quartile. Within estimations with year dummies.  
 \*\*\*, \*\* and \* for respectively for significance at the 1%, 5% and 10% level. Robust SE clustered at the country-pair-sector level in parentheses.

**Table 4: Effect of financial crises on African exports**

Dep Var. :	ln Bilateral Trade	ln Relative Imports			
Estimation:	(1)	(2)	(3)	(4)	(5)
ln Relative GDP		0.768*** (0.025)	0.769*** (0.025)	0.086** (0.015)	0.770*** (0.010)
ln Relative Prices		-0.485*** (0.009)	-0.485*** (0.009)	-0.348*** (0.006)	-0.486*** (0.005)
ln GDP importer	1.285*** (0.032)				
ln GDP exporter	1.298*** (0.030)				
ln Price importer	-0.590*** (0.021)				
ln Price exporter	0.913*** (0.019)				
FC importer*African exporter	-0.315*** (0.070)	-0.372*** (0.079)	-0.379*** (0.079)	-0.229*** (0.056)	-0.379*** (0.057)
FC importer (t-1)*African exporter	-0.359*** (0.065)	-0.378*** (0.078)	-0.385*** (0.079)	-0.277*** (0.052)	-0.382*** (0.052)
FC importer (t-2)*African exporter	-0.144** (0.061)	-0.116 (0.072)	-0.122* (0.072)	-0.066 (0.050)	-0.115** (0.050)
FC importer (t-3)*African exporter	-0.174*** (0.051)	-0.157*** (0.058)	-0.161*** (0.058)	-0.139*** (0.042)	-0.162*** (0.042)
FC importer (t+1)*African exporter	-0.101 (0.078)	0.158* (0.094)	0.158* (0.094)	0.290*** (0.062)	0.146*** (0.062)
FC exporter*African importer			-0.046 (0.046)		
FC exporter(t-1)*African importer			0.092** (0.046)		
FC exporter(t-2)*African importer			0.108** (0.047)		
FC exporter(t-3)*African importer			-0.151*** (0.055)		
FC exporter (t+1)*African importer			0.122** (0.048)		
Observations	868711	868711	868711	868711	868711
R-squared	0.88	0.86	0.86	0.87	0.86
Year dummies	Yes	Yes	Yes	No	No
Exporter-year dummies	No	No	No	Yes	No
Sector-year dummies	No	No	No	No	Yes

Panel, within / fixed effects estimations. Currency crises coefficients not reported. Robust SE clustered at the country-pair-sector level in parentheses. \*\*\*, \*\* and \* for respectively for significance at the 1%, 5% and 10% level.

**Table 5: Effect of financial crises on African exports, channels of transmission**

Dep Var. :	ln Relative Imports							
	(1)		(2)		(3)		(4)	
Estimation:	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
In Relative GDP	0.765***	(0.012)	0.767***	(0.012)	0.180***	(0.046)	0.985***	(0.082)
In Relative Prices	-0.485***	(0.006)	-0.485***	(0.006)	-0.426***	(0.014)	-0.413***	(0.023)
FC <sub>j</sub> *African exporter	-0.371***	(0.069)	-0.219**	(0.110)	-0.495***	(0.084)	-0.148	(0.162)
(t-1)	-0.377***	(0.067)	-0.265***	(0.100)	-0.611***	(0.082)	-0.330*	(0.174)
(t-2)	-0.116*	(0.062)	-0.159*	(0.090)	-0.209***	(0.076)	-0.084	(0.169)
(t-3)	-0.157***	(0.050)	-0.175**	(0.075)	-0.216***	(0.068)	-0.236	(0.161)
(t+1)	0.158*	(0.084)	0.327**	(0.131)	0.077	(0.097)	0.05	(0.177)
FC <sub>j</sub> *African exporter*Primary good	0.001	(0.025)						
(t-1)	-0.096***	(0.025)						
(t-2)	0.005	(0.024)						
(t-3)	-0.02	(0.020)						
(t+1)	0.092***	(0.021)						
FC <sub>j</sub> *African exporter*Industrialized importer			-0.251*	(0.140)				
(t-1)			-0.188	(0.133)				
(t-2)			0.076	(0.123)				
(t-3)			0.036	(0.099)				
(t+1)			-0.277	(0.170)				
FC <sub>j</sub> *African exporter*High Trade Finance (1)					0.033	(0.472)		
(t-1)					-0.865*	(0.464)		
(t-2)					0.347	(0.430)		
(t-3)					-0.046	(0.140)		
(t+1)					0.990**	(0.484)		
FC <sub>j</sub> *High Trade Finance (2)							-0.093***	(0.031)
(t-1)							-0.121***	(0.032)
(t-2)							-0.050*	(0.029)
(t-3)							-0.044	(0.033)
(t+1)							0.159***	(0.035)
Observations	868711		868711		343746		128397	
R-squared	0.86		0.86		0.83		0.82	

Panel, within / fixed effects estimations. All estimations include year dummies. Currency crises coefficients not reported. (1) BIS trade finance proxy. (2) WBES trade credit proxy. Robust SE clustered at the country-pair-sector level in parentheses.

\*\*\*, \*\* and \* respectively for significance at the 1%, 5% and 10% level.



**Table 6a: Banking Crises**

Country	Banking Crises	
	Systemic	Borderline
Algeria	1990	-
Argentina	1980-82, 1989-90, 1995, 2001	-
Australia		1989-1992
Austria	-	-
Bangladesh	1987	-
Belgium	-	-
Benin	1988-1990	-
Bolivia	1986-1988, 1994	-
Botswana	-	1994-1995
Brazil	1990, 1994-1999	-
Burkina Faso	1988-94	-
Cameroon	1987-93, 1995-98	-
Canada	-	1983-1985
Central African Republic	1976, 1988	-
Chile	1976, 1981-1986	-
China	1998	-
Colombia	1982, 1987	-
Costa Rica	1987	1984
Côte d'Ivoire	1988	-
Denmark	-	1987-92
Djibouti	1991-1993	-
Ecuador	1981, 1996-97, 1998-...	-
Egypt	1981	1991-1995
El Salvador	1989	-
Equatorial Guinea	1983-1985	-
Eritrea	1993	-
Ethiopia	-	1994
Finland	1991-1994	-
France	-	1994
Germany	-	1977
Ghana	1982-1989	1997
Greece	-	1991-95
Guinea	1985, 1993	-
Hong Kong	-	1982-1983, 1983-86, 1998
Iceland	-	1985-1986, 1993
India	-	1993
Indonesia	1997	1994
Israel	1977-83	-
Italy	-	1990-95
Jamaica	1994, 1995-2000	-
Japan	1991-...	-
Kenya	1985-1989, 1992, 1993-1995	-

Note: For a detailed description of each event, see Caprio and Klingebiel (2003).

**Table 6b: Banking Crises**

Country	Banking Crises	
	Systemic	Borderline
Korea	1997	-
Lebanon	1988-90	-
Liberia	1991	-
Madagascar	1988	-
Malaysia	1997	1985-88
Mali	1987	-
Mauritania	1984	-
Mexico	1981-91, 1994-97	-
Morocco	1981	-
Nepal	1988	-
Netherland	-	-
New Zealand	-	1987-90
Nicaragua	1989-1996	-
Nigeria	1993	1997
Norway	1987-1993	-
Pakistan	-	-
Panama	1988-89	-
Paraguay	1995-1999	2001
Peru	1983-90	-
Philippines	1981, 1998	-
Portugal	-	-
Senegal	1988	-
Singapour	-	1982
South Africa	-	1977
Spain	1977-1985	-
Sri Lanka	1989-93	-
Swaziland	1995	-
Sweden	1991	-
Switzerland	-	-
Taiwan	1997-98	1983-1984, 1995
Thailand	1983, 1997	-
Togo	1993, 1994, 1995	-
Tunisia	-	1991
Turkey	1982-85, 2000	1994
UK	-	1974-1976
Uruguay	1981-1984, 2002	-
USA	-	1984
Venezuela	1994-1995	-
Vietnam	-	-
Yemen	1996	-
Zambia	1995	-
Zimbabwe	-	-

Note: For a detailed description of each event, see Caprio and Klingebiel (2003).

**Table 7: Trade credit proxy, descriptive statistics**

Var. : Trade Credit Proxy / GDP	Observations	Mean	Median	Std Deviation
African Countries	506565	0.95	0.75	0.70
Rest of World	1132737	0.60	0.48	0.40

# Figures

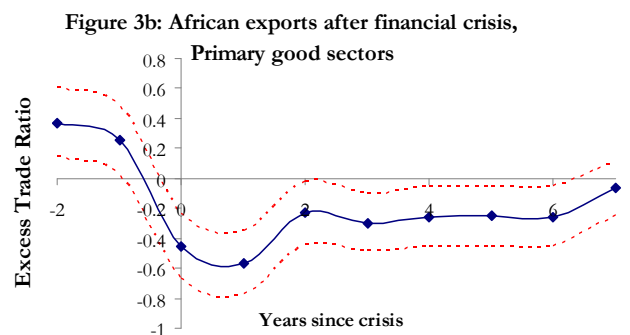
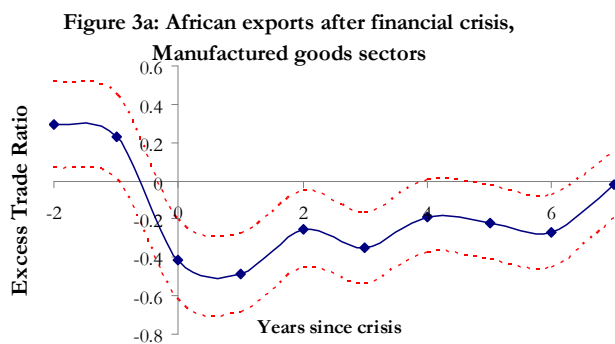
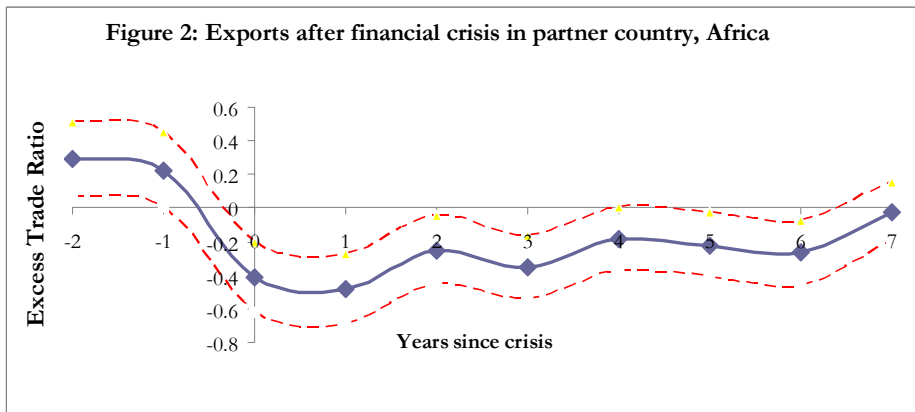
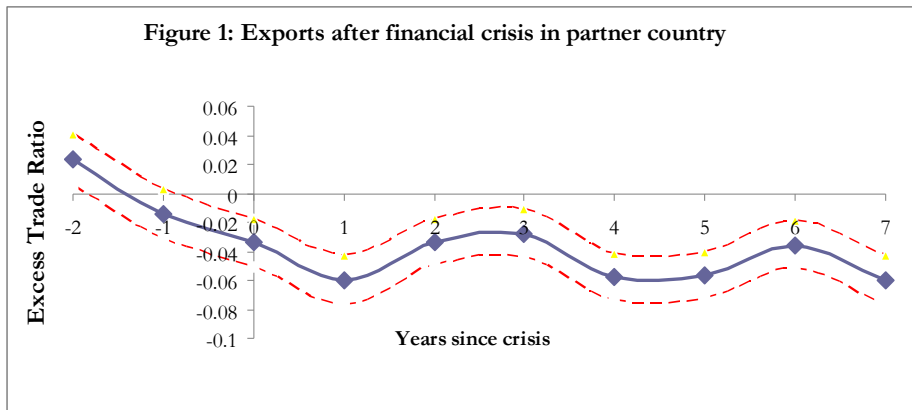


Figure 4a: African exports after financial crisis, crisis in non-industrialized country

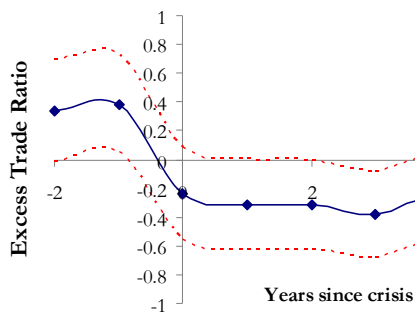


Figure 4b: African exports after financial crisis, crisis in industrialized country

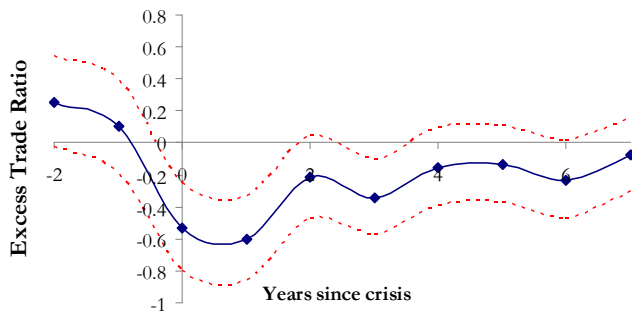


Figure 5a: African exports after financial crisis, low Trade Finance

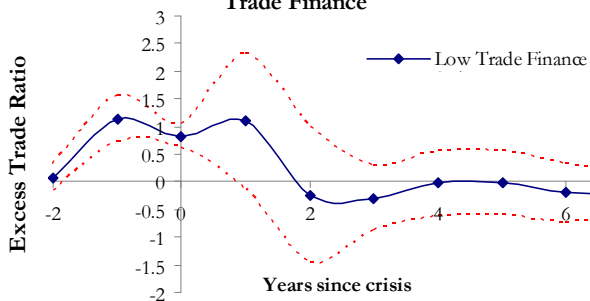


Figure 5b: African exports after financial crisis, high Trade Finance

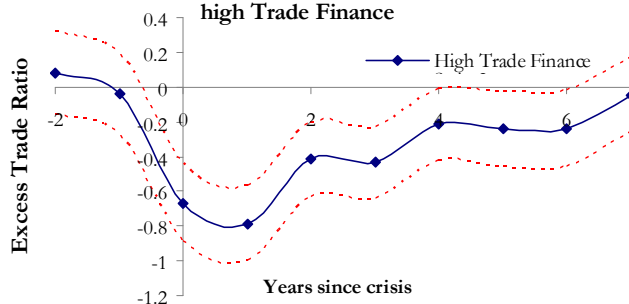


Figure 6: Exports after financial crisis in partner country, High Trade Finance

