Working paper

International Growth Centre

The Vulnerability of Sub-Saharan Africa to Financial Crises

The Case of Trade

Nicolas Berman
Philippe Martin

March 2012

DIRECTED BY LSE UNIVERSITY OF OXFORD

FUNDED BY UKaid from the British people

The vulnerability of sub-Saharan Africa to financial crises: the case of trade *

Nicolas Berman†
Graduate Institute of International and Development Studies (Geneva)

Philippe Martin‡
Sciences-Po (Paris) and CEPR

December 30, 2011

Abstract

Motivated by the 2008-2009 financial crisis and the trade collapse, we analyze the effect of past banking crises (1976-2002) on trade with a focus on African exporters. We show that they are particularly vulnerable to a banking crisis in the countries they export to. We distinguish between an income effect (during a banking crisis, income and exports to the country fall) and a disruption effect (a banking crisis disrupts the financing of trade channels). For the average country, the disruption effect is moderate (a deviation from the gravity predicted trade of around 3 to 5%) but long lasting. We find however that the disruption effect is much larger for African exporters as the fall in trade (relative to gravity) is around 15 percentage points higher than for other countries in the aftermath of a banking crisis. Part of the vulnerability of African exports in the short-run comes from a composition effect because primary exports are disrupted more severely than manufacturing exports. However, the dependence of African countries on trade finance also explains the vulnerability of African exporters to banking crises in partner countries.

*Both authors thank the International Growth Centre (LSE and Oxford University) for financial support.

†Graduate Institute of International and Development Studies, Case Postale 136, 1211 Geneva, Switzerland. email: nicolas.berman@graduateinstitute.ch

‡Sciences-Po, Department of economics, 28 rue des Saints Pères, 75007 Paris, France. email: philippe.martin@sciences-po.fr

1 Introduction

In this paper, we show that African exports are particularly vulnerable to a banking 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 more open in terms of financial flows. However, based on past financial crises (1976-2002), we show that African exports are more affected by banking crises in their trade partners 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 a banking crisis.

During the financial crisis of 2008-2009, one indication of the vulnerability of African countries on the trade side was illustrated by their trade flows with the US. Following the crisis, the fall of US imports from Sub-Saharan African countries has been more dramatic than from the rest of the world. As shown in Figure 1 in the appendix, from September 2008 and the failure of Lehman, the fall in US imports from African countries has been much stronger than from other countries. As shown in Figure 2, both African primary and manufacturing exports were hit harder. 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.

To strengthen the motivation of this paper, we can analyze more precisely the way the 2008-2009 crisis affected African exports by a simple gravity type regression of US bilateral imports using monthly data from the US International Trade Commission on the period January 2005-August 2009. In this simple regression, we include seasonal country-month dummies μ_{jm} (to control for seasonality effects and for country fixed effects) and time (month) dummies μ_t. Hence, all determinants of US imports from a specific country which are constant over time, or specific to a month (in particular during the crisis or due to changes in commodity prices) are controlled for. We also control for monthly bilateral exchange rates. We are interested to see whether, during the crisis months, US imports from African countries declined more than imports from other countries, everything else equal. Hence, we include an interaction term between a binary variable which equals 1 during the period September 2008 to March 2009[1] (both months included), and a dummy SSA_j that equals 1 when the exporter country is a Sub-Saharan African (SSA) country. We get the following result (where *** denotes significance at the 1 percent level, and robust standard errors are indicated below the coefficient):

[1]We have chosen the starting date of the financial crisis in September 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.

$$\log(m_{jt}) = \underset{(0.020)}{-0.336^{***}} \log(ER_{jt}) - \underset{(0.201)}{1.006^{***}} Crisis_t \times SSA_j + \mu_{jm} + \mu_t \quad (1)$$

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 in month t (an increase means a bilateral depreciation of the dollar). The negative and significant coefficient on the interaction between the crisis months and the African exporter dummies suggests that African exports to the US have been hit more strongly during the crisis. Quantitatively, the coefficient on the double interaction of dummies implies that, during the crisis, African exports to the US have decreased around 60% more than exports of other countries. The aim of the paper is to show that this is not a specificity of the 2008-2009 financial crisis and to try to investigate some reasons of this vulnerability of African exports to financial crises in their trade partners.

Using a large sectoral database of bilateral trade and of banking crises on the period 1976-2002, 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 or trade agreements. 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 banking 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, exports may be adversely hit by a banking 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 banking crisis may negatively affect trade. In particular, although it is difficult to measure it, attitudes towards risk may change amongst bankers and traders during a banking 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. 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. 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 banking

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, 2008) 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 banking crisis that affects banks, risk perception and trust in both the importing and exporting country. This is the case for letters of credit. Importers use letters of credit 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. On the theoretical side, Schmidt-Eisenlohr (2010) studies the optimal choice between different types of trade finance: exporter (open account), importer (cash in advance) finance and letters of credit. His simulations predict that export volume may drop up to 20% when all firms are

forced to use exporter finance only.

In the aftermath of the financial crisis and the trade collapse, a burgeoning literature has analyzed 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 specific 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.

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), Abiad et al. (2011)[2], and Amiti and Weinstein (2009) also find evidence on the negative effects of financial crises on trade. 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. Our results that countries more dependent on trade credit are also typically more negatively affected by a financial crisis that takes place in their trade partner, contributes to this literature that ties export falls during financial crisis to financing conditions. This is however not the view of other papers on this issue. Model-based simulations (Eaton et al., 2011 suggest that the contagion to countries

[2]These authors find that financial crises have a negative and long-lasting effect on imports, but no effect on exports. In this paper we also find that the impact is larger on the import side.

world-wide came mainly through the contraction of demand rather than through direct financial channels. Levchenko, Lewis and Tesar (2010), using American data, find no support for the hypothesis that trade credit played a role in the trade collapse. Alessandria, Kaboski and Midrigan (2011), show that the calibration of a two-country general equilibrium model with endogenous inventory holdings generates magnitudes of production, trade, and inventory responses that are quantitatively similar to those of both past crises and of the 2008-2009 crisis. Finally, Bems, Johnson and Yi (2010) find that vertical linkages are quantitatively important in understanding the global trade collapse.

Section 2 describes the empirical strategy we choose to quantify the effect of a banking crisis in a gravity equation. Section 3 reports our main results on both the income effect and the disruption effect of past banking crises and the extent to which African countries were hit differently.

2 Empirical methodology

Baseline specification. Our main objectives are (i) to use data on past banking crises to analyze their impact on bilateral trade; (ii) to test whether African exports react differently to crises in partner countries. The econometric specification we present is based on the gravity equation. Our aim is to understand how a banking crisis in year t, country i (the importer country) affects exports of country j. We think about a banking 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 i in year t, Y_{it}: this is the direct income effect. As the banking 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 is different for African exports. These are issues which have also partly been addressed by Freund (2009).

- the bilateral trade costs between countries i and j in year t, T_{ijt}: broadly speaking if a financial/banking crisis hits the importer country this may affect its cost of trading, over and above the direct effect it has on income. This in particular will be the case if importers or exporters rely heavily on credit for their trading relation. We call this the trade disruption effect.

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

Our baseline specification takes the form of a gravity equation augmented with crises dummies:

$$\log m_{ijht} = \alpha_1 \log Y_{it} + \alpha_2 \log Y_{jt} + \alpha_3 \log P_{it} + \alpha_4 \log P_{jt} + \delta X_{ij} + \sum_{k=a}^{b} \beta_k BC_{it-k} + \sum_{k=a}^{b} \gamma_k BC_{jt-k} + \nu_h + \xi_t + \varepsilon_{ijht} \quad (2)$$

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, P_{it} is the price index of the importer country, and ξ_t and ν_h are year and industry dummies. Year dummies capture, among others, changes in world commodity prices which are particularly important for African exports. Note that we will also estimate this equation with country (exporter and importer) fixed effects or alternatively individual (country pair-sector) fixed effects. Finally, X_{ij} is a vector of time-invariant bilateral determinants of trade, including distance, common language, common colonizer and contiguity (which will drop out when including country pair fixed effects).

BC_{it} is a binary variable which equals 1 when country i experienced a banking crisis in year t, 0 otherwise. The coefficients β_k are the coefficients of main interest in this regression. To look at the short to medium run impact of crises we will include three lags of the crises dummies (i.e. $a = 0, b = 3$). We will also estimate the persistent or long-run effects of the banking crises on the trade relation by introducing more lags and a lead i.e. $a = -1, b = 5$. 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 leaves the results qualitatively unchanged.

Our main question is whether the effect of crises in a partner country differs when the exporter is a Sub-Saharan African country. To determine this, we add to equation (2) a full set of interaction terms between the importer crises dummies and a dummy which equals 1 if country j (the exporter) is a SSA country:

$$\log m_{ijht} = \alpha_1 \log Y_{it} + \alpha_2 \log Y_{jt} + \alpha_3 \log P_{it} + \alpha_4 \log P_{jt} + \delta X_{ij} + \sum_{k=a}^{b} \beta_k BC_{it-k} + \sum_{k=a}^{b} \gamma_k BC_{jt-k} + \sum_{k=a}^{b} \lambda_k BC_{it-k} \times SSA_j + \nu_h + \xi_t + \varepsilon_{ijht} \quad (3)$$

Here the coefficients λ_k inform us on the potential additional effect on African exporters of a banking crisis in the importer country.

Methodological issues. Two main issues, which have been largely discussed in the gravity equation literature, arise when estimating this equation. First, the price index of the importer country that may

be hit by a banking 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. One solution (see for example Martin et al., 2008), assuming a CES demand structure, is 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 appears in both the imports from country i and of the base country and does not depend on the characteristics of the exporter, it cancels out in the ratio $\frac{m_{ijht}}{m_{ibht}}$ where m_{ibht} are the imports of country i in year t from the benchmark country[3]. In this case, however, we cannot estimate the average disruption effect, since the FC_{it} terms cancel each other in the relative version of (2). However, we can still estimate whether African exports to a country hit by a banking crisis are affected differently. This estimation is then:

$$\log \frac{m_{ijht}}{m_{ibht}} = \alpha_5 \log \frac{Y_{jt}}{Y_{bt}} + \alpha_6 \log \frac{P_{jt}}{P_{bt}} + \sum_{k=a}^{b} \gamma_k BC_{it-k} \times SSA_j + ... + \varepsilon_{ijht} \tag{4}$$

In the following estimations, we use the USA as the benchmark country. We have checked that our results are robust to alternative benchmark countries.

A second issue is the treatment of zero trade flows. Taking the log of bilateral trade prevents from including these observations in the regression. As zero trade flows account for a significant share of the potential flows, this can generate a selection bias. Different possibilities exist to account for these zero trade flows (see Santos-Silva and Tenreyro, 2006, Helpman, Melitz and Rubinstein, 2007, Felbermayr and Kohler, 2006, among others). One is to use $\log(m_{ijht} + 1)$ as a dependent variable. Another, more satisfactory, is to use a different estimator which effectively accounts for the presence of zeros, such as Poisson or Tobit. To check the robustness of our results we will estimate (3) and (4) using a Zero Inflated Poisson or a fixed effects Poisson estimator. One problem is worth mentioning here. As more extensively discussed in Head et al. (2010), zeros in the trade data can either represent "true" zeros (i.e. no trade actually occurs between the two countries) or missing values. The common practice in the literature has been to treat all zeros as "true" ones. This may however generate a bias as a potentially large share of zeros are in fact missing values.[4] Each specification therefore has its limitation. As shown later, our main

[3]With cross-sectional data, a simpler solution is to introduce exporter and importer fixed effects. However, this does not solve the omitted variable problem with panel data, as the variations in the price indexes over times are not accounted for.

[4]Using DOTS data, Head et al. (2010) report a number of examples suggesting that this problem may be important. For instance, the data contains zero trade flows between Russia, Ukraine and a number of other former USSR countries in the

results are however robust to the use of these different estimation techniques.

3 Data

Gravity Variables. We use a large sectoral database of bilateral trade which combines COMTRADE and CEPII data for 27 ISIC 3-digit industries between 1976 and 2002.[5] To study the effect of banking 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. Due to data availability, we cannot use sector-specific prices. We have run robustness checks including industry $\times$ year dummies to control for sector-specific price changes.

Crises. We focus on banking crises and the data comes from Reinhart and Rogoff (2009). Their data combines various sources. Our final dataset includes around a hundred of events, which include both, in their classification, severe and systemic banking crises. The definition of a banking crisis is therefore the one adopted and described in Reinhart and Rogoff (2009). It is marked by two types of events (1) "bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions; and (2) if there are no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions), that marks the start of a string of similar outcomes for other financial institutions." The list of countries included in our data, together with the years of the crises, is presented in Table 7 in the appendix. This table also contains our proxies for trade finance that we will describe in more details later in the paper.

4 Results

4.1 Average effect of banking crises on trade

We first provide some evidence of the impact of banking crises on trade on the whole sample. To do so, we estimate equation (2), which may be biased to some extent if the producer price indices do not control for the movement of welfare based ideal price indexes. We will check the robustness of our results to the inclusion of zero trade flows by using alternatively a zero inflated poisson or a fixed effect poisson estimator. 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 1 contains the results. Columns (1) and (2) present OLS estimations, with and without country-pair fixed effects respectively. Columns

early nineties. As we use in this paper sectoral bilateral trade data, this issue is a priori even more problematic.

[5] 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.

(3) to (5) contain within estimations, i.e. including dyad-sector fixed effects. In columns (4) and (5) we drop the GDP and prices variables. The change in the crisis coefficients in comparison with column (3) therefore provides information on whether the income or price effects are significant channels through which a crisis affects trade.

The standard gravity variables coefficients display the expected signs. Banking crises are found to have a negative impact on both exports and imports, with a more robust negative impact on imports which is our focus. The average yearly deviation in imports in the three years following the crisis is around -2.5%[6] when controlling for GDPs and prices (columns (1) to (3)). 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 much more negative, up to 10% on average in the three years that follows the event. This suggests that the impact of banking crises on trade also goes through income and prices changes. Finally, accounting for zero trade flows dampens the effect of crises on imports, although their effect remains negative and statistically significant at the 1% level.

[Table 1]

Figures 3 and 4 are based on the estimated coefficient and confidence intervals of the specification similar to the one presented in Table 2, respectively in columns (3) and (4), but with additional lags and a lead. It shows the deviation of bilateral imports before and after a 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 10% confidence intervals are depicted by dotted lines around the estimated effect. The other figures in the paper are constructed similarly even though we do not report all the associated regressions.

The estimated effect in the short-run is very close to the one presented in Table 1. We can see in figure 3 that the average disruption effect of banking crises on imports is moderately negative (3 to 5%) but persistent, with trade remaining below its natural level for at least four years after the event. When GDP variables are not controlled for (figure 2), the effect of banking crises is found not surprisingly to be much stronger, and more persistent (up to seven years).

[figures 3 and 4 about here]

[6]Note that the coefficients on the crisis dummies cannot be directly interpreted as elasticities: the exact percentage change in exporter following a crisis in t in the importer country is (taking for instance Table 1, column (5)) $\exp(-0.031)-1 = -0.03$. This makes virtually no difference when the coefficient in low, but the correction becomes more important when the effect is large. The average crisis effects reported in the regression tables throughout the paper are all computed using the above formula, so that they can be directly interpreted in terms of percentage change.

4.2 The income effect

A first channel through which a banking crisis can hit trade is directly through a fall in demand for all imports due to a fall of the income of the importers. 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 and the elasticity is one. However, there may be reasons for which the income elasticity of demand of imports may be different in different sectors and different countries. 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 α_1, the income elasticity of import demand. Note that this means that to estimate this elasticity, we cannot use the "relative" gravity equation (4) but (2), so that the price index potential bias cannot be fully eliminated. Note that in theory, we do not expect African countries goods to be more income elastic: as discussed by Fieler (2011), with non-homothetic preferences low-income economies are generally predicted to specialize in low-quality, less income elastic goods than advanced economies.[7]

The results are given in table 2. Regression (1) shows that the income elasticity for all countries is in general above unity in our sample. For African countries, this elasticity is lower as shown by the fact that the interaction between the income of the destination country and a dummy for African Exporters is significatively negative. One interpretation is that African countries are more specialized in sectors which respond less to the income level of the importer countries. However, a banking 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 larger during large recessions than during mild ones. This is what we test in regressions (2) to (7) 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', 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 these slowdowns in partner countries: 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 additional negative effect is quantitatively important: $\exp(-0.176) - 1$ =-16% in column (2) and (4), -15% when using a fixed effect Poisson estimator in column (7). Hence, the conclusion is that African exports, although they do not have a particularly high income elasticity, seem particularly vulnerable to recessions in the countries to which their export.

[Table 2 about here]

[7] See also Linder (1961).

In regressions (5) and (6), we ran the same regression as in specification (2) but separate the manufacturing and primary sectors. African exports are found to react more negatively to recessions in partner countries in both manufacturing and primary goods sectors - with a quantitatively larger effect in manufacturing sectors. Interestingly, we found that all these results are unchanged if we control for the occurrence of a banking crisis in the destination country and its interaction between with the SSA dummy. (columns (3) and (4)). 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. We now turn to the study of the disruption effect.

4.3 The disruption effect

We now analyze how African exports react after a banking crisis that takes place in the partner country, i.e. the country of destination. The results are shown in Table 3. 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× sector fixed effects) and for yearly changes in trade which are common to all countries (through the inclusion of year fixed effects), in particular world price movements of primary goods.

Columns (1) to (3) show the results when estimating equation (3), with or without individual fixed effects. Columns (4) shows the results using the "relative" version of the gravity equation ((4)). Columns (5) to (7) include zero trade flows and estimate equation (3) using three alternative estimators: zero inflated Poisson, fixed effects Poisson, and random effects Tobit. Finally, in column (8) we estimate equation (4) using a fixed effect Poisson estimator.

Whatever the specification, the fall of exports following a crisis in partner country is dramatically higher for African countries. In columns (1) to (4), the additional drop of African exports in the year of the crisis is between 12 and 20%. The average additional disruption effect for these countries during the three years after the crisis starts is between 9 and 18% depending on the specification. Note that the effect is similar on average in the standard gravity results (column (3)) and when using the relative version (column (4)), except that the contemporaneous effect is smaller in the relative version. Finally, the effect decreases slightly but remains significant at the 1% level, when including the zero trade flows (columns (5) to (7)). In this case, the average additional disruption effect between t and t+3 is between 8 and 9%. When using the relative version in column (8) the effect of crises is found to be very large: up to 55% for SSA countries. This result should however be considered with caution as the dependent variable (which is a ratio) is very far from being Poisson distributed. Moreover we cannot fully solve the zero trade flow problem in this specification, as the dependent variable cannot be computed when its

denominator is zero.

[Table 3 about here]

The results are illustrated on figure 5, where we run the same regression as in column (4), Table 3 but with more lags to study the longer-run effects. It shows the deviation of African exports before and after a banking 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. The disruption effect is stronger: the year the country is hit by a banking crisis, the additional effect for African exports is close to -20%. This specific vulnerability of African exports progressively vanishes but remains significant for four years after the event[8]. Note again that that this number measures the disruption of trade that comes from the banking crisis and not the fall of income of the crisis-hit country as this is controlled for.

[figure 5 about here]

Country-specific effect. We have also checked whether these results were due to some particular countries in SSA, or if all SSA countries were significantly more affected than the rest of the world. In table 4 we present the average disruption effect of African exporters in the year of the crisis and the three following ones. Among the 17 considered countries, the effect is negative in 14 cases, and negative and significant in 10 of them. Only one country (Equatorial Guinea) is found to respond positively (with a p-value of 0.098). This clearly suggests that the vulnerability found before may be due to some factors that are common to most SSA countries.

[Table 4 about here]

4.4 Channels of transmission

Composition effect. We now want to better understand the sources of the vulnerability of African exports. The first possibility is that African countries are specialized in sectors that are particularly vulnerable to a 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 of the importing country. We run an number of robustness checks. First, to capture movements in sector-specific prices during crises episodes, we include a full set of year×sector dummies in our estimations. The results are reported in Table 5, column (1). Our main result is actually strengthened: the additional disruption effect for SSA countries is around -12% (to be compared with -9.4% in Table 3, column 4). Second, we include in our estimations interaction terms between sector dummies and the crises variables.

[8]When including more lags, we find that the African trade remains negatively and significantly affected after six years.

As shown in Table 5, column (2), this leaves the results largely unchanged. We also directly look at the difference between exports of primary goods and raw materials and of manufacturing goods by separating the sample into two subsamples. The results are presented in Table 5, columns (3) and (4). We indeed find that African exports of primary goods and raw materials are hit more strongly by a banking crisis in the destination country than exports of manufactured goods. This is however only true in the short-run to medium-run (up to two years after the crisis).

[Table 5 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 the composition effect is far from explaining everything. The exports of African countries are much more affected by a banking crisis in the destination country, and this is true both for manufacturing and non manufacturing sectors.

Trade credit. As mentioned in the introduction, one of the main reasons that may explain the drop in exports of African countries when their trading partners are facing a banking 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 banking crises (Ronci, 2004), exports of African countries may be hit harder whatever the sector considered. As a proxy for trade finance dependence, 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. On the other hand, it has a good coverage for developing countries.

For each country, we construct the average ratio of trade credit over total credit over the period. As shown in Table 7, African countries clearly display a higher level of dependence upon trade finance: the median (mean) of the ratio is 0.20 (0.24) for African countries, and only 0.07 (0.09) for the rest of the sample. This dependence of African on trade finance was also noted by Jinjarak (2007). Can dependence on trade finance partly explain the vulnerability of African trade to crises in partner countries? To answer this question, we include in our regression an interaction term between the trade credit dependence proxy and banking crisis in the importer country. The results are reported in Table 6, columns (1) to (3). Column (1) replicates our baseline regression on the subsample of countries for which the trade credit proxy is available: again, African countries are found to react significantly more negatively than other

countries to a crisis in the destination country. Note that the additional disruption effect here is lower because we exclude developed countries, for which the proxy is not available, but that react more positively to crises than the average country.

The interactions between trade finance dependence and the crisis dummies are, as expected, negative and strongly significant (column (2)). More importantly, the vulnerability of SSA countries disappears when including these interactions: the average additional disruption effect of these countries falls from -8% (significant at the 1% level) to -1% (insignificant). This strongly suggests that trade finance dependence may explain part of the vulnerability emphasized before. Figure 6 represents the longer-run disruption effect for African countries, controlling for trade finance dependence. No additional effect for African countries remains in this case.

[Table 6 and Figure 6 about here]

More generally, we can analyze the role of trade finance dependence not specifically in the case of African countries. One way is to interact our banking crises variables with a dummy variable which equals 1 if the exporter country is above the median of the sample in terms of our trade finance dependence proxy. Figure 7 represents the additional disruption effect for these exporters: they react more negatively in the short-run (around 10% more negatively than the other exporters) and for these countries, exports remain below their natural level during 5 years after a banking crisis hits their trading partners. Note that Figure 7 looks very similar to 5, further supporting the trade finance explanation.

We also constructed another proxy for trade finance dependence, 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 it with our banking crisis variable. The results are shown in columns (4) to (6) of Table 6. Again, exports of countries which display a higher dependence upon trade credit react more negatively to a banking crisis in the destination country. Moreover, controlling for this interaction term importantly decreases the significance of the additional disruption effect on African exports (Table 6, column (6)), which remains only significant the year of the crisis. Of course, these results should be interpreted with caution, as our proxy for trade finance is imperfect. They however suggest that this particular type of financing may play an important role to explain the vulnerability of certain countries to financial crises in their trade partners.

[Table 6, Figure 7 about here]

Finally, in column (7) we have interacted our crisis dummy with the exporter's level of financial development (defined as the average ratio of private credit over GDP over the period). The interaction

term is positive and significant (except in the third year), suggesting that more financial developed economies react less negatively to financial crises in their partner countries. However, in this case the additional effect on African exports remains significant and of similar size.

5 Conclusion

Macroeconomic volatility is typically higher in African countries. This is in particular due to large external shocks such as terms of trade shocks. In this paper we have documented another potential source of macroeconomic volatility that comes from financial shocks affecting trade partners. We have shown that African countries are more vulnerable to financial crises that affect these trade partners. We found that in the past banking crises, African exports have been hit harder and longer by recessions and banking crises in countries they export to. This is not only due to the composition of African exports and the concentration on primary goods. We have also found that the higher dependence of African exports on trade finance may explain this particular fragility of African exporters to a banking crisis in importer countries. One interpretation is that during a banking 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 banking 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. However, our results point to the role that some forms of financial development may play in helping to cope with external shocks such as financial crises in partner countries.

References

[1] Abdul Abiad & Petia Topalova & Prachi Mishra, 2011. "How Does Trade Evolve in the Aftermath of Financial Crises?," IMF Working Papers 11/3, International Monetary Fund.

[2] African development Bank, 2009, The African Development Bank Group Response to the Economic Impact of the Financial Crisis.

[3] Alessandria George, Joseph P. Kaboski and Virgiliu Midrigan, 2010, The Great Trade Collapse of 2008-09: An Inventory Adjustment, IMF Economic Review, 58: 254-294.

[4] Amiti, Mary and David Weinstein (2009),"Exports and Financial Shocks", Columbia University mimeo.

[5] James E. Anderson & Eric van Wincoop, 2003. "Gravity with Gravitas: A Solution to the Border Puzzle," American Economic Review, American Economic Association, vol. 93(1), pages 170-192, March.

[6] Auboin, M. (2009), "The challenges of trade financing", VOX-Eu, Jan. 28.

[7] Baldwin, R. and D. Taglioni, 2006, "Gravity for Dummies and Dummies for Gravity Equations,". NBER Working Papers 12516.

[8] Beck, Thorsten, 2002."Financial development and international trade: Is there a link?," Journal of International Economics, vol. 57(1), pages 107-131, June.

[9] Bems, Rudolfs, Robert C Johnson and Kei-Mu Yi, 2010, Demand Spillovers and the Collapse of Trade in the Global Recession, IMF Economic Review, 58: 295-326.

[10] Berman, N., 2009, "Financial Crises and International Trade: The Long Way to Recovery", Max Weber Programme Working Paper 2009.04, European University Institute

[11] Boshoff, Willem H. (2006): The transmission of foreign financial crises to South Africa: a firm-level study. Studies in Economics and Econometrics 2 30 (2006): pp. 61-85.

[12] Bricongne Jean-Charles , Lionel Fontagné, Guillaume Gaulier, Daria Taglioni and Vincent Vicard, "Firms and the global crisis: French exports in the turmoil", mimeo, University of Paris 1.

[13] Campa, Jose M., 2000. "Exchange rate crises and bilateral trade flows in Latin America," IESE Research Papers D/470, IESE Business School.

[14] Caprio, G. and Klingebiel, D., 2003, "Episodes of Systemic and Borderline Banking Crises", Worldbank

[15] Cavallo, Eduardo A. & Frankel, Jeffrey A., 2008."Does openness to trade make countries more vulnerable to sudden stops, or less? Using gravity to establish causality," Journal of International Money and Finance, vol. 27(8), pages 1430-1452, December.

[16] Chor, Davin and Kalina Manova (2009), "Off the Cliff and Back? Credit Conditions and International Trade during the Global Financial Crisis", Stanford University mimeo.

[17] Claessens Stijn , Ayhan Kose and Marco E. Terrones, 2009, "What Happens During Recessions, Crunches and Busts?" Paper presented at the Economic Policy Panel, April 2009.

[18] Fischer, S.(1999). "The Asian Crisis: The Return of Growth", Speech, International Moneraty Fund.

[19] Jonathan Eaton & Samuel Kortum & Brent Neiman & John Romalis, 2011. "Trade and the Global Recession," NBER Working Papers 16666, National Bureau of Economic Research, Inc.

[20] Freund, C (2009) "The Trade Response to Global Crises: Historical Evidence" World Bank working paper.

[21] Glick, Reuven & Rose, Andrew K., 1999."Contagion and trade: Why are currency crises regional?," Journal of International Money and Finance, vol. 18(4), pages 603-617, August.

[22] Elhanan Helpman & Marc Melitz & Yona Rubinstein, 2008. "Estimating Trade Flows: Trading Partners and Trading Volumes," The Quarterly Journal of Economics, MIT Press, vol. 123(2), pages 441-487, 05.

[23] Gabriel J. Felbermayr & Wilhelm Kohler, 2006. "Exploring the Intensive and Extensive Margins of World Trade," Review of World Economics (Weltwirtschaftliches Archiv), Springer, vol. 142(4), pages 642-674, December.

[24] Fieler, Anna Cecilia, "Non-Homotheticity and Bilateral Trade: Evidence and a Quantitative Explanation" 2010, forthcoming at Econometrica.

[25] Head, Keith & Mayer, Thierry & Ries, John, 2010. "The erosion of colonial trade linkages after independence," Journal of International Economics, Elsevier, vol. 81(1), pages 1-14, May.

[26] Iacovone, L. and V. Zavacka. (2009). "Banking Crises and Exports: Lessons from the Past." Policy Research Working Paper Series 5016. The World Bank, Washington, D.C.

[27] International Monetary Fund, 2009a, Impact of the Global Financial Crisis on Sub-Saharan Africa, Africa department, March.

[28] International Monetary Fund, 2009b, Global Financial Stability Report, Navigating the Financial Challenges AheadOctober 2009

[29] Irwin, D. (2002) Long-Run Trends in World Trade and Income World Trade Review 1: 1, 89100.

[30] Jinjarak Yothin, 2007, On the Causality between Trade Credits and Imports: Evidence and Possible Implication for Trade Penalties on Debt Defaults, International Economic Journal, Volume 21, Issue 3 September 2007, pages 317 - 333

[31] Kaminsky, Graciela L. & Reinhart, Carmen M., 2000."On crises, contagion, and confusion," Journal of International Economics, vol. 51(1), pages 145-168, June.

[32] Levchenko Andrei A., Logan T. Lewis and Linda L. Tesar, 2009, The Collapse of International Trade During the 2008-2009 Crisis: In Search of the Smoking Gun, University of Michigan, mimeo.

[33] Linder, S. (1961), An Essay on Trade and Transformation. New York: John Wiley.

[34] Ma Zihui and Leonard Cheng, 2003."The Effects of Financial Crises on International Trade," NBER Working Papers 10172, National Bureau of Economic Research, Inc.

[35] Manova, Kalina, 2008, "Credit Constraints, Heterogeneous Firms, and International Trade,"NBER Working Papers 14531

[36] Martin Philippe, Thierry Mayer and Mathias Thoenig, 2008. "Make Trade Not War?," Review of Economic Studies, vol. 75(3), pages 865-900, 07.

[37] Ronci, Marcio, 2004, Trade finance and Trade Flows: Panel Data Evidence from 10 Crises, IMF

[38] Reinhart, Carmen and Kenneth Rogoff, 2008, "This Time is Different: A Panoramic View of Eight Centuries of Financial Crises," NBER Working Paper, No. 13882. (Cambridge, MA: National Bureau of Economic Research).

[39] J. M. C. Santos Silva & Silvana Tenreyro, 2006. "The Log of Gravity," The Review of Economics and Statistics, MIT Press, vol. 88(4), pages 641-658, 09.

[40] Tim Schmidt-Eisenlohr, 2010. Towards a Theory of Trade Finance," Working Papers 1023, Oxford University Centre for Business Taxation.

6 Appendix

Figures

Figure 1: African exports during the 2008-2009 crisis

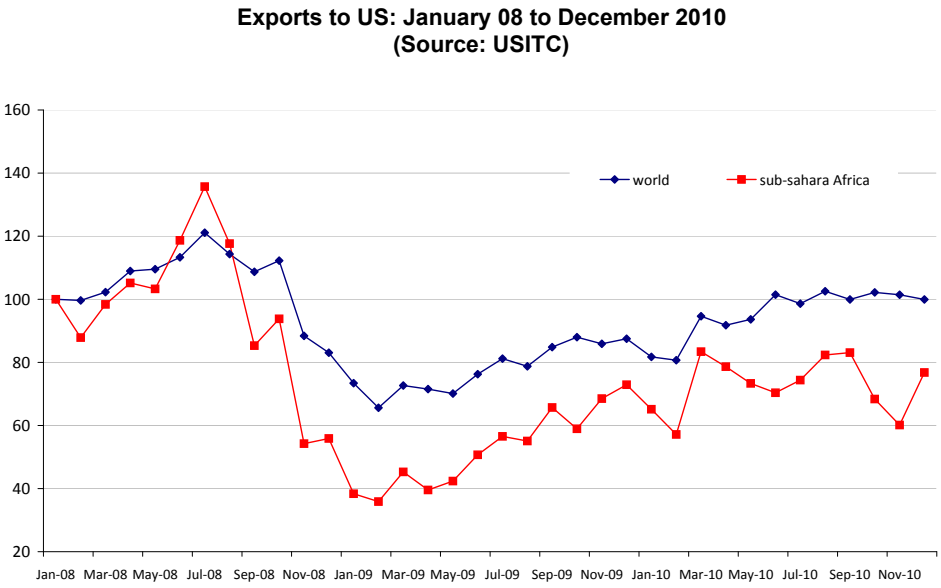


Figure 2: African exports during the 2008-2009 crisis, by commodity

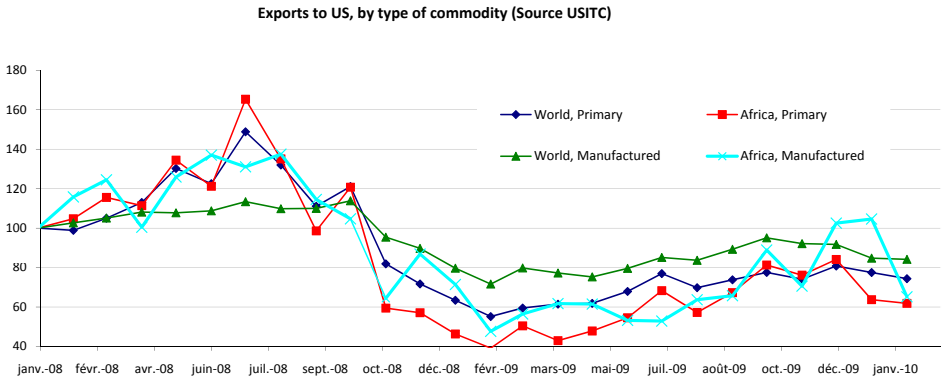


Figure 3: Exports after banking crisis in partner country

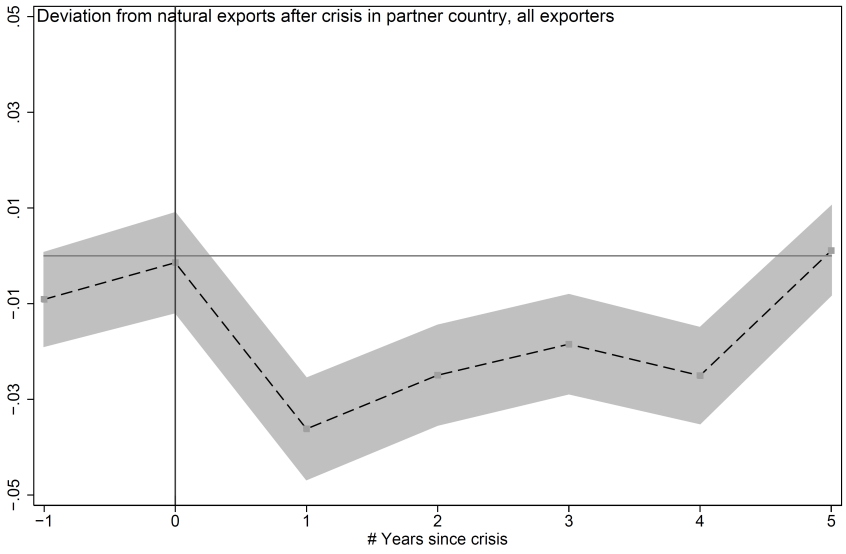


Figure 4: Exports after banking crisis in partner country, including income effect

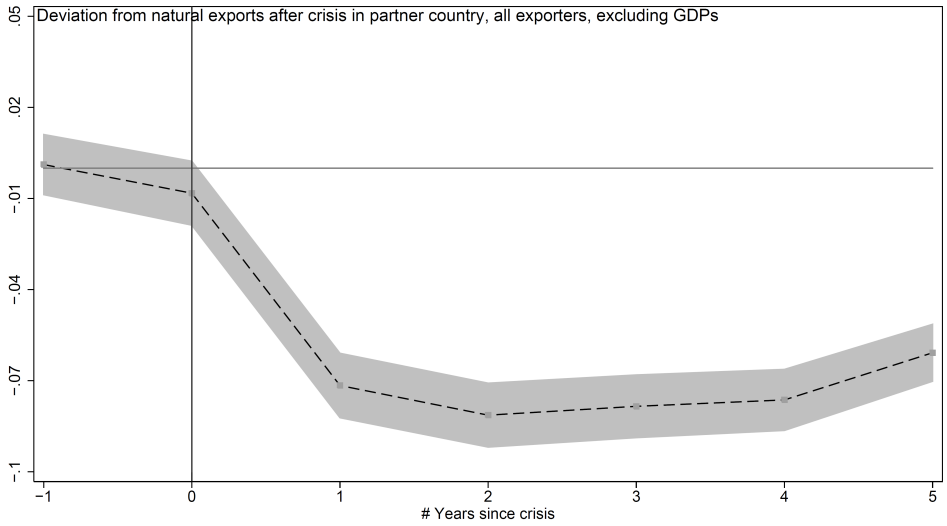


Figure 5: Exports after banking crisis in partner country, SSA vs ROW

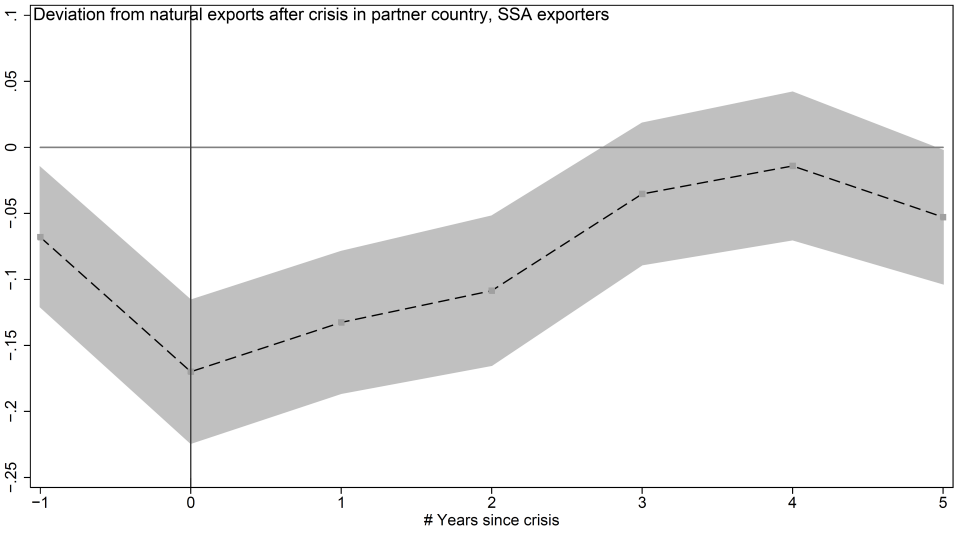


Figure 6: Exports after banking crises in partner country, SSA exporters vs ROW, controlling for trade finance

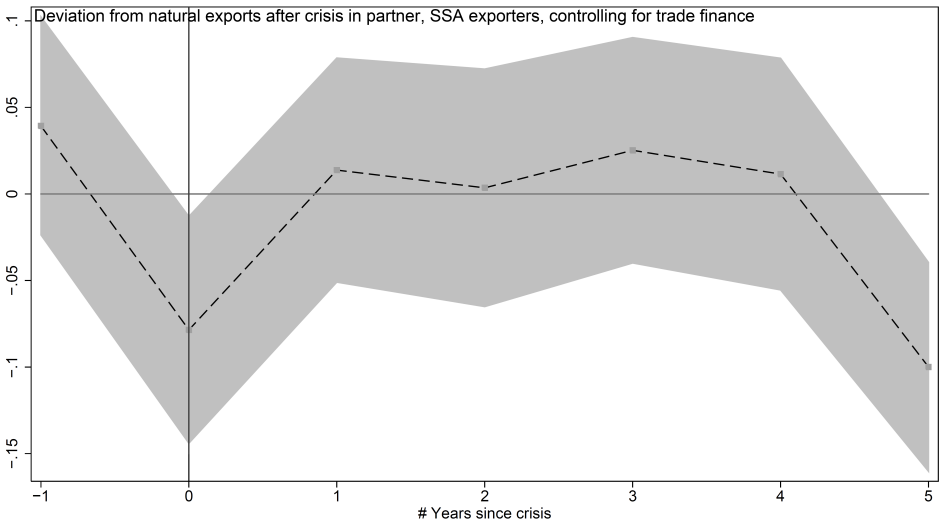
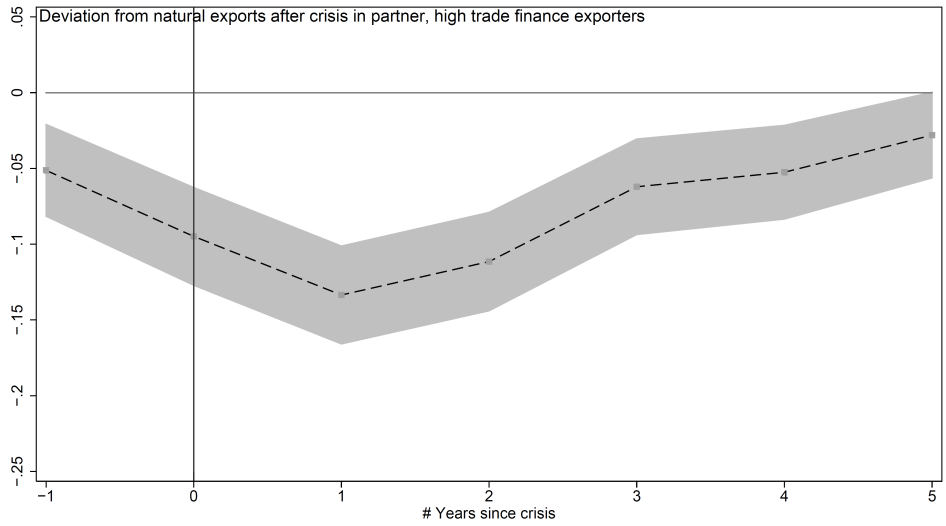


Figure 7: Exports after banking crises in partner country, high trade finance



Tables

Table 1: Overall effect of banking crises in partner countries on exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimator	OLS		Within			ZIP (a)	FE Poisson
Dep. var	ln m_{ijht}		ln m_{ijht}			m_{ijht}	
ln GDP exporter	1.107^a	1.110^a	1.254^a			0.508^a	0.624^a
	(0.035)	(0.034)	(0.033)			(0.017)	(0.033)
ln GDP importer	1.190^a	1.222^a	1.286^a			0.505^a	0.802^a
	(0.030)	(0.029)	(0.029)			(0.016)	(0.029)
ln distance	-1.208^a					-0.578^a	
	(0.011)					(0.002)	
ln price exporter	-0.225^a	-0.183^a	-0.313^a	-0.326^a		-0.123^a	-0.249^a
	(0.019)	(0.018)	(0.017)	(0.017)		(0.012)	(0.017)
ln price importer	0.756^a	0.806^a	0.871^a	0.836^a		0.412^a	0.469^a
	(0.016)	(0.015)	(0.015)	(0.015)		(0.010)	(0.013)
BC importer + 0 years	-0.010	-0.008	-0.006	-0.037^a	-0.031^a	-0.010	0.007
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)
BC importer + 1 years	-0.042^a	-0.037^a	-0.040^a	-0.084^a	-0.120^a	-0.023^a	-0.023^a
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)
BC importer + 2 years	-0.029^a	-0.024^a	-0.022^a	-0.067^a	-0.106^a	-0.012^c	-0.029^a
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
BC importer + 3 years	-0.035^a	-0.032^a	-0.031^a	-0.081^a	-0.115^a	-0.015^b	-0.017^a
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)
BC exporter + 0 years	0.008	0.010	0.005	-0.023^a	-0.031^a	-0.012^c	-0.025^a
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)
BC exporter + 1 years	-0.005	0.004	-0.002	-0.038^a	-0.028^a	-0.014^b	-0.013^b
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)
BC exporter + 2 years	-0.003	0.000	-0.008	-0.048^a	-0.039^a	-0.006	-0.013^b
	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)
BC exporter + 3 years	0.007	0.006	-0.002	-0.047^a	-0.040^a	-0.000	-0.002
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.005)
Average crisis effect$(t, t+3)$ (b)	-0.028^a	-0.025^a	-0.025^a	-0.065^a	-0.089^a	-0.015^a	-0.016^a
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Observations	1089864	1089864	1089864	1089864	1089864	1794280	1635189
Sector FE	Yes	Yes		No		Yes	No
Exporter, importer FE	Yes	No		No		Yes	No
Dyadic FE	No	Yes		No		No	No
Dyad-sector	No	No		Yes		No	Yes
R-squared	0.56	0.61	0.86	0.86	0.86	-	-

A full set of year dummies is included in all estimations. (a) Zero inflated Poisson. (b) Average disruption effect for crisis in importer country from t to t+3. Robust s.e. in parentheses, clustered by country-pair-sector. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. Other bilateral, time-invariant controls (common language, common colonizer, contiguity) not reported in column (1).

Table 2: Income effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimator			Within			Within	FE Poisson
Dep. var			ln m_{ijht}			ln m_{ijht}	m_{ijht}
Sector			All		Primary	Manuf.	All
ln GDP exporter	1.230^a	1.254^a	1.255^a	1.255^a	0.886^a	1.316^a	0.596^a
	(0.033)	(0.033)	(0.033)	(0.033)	(0.087)	(0.036)	(0.032)
ln GDP importer	1.322^a	1.286^a	1.303^a	1.287^a	1.283^a	1.284^a	0.721^a
	(0.029)	(0.029)	(0.029)	(0.029)	(0.074)	(0.032)	(0.028)
ln price exporter	-0.406^a	-0.318^a	-0.311^a	-0.318^a	-0.101^b	-0.354^a	-0.254^a
	(0.017)	(0.017)	(0.017)	(0.017)	(0.041)	(0.018)	(0.016)
ln price importer	0.883^a	0.883^a	0.878^a	0.883^a	0.579^a	0.944^a	0.550^a
	(0.015)	(0.015)	(0.015)	(0.015)	(0.035)	(0.016)	(0.013)
ln GDP importer× SSA exp.	-0.816^a						
	(0.045)						
BC importer× SSA exp.			-0.122^a	-0.102^a			
			(0.028)	(0.028)			
Slowdown (1)		-0.031^a		-0.032^a	-0.042^a	-0.030^a	-0.038^a
		(0.004)		(0.004)	(0.010)	(0.004)	(0.003)
Slowdown (1)× SSA exporter		-0.176^a		-0.172^a	-0.131^a	-0.190^a	-0.162^a
		(0.018)		(0.018)	(0.043)	(0.020)	(0.022)
Observations	1082519	1082519	1082519	1082519	171746	910773	1691199
R-squared	0.86	0.86	0.86	0.86	0.85	0.86	-

S.E. in parentheses, robust and clustered by country-pair-sector. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include dyad-sector fixed effects and year dummies. (2): Dummy equal to 1 when ΔGDP$_{it}$ lower than country-specific first quartile, zero otherwise.

Table 3: Overall effect of banking crises in partner countries on exports, SSA countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimator	OLS		Within	Within	ZIP (a)	FE Poisson	FE Poisson
Dep. var	ln m_{ijht}			ln m_{ijht}/m_{ibht}	m_{ijht}		m_{ijht}/m_{ibht}
ln GDP exporter	0.985^a	1.126^a	1.268^a		0.438^a	1.117^a	
	(0.006)	(0.034)	(0.034)		(0.001)	(0.031)	
ln GDP importer	0.684^a	1.243^a	1.307^a		0.354^a	1.215^a	
	(0.006)	(0.030)	(0.029)		(0.001)	(0.025)	
ln price exporter	1.225^a	-0.175^a	-0.315^a		0.516^a	-0.106^a	
	(0.015)	(0.019)	(0.018)		(0.004)	(0.011)	
ln price importer	1.057^a	0.811^a	0.879^a		0.476^a	0.819^a	
	(0.015)	(0.016)	(0.015)		(0.003)	(0.010)	
ln distance	-0.979^a				-0.470^a		
	(0.010)				(0.002)		
ln relative GDP				1.243^a			0.073
				(0.034)			(0.636)
ln relative prices				-0.378^a			-1.016^a
				(0.018)			(0.373)
BC importer + 0 years	0.067^a	0.005	0.008		-0.009	-0.008	
	(0.011)	(0.007)	(0.007)		(0.007)	(0.003)	
BC importer + 1 years	0.060^a	-0.030^a	-0.033^a		-0.009	-0.029^a	
	(0.010)	(0.007)	(0.007)		(0.007)	(0.009)	
BC importer + 2 years	0.061^a	-0.025^a	-0.026^a		0.007	-0.030^a	
	(0.010)	(0.007)	(0.006)		(0.007)	(0.007)	
BC importer + 3 years	0.046^a	-0.023^a	-0.026^a		0.013^b	-0.024^a	
	(0.009)	(0.006)	(0.006)		(0.007)	(0.005)	
BC importer - 1 years	0.002	-0.018^a	-0.005		-0.034^a	-0.010^a	
	(0.010)	(0.007)	(0.006)		(0.007)	(0.006)	
BC importer + 0 years× SSA exp.	-0.236^a	-0.174^a	-0.177^a	-0.121^a	-0.082^a	-0.080^a	-1.477^a
	(0.053)	(0.037)	(0.033)	(0.033)	(0.033)	(0.025)	(0.510)
BC importer + 1 years× SSA exp.	-0.166^a	-0.106^a	-0.095^a	-0.102^a	-0.073	-0.095^a	-1.218^a
	(0.052)	(0.037)	(0.032)	(0.032)	(0.051)	(0.024)	(0.419)
BC importer + 2 years× SSA exp.	-0.261^a	-0.145^a	-0.098^a	-0.118^a	-0.098^b	-0.115^a	-0.678^c
	(0.050)	(0.037)	(0.033)	(0.033)	(0.053)	(0.026)	(0.363)
BC importer + 3 years× SSA exp.	-0.136^a	-0.089^a	-0.030	-0.054^c	-0.083^c	-0.072^a	-0.274
	(0.044)	(0.033)	(0.030)	(0.031)	(0.049)	(0.023)	(0.459)
BC importer - 1 years× SSA exp.	-0.200^a	-0.072^c	-0.085^a	-0.049	-0.143^a	-0.044^c	-0.018
	(0.048)	(0.037)	(0.033)	(0.033)	(0.053)	(0.023)	(0.750)
Average effect$(t, t+3)$ (b)	-0.180^a	-0.120^a	-0.094^a	-0.094^a	-0.081^a	-0.080^a	-0.552^a
	(0.035)	(0.024)	(0.022)	(0.022)	(0.026)	(0.018)	(0.161)
Observations	1036692	1036692	1036692	1036692	1710477	1635189	1738914
Sector FE	Yes	Yes	No	No	Yes	No	Yes
Exporter, imp. FE	No	No	No	No	Yes	No	Yes
Dyadic FE	No	Yes	No	No	No	No	No
Dyad-sector FE	No	No	Yes	Yes	No	Yes	No
R-squared	0.48	0.61	0.86	0.86	-	-	-

A full set of year dummies is included in all estimations. Robust s.e. in parentheses, robust and clustered. (a): Zero inflated Poisson. (b) Average additional effect for SSA countries. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. Exporter's financial crises dummies not reported. Other bilateral, time-invariant controls (common language, common colonizer, contiguity) not reported in columns (1) and (6).

Table 4: Effect of banking crises on African trade, by country

(1) Exporter	(2) Average effect of BC$(t, t+3)$	(3) s.e
Benin	-0.191^{c}	(0.101)
Burkina Faso	-0.212^{b}	(0.088)
Central African Rep.	-0.238^{c}	(0.124)
Ivory Coast	-0.110^{c}	(0.063)
Cameroon	-0.055	(0.047)
Ethiopia	0.239	(0.149)
Ghana	-0.228^{a}	(0.063)
Equatorial Guinea	0.609^{c}	(0.368)
Kenya	-0.044	(0.056)
Mali	-0.147^{c}	(0.088)
Mauritania	-0.048	(0.118)
Nigeria	-0.066	(0.067)
Senegal	-0.200^{a}	(0.067)
South Africa	-0.209^{a}	(0.033)
Togo	-0.147^{c}	(0.085)
Zambia	1.028	(0.625)
Zimbabwe	-0.177^{b}	(0.081)

Robust Standard errors, clustered by country-pair-sector, in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include dyad-sector fixed effects and year dummies.

Table 5: Effect of banking crises on African trade, composition effect

	(1)	(2)	(3)	(4)
Dep. var	ln m_{ijht}/m_{ibht}		ln m_{ijht}/m_{ibht}	
Sample	Sector		Sector	
	All		Manuf.	Primary
ln relative GDP	1.971^{a}	1.242^{a}	1.236^{a}	0.663^{a}
	(0.027)	(0.034)	(0.037)	(0.092)
ln relative price	-0.057^{a}	-0.378^{a}	-0.300^{a}	-0.103^{b}
	(0.017)	(0.018)	(0.021)	(0.050)
BC importer + 0 years× SSA exp.	-0.156^{a}	-0.130^{a}	-0.083^{b}	-0.373^{a}
	(0.033)	(0.034)	(0.042)	(0.102)
BC importer + 1 years× SSA exp.	-0.136^{a}	-0.102^{a}	-0.079^{c}	-0.142
	(0.032)	(0.032)	(0.043)	(0.091)
BC importer + 2 years× SSA exp.	-0.140^{a}	-0.118^{a}	-0.142^{a}	-0.187^{b}
	(0.032)	(0.033)	(0.042)	(0.091)
BC importer + 3 years× SSA exp.	-0.069^{b}	-0.054^{c}	-0.075^{c}	-0.087
	(0.030)	(0.031)	(0.039)	(0.087)
BC importer - 1 years× SSA exp.	-0.076^{b}	-0.049	0.006	-0.299^{a}
	(0.033)	(0.033)	(0.041)	(0.100)
Average effect$(t, t+3)$ (a)	-0.117^{a}	-0.096^{a}	-0.090^{a}	-0.174^{a}
	(0.021)	(0.022)	(0.029)	(0.053)
Observations	498472	538220	873386	163306
Sector×year dummies	Yes	No	No	No
Sector×crises dummies	No	Yes	Yes	Yes
R-squared	0.89	0.83	0.58	0.58

Robust Standard errors, clustered by country-pair-sector, in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include dyad-sector fixed effects and year dummies. (a) Average additional disruption for SSA countries after a crisis in importer country, from t to t+3.

Table 6: Effect of banking crises on African trade: the role of trade finance

Estimator	(1)	(2) Within	(3)	(4)	(5) Within	(6)	(7)
Dep. var.: ln m_{ijht}/m_{ibht}							
ln relative GDP	1.526^{a}	1.530^{a}	1.529^{a}	0.337^{a}	0.345^{a}	0.342^{a}	1.329^{a}
	(0.054)	(0.054)	(0.054)	(0.082)	(0.083)	(0.083)	(0.035)
ln relative prices	0.002	0.001	0.000	0.129^{a}	0.127^{a}	0.129^{a}	-0.377^{a}
	(0.023)	(0.023)	(0.023)	(0.033)	(0.033)	(0.033)	(0.018)
BC importer + 0 years× SSA exp.	-0.087^{b}		-0.034	-0.139^{b}		-0.129^{b}	-0.123^{a}
	(0.034)		(0.041)	(0.056)		(0.059)	(0.034)
BC importer + 1 years× SSA exp.	-0.078^{b}		0.037	-0.126^{b}		-0.057	-0.103^{a}
	(0.033)		(0.040)	(0.055)		(0.059)	(0.032)
BC importer + 2 years× SSA exp.	-0.088^{a}		-0.013	-0.133^{b}		-0.074	-0.118^{a}
	(0.034)		(0.041)	(0.056)		(0.060)	(0.033)
BC importer + 3 years× SSA exp.	-0.049		-0.011	-0.020		-0.005	-0.052^{c}
	(0.031)		(0.037)	(0.053)		(0.056)	(0.031)
BC importer + 0 years× trade fin. (a)		-0.369^{a}	-0.314^{b}		-0.146	-0.067	
		(0.113)	(0.135)		(0.107)	(0.113)	
BC importer + 1 years× trade fin. (a)		-0.588^{a}	-0.648^{a}		-0.456^{a}	-0.419^{a}	
		(0.110)	(0.133)		(0.115)	(0.122)	
BC importer + 2 years× trade fin. (a)		-0.457^{a}	-0.436^{a}		-0.406^{a}	-0.360^{a}	
		(0.106)	(0.127)		(0.112)	(0.118)	
BC importer + 3 years× trade fin. (a)		-0.228^{b}	-0.212^{c}		-0.094	-0.096	
		(0.095)	(0.113)		(0.104)	(0.109)	
BC importer + 0 years× fin. devt.							0.032^{a}
							(0.009)
BC importer + 1 years× fin. devt.							0.021^{b}
							(0.009)
BC importer + 2 years× fin. devt.							0.012
							(0.009)
BC importer + 3 years× fin. devt.							-0.016^{b}
							(0.007)
Average effect$(t, t+3)$	-0.073^{a}		-0.005	-0.098^{a}		-0.063	-0.094^{a}
	(0.023)		(0.031)	(0.037)		(0.040)	(0.022)
Observations	397141	397141	397141	163030	163030	163030	1017939
R-squared	0.83	0.83	0.83	0.82	0.82	0.82	0.86

Robust Standard errors, clustered by country-pair-sector, in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include dyad-sector fixed effects and year dummies. (a) Short term credit over total private credit (BIS) in column (1) to (3), percentage of financing from suppliers (Worldbank) in columns (4) to (6). Financial development denotes the ratio of private credit over GDP.

Table 7: Crises and trade finance data

Country	Crisis	Trade fin. #1	Trade fin. #2	Country	Crisis	Trade fin. #1	Trade fin. #2
Algeria	1990	0.14	-	Japan	1992	-	-
Argentina	1980, 1989, 1995, 2001	0.12	0.19	Kenya	1985, 1992	0.10	-
Australia	1989	-	-	Korea	1983, 1986, 1997	-	-
Austria	-	-	-	Mexico	1981, 1992, 1994	0.14	0.14
Bangladesh	1987	0.03	-	Mali	1987	0.23	-
Belgium	-	-	-	Morocco	1983	0.08	-
Benin	1988	0.22	-	Malaysia	1985, 1997	0.04	-
Burkina Faso	1988	0.25	0.14	Nigeria	1992, 1997	0.19	-
Bolivia	1987, 1994	0.09	0.12	Netherlands	-	-	-
Brazil	1985, 1990, 1994	0.06	-	Norway	1987	-	-
Central Afr. Rep.	1976, 1988	0.63	-	New Zealand	1987	-	-
Canada	1983	-	-	Panama	1988	0.07	0.09
Chile	1982	0.05	0.15	Peru	1983, 1999	0.14	0.19
China	1997	-	-	Philippines	1981, 1997	0.07	-
Ivory Coast	1988	0.21	-	Portugal	-	-	-
Cameroon	1987, 1995	0.16	0.16	Paraguay	1995,2002	0.06	-
Colombia	1982, 1998	0.09	0.21	Senegal	1988	0.16	0.14
Costa Rica	1987, 1994	0.17	-	Singapore	1982	-	-
Denmark	1987	-	-	Slovenia	1989, 1993	-	0.13
Ecuador	1981, 1994, 1996, 1998	0.14	0.24	Sweden	1991	-	-
Germany	-	-	-	Switzerland	-	-	-
Egypt	1977, 1981, 1990	0.06	-	Togo	1993	0.20	-
Spain	1977	-	-	Thailand	1979, 1983, 1996	0.02	-
Ethiopia	1994	0.10	-	Tunisia	1991	0.04	-
Finland	1991	-	-	Turkey	1982, 1991, 1994, 2000	0.19	-
France	1994	-	-	Taiwan	1983, 1995, 1997	-	-
Ghana	1982	0.20	0.18	Uruguay	1981, 2002	0.07	0.15
Eq. Guinea	1983	-	0.21	UK	1984	-	-
Greece	1991	-	-	USA	1984	-	-
Honk Kong	1982, 1998	-	-	Venezuela	1978, 1993	0.18	-
Indonesia	1992, 1997	0.04	-	Zambia	1995	0.93	-
India	1993	0.03	-	Zimbabwe	1995	0.06	-
Italy	1990	-	-	South Africa	1977, 1989	-	0.23
Italy	1990	-	-	Mauritania	1984	0.25	0.21
Israel	1977, 1983	-	-				

Trade finance 1 represents the ratio of short term over total credit as presented in the main text. Trade finance 2 is the proxy from the World Business Environment Survey (WBES) conducted by the WorldBank during the year 2000, i.e. average the percentage of firms' total financing coming from their suppliers. Crisis is the beginning year of the banking crisis as in Reinhart and Rogoff (2009).

The International Growth Centre (IGC) aims to promote sustainable growth in developing countries by providing demand-led policy advice based on frontier research.

Find out more about
our work on our website
www.theigc.org

For media or communications
enquiries, please contact
mail@theigc.org

Subscribe to our newsletter
and topic updates
www.theigc.org/newsletter

Follow us on Twitter
@the_igc

Contact us
International Growth Centre,
London School of Economic
and Political Science,
Houghton Street,
London WC2A 2AE

IGC
International
Growth Centre

DIRECTED BY
LSE
UNIVERSITY OF OXFORD

FUNDED BY
UKaid
from the British people

Designed by soapbox.co.uk