The Vulnerability of Sub-Saharan Africa to Financial Crises: the Case of Trade

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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 between 1 to 5%). We find however that the disruption effect is much larger and long-lasting for African exporters as the fall in trade (relative to gravity) is 10 to 15 percentage points higher than for other countries in the aftermath of a banking crisis. This vulnerability of African exports in the short-run does not come from a composition effect, i.e. from the fact that primary exports are disrupted more severely than manufacturing exports. Instead, we provide suggestive evidence that the dependence of African countries upon trade finance is an important determinant of their vulnerability to banking crises in partner countries.

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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 find 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 upon trade finance 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 5 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 6 in the appendix, 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 dummies for each country, month-of-year dyad 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 in knowing 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

[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 assume that the financial crisis was still going on until the end of our sample.

robust standard errors are indicated below the coefficient[2]):

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

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 interaction between $Crisis_t$ and SSA_j implies that, during the crisis, African exports to the US have decreased around 60% more than exports of other countries ($\exp(-1.006)-1$).

The recent crisis was not the first event during which trade from SSA countries hit particularly hard. As shown in Figure 7 in the appendix, a similar pattern was observed during the 1997-98 Asian crisis. In this figure plot the variations in exports to the five main countries involved in the Asian crisis (Philippines, Korea, Thailand, Malaysia and Indonesia) of SSA countries and of the rest of the world during this event.[3] The drop in exports to the crisis countries was dramatically larger and longer-lasting for SSA countries. The aim of the paper is to show that this is not a specificity of these two events, and to try to investigate some reasons of this vulnerability of African exports to financial crises in their trade partners.

We see our results as identifying a vulnerability specific to SSA countries a little bit like they are also vulnerable to political instability and ethnic divisions (see for example Easterly and Levine, 1997). From this point of view, the fact that growth in SSA countries has rebounded quickly after the financial crisis is all the more noteworthy. There are several possible reasons for this growth resilience in face of the trade vulnerability we identify (see IMF, 2009a). First, there was no direct effect of the crisis on the financial systems in SSA countries. Those were not infected by the products at the core of the crisis in the US and in Europe. Second, many countries in sub-Saharan Africa placed fiscal and monetary policies on an expansionary footing in 2009 and 2010. Third, SSA exports have been partly redirected towards countries (especially in Asia) which have not been at the core of the financial crisis.

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

[2]These results are robust to clustering the standard errors at the country level.

[3]The data comes from the IMF Direction of Trade Statistics (DOTS). We keep in the sample only those countries for which at least 5% of total exports were directed to these countries before the crisis (between 1990 and 1996). This include the following SSA countries: Benin, Burkina Faso, Mali, Togo, and Zambia. Non SSA countries include Australia, Chile, China, Ecuador, Hong-Kong, India, Japan, New Zealand, Panama, Singapore, Taiwan, USA, and Yemen.

by standard determinants such as GDPs or bilateral distance. 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 find 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 finance. 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. In general, this finding does not seem to be driven by any sector-specific factor. Finally, using proxies for dependence upon trade finance, we provide suggestive 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 quite recently, the effect of banking crises had only been studied 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 credit[4] 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 finance 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 finance. 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,

[4]As explained very clearly by Amiti and Weinstein (2011), trade credit - contrary to trade finance - has a clear accounting definition, and refer to the value of transactions between a firm and its buyers/sellers where goods and services are provided without an advance or immediate payment (see Amiti and Weinstein, 2011, p.1843, footnote 1.). Our data does not allow us to test for the relevance of specific forms of trade finance - including trade credit - so we will interpret trade finance in a broad sense in the rest of the paper.

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 (2012), 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)[5], and Amiti and Weinstein (2011) 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. (2012), 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 finance 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. Our results on the importance of trade finance is also consistent with Ahn, Amiti and Weinstein (2011) who document raises in export prices relative to domestic manufacturing prices in a number of countries, especially for the goods shipped by sea. 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 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 finance 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.

[5]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.

Section 2 describes the empirical strategy we choose to quantify the effect of a banking crisis in a gravity equation. Section 3 presents the data, and section 4 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. Finally, section 5 concludes.

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 starting in year t in 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:

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

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 in general estimate this equation using individual (dyad-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 dyad-sector fixed effects).

BC_{it} is a binary variable which equals 1 if a banking crisis started in country i during 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 and a lead of the crises dummies (i.e. $a = -1, b = 3$). We will also estimate the persistent or long-run effects of banking crises on the trade relation by introducing more lags i.e. $b = 5$. The number of lags is mainly chosen here to keep a maximum number of crises in the sample, but the inclusion of a different number of lags leaves our main results qualitatively unchanged.

We will in general carry regressions at the dyad-sector level. We tend to prefer disaggregated data for several reasons. First because it limits aggregation biases, i.e. the possibility that we identify for instance an effect for SSA countries which is due to their specialization in some sectors. Second, because using sector-specific data allows to study the effect of foreign banking crises on SSA countries across sectors, in particular in primary versus manufacturing goods sectors. Finally, considering disaggregated data obviously improves the efficiency of the estimations, which is especially important in the presence of a large number of fixed effects as it is the case here. We will nevertheless check the robustness of our results using aggregated bilateral trade flows, i.e. dropping the h subscript from equation (2).

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 set of interaction terms between the importer crises dummies and a dummy which equals 1 if country j (the exporter) is a SSA country:

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

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 specification. 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 (the "multilateral resistance" indexes) 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.[6] 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 specification 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. One can argue, however that this specification relies on a particular CES structure. We will therefore check the robustness of the disruption effect to the inclusion of a full set of importer×sector×year dummies, therefore estimating:

$$\log m_{ijht} = \alpha_1 \log Y_{it} + \alpha_2 \log P_{it} + \sum_{k=a}^{b} \lambda_k BC_{it-k} \times SSA_j + D_{jht} + D_{ijk} + ... + \varepsilon_{ijt} \tag{5}$$

This specification being computationally very demanding, we will keep equation (4) as our baseline specification. We will however show that the results obtained using specifications (5) and (4) are quantitatively very similar. We will also check that our results are robust to the additional inclusion of exporter×sector×year dummies in specification (5). Finally, we will estimate the additional disruption effect of banking crises in partner countries for SSA countries using aggregated bilateral trade data, also including importer×year and exporter×year dummies.

A second issue is the treatment of zero trade flows. Taking the log of bilateral trade prevents from including these observations in the regressions. As zero trade flows account for a significant share of the

[6] 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.

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. This leads to inconsistent estimates. Another, more satisfactory, is to use a different estimator which effectively accounts for the presence of zeros, such as Poisson or Tobit. Following Santos-Silva and Tenreyro (2006) we will check the robustness of our results using a fixed effects Poisson (PPML) estimator. Again, we will check the robustness of the results to the use of trade flows aggregated at the bilateral level. 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.[7] Each specification therefore has its limitation. As shown later, our main results are however robust to the use of these different estimation techniques.

3 Data

Gravity Variables. Our main dataset combines COMTRADE and CEPII data for 27 ISIC 3-digit industries between 1976 and 2002. To study the effect of banking crises on primary goods sectors as well, we augmented this database using COMTRADE for different primary good sectors.[8] To check the robustness of the results on aggregate bilateral trade flows, we use data from the IMF Direction of Trade Statistics (DOTS) over the same period.[9] 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 will show robustness checks which include 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

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

[8] These sectors are based on SITC classification and contain respectively: raw food and live animals, crude material except fuels, and raw fuels. We aggregate these sectors into two broad sectors,: raw food and live animals and raw materials. As the SITC and ISIC classifications partly overlap, we dropped some of the subcategories for each of these sectors. More details are provided in the appendix.

[9] Another solution would have been to aggregate the sectoral trade flows from our first dataset, but these aggregated trade flows would not be necessarily exhaustive. Our results on the vulnerability of SSA countries to foreign income shocks and banking crises are robust to this aggregation (results available upon request), but we preferred working with exhaustive trade flows. The correlation between the DOTS data and our aggregated data is 0.96.

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 9 in the appendix. This table also contains our proxy for dependence upon 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 coefficients may be biased to some extent if the price indices do not control for the movement of welfare based ideal price indexes. We check the robustness of our results to the inclusion of zero trade flows by using alternatively a Poisson PML 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. Column (1) presents OLS estimations with dyad-sector fixed effects and year dummies. In columns (2) and (3) we drop the GDP and prices variables. The change in the crisis coefficients with respect to column (1) therefore provides information on whether the income or price effects are significant channels through which a crisis affects trade. Column (4) uses a fixed effects poisson (Pseudo-Maximum Likelihood) estimator. Columns (5) to (8) replicate columns (1) to (4) using the trade data aggregated at the bilateral level.

Banking crises are found to have a negative yet quantitatively limited impact on imports, which is consistent with Abiad *et al.* (2011).[10] The average yearly deviation in imports in the three years after the start of the crisis is between -2% and -3%[11] when controlling for GDPs and prices (columns (1) and (5)). Interestingly, this negative effect is found to be significant even controlling for changes in income and

[10]The positive or insignificant coefficients on the contemporaneous crisis variables might be due to the fact that we are not capturing the precise time of the year at which the crisis happen. If crises tend to occur on average toward the end of the calendar year, this coefficient may be capturing increases in trade, for instance to due pre-crisis credit booms. The coefficient on the exporter crises dummies, not reported, are either slightly positive or insignificant depending on the specification. This less robust impact is also consistent with Abiad *et al.* (2011).

[11]Note that the coefficients on the crisis dummies cannot be directly interpreted as semi-elasticities: the exact percentage change in exporter following a crisis in t in the importer country is (taking for instance Table 1, column (5)) $\exp(-0.053)-1 = -0.051$. This makes virtually no difference when the coefficient in low, but the correction becomes more important when the effect is large.

prices: when excluding these variables, the effect of the crisis is more negative, up to -5% on average in the three years that follow the event (columns (3) and (7)). This suggests that the impact of banking crises on trade also goes through income and prices changes. Finally, accounting for zero trade flows and using a PPML estimator leads to a similar moderate impact of crises on imports, around -3% to -6% (columns (4) and (8)).

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. var		ln m_{ijht}		m_{ijht}		ln m_{ijt}		m_{ijt}
ln GDP exporter	1.279^a			0.988^a	1.318^a			1.032^a
	(0.025)			(0.072)	(0.067)			(0.124)
ln GDP importer	1.306^a			0.864^a	1.020^a			0.904^a
	(0.024)			(0.058)	(0.059)			(0.069)
ln price exporter	-0.312^a	-0.403^a		-0.106^b	0.176^a	0.116^a		0.220^a
	(0.015)	(0.016)		(0.050)	(0.037)	(0.038)		(0.068)
ln price importer	0.898^a	0.850^a		0.567^a	0.340^a	0.292^a		0.478^a
	(0.014)	(0.015)		(0.042)	(0.036)	(0.037)		(0.060)
BC importer + 0 years	0.011^c	0.017^a	0.047^a	-0.024^b	0.016	0.026	0.035^b	-0.045^a
	(0.006)	(0.006)	(0.006)	(0.011)	(0.017)	(0.017)	(0.017)	(0.017)
BC importer + 1 years	-0.023^a	-0.035^a	-0.048^a	-0.047^a	-0.040^b	-0.040^b	-0.045^a	-0.067^a
	(0.006)	(0.006)	(0.006)	(0.011)	(0.017)	(0.017)	(0.017)	(0.016)
BC importer + 2 years	-0.016^a	-0.028^a	-0.048^a	-0.034^a	-0.053^a	-0.061^a	-0.068^a	-0.062^a
	(0.006)	(0.006)	(0.006)	(0.013)	(0.017)	(0.017)	(0.017)	(0.018)
BC importer + 3 years	-0.025^a	-0.040^a	-0.056^a	-0.052^a	-0.033^b	-0.039^b	-0.044^a	-0.045^b
	(0.005)	(0.005)	(0.005)	(0.011)	(0.016)	(0.017)	(0.017)	(0.018)
Average disruption effect[t,t+3] (a)	-0.013^a	-0.021^a	-0.026^a	-0.039^a	-0.027^b	-0.029^b	-0.031^a	-0.055^a
	(0.004)	(0.004)	(0.004)	(0.011)	(0.013)	(0.013)	(0.013)	(0.017)
Observations	1211897	1211897	1211897	2289789	95241	95241	95241	105600
Estimator		OLS		PPML		OLS		PPML
Dyad-sector FE		Yes				No		
Dyadic FE		No				Yes		

Robust s.e. in parentheses, clustered by country-pair-sector (columns (1) to (4)) or country-pair (columns (5) to (8)). A full set of year dummies is included in all estimations. (a) Average disruption effect for crisis in importer country from t to t+3. Columns (1) to (4) report the results using trade data disaggregated at the country-pair-sector level. Columns (5) to (8) uses trade data aggregated at the country-pair level. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include equivalent banking crises dummies for the exporter country and a lead of the crises dummies.

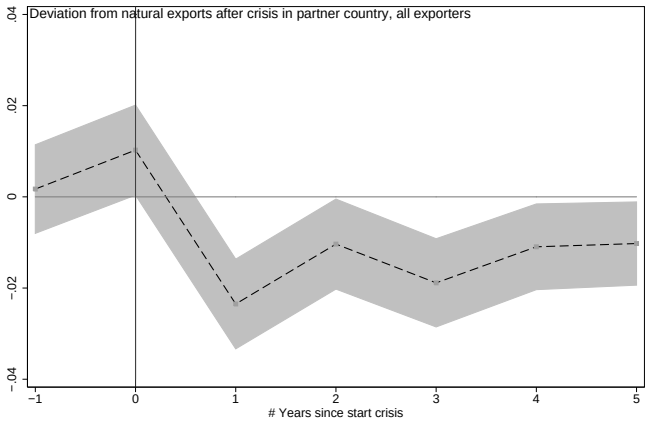
Figures 1.a and 1.b are based on the estimated coefficients and confidence intervals of a specification similar to the one presented in Table 1, respectively in columns (1) and (2), but with additional lags and a lead. It shows the deviation of bilateral imports before and after a crisis that starts 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 90% 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.

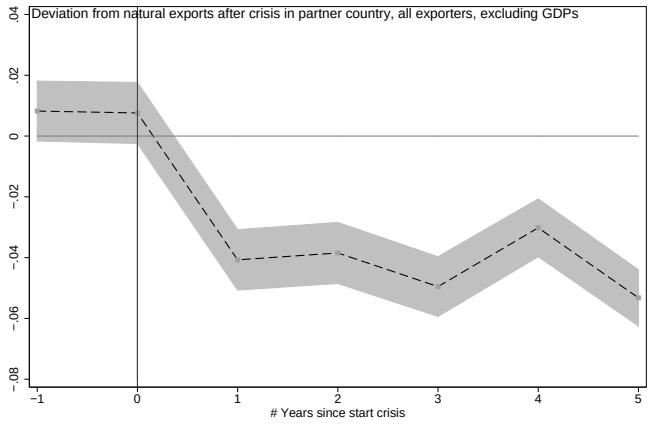
The estimated effect in the short-run is close to the one presented in Table 1. We can see in Figure 1.a that the average disruption effect of banking crises on imports is moderate but persistent. When the GDP variables are not controlled for (Figure 1.b), the effect of banking crises is found not surprisingly to be much stronger, and much more persistent.

Figure 1: Exports after banking crisis in partner country

(a) Without income effect



(b) With income effect



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 might 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. 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.[12]

Table 2: Income effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. var	ln m_{ijht}		m_{ijht}	ln m_{ijht}		ln m_{ijt}	m_{ijt}
Sample	All			Manuf.	Primary	All	
ln GDP exporter	1.226^a	1.276^a	0.964^a	1.365^a	0.335^a	1.312^a	1.000^a
	(0.025)	(0.025)	(0.072)	(0.027)	(0.066)	(0.066)	(0.126)
ln GDP importer	1.330^a	1.299^a	0.847^a	1.309^a	1.121^a	1.016^a	0.872^a
	(0.024)	(0.024)	(0.059)	(0.026)	(0.067)	(0.059)	(0.069)
ln price exporter	-0.390^a	-0.320^a	-0.126^a	-0.394^a	0.155^a	0.169^a	0.195^a
	(0.015)	(0.015)	(0.047)	(0.016)	(0.041)	(0.037)	(0.065)
ln price importer	0.907^a	0.911^a	0.560^a	0.970^a	0.478^a	0.356^a	0.467^a
	(0.014)	(0.014)	(0.041)	(0.015)	(0.036)	(0.036)	(0.061)
ln GDP importer× SSA exp.	-0.496^a						
	(0.036)						
Slowdown (1)		-0.024^a	-0.046^a	-0.026^a	-0.024^b	-0.028^a	-0.050^a
		(0.003)	(0.006)	(0.004)	(0.011)	(0.010)	(0.008)
Slowdown (1)× SSA exp.		-0.168^a	-0.059^b	-0.171^a	-0.155^a	-0.083^b	-0.098^b
		(0.015)	(0.029)	(0.016)	(0.038)	(0.033)	(0.042)
Estimator	OLS		PPML	OLS		OLS	PPML
Observations	1211897	1211674	2287710	1059842	151832	95136	105474
Dyad-sector FE	Yes	Yes	Yes	Yes	Yes	No	No
Dyad FE	No	No	No	No	No	Yes	Yes

S.E. in parentheses, robust and clustered by country-pair-sector (columns (1) to (5)) or country-pair (columns (6) and (7)). ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include a full set of year dummies. (1): Dummy equal to 1 when ΔGDP_{it} lower than importer-specific first quartile, zero otherwise.

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

[12]See also Linder (1961).

"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: $\exp(-0.168)-1$ =-15.3% in column (2), -6% when using a fixed effect Poisson estimator in column (3). 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. The interaction between "slowdown" and the SSA dummy is also significant when replicating the results at the bilateral level (column (6) and (7)).

In regressions (4) and (5), we perform the same regression as in specification (2) but distinguish between manufacturing and primary sectors.[13] African exports are found to react more negatively to recessions in partner countries in both manufacturing and primary goods sectors. Interestingly, in unreported regressions 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 with the SSA dummy. 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

Baseline results. 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) shows the results of estimating equation (3), while columns (2) shows the results using the "relative" version of the gravity equation (4). In column (3) we include, in addition to the dyad-sector fixed effect, importer×sector×year fixed effects that aim at controlling in particular for changes in the importer's multilateral resistance index. Column (4) presents the most demanding specification, with sector-dyad, importer×sector×year and exporter×sector×year. In column (5) we include zero trade flows and check the results of column (1) using a PPML estimator. Finally, in columns (6) to (8) we consider trade flows aggregated at the bilateral level, either with bilateral fixed effects (column (6)), importer×year

[13]Primary goods include the following sectors: raw food and live animals, food products, crude material and raw fuels.

Table 3: Effect of banking crises in partner countries on exports: SSA countries

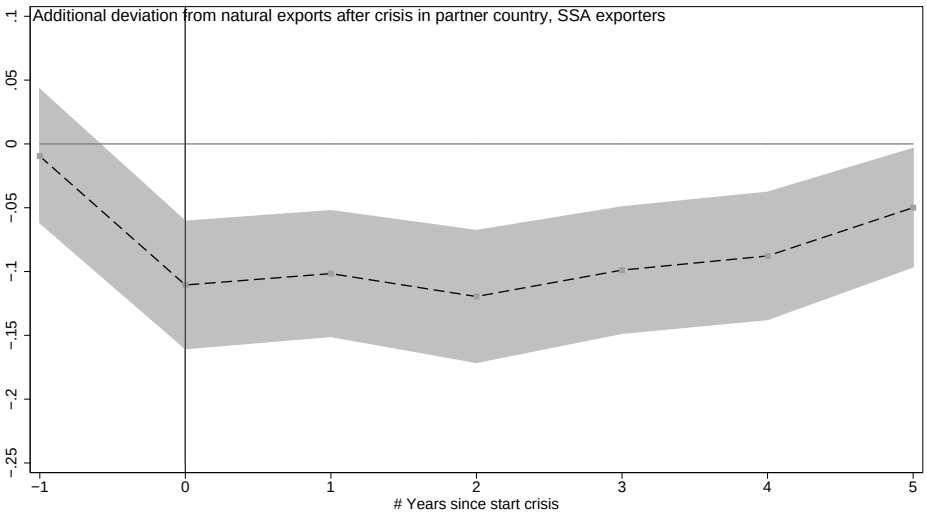
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. var	ln m_{ijht}	ln m_{ijht}/m_{ibht}	ln m_{ijht}		m_{ijht}	ln m_{ijt}		m_{ijt}
ln GDP exporter	1.278^a		1.260^a		0.988^a	1.316^a		1.032^a
	(0.025)		(0.024)		(0.072)	(0.067)		(0.124)
ln GDP importer	1.304^a				0.864^a	1.021^a		0.904^a
	(0.024)				(0.058)	(0.059)		(0.069)
ln price exporter	-0.313^a		-0.361^a		-0.107^b	0.173^a		0.221^a
	(0.015)		(0.015)		(0.050)	(0.037)		(0.068)
ln price importer	0.897^a				0.567^a	0.340^a		0.478^a
	(0.014)				(0.042)	(0.036)		(0.060)
ln relative GDP		1.256^a						
		(0.025)						
ln relative prices		-0.369^a						
		(0.016)						
BC importer + 0 years	0.029^a				-0.024^b	0.033^b		-0.044^a
	(0.006)				(0.012)	(0.016)		(0.017)
BC importer + 1 years	-0.010^c				-0.046^a	-0.053^a		-0.066^a
	(0.006)				(0.011)	(0.016)		(0.016)
BC importer + 2 years	-0.004				-0.033^a	-0.035^b		-0.060^a
	(0.006)				(0.013)	(0.016)		(0.019)
BC importer + 3 years	-0.015^a				-0.050^a	-0.000		-0.043^b
	(0.005)				(0.011)	(0.016)		(0.019)
BC importer + 0 years× SSA exp.	-0.256^a	-0.162^a	-0.193^a	-0.145^a	-0.001	-0.090	-0.358^a	-0.020
	(0.025)	(0.026)	(0.027)	(0.025)	(0.050)	(0.059)	(0.077)	(0.075)
BC importer + 1 years× SSA exp.	-0.179^a	-0.130^a	-0.135^a	-0.064^b	-0.077^c	0.072	-0.154^b	-0.105^c
	(0.025)	(0.025)	(0.026)	(0.025)	(0.044)	(0.055)	(0.073)	(0.061)
BC importer + 2 years× SSA exp.	-0.167^a	-0.128^a	-0.121^a	-0.053^b	-0.116^b	-0.098^c	-0.310^a	-0.118^c
	(0.025)	(0.026)	(0.027)	(0.025)	(0.050)	(0.059)	(0.072)	(0.061)
BC importer + 3 years× SSA exp.	-0.140^a	-0.116^a	-0.105^a	-0.059^b	-0.148^a	-0.179^a	-0.275^a	-0.128^b
	(0.024)	(0.025)	(0.026)	(0.024)	(0.045)	(0.058)	(0.071)	(0.059)
Average additional disruption effect SSA[t,t+3] (a)	-0.185^a	-0.134^a	-0.139^a	-0.080^a	-0.086^b	-0.074^c	-0.274^a	-0.093^c
	(0.018)	(0.018)	(0.019)	(0.018)	(0.039)	(0.042)	(0.059)	(0.056)
Observations	1211897	1211897	1211897	1211897	2289789	95241	95241	105600
Estimator		OLS			PPML	OLS		PPML
Dyad-sector FE	Yes	Yes	Yes	Yes	Yes	No	No	No
Dyadic FE	No	No	No	No	No	Yes	No	Yes
Importer× sector × year FE	No	No	Yes	Yes	No	No	No	No
Exporter× sector × year FE	No	No	No	Yes	No	No	No	No
Importer× year FE	No	No	No	No	No	No	Yes	No
Exporter× year FE	No	No	No	No	No	No	Yes	No

A full set of year dummies is included estimations (1) to (5). Robust s.e. in parentheses, robust and clustered by country-pair-sector (columns (1) to (5)) or country-pair (columns (6) to (8)). (a) Average additional disruption effect for crisis in importer country from t to t+3 for SSA exporters. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. All estimations include equivalent banking crises dummies for the exporter country and a lead of the crises variables. Estimation (7) contains a vector or bilateral, time-invariant controls (distance, common language, common colonizer, contiguity).

and exporter×year fixed effects (column (7)) or using a PPML estimator (column (8)).

Whatever the specification, the fall of exports following a crisis in partner country is much higher for African countries. In columns (1) and (2), the additional drop of African exports in the years following the start of the crisis is between 13 and 16% (column (1), exp(-0.185)-1). Note that the effect is similar on average in the standard gravity results (column (1)) and when using the relative version (column (2)), except that the contemporaneous effect is smaller in the relative version. Including importer×sector×year fixed effects in column (3) leads to results very similar to column (2) (which we will keep as our baseline specification), which lends support to the use of this methodology to control for the unobserved multilateral resistance indexes. Importantly, this additional disruption effect for SSA exporters survives to the inclusion of the three dimensions of fixed effects in column (4). In this case, the average additional disruption effect between t and t+3 is around -8%. The effect is quantitatively similar when including the zero trade flows and using a PPML estimator (column (5)). The average additional disruption effect for SSA countries during the three years after the event is therefore -8 and -16% depending on the specification. Columns (6) to (8) show the results using aggregate trade flows. The additional disruption effect, although less precisely estimated, is still observed for SSA countries and controlling for importer×year and exporter×year dummies actually magnifies the size of the effect (column (7)).[14]

Figure 2: Exports after banking crisis in partner country, SSA vs ROW



Country-specific effect. We now check that the results are not driven by a specific Sub-Saharan African country. First, we illustrate our previous results in figure 2, where we run the same regression as in

[14]In a related work (Berman, de Sousa, Martin and Mayer, 2012) we also find a significantly larger disruption effect for SSA countries (and quantitatively similar, around -15%) using aggregate bilateral trade data over a much longer time period (1950-2009).

column (2), Table 3 but with more lags to study the longer-run effects, and excluding South Africa from the SSA group. 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 strong: the year the country is hit by a banking crisis, the additional effect for SSA exports is close to -12%. This specific vulnerability of SSA exports progressively vanishes but remains significant for at least five years after the start of the event.[15] 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 through the inclusion of GDPs.

Table 4: Additional disruption effect of banking crises on African trade, by country

(1) Exporter	(2) Average additional disruption effect[t,t+3]	(3) s.e.
Equatorial Guinea	-0.553^{a}	(0.207)
Senegal	-0.301^{a}	(0.075)
Ghana	-0.273^{a}	(0.075)
Burkina Faso	-0.264^{a}	(0.097)
Cote d'Ivoire	-0.201^{a}	(0.066)
Nigeria	-0.190^{a}	(0.070)
Madagascar	-0.182^{a}	(0.080)
Zambia	-0.181^{b}	(0.078)
Central African Rep.	-0.181	(0.127)
South Africa	-0.159^{a}	(0.041)
Mauritania	-0.138	(0.125)
Kenya	-0.127^{b}	(0.052)
Zimbabwe	-0.060	(0.071)
Mali	-0.059	(0.093)
Togo	0.015	(0.107)
Cameroon	0.018	(0.072)
Benin	0.034	(0.114)
Ethiopia	0.181	(0.113)

Robust Standard errors, clustered by country-pair-sector, in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. The coefficients displayed are the average additional disruption effects computed from a specification similar to Table 3, column (2) where the African exporter dummy is replaced by a country-specific dummy. For each considered country, the other SSA exporters are dropped from the estimation.

We have also checked whether these results were due to some other 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 additional disruption effect of African exporters in the year of the crisis and the three following ones. Among the 18 considered countries, the effect is negative in 14 cases, and negative and significant at the 1 or 5% level in 10 of them. No SSA country is found to react significantly more positively that the average to banking crises in their partner countries. When significant, the average additional disruption effect is always at least -10%. This clearly suggests that the vulnerability found before may be due to some

[15] When including more lags, we find that the additional disruption effect becomes insignificant after 7 years.

factors that are common to most SSA countries.

Extensive margin. Until now we have considered the effect of banking crises on total trade. It might also be the case that the probability that two countries trade together after a crisis is significantly lower for SSA exporters. This is what we test in Table 8 in the appendix, in which we estimate the effect of banking crises, and of their interactions with the SSA dummy. We use a linear probability model which allows the inclusion of bilateral fixed effects and eases the interpretation of coefficients. Consistently with our previous results, the probability that the bilateral trade flow is positive after a banking crisis is generally significantly lower for SSA exporters, both when using disaggregated (column (1) to (3)) or bilateral trade data (column (5)).

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 upon the financial system of the importing country. We run a 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 remains very similar: the additional disruption effect for SSA countries is around -13% (exp(-0.141)-1), to be compared with Table 3, column (2)). Second, we include in our estimations interaction terms between sector dummies and the crises variables to control for the fact that some sectors (e.g. those more dependent upon external finance) might be more hit by banking crises. As shown in Table 5, column (2), this leaves the results largely unchanged. Finally, as shown in columns (3) and (4), this additional disruption effect for SSA countries is found for both primary products and manufacturing goods, although the effect is less precisely estimated for primary goods. Hence, composition effects do not seem to be at the source of our results. The exports of African countries are more affected by a banking crisis in the destination country, and this is true even after controlling for sector-specific characteristics.

This can be seen clearly in Table 6, which shows the additional disruption effect of SSA countries for each sector separately (i.e. estimating equation (3) on each sector separately). SSA exports are found to respond more negatively to crises in partners countries in 26 out of 29 sectors, the effect being significant at the 1 or 5% level in 15 cases.

Additional robustness. We now perform a number of additional exercises. We first control for an interac-

Table 5: Effect of banking crises on African trade: more robustness

Dep. var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln m_{ijht}/m_{ibht}							ln m_{ijht}
Sector	All		Manuf.	Primary	All			All
ln relative GDP	1.769^a	1.256^a	1.354^a	0.359^a	1.207^a	1.256^a	1.253^a	
	(0.021)	(0.025)	(0.027)	(0.071)	(0.025)	(0.025)	(0.025)	
ln relative prices	-0.185^a	-0.370^a	-0.438^a	0.124^a	-0.438^a	-0.370^a	-0.386^a	
	(0.015)	(0.016)	(0.017)	(0.044)	(0.016)	(0.016)	(0.016)	
ln GDP exporter								1.274^a
								(0.025)
ln GDP importer								1.303^a
								(0.024)
ln price exporter								-0.314^a
								(0.015)
ln price importer								0.898^a
								(0.014)
BC importer + 0 years× SSA exp.	-0.178^a	-0.203^a	-0.166^a	-0.119	-0.166^a	-0.198^a	-0.182^a	-0.263^a
	(0.025)	(0.026)	(0.027)	(0.076)	(0.026)	(0.026)	(0.026)	(0.026)
BC importer + 1 years× SSA exp.	-0.137^a	-0.158^a	-0.153^a	0.014	-0.125^a	-0.152^a	-0.142^a	-0.180^a
	(0.025)	(0.026)	(0.026)	(0.078)	(0.025)	(0.026)	(0.026)	(0.025)
BC importer + 2 years× SSA exp.	-0.132^a	-0.153^a	-0.120^a	-0.164^b	-0.123^a	-0.152^a	-0.126^a	-0.155^a
	(0.025)	(0.026)	(0.027)	(0.073)	(0.025)	(0.026)	(0.026)	(0.026)
BC importer + 3 years× SSA exp.	-0.117^a	-0.122^a	-0.100^a	-0.189^a	-0.104^a	-0.123^a	-0.127^a	-0.125^a
	(0.025)	(0.025)	(0.026)	(0.071)	(0.025)	(0.025)	(0.025)	(0.025)
Average add. disruption effect[t,t+3](a)								
Sub-Saharan Africa	-0.141^a	-0.159^a	-0.135^a	-0.114^b	-0.130^a	-0.156^a	-0.144^a	-0.181^a
	(0.018)	(0.019)	(0.019)	(0.054)	(0.018)	(0.019)	(0.019)	(0.018)
Mediterranean and Middle East								-0.072^a
								(0.023)
Asia								0.044^a
								(0.011)
Central and Latin America								-0.009
								(0.013)
Observations	1211897	1211897	1059947	151950	1211897	1211897	1211897	1211897
Sector×year dummies	Yes	No	No	No	No	No	No	No
Sector×crises dummies	No	Yes	No	No	No	No	No	No
Interaction SSA exp.× ln GDP imp.	No	No	No	No	Yes	No	No	No
Interactions Banking crises× ln GDP exporter	No	No	No	No	No	Yes	No	No
Interactions Currency crises× SSA exp.	No	No	No	No	No	No	Yes	No

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 a group of countries after a crisis in importer country, from t to t+3. All estimations include equivalent banking crises dummies for the exporter country and a lead of the crises variables. Estimation (5) include importer banking crises dummies and their interaction with dummies for each zone except industrialized countries, taken as the benchmark.

Table 6: Effect additional disruption of banking crises on African trade, by sector

(1) Sector	(2) Average additional disruption effect$[t, t+3]$, SSA	(3) s.e
Plastic products	-0.385^a	(0.098)
Wearing apparel, exc. footwear	-0.321^a	(0.099)
Electrical machinery	-0.293^a	(0.066)
Pottery china earthenware	-0.290^a	(0.095)
Paper and products	-0.286^b	(0.106)
Prof. and sci. equipment	-0.258^a	(0.081)
Food products	-0.250^a	(0.079)
Leather products	-0.243^a	(0.097)
Other chemicals	-0.223^a	(0.080)
Printing and publishing	-0.209^a	(0.092)
Rubber products	-0.209^b	(0.104)
Glass and products	-0.176	(0.108)
Non-ferrous metal	-0.170	(0.118)
Fabricated metal products, exc. mach. and equip.	-0.164^b	(0.075)
Textiles	-0.163^b	(0.072)
Machinery except electrical	-0.158^b	(0.066)
Wood products except furniture	-0.153^b	(0.077)
Raw food and live animals	-0.138	(0.091)
Transport equipment	-0.134	(0.104)
Other manuf.	-0.134	(0.082)
Other non-metal min. prod.	-0.110	(0.107)
Industrial chemicals	-0.102	(0.083)
Footwear	-0.096	(0.165)
Beverages	-0.047	(0.157)
Petroleum refineries	-0.045	(0.151)
Raw materials (incl. fuels)	-0.033	(0.093)
Furniture except metal	0.023	(0.108)
Iron and steel	0.016	(0.121)
Tobacco manufactures	0.380^b	(0.173)

Robust Standard errors, clustered by country-pair-sector, in parentheses. ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%. The coefficients displayed are the average additional disruption effects computed from a specification similar to Table 3, column (1), run separately for each sector in the sample.

tion term between the SSA dummy and the GDP of the importer in Table 5, column (5). This leaves the results unchanged (to be compared with Table 3, column (2)), suggesting that indeed the disruption and income effects are two distinct channels through which SSA exporters are more affected by banking crises in destinations countries. Second, we test whether this vulnerability is explained by the income level of SSA countries, by including a set of interaction terms between the crisis dummies and the (average) log of GDP of the exporter country.[16] As shown in column (6) of Table 5, the results are again very similar. In column (7), we include interaction terms between the SSA dummies and currency crises dummies, to check that the SSA vulnerability is indeed related to banking crises and not to the large currency devaluations that often occur simultaneously.[17]

[16]Similar results are found when using contemporaneous GDP or GDP per capita.

[17]The currency crises dates have been computed from IFS data using the methodology described in Eichengreen and Bordo

Finally, In column (8) of Table 5 we show that, despite the fact that the response of a country's export to banking crises in destination countries is heterogeneous across regions, SSA countries are clearly the most affected group. Taking industrialized countries as a benchmark, we find that Mediterranean and Middle East countries are also found to react more negatively, although this additional disruption effect is quantitatively much smaller (-7%) than the one we find for SSA countries. Asian countries are found to respond slightly more positively than industrialized countries.

To summarize, our results suggest that the vulnerability of SSA exporters is not due to sector-specific composition effects, to the income level of SSA countries, or to the income or exchange rate effects which often go together with banking crises.

Trade finance. As mentioned in the introduction, one of the main reasons that might 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 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 is derived from Balance of Payment information and 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, and is available over the entire period.

For each country, we construct several measures: (i) a time-varying measure representing the average ratio of trade finance over total credit, computed by decade and country; (ii) the average ratio of trade finance over total credit over the entire period; (iii) a dummy which equals 1 if the average ratio computed by exporter is above the median of the sample. As shown in Table 9, African countries clearly display a higher level of dependence upon trade finance on average: the median (mean) of the ratio is 0.21 (0.25) for African countries, and only 0.08 (0.10) for the rest of the sample. This dependence of African countries on trade finance was also noted by Jinjarak (2007).

Can it partly explain the vulnerability of African trade to crises in partner countries? To answer this question, we include in our regressions interaction terms between the trade finance dependence proxies and banking crisis in the importer country. The results are reported in Table 7, columns (1) to (8). Columns

(2002).

Table 7: Effect of banking crises on African trade: the role of trade finance

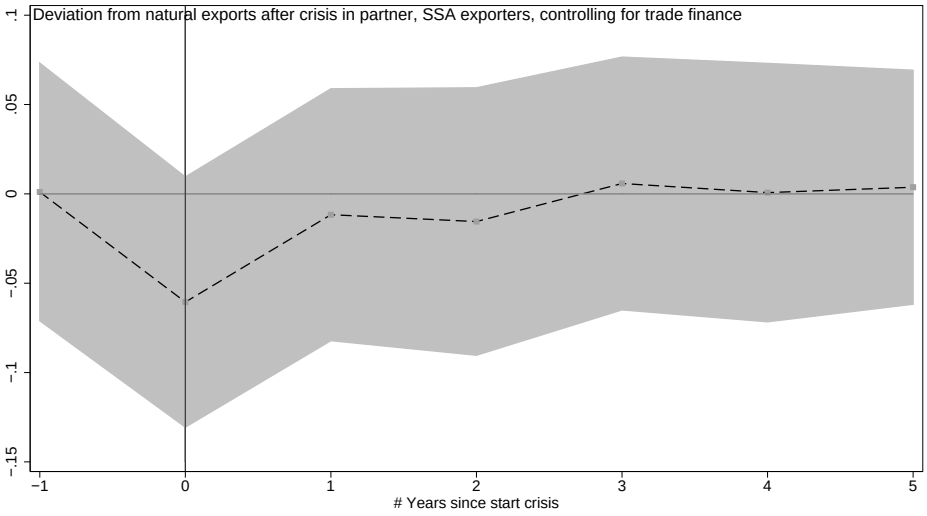
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. var.: ln m_{ijht}/m_{ibht}								
ln relative GDP	1.527^{a}	1.526^{a}	1.525^{a}	1.688^{a}	1.685^{a}	1.688^{a}	1.685^{a}	1.313^{a}
	(0.051)	(0.051)	(0.051)	(0.048)	(0.048)	(0.048)	(0.048)	(0.032)
ln relative prices	0.024	0.022	0.022	-0.041^{c}	-0.042^{c}	-0.041^{c}	-0.042^{c}	-0.372^{a}
	(0.023)	(0.023)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)	(0.017)
BC importer + 0 years× SSA exp.	-0.119^{a}		-0.081^{b}	-0.136^{a}	-0.107^{b}	-0.136^{a}	-0.085^{b}	-0.193^{a}
	(0.036)		(0.041)	(0.035)	(0.043)	(0.035)	(0.040)	(0.028)
BC importer + 1 years× SSA exp.	-0.082^{b}		-0.031	-0.113^{a}	-0.049	-0.113^{a}	-0.051	-0.146^{a}
	(0.035)		(0.040)	(0.035)	(0.043)	(0.035)	(0.039)	(0.027)
BC importer + 2 years× SSA exp.	-0.106^{a}		-0.054	-0.131^{a}	-0.043	-0.131^{a}	-0.059	-0.154^{a}
	(0.037)		(0.042)	(0.036)	(0.045)	(0.036)	(0.041)	(0.028)
BC importer + 3 years× SSA exp.	-0.102^{a}		-0.051	-0.129^{a}	-0.033	-0.129^{a}	-0.081^{b}	-0.133^{a}
	(0.035)		(0.040)	(0.035)	(0.042)	(0.035)	(0.039)	(0.027)
BC imp. + 0 years × trade fin. (a)		-0.263^{a}	-0.176^{c}		-0.147		-0.076^{a}	
		(0.077)	(0.090)		(0.129)		(0.028)	
BC imp. + 1 years × trade fin. (a)		-0.270^{a}	-0.240^{a}		-0.335^{b}		-0.093^{a}	
		(0.079)	(0.090)		(0.135)		(0.027)	
BC imp. + 2 years × trade fin. (a)		-0.307^{a}	-0.252^{a}		-0.469^{a}		-0.108^{a}	
		(0.076)	(0.088)		(0.136)		(0.027)	
BC imp. + 3 years × trade fin. (a)		-0.293^{a}	-0.243^{a}		-0.501^{a}		-0.073^{a}	
		(0.071)	(0.082)		(0.118)		(0.026)	
BC imp. + 0 years× fin. dev. exp.								0.010
								(0.017)
BC imp. + 1 years× fin. dev. exp.								0.019
								(0.017)
BC imp. + 2 years× fin. dev. exp.								-0.022
								(0.017)
BC imp. + 3 years× fin. dev. exp.								-0.042^{a}
								(0.016)
Average add. disruption effect SSA[t,t+3]	-0.102^{a}		-0.054^{c}	-0.127^{a}	-0.058^{c}	-0.127^{a}	-0.069^{b}	-0.156^{a}
	(0.025)		(0.029)	(0.025)	(0.031)	(0.024)	(0.028)	(0.020)
Observations	435680	435680	435680	467960	467960	467960	467960	1151129
Interactions Banking crises× ln GDP per cap. exporter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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 (Global Development Finance database), computed by decade in columns (2) and (3), as an average over the entire period in columns (5), and as a dummy taking the value 1 for exporters above the sample median in column (7). All estimations include equivalent banking crises dummies for the exporter country and a lead of the crises variables. Financial development denotes the ratio of private credit over GDP.

(1), (4) and (6) replicate our baseline regression on the subsample of countries for which the trade finance proxies are 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 slightly lower than in our benchmark estimations because we exclude developed countries, for which the trade

finance proxies are not available, but that react more positively to crises than the average country. We include in these estimations interaction terms between the (average) log of GDP per capita of the exporter country and banking crises in the importer country to ensure that we are capturing the effect of trade finance and not economic development in general. Clearly, the level of development of SSA countries is not found to explain their vulnerability to foreign banking crises, as the average additional disruption effects remains negative and highly significant in these estimations.[18]

Figure 3: Exports after banking crises in partner country, SSA exporters vs ROW, controlling for trade finance

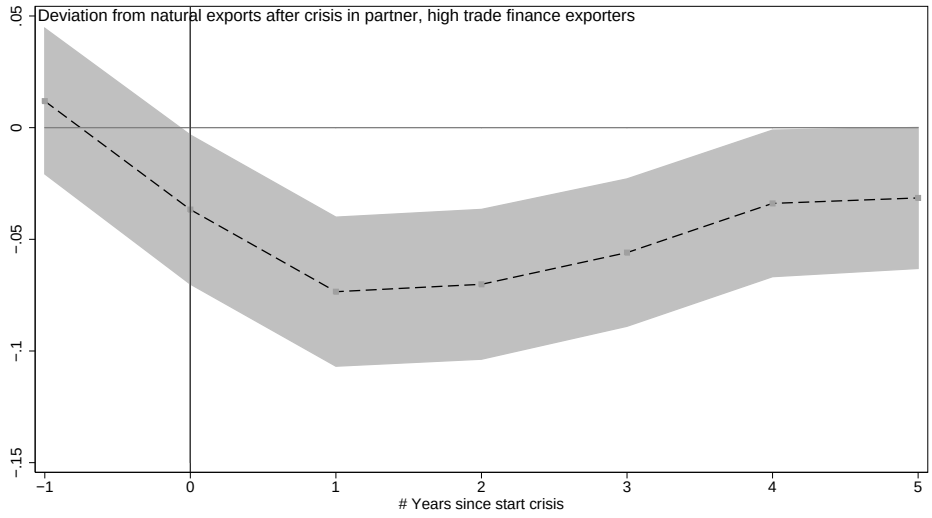


On the other hand, the interactions between trade finance dependence and the crisis dummies are negative and strongly significant, regardless of whether we use the measure computed by decade (columns (2) and (3)), over the entire period (column (5)) or the dummy (column (7)). More importantly, the vulnerability of SSA countries is divided by at least two when including these interactions: the average additional disruption effect of these countries falls from 10-13% to 5-6%. Note again that we control for interactions between GDP per capita and importer crises dummies, so that it is therefore unlikely that we are capturing the effect of overall economic rather that dependence upon trade finance.

In general, these results suggest that trade finance dependence may explain part of the vulnerability emphasized before. When including the trade finance interactions, the additional disruption effect of SSA countries remains significant (but quantitatively small) only during the year. This can be seen clearly in Figure 3 which represents the longer-run disruption effect for African countries, controlling for trade

[18]Not reported, the coefficients on the interaction terms between GDP per capita of the exporter and banking crises in the importing country are positive and significant, suggesting that rich countries react more positively to crises in their destination countries.

Figure 4: Exports after banking crises in partner country, high trade finance



finance dependence: no additional effect for African countries remains in this case. 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.

More generally, we can analyze the role of trade finance dependence not specifically in the case of African countries. Again, we 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, as in Table 7, column (7), but excluding the interaction between crises and the SSA dummy. Figure 4 represents the additional disruption effect for these exporters: they react more negatively in the short-run and for these countries, exports remain below their natural level during at least 5 years after a banking crisis hits their trading partners. Note that Figure 4 looks very similar to Figure 2, further supporting the trade finance explanation.

Finally, in column (8) 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.

In general, our results suggest that financial crises in foreign countries might affect Sub-Saharan African economies importantly through their effect on trade. In a recent work, Berman and Couttenier (2012) find, using data on civil conflict locations within a set of SSA countries, that the country's exposure to financial crises in the rest of the world increases the likelihood of conflict within the country, especially in the most opened regions. These external (financial) shocks might therefore have important effects on economic and political instability within Sub-Saharan African countries through international trade.

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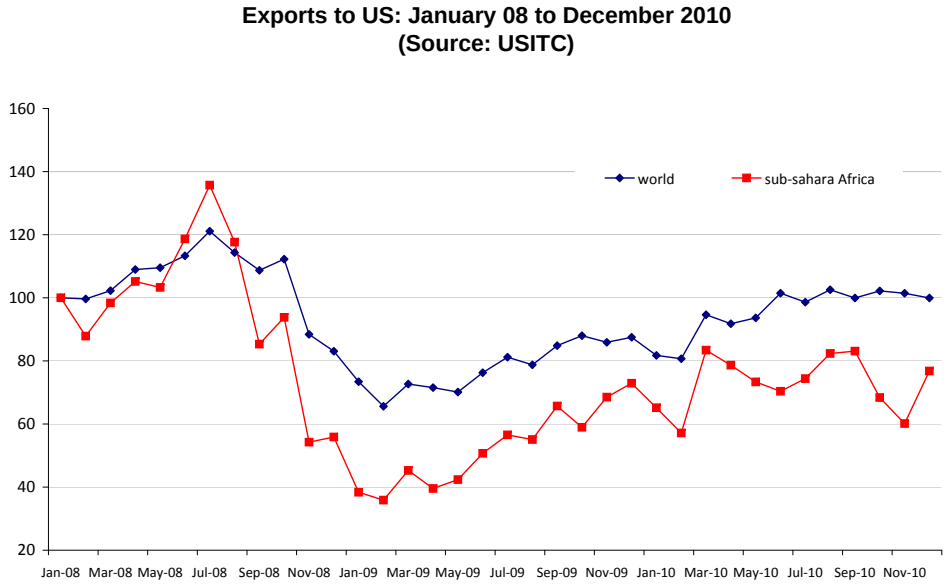
6 Appendix

6.1 Primary goods

We add to the CEPII data information on primary goods bilateral trade from COMTRADE. We consider the following SITC sectors: raw food and live animals (0), crude material, inedible, except fuels (2), mineral fuels lubricants and related materials (3). We do not consider sector 2 as it is already included in the CEPII data. For each of these sectors, we drop some subcategories which are already included in the CEPII data (and therefore do not represent primary goods). To do so we use a concordance Table from Maskus (1989) available on Jon Haveman's website[19]. This leads us to drop the following SITC categories: 035, 037, 046, 047, 048, 059, 073, 081; 223, 232, 244, 248, 251, 264, 265, 266, 267, 269; 322, 325, 334, 335, 342, 344, 345. Finally, we aggregate categories 2 and 3 to consider raw materials as a whole.

6.2 Additional figures

Figure 5: African exports during the 2008-2009 crisis



[19] http://www.macalester.edu/research/economics/page/haveman/Trade.Resources/Concordances/FromISIC/3isic2sitc.txt

Figure 6: African exports during the 2008-2009 crisis, by commodity

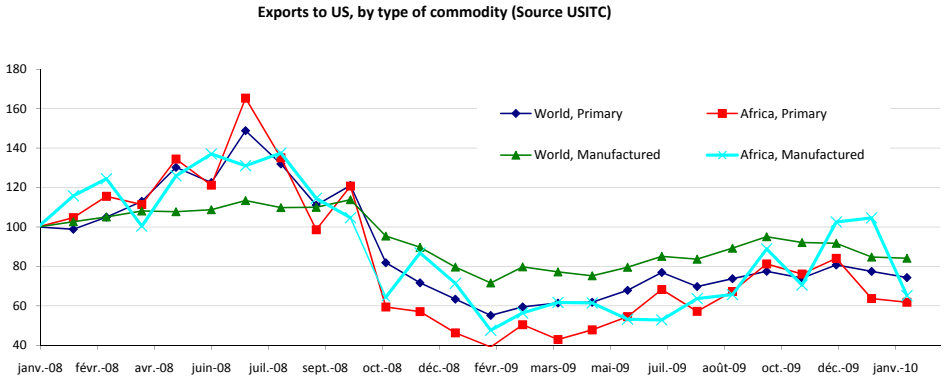


Figure 7: Exports to Asian crisis countries

6.3 Additional Tables

Table 8: Effect of banking crises in partner countries on export probability

	(1)	(2)	(3)	(4)	(5)
Dep. var	$\Pr(m_{ijht}>0)$			$\Pr(m_{ijt}>0)$	
ln GDP exporter	0.093^{a}	0.087^{a}		-0.025^{b}	
	(0.003)	(0.003)		(0.011)	
ln GDP importer	-0.070^{a}			0.040^{a}	
	(0.003)			(0.011)	
ln price exporter	-0.017^{a}	-0.028^{a}		-0.061^{a}	
	(0.002)	(0.002)		(0.006)	
ln price importer	-0.028^{a}			-0.027^{a}	
	(0.002)			(0.006)	
BC importer + 0 years	0.019^{a}			-0.005	
	(0.001)			(0.003)	
BC importer + 1 years	-0.004^{a}			-0.002	
	(0.001)			(0.003)	
BC importer + 2 years	0.007^{a}			0.002	
	(0.001)			(0.003)	
BC importer + 3 years	0.009^{a}			-0.004	
	(0.001)			(0.003)	
BC importer + 0 years× SSA exp.	-0.022^{a}	-0.021^{a}	-0.018^{a}	-0.007	-0.058^{a}
	(0.003)	(0.003)	(0.003)	(0.010)	(0.011)
BC importer + 1 years× SSA exp.	-0.012^{a}	-0.016^{a}	-0.010^{a}	-0.018^{c}	-0.074^{a}
	(0.003)	(0.003)	(0.003)	(0.010)	(0.010)
BC importer + 2 years× SSA exp.	-0.037^{a}	-0.031^{a}	-0.027^{a}	-0.008	-0.067^{a}
	(0.003)	(0.003)	(0.003)	(0.010)	(0.011)
BC importer + 3 years× SSA exp.	-0.028^{a}	-0.026^{a}	-0.019^{a}	-0.006	-0.064^{a}
	(0.003)	(0.003)	(0.002)	(0.010)	(0.011)
Average add. disruption effect SSA[t,t+3] (a)	-0.025^{a}	-0.023^{a}	-0.019^{a}	-0.010	-0.066^{a}
	(0.002)	(0.002)	(0.002)	(0.008)	(0.008)
Observations	2313210	2347856	2313210	108237	108237
Estimator		LPM		LPM	
Dyad-sector FE		Yes		No	
Dyadic FE		No		Yes	No
Importer× sector × year FE	No	Yes	Yes	No	No
Exporter× sector × year FE	No	Yes	Yes	No	No
Importer× year FE	No	No	No	No	Yes
Exporter× year FE	No	No	No	No	Yes

Robust s.e. in parentheses, clustered by country-pair-sector (columns (1) to (4)) or country-pair (columns ((5) to (8)). A full set of year dummies is included in all estimations. (a) Average additional disruption effect for crisis in importer country from t to t+3 for SSA exporters. Columns (1) to (3) report the results using trade data disaggregated at the country-pair-sector level. Columns (4) and (5) use trade data aggregated at the country-pair level. All estimations include equivalent banking crises dummies for the exporter country and a lead of the crises variables. Estimation (4) contains a vector or bilateral, time-invariant controls (distance, common language, common colonizer, contiguity). ^{c} significant at 10%; ^{b} significant at 5%; ^{a} significant at 1%.

Table 9: Crises and trade finance data

Country	Crisis	Trade finance	Country	Crisis	Trade finance
Algeria	1990	0.11	Korea	1983, 1986, 1997	-
Argentina	1980, 1985, 1989, 1995, 2001	0.14	Madagascar	1988	0.29
Australia	1989	-	Mauritania	1984	0.25
Austria	-	-	Mexico	1981, 1982, 1992, 1994	0.15
Bangladesh	1987	0.03	Mali	1987	0.24
Belgium	-	-	Morocco	1983	0.08
Benin	1988	0.23	Malaysia	1985, 1997	0.03
Burkina Faso	1988	0.15	Nepal	1988	0.07
Bolivia	1987, 1994, 1999	0.08	Netherlands	-	-
Brazil	1985, 1990, 1995	0.05	Nigeria	1992, 1997	0.24
Central Afr. Rep.	1976, 1988	0.44	Norway	1987	-
Canada	1983	-	New Zealand	1987	-
Chile	1976, 1980	0.05	Panama	1988	0.08
China	1997	-	Peru	1983, 1999	0.18
Cote d'Ivoire	1988	0.18	Philippines	1981, 1997	0.06
Cameroon	1987, 1995	0.18	Portugal	-	-
Colombia	1982, 1998	0.06	Paraguay	1995, 2002	0.08
Costa Rica	1987, 1994	0.16	Senegal	1988	0.16
Denmark	1987	-	Singapore	1982	-
Ecuador	1981, 1994, 1996, 1998	0.12	Spain	1977	-
Eq. Guinea	1983	-	South Africa	1977, 1989	-
Egypt	1980, 1990	0.05	Sri Lanka	1989	-
El Salvador	1989, 1998	-	Sweden	1991	-
Ethiopia	1994	0.16	Switzerland	-	-
Finland	1991	-	Togo	1993	0.21
France	1994	-	Thailand	1979, 1983, 1996	0.02
Ghana	1982, 1997	0.44	Tunisia	1991	0.04
Greece	1991	-	Turkey	1982, 1991, 1994, 2000	0.19
Indonesia	1992, 1997	0.05	Taiwan	1983, 1995, 1997	-
India	1993	0.03	Uruguay	1981, 2002	0.08
Italy	1990	-	UK	1984, 1991, 1995	-
Iceland	1985, 1993	-	USA	1984	-
Hong Kong	1982, 1983, 1998	-	Venezuela	1978, 1993	0.12
Japan	1992	-	Yemen	1996	0.66
Jamaica	1994	0.21	Zambia	1995	0.85
Lebanon	1988	-	Zimbabwe	1995	0.06
Kenya	1985, 1992	-			

Trade finance represents the average ratio of short term over total credit as presented in the main text. Crisis is the beginning year of the banking crisis as in Reinhart and Rogoff (2009).