

Withstanding Financial Crises: Would Trade Partners Help or Hurt?

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ABSTRACT

This paper provides new empirical evidence on the losses of real activity caused by various financial shocks. Spillover effects due to foreign trade linkages deserve special attention. To this end, Cerra and Saxena (2008) econometric specification is enriched and a Seemingly Unrelated Regression Equations estimator is used to account for the dependency of one's country growth on its trade-weighted partners growth. We run estimations on a set of currency collapses, banking crises and sovereign defaults in 49 advanced and developing countries from 1978 to 2011. The trade-weighted foreign demand effect mitigated the economic downturn following a banking or a sovereign debt crisis in all countries, while only the advanced ones benefited from it after a currency collapse. Trade-based spillover effects make banking crises more costly in the developing countries, in those financial openness or that peg their currency to some parity. It contrasts with what is observed during currency or sovereign debt crises.

KEYWORDS

Cross-border spillovers; Financial crises; Impulse response functions; Output loss; Trade links

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JEL CLASSIFICATION

F14, G01, F15

1. Introduction

The economic resilience of countries to financial shocks remains under debate. Recently, contrasting macroeconomic performances have been recorded worldwide in response to the Global Financial Crisis of 2008 (see Gourinchas and Obstfeld, 2012). As many advanced countries faced deep and protracted recessions, the unprecedented world trade collapse in 2009 was seen as an additional threat to the recovery of economic activity raising concerns about spillover effects (see Montinari and Stracca, 2016). An important lesson from this episode is that any tentative assessment of the aftermath of financial crises requires to account for their direct impact on real output given countries' peculiarities and economic linkages.

From this perspective, our paper aims to provide additional pieces of empirical evidence on the importance of indirect effects channeled through growth from trade partners when countries are subject to a financial shock. We do this by proposing an original way to handle the omitted variable bias potentially arising from Cerra and Saxena's (2008) econometric approach. It has become common practice to assess the severity of the real consequences of financial crises in the medium run by computing the impulse response functions of output growth in a single-equation setting (Abiad et al., 2014, 2015; Bussière et al., 2012; Furceri and Mourougane, 2012; Furceri and Zdzienicka, 2012). There is growing support for a significant influence of external macroeconomic conditions on the aftermath of the Global Financial Crisis (Tsangarides, 2012 ; Feldkircher, 2014).

Due to different views on the role played by foreign trade in the aftermath of financial crises, our work is related to various strands of the existing literature. On the one hand, countries may recover more rapidly from a financial crisis if domestic firms can export more goods or new varieties. Foreign demand may then stimulate domestic activity in the depressed economy. In particular, a collapsing regime of fixed exchange rates can lead to a huge depreciation of the domestic currency that benefits the coun-

try's export sector. Such a positive impact on the aftermath of a currency crisis has been well documented by Hong and Tornell (2005) and Ma and Cheng (2005). However, this influence of economic conditions on foreign trade partners during the 2008 crisis is not convincing, according to Rose and Spiegel (2011). On the other hand, a financial crisis occurring in a given country may spread to its foreign trade partners in various ways. When a currency crisis occurs, neighbour countries may engage in self-defeating competitive devaluations that may discourage trade flows and depress economic activity (Corsetti et al., 2000). Negative cross-border spillover effects can make financial crises worse in terms of output losses than they would have been in their absence.

On the opposite side, the idea that trade propagates shocks is supported by Abeyasinghe and Forbes (2005) and Fidrmuc and Korhonen (2010). These authors point towards a greater synchronization of recession shocks in the presence of stronger trade ties. Haile and Pozo (2008) support this view in the case of currency crises. Feldkircher (2014) concludes that trade openness has amplified rather than mitigated the depressive impact of the 2008 systemic banking crisis on the real economy. All these empirical findings support the idea that the trade channel may act as transmitting stress globally. Finally, international trade can boost recovery in countries facing a currency crisis because foreign demand acts as a pull factor of domestic activity. Tsangarides (2012) finds that a one per cent acceleration of output growth abroad implies a two per cent rise in growth at home.

Financial crises are also likely to affect trade flows through two main channels depending on their effects on supply or on demand. On the production side, a credit crunch may occur due to bank deleveraging and a greater reluctance among financial intermediaries. That credit channel is often magnified on trade finance because, compared to domestic-oriented activities, foreign-oriented ones are subject to greater risks (Love et al., 2007), higher sunk costs of entry (Campa, 2004), and more stringent financial constraints (Manova et al., 2015). This is consistent with Rajan and Zingales' (1998) idea. Deleveraging by distressed banks and export-oriented firms may well magnify the impact of troubled financial conditions on international trade flows.

On the demand side, the post-crisis economic slump may lead to a fall in the aggregate demand that deters trade flows. A given country can then suffer from a banking crisis occurring abroad when it is followed by a substantial decline in import demand from its partners. By contrast, domestic exports may either rise or fall depending on whether the banking crisis is twinned with a strong depreciation of the domestic currency. At the firm level, Amiti and Weinstein (2011) show how Japanese exporters suffered from a major squeeze in credit by domestic banks in the 1990s. Chor and Manova (2012) conclude that the rising cost of financing from September 2008 to August 2009 depressed US imports by 5.5 percent. Bricongne et al. (2012) find that French exporters more dependent on external funds were more adversely hit during the Global Financial Crisis. In addition, the risk of default increases with the delay in shipping goods abroad, thus making the contraction of foreign trade that follows a financial crisis more severe (see Berman et al., 2013). Using an augmented gravity regression equation and considering 179 financial crisis episodes, Abiad et al (2014) show that the persistent fall in imports below their gravity-predicted levels contrasts with the small and transitory reduction in exports.

Therefore, it is useful to know more about the spillover effects arising from trade links on economic activity in crisis times. Does this external channel dampen or deepen the domestic recession and does it foster or lengthen the subsequent recovery? To answer this, we propose here an extension to Cerra and Saxena's (2008) method by considering the specific contribution of foreign growth. An equation-by-equation strategy is no longer relevant when constraints from third-party growth are included as a potential spillover effect across countries. This motivates a Seemingly Unrelated Regression Equation estimator. We run Monte Carlo simulations of the resulting impulse response functions of real output to a financial shock in each country. The estimated responses are also aggregated to control for other possible influential factors. We run estimations for 49 countries from 1978 to 2011. The results emphasize the ambiguous impact of the weighted-trade partners' growth rate of one's country (or a group of them) on the post-crisis dynamics of real activity. The magnitude of the trade channel and the way it operates depend crucially on regional and national features. The estimated GDP

responses are also sensitive to the source of financial disruption.

The paper is organized as follows. Section 2 describes our dataset and our empirical strategy. Section 3 discusses our main findings. Section 4 concludes.

2. Methodology

In this section, we first describe our sample of financial crises. We then show how Cerra and Saxena's (2008) univariate setting has to be refined in order to account for cross-border spillovers among trade partners.

2.1. *Dating financial crises*

We focus on three types of financial crises: currency crashes, systemic banking failures, and defaults on sovereign debt. Several methods have been proposed for dating financial crisis events. We consider here two major datasets.

On the one hand, we build on the detailed compilation of currency and sovereign debt crises made by Gourinchas and Obstfeld (2012). In a developing country, a crisis is thought to occur when Frankel and Rose's (1996) criteria are met: (i) a nominal depreciation of the local currency vis-a-vis the US dollar of at least 25 percent in a given year that (ii) corresponds to at least a 10 percent depreciation compared to the previous year.

In an advanced country, a currency crisis is based on two sets of criteria defined by Bordo et al. (2001): (i) a change in parity, a switch to greater floating or an international rescue package or (ii) an index of exchange market pressure.

Episodes of sovereign defaults rely essentially on the historical record of Reinhart and Rogoff (2009). In our sample, we make no differences between internal and external debt defaults. A crisis occurs when lenders incur substantial losses from the non-payment, repudiation, or restructuring of debt. A default event occurs as soon as a sovereign: (i) does not honour its payments of principal or interest on the due date (or after a grace period); (ii) decides to freeze bank deposits or convert US dollar deposits to local currency (in case of internal default); (iii) reaches an agreement on a debt

Table 1. Number of crisis events (cumulated by country group and year, 1978–2011)

	Currency crises (1)	Systemic banking (2)	Sovereign default (3)	Financial	Twin	Sum (1+2+3)
All countries	166 (56.85)	85 (29.11)	41 (14.04)	232	26	292
Advanced group	57 (63.33)	31 (34.44)	2 (2.22)	84	4	90
Developing group	109 (53.96)	54 (26.73)	39 (19.31)	148	22	202
Europe	56 (65.88)	26 (30.59)	3 (3.53)	76	6	85
Non euro	31 (65.96)	15 (31.91)	1 (2.13)	40	4	47
Euro	25 (65.79)	11 (28.95)	2 (5.26)	36	2	38
Asia & the Pacific	27 (64.29)	13 (30.95)	2 (4.76)	35	2	42
Developing	17 (60.71)	9 (32.14)	2 (7.14)	22	2	28
Advanced	10 (71.43)	4 (28.57)	0 (0.00)	13	0	14
Americas	66 (28.70)	37 (48.53)	33 (27.21)	97	15	136
Developing	65 (49.62)	33 (25.19)	33 (25.19)	92	15	131
Advanced	1 (20.00)	4 (80.00)	0 (0.00)	5	0	5

Figures in parentheses are shares of total (by row). The *Financial* dummy equals one if the country is faced to a currency crisis or a banking crisis. Variable *Twin* is equal to one if a currency crisis occurs in year t or $t-1$ and a banking crisis occurs in t or $t-1$.

rescheduling that is less favorable for creditors than the initial terms.

Consistently with Laeven and Valencia (2013), a banking crisis becomes systemic if a country experiences significant bank runs or losses in its banking system and/or bank liquidations that call for significant banking policy measures. Policy interventions in the banking sector are found to be significant if at least three of the following six measures have been used: (i) an extensive liquidity support of more than 5 percent of deposits and liabilities to nonresidents; (ii) a bank restructuring gross costs of at least 3 percent of GDP; (iii) significant bank nationalizations; (iv) significant guarantees put in place; (v) asset purchases equal to 5 percent of GDP or more; (vi) deposit freezes and/or bank holidays.

According to Table 1 and Figure 1, the recorded crisis events imply a currency collapse in 56 percent of cases, a banking crisis in another 29 percent of occurrences, and a sovereign default in the remaining 14 percent of them. Over the period 1978-2011, all countries in our sample¹ faced at least two financial crises and seven of them – Argentina, Bolivia, Brazil, Ecuador, Peru, Turkey and Venezuela – faced at least ten financial shocks.

Furthermore, one-third of financial crises (currency and/or banking) concerns advanced countries and only 5% concern sovereign default (the Netherlands in 1983 and Belgium-Luxemburg in 1989). In the European countries, currency and banking crises are slightly more frequent outside the euro area than inside it. In contrast, euro mem-

¹The list of countries is given by the Table A1 in Appendix.

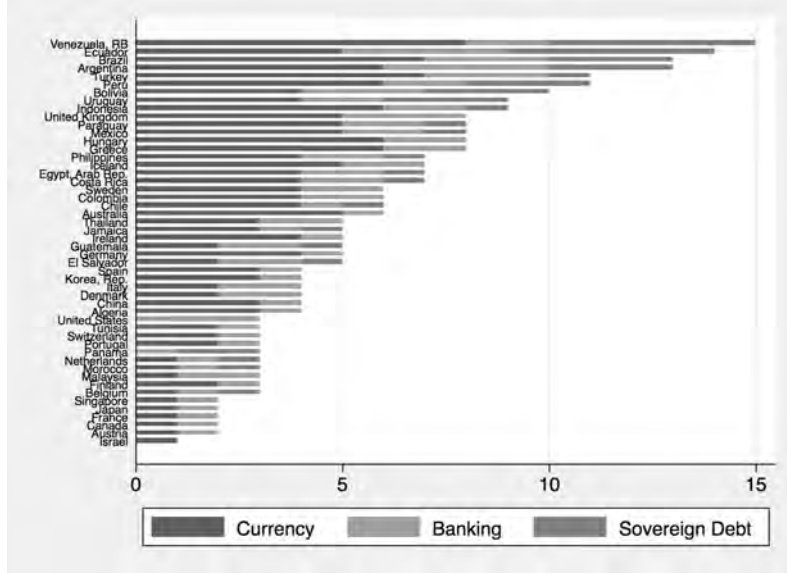


Figure 1. Currency, banking and sovereign debt crises (by country, 1978-2011)

bers are more subject to sovereign defaults than non-euro economies. Not surprisingly, there is greater financial instability in the emerging market economies in South and Central Americas than in the advanced countries (i.e., Canada and the United States); most of (if not all) the crisis events are concentrated in the former economies, as Table 1 shows. There is a similar picture in the Asian region, though the level of development seems to play a less decisive role than in the Americas.

2.2. Building impulse response functions à la Cerra-Saxena including spillovers

Our aim is to assess empirically the impact of financial crises on output in the medium run. We rely here on the single-equation framework with fixed country and temporal effects initially proposed by Cerra and Saxena (2008). They compute impulse response functions of real output on the basis of the dynamic specification given by:

$$g_{i,t} = \alpha_i + \lambda_i t + \sum_{p=1}^4 \beta_p g_{i,t-p} + \sum_{r=0}^4 \delta_r D_{i,t-r} + u_{i,t} \quad (1)$$

where g is the monthly growth rate of GDP, and D_i is a dummy variable that is equal

to 1 at the start of a financial crisis. Parameters α_i and λ_i are the country fixed effect and the time effect respectively, and $u_{i,t}$ is the error term. This way of estimating the real impact of financial crises has become popular in the literature (Furceri and Mourougane, 2012, Furceri and Zdzienicka, 2012, Bussière et al., 2012, among others). One potential drawback is that such a specification may be subject to an omitted variable bias, as claimed by Teulings and Zubanov (2014). However, relying on local projections as these authors do may well give unreliable estimates in small samples (Kilian and Kim, 2011). For this reason, and to address the specification bias, we consider an augmented version of Cerra and Saxena's (2008) dynamic setting in the following way:

$$g_{i,t} = \alpha_i + \lambda_i t + \sum_{p=1}^4 \beta_{i,p} g_{i,t-p} + \sum_{q=0}^4 \gamma_{i,q} g_{i,t-q}^{partners} + \sum_{r=0}^4 \delta_{i,r} D_{i,t-r} + u_{i,t} \quad (2)$$

where $g^{partners}$ is the sum of the growth rates weighted by export shares.

$$g_{i,t}^{partners} = \sum_{j \neq i}^{24} \omega_{ij,t} g_{j,t}$$

Inspired by Furceri and Mourougane (2012), our study takes a different path by distinguishing the crisis origins and accounting not only for trade openness but also for mutual dependences arising from economic growth in any domestic economy and its trading partners. As a consequence, our econometric model cannot be estimated by standard dynamic panel techniques.

The latter equation is estimated on a balanced panel of annual observations from 1978 to 2011 for 49 OECD and non-OECD economies. Bilateral trade data come from the UN-COMTRADE data base and rates of economic growth are based on PPP GDP data from the Penn World Tables and the IMF-World Economic Outlook. Financial shocks are coded with dummy variables with unit values in the starting year of a given episode in one country (see subsection 2.1).

Impulse response functions (IRFs) are obtained by simulating a once-for-all shock on the crisis dummy. The above system of regression equations has been simulated 20,000 times using a Monte Carlo procedure based on the random Wishart law. Given equation 2 above, the shape of these response functions depends on the value of the $\beta_{i,p}$, $\gamma_{i,q}$, and $\delta_{i,r}$ parameters. They measure the influence of past realizations of potential output growth, of trade-weighted foreign demand, and of the financial crisis dummy, respectively.

To disentangle the role of trade links through foreign demand, we build two sets of IRFs. First, we consider the basic specification initially proposed by Cerra and Saxena (2008). This can be done by putting a zero restriction on all $\gamma_{i,q}$ parameters in formula 2. Thus, second round effects through trade-weighted foreign growth are disregarded. Second, the IRFs are computed on the basis of the full specification above. The comparison between the two resulting sets of responses allows one to identify the contribution of international trade through a third-party growth effect on the incurred loss of activity in a given country (or a set of economies).

3. International linkages through trade in crisis times

We first discuss our main results according to various country groupings and given the various origins of financial stress. Next we question the robustness of the contribution of third-party growth to the post-crisis output dynamics given the countries' structural features.

3.1. *Main findings*

We first describe the trade channel during financial crises accross regions and then we take into account the origins of financial crises. Figures 2 give the Impulse Response Functions (IRFs) of a financial crisis without (grey line) and with (black line) foreign growth contribution for the advanced and the developing countries.

Table 2 reports the ratio between the instantaneous responses of output to a financial shock depending on whether foreign demand from the country's trade partners

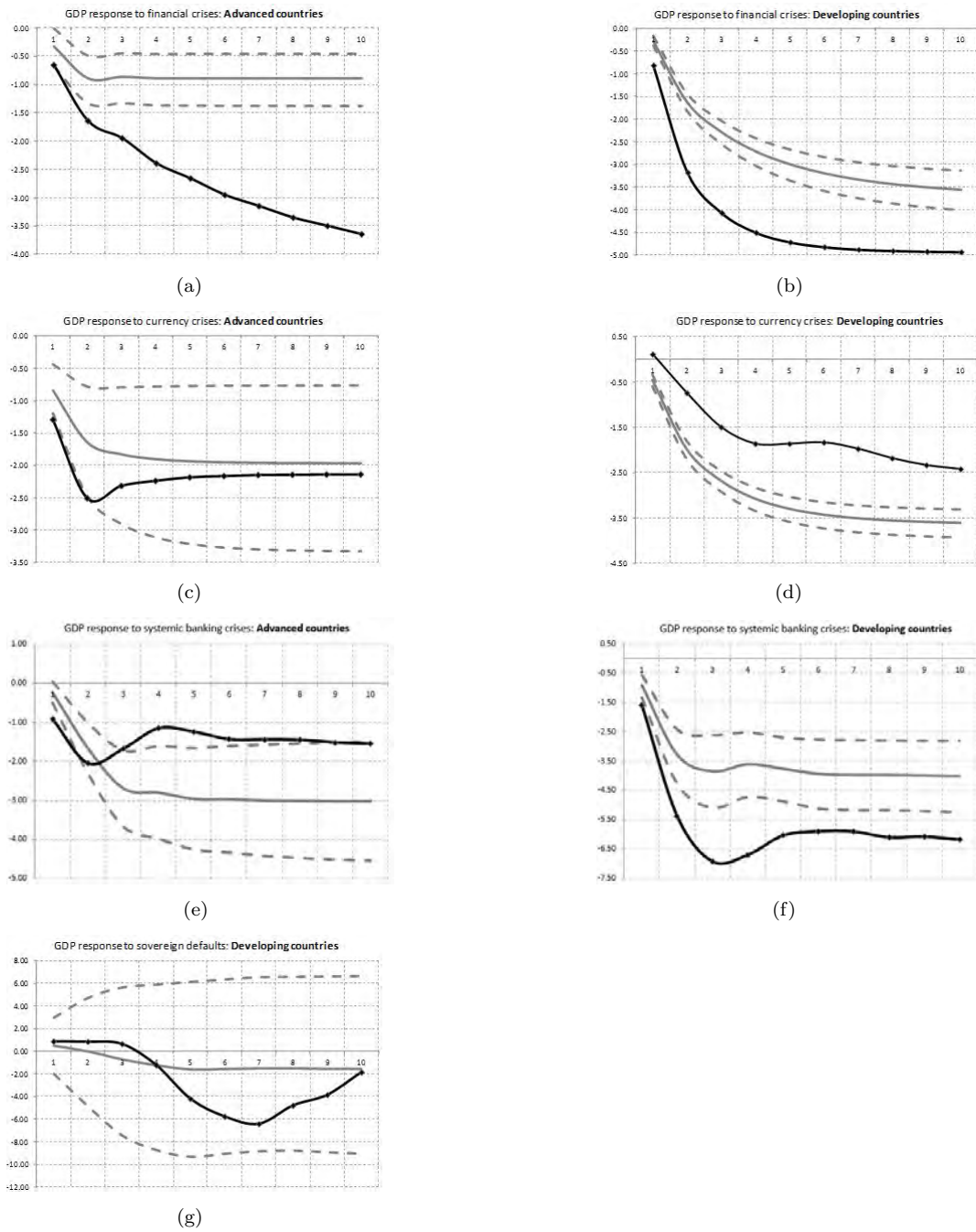


Figure 2. IRFs of a financial crisis without (grey line) and with (black line) trade effects. Dotted lines represent the 95 percent confidence interval.

Table 2. Growth contribution of trade partners (output response on impact, in %)

	Currency crises	Systemic Banking	Sovereign defaults	All types
Advanced group	53.7	280.5		101.4
Developing group	-125.2	73.9	91.7	196.2
Americas	-98.9	167.5	32.8	78.4
Asia & the Pacific	61.6	144.6		129.0
<i>Advanced</i>	80.7	326.4		55.6
<i>Developing</i>	-333.8	78.0	48.8	-1035.9
Europe	-67.2	647.8		-13.4
<i>Euro</i>	-224.5	108.5		149.5
<i>Non-euro</i>	-78.8	1444.7		-26.2
North Africa	-47.4	140.5	112.9	78.8

Column 'All types' means the occurrence of a currency and/or a systemic banking and/or a sovereign debt crisis.

Table 3. Growth contribution of trade partners (output response after 10 years, in %)

	Currency crises	Systemic banking	Sovereign defaults	All types
Advanced group	8.9	-48.8		310.0
Developing group	-33.0	53.5	20.6	38.6
Americas	-52.2	-44.0	35.7	250.2
Asia & the Pacific	47.3	23.9		2.8
<i>Advanced</i>	76.6	9.3		-25.2
<i>Developing</i>	-10.4	46.0	53.2	31.8
Europe	-89.4	-7.8		96.8
<i>Euro</i>	-232.1	-106.1		1294.5
<i>Non-euro</i>	-74.2	25.3		-49.1
North Africa	-1877.5	-82.3	672.2	-211.8

Column 'All types' means the occurrence of a currency and/or a systemic banking and/or a sovereign debt crisis.

is accounted for. Another comparison on the same grounds is provided in Table 3 on a ten-year horizon. This is a way to assess the real consequences of a financial disturbance in the medium-long run.

The post-crisis dynamics of output appears to be sensitive to the influence of foreign demand from trade partners. Positive values indicate that trade tends to magnify the response (either negative or positive) of output to a financial crisis, whereas trade tends to dampen the output response when the reported estimates turn negative. Provided that the financial shock has a negative impact on output in the benchmark case, a positive value of the ratio means that an economy remaining open to foreign trade would further depress it. This second-round effect thus makes the financial crisis costlier for the concerned economy.

The third-party growth amplifies the instantaneous response of output to a financial shock, whatever the country's type. It happens regardless of the nature of the financial distress that induced it. The last column of Table 2, however, shows that the contagion

of the crisis through trade linkages is stronger in developing countries than in more advanced ones (three times and two times higher, respectively).

This situation changes markedly as the horizon lengthens. The magnification effect of the trade-weighted average of foreign growth is now considerably higher in the advanced economies than in their developing neighbours ten years after the financial crash. This can be seen at the aggregate level from the reported ratios in the last column of Table 3. This conclusion is supported again by the graphical representations of the cumulative responses of GDP growth to a financial shock when no distinction is made across financial crisis episodes (Figures 2.a and 2.b). Based on the 20,000 simulations, the two solid lines in Figure 2.a show that the gap between the mean response widens as time passes in the advanced group. The average long-run loss in the annual rate of output growth rises from less than 1 percent to roughly 3.6 percent as the result of an episode of financial distress and given the trade linkages (compare the grey solid line with the black one). By contrast, the difference between output dynamics in the developing economies under study tends to widen in the first four years following a financial crisis before reducing in the longer run. The corresponding fall in output growth in this second group goes from 3.5 percent on average annually in the benchmark case (see the black solid line in panel Figure 2.b) to almost 5 percent (grey solid line).

The contraction of foreign trade flows in response to a financial crisis can induce additional losses of domestic output. A fall in exports and/or imports can increase the economic cost of such a crisis. Abiad et al. (2014) provide empirical evidence that imports are more responsive than exports to both banking and debt crises. That reduction in imports comes from the intensive and the extensive margins: there is not only a reduction in the quantity of imports, but also a reduction in the varieties of imported goods. This is associated with greater variability of the real exchange rate, murky protectionism, and, when it comes, an impressive depreciation of the US dollar exchange rate of the local currency. The origin of the financial crisis does not play any role in the way external trade adjusts to it.

The observed discrepancies due to the trade channel within these two subsamples of

countries partly result from sharp differences across geographical areas. Let us first consider the case of the advanced economies. The behaviour of the European region explains most of the departure of the estimated average response of output growth to a financial crisis when accounting for trade links from the one obtained with Cerra and Saxena's (2008) benchmark specification. More precisely, the worsening of the post-crisis output dynamics is observed only in the euro area (see figure 1.f provided as supplementary material): output falls by nearly 8 percent due to negative spillover effects from trading partners (red line). On the opposite side, non-euro countries seem to benefit from the growth of their trade partners during the aftermath of a financial crisis (supplementary fig 1.e). This difference between these two European regions can be explained by institutional factors such as the exchange rate regime. Recently, Tsangarides (2012) provided empirical support for the better resilience of floating, but developing, economies to the 2008 great financial crisis than those pegging their currency to a foreign currency.

Similar discrepancies can be observed on the other two main subgroups, i.e. the Americas and Asia and the Pacific. At the aggregate level, first, trade relationships matter for assessing losses in economic activity immediately following a financial crisis, regardless of its origin. In Table 2, the magnification effect of foreign demand from trade partners is at least fifty percent higher in the Asian economies than in the American ones (see also figures 1.c and 1.b provided as supplementary material).

Again, the picture changes with the length of the time horizon. If we now look at the estimated trade effect over a decade reported in Table 3, the GDP growth of a country's trade partners has virtually no influence on the post-crisis losses of activity in the Asian region. Meanwhile the same effect almost doubles in the Americas as the fall in GDP growth deepens by 250 percentage points.

Finally, a financial crisis seems to boost GDP growth on average in the North African economies in our sample, i.e. Algeria, Egypt, Morocco, and Tunisia (Supplementary Fig. 1.d).

We now discuss the influence of cross-border spillover effects through trade relationships in the context of various types of financial disturbances. We separately consider

the impact on the real economy of currency collapses, systemic banking failures, and sovereign debt defaults.

Currency crises

First, the trade channel may play a specific role when the (pegged) currency regime collapses in a given country. The response of output to a currency crisis displays peculiar patterns in both the short run and the long run. One striking feature from the comparison of the corresponding values in Table 2 is a strong reversal in the immediate response in the Americas, the euro area, and the North African economies. In these three regions, the GDP growth from the trade partners is now likely to moderate the economic recession in subsequent years to an exchange rate crisis. This is in line with Freund (2009), who notes that trade and output tend to recover simultaneously. According to the Figures 2.c and 2.d, foreign growth seems to be not significant to explain effects of currency crises for Advanced countries. However, trade reduces the negative impact of those crises for Developing countries in line with Hong and Tornell (2005).

The strongest reversal is observed amid euro members (see Fig. 3.f reported in the supplementary material), but it must be interpreted carefully. All currency crises in our sample occurred years before the inception of the single currency. Most of them took the form of parity realignments under the Exchange Rate Mechanism. In this context, a sizable depreciation of the local currency is expected to stimulate domestic production as price-competitiveness and foreign demand increase. Though external growth from trade partners also helps the non-euro countries withstand a currency collapse in both the short run and longer run (see again the former two tables together with supplementary figure 3.e), this region is subject to a rather persistent but limited economic recession. Its magnitude is four times lower than what is revealed by estimates of the benchmark specification.

Another issue arises as the role of trade partner growth differs across members of the European monetary union. Trade seems to amplify the real consequences of a currency crisis in Belgium-Luxembourg and the Netherlands, two of the European

countries most open to international trade. Instead, it dampens post-crisis recessions in the remaining eight founders of the euro (including Greece). Divergence in the GDP responses to a financial shock should be a matter of concern for a monetary union with a high degree of trade integration.

Concerning the Americas, currency collapses are observed only in the developing countries over 1978–2011 (Table 1). GDP losses are smaller in response to a currency crisis when the trade-weighted economic growth abroad is taken into account. Unlike the euro area, the American economies benefit more from trade links over short horizons than longer ones: the relative contribution of the trade channel shrinks (in absolute value) from nearly 100 percent on impact to 50 percent over a decade. The corresponding IRF pictured in Figure 3.c shows that, following a currency crisis, GDP growth *per annum* is reduced by 5 percent on average over a decade in the baseline case, whereas the estimated multiplier amounts to 2 percent when foreign trade links are in play. Our findings differ from Bussière et al.’s (2012) because they investigate the incidence of currency collapses on potential output whereas we consider actual growth. According to these authors, potential output tends to improve from 5 to 7 percent after a currency collapse, which compensates for losses during the crisis build-up amounting to 2 to 6 percent. Unlike these authors, it is hard to conclude that a currency collapse implies either a deeper negative impact or a stronger recovery of output in the Latin American region than elsewhere.

Perhaps more surprising is the radical change in the GDP dynamics in response to a currency crisis in the North African economies under study. There is a statistically significant and impressive positive contribution of trade-weighted third-party growth to the GDP trend over the decade that follows a currency crisis. Observing Fig. 3.d in the supplementary material, post-crisis GDP growth accelerates up to 8 percent annually on average for the whole region. This contrasts with the moderate though protracted recession in the same area when positive trade spillovers are neglected. Again, Tables 2 and 3 show that, in this region too, the adjustment of the real economy to an exchange rate crisis differs from one country to another.

Trade spillover effects become positive when the developing Asian economies are sub-

ject to a currency collapse (see supplementary Fig.4.b). As opposed to undistinguished financial crises (see supplementary Fig. 2.b), international trade does not make the recession more severe than it would have been otherwise (i.e., when parameters $\gamma_{i,q}$ are constrained to be zero in the regression equation 2 above). Finally, the trade channel is considerably weakened in the subset of advanced Asian countries facing currency crises only. Supplementary Figure 4.a shows that it makes almost no difference to consider the full specification or the benchmark case in the medium run at the five-percent level of risk.

Specific regional features of the real consequences of currency collapses are already found by Bussière et al. (2012) in developing economies. One explanation may lie in the intensity of currency crashes that are, on average, twenty percent higher in African countries than in their Asian neighbours. These differences in the size of the shock are likely to reflect greater economic imbalances in the former than in the latter countries. In line with the authors' conclusions, we also find that recession in the Latin American economies is most severe among those three regions. However, these economic losses do not appear short-lived given our estimated impulse response functions.

Systemic banking crises

Let us next consider the role played by the trade channel during the aftermath of a systemic banking crisis. Unlike currency crises, systemic events imply international contagion through trade on impact. The economic recession deepens in the first two or three years in all regions (Advanced and Developing ones). In contrast to the findings of Cerra and Saxena (2008), one would conclude that systemic banking crises are as costly for advanced countries as they are for the developing world. This equivalence does not hold if one considers the indirect impact of trade-weighted foreign growth on the post-crisis GDP dynamics. The recession widens by nearly half relative to its benchmark level so that it reaches a trough at 7% in the developing economies.

The negative contribution of trade to domestic activity does not always last the whole decade following systemic distress in the financial sector. For example, in the advanced countries, a sharp economic rebound can be observed in the euro area (see

supplementary Fig. 5.f) that translates only partially to the whole European region (see supplementary Fig. 5.a). Banking crises would not entail permanent losses in output in the euro countries. By contrast, the European countries outside the monetary union still suffer from deep and long-lasting output losses when cross-border effects through trade are explicitly accounted for (see supplementary Fig. 5.e). GDP falls by at least 3.5 percentage points when a systemic event occurs. Negative spillovers from abroad on domestic activity deepens the post-crisis recession to an additional loss of 0.5 percent.

There has been substantial heterogeneity between European countries regarding the contribution of trade linkages to the severity of the Global Financial Crisis of 2008. This is the main conclusion drawn by Cuaresma and Feldkircher (2012). They show that strong links with the US economy through imports, as through exports, aggravated the recession in the New Member States while they had almost no influence on their advanced European neighbours.

The results for the Asian group also mask important differences between the corresponding developing and advanced members. The idea of trade contagion receives some support in the Asian developing group. On the opposite side, that trade-spillover effect is very hard to distinguished the advanced group. Developing American countries exhibit specific patterns because they do not conform with the Americas as a whole (compare supplementary Fig. 6.c with supplementary Fig. 5.c). Systemic events are followed by a moderate recession compared with the fall in GDP in developing Asia. In North Africa, systemic banking events are no more persistently costly when trade-growth is accounted for (see supplementary Fig. 5.d).

As Cuaresma and Feldkircher (2012) do, Goldstein and Xie (2009) assess the importance of trade patterns in the transmission of the exposure of Asian economies to the Global Financial Crisis of 2008 (see supplementary Figures 6.a and 6.b). In their view, trade could have fueled the crisis in Asia for three reasons: first, the exposure of the region's exports to the advanced world increased over the prior two decades, especially in industrial products; second, Asian countries have become closer trade partners with one another than before; and third, economic growth is still led by their export sec-

tor. Unlike the last two factors, Goldstein and Xie (*op. cit*) remain doubtful about a decisive influence of trade exposure.

However, their conclusion does not match the recent empirical evidence provided by Almansour et al. (2014). Stronger external demand has a lasting positive effect on emerging markets' growth. In particular, a one-percentage point increase in U.S. real GDP boosts emerging markets' growth by 0.3 percentage points on impact. The incremental effects remain positive for six quarters, and the cumulative effects remain positive more than one to two years. Positive spillovers on growth in developing economies are also transmitted through better terms of trade after the 2008 financial crisis than before. The impact tends to be stronger for economies that trade relatively more with advanced economies, though there are exceptions such as Turkey.

The exposure of developing countries to trade with advanced economies, i.e. the US and the euro area together, did play a role in the aftermath of the 2008 crisis as trade linkages across the major emerging countries did. Developing countries should thus worry about negative trade spillovers from the euro area. Two additional factors seem to have an increasing influence: trade diversification towards China and vertical integration boosting global value chains. According to Almansour et al. (2014), these new sources of trade channel may well mitigate other negative external factors or else be at the origin of or amplify cross-border spillovers in case of an adverse financial shock.

Cerra et al. (2013) provide empirical evidence on the negative influence of foreign trade during recovery from a banking crisis. In their view, such a result may not be surprising because fiscal policy is less effective in stimulating output in countries that are more open to trade. Unlike these authors, we do not focus exclusively on the year of recovery, i.e. the first year of positive growth after the recession trough. Our empirical evidence extends theirs in the sense that trade openness may not only jeopardize the economic rebound but it also leads to a more protracted recession. According to the former authors, trade and capital account openness help advanced countries recover from banking crises. This positive impact contrasts with the less effective role of floating exchange rates in the advanced economies. As Tsangarides (2012) does,

Cerra et al. (2013) find that developing countries adopting a floating currency regime tend to recover faster and better from a banking crisis.

Moving towards greater trade openness seems to have hastened economic recoveries in developing economies, as shown by Abiad et al. (2015). However, this positive contribution of greater trade links appears statistically significant only during the pre-1990 period. The authors contend that trade integration may have had an ambiguous impact on the resilience of developing economies. On one hand, there is less dependence on domestic demand and less vulnerability to internal shocks such as banking crises. On the other hand, open economies are becoming more subject to external shocks to their major trading partners. The authors further show that episodes of bank distress contribute to ending a phase of expansion, but they do not specifically discuss the role played by foreign trade relationships during the economic aftermath of such financial crises.

Sovereign debt crises

To end the discussion, one should note the specific influence of trade-weighted foreign growth when a country is subject to a sovereign debt default. Developing countries, regardless of their geographical area, are less responsive to a default than they are to an undefined financial crisis. This dampening effect can be observed in Tables 2 and 3. Cross-border spillovers in GDP dynamics through the trade channel tend to vanish despite substantial departures from the estimated mean value of response in the medium run (see Fig. 2.g). This is also reflected in the wide confidence interval that signals much greater uncertainty from our Monte Carlo simulations: the crisis impact on the annual GDP growth now varies from negative 9 to positive 6 percent. Sovereign debt crises are costlier to export-oriented industries, according Borenzstein and Panizza's (2010) estimates. These authors show, however, that these effects are short-lived when endogeneity is accounted for. They explain this finding by the fall in trade credit from 35 percent in the first year to nearly one half in the first four years on average following an episode of default. This results in the loss of confidence by financial institutions and foreign investors, which makes them more reluctant to

provide credit to exporting firms. As an alternative view, creditors might retaliate. All in all, our results broadly support Cerra et al.'s (2013) idea that trade partner growth helps economies recover from financial crises. This is also consistent with the empirical findings of Furceri and Zdzienicka (2012). Trade openness, measured by the share of exports and imports in GDP, has a significantly positive influence on the post-crisis GDP growth in a defaulted country. Moreover, the positive trade channel appears robust to alternative endogeneity issue on crisis dating, to the exclusion of twinned debt and banking crises, and to additional control factors. According to the preceding authors, there are some threshold effects suggesting a nonlinear relationship between potential growth and its determinants during the recovery period, a feature that is disregarded here.

3.2. *Robustness check*

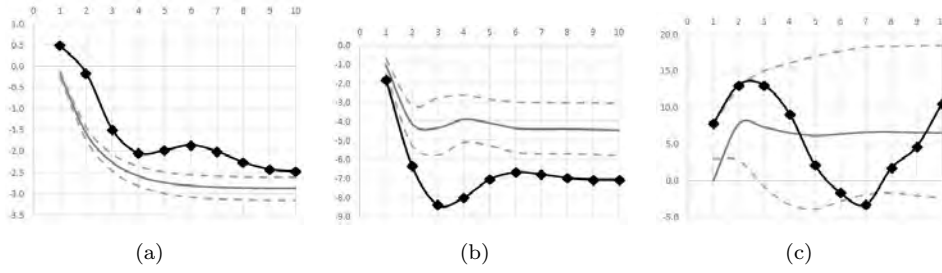
The contribution of economic growth in trade partner countries to the aftermath of a financial crisis may also depend on other structural features. Among them, we address here the degree of financial liberalization, the income level per capita and the degree of foreign exchange rate flexibility (Figures 3 to 5) below.

Countries with high or low income per capita

As a first robustness check, we account for the initial ranking of countries in our sample in terms of per capita income expressed in PPP adjusted US dollars. Given the uneven convergence process (if any), this way of splitting countries may differ somewhat from the World Bank's classification in 2013, which we considered initially to distinguish Advanced from Developing countries. Figures 3a-f distinguish the low income group from the high income one depending on whether a country's per capita gross income is below or above the median value of the 191 countries for which data were available in the IMF Economic Outlook database.

The foreign component tend to mitigate output losses in the low-income group when countries face a currency collapse (compare the solid black line with diamonds with the grey solid one where the foreign part is omitted). The same economies incur

Low income



High income

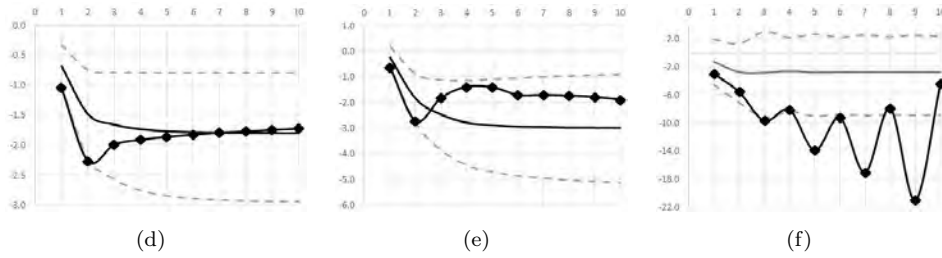


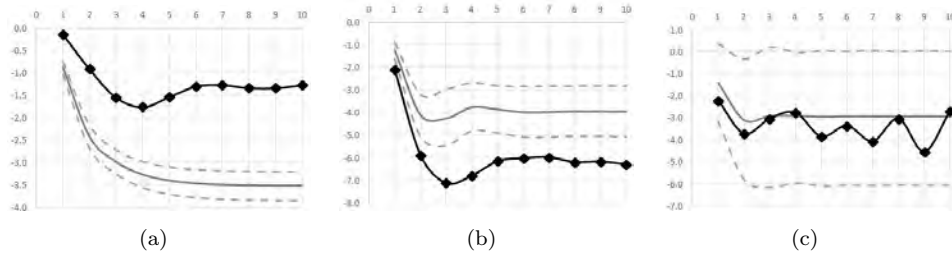
Figure 3. IRFs of a financial crisis without (grey line) and with (black line) trade effects in the context of currency crises (left), banking crises (center) and debt crises (right). Dotted lines represent the 95 percent confidence interval. Low/high income ranking according to the 2010 data.

higher costs in case of banking crises when trade links are accounted for. This external channel also amplifies output losses when high-income economies are threatened by a sovereign debt crisis. In that case, trade-weighted foreign growth leads to higher economic losses with greater variability than otherwise. This would favor the pessimistic view held by authors such as Abeyasinghe and Forbes (2005), Fidrmuc and Korhonen (2010), and Haile and Pozo (2008). Our findings are also consistent with Borenzstein and Panizza (2010) because the importance of the export-oriented sector in a country grows with its average level of per capita income.

Financially closed or opened countries

A second check leads us to account for the extent of financial interdependencies. Financial openness is measured with Chinn and Ito's (2006) index. We build a dichotomous variable as follows: a country appears financially closed if the corresponding index is below 0.5 and thus takes value 0. Otherwise, it is assumed to be relatively open to cross-border capital flows and the corresponding dummy variable equals one. The estimated impulse response functions are gathered according to the countries' status

Financially closed



Financially opened

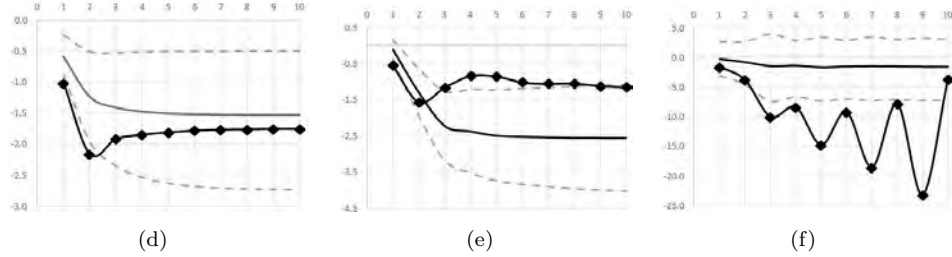


Figure 4. IRFs of a financial crisis without (grey line) and with (black line) trade effects in the context of currency crises (left), banking crises (center) and debt crises (right). Dotted lines represent the 95 percent confidence interval. Closed/opened economies classification according to the 2010 data.

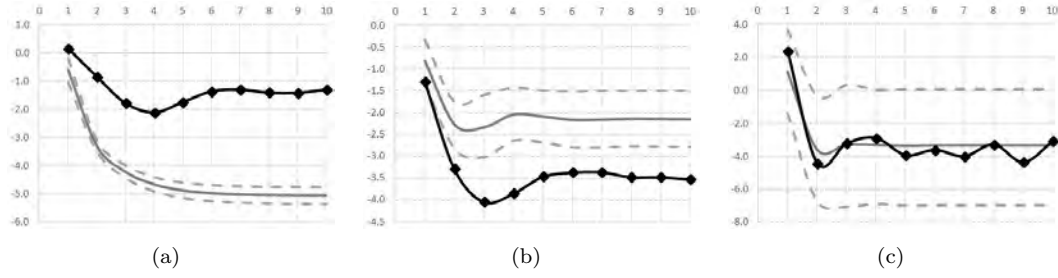
in terms of financial closeness. Endogeneity may be at issue again because countries, especially developing ones, are prone to put more restrictions on short-term capital movements in order to limit domestic financial vulnerability and to avoid a sudden-stop. We address this issue by considering the degree of liberalization of countries' capital account over three decades (1980–2010).

As one can observe from Figures 4a-f, the trade-weighted foreign growth channel tends to mitigate economic losses in the event of a collapse of its exchange rate or a banking panic in economies that restrict capital flows. However the stimulus of economic growth in the country's main trade partners loses nearly all of its influence in the aftermath when the economy is open to foreign capital flows. There is no similar pattern across countries subject to sovereign debt crises that kept restrictions on international capital movements. This finding contrasts again with the pattern observed in financially open economies.

Currency pegs or floats

As a third and final check, we discuss the role played by the exchange rate regime

Pegs



Floats

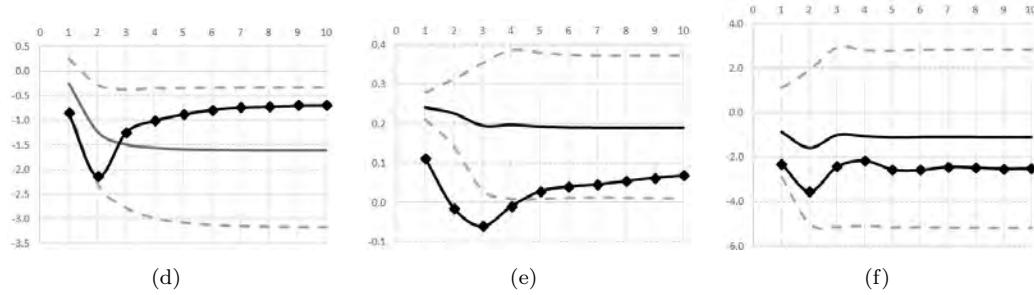


Figure 5. IRFs of a financial crisis without (grey line) and with (black line) trade effects in the context of currency crises (left), banking crises (center) and debt crises (right). Dotted lines represent the 95 percent confidence interval. Pegs/floats classification according to the 2010 data.

during crisis times. To this end, we build an annual chronology on the basis of Klein and Shambaugh’s (2008) monthly database of *de facto* currency arrangements for the 49 countries in our sample spanning from 1978 to 2011. We build a dichotomous variable on an annual frequency in the following way: a fixed exchange rate system prevails if the Klein–Shambaugh index is equal to 3 or less, so that the corresponding dummy variable equals one. Otherwise, a currency floating regime is supposed to be at play and the dummy switches to zero.

The contribution of trading partners’ economic growth to the recovery of a given country seems to have evolved over time (see Figures 5a-f).

According the 2010 classification, trade relationships help reduce output losses from 5 to 1 per cent in the subsequent decade among countries pegging their currency to an external anchor. The subsequent recession is half as severe, and the economic rebound is stronger and comes faster than when these external interdependencies are omitted (compare again the solid black and grey lines). This is consistent with Hong and Tor-nell’s (2005) findings. The strength of recovery depends on the ability of domestic firms

to solve their impaired financial situation and on the vigorousness of foreign demand to boost their exports. Such a positive impact on the resilience to currency crashes is not observed among floaters. Conclusions are diametrically reversed as one focuses on the 1980 bipolar classification of exchange rate regimes. Countries with relatively flexible exchange rate systems cope better with currency turmoil when their external dependence through trade is accounted for than when it is not. The corresponding figure shows that a currency collapse has a positive rather than a negative impact on the domestic real GDP. Countries under a currency peg regime do not exhibit the same resilience of economic activity.

Things look slightly different when countries witness banking crises. As one observes from the figures, the qualitative conclusions remain unchanged given the currency regimes in practice in 1980. In line with Feldkircher (2014), the external links through trade tend to magnify the post-crisis slowdown of GDP growth, regardless of the exchange rate regime at the end of our sample. This negative cross-border effect is stronger and more persistent in the former than in the latter case. This result is also in accordance with the negative impact of trade openness found by Furceri and Mourougane (2012) when no distinction is made across types of financial crises. All in all, the estimated impulse response functions support the idea of the better resilience of countries that let their currency float than those that target a declared parity. This finding is consistent with Tsangarides' (2012) conclusion, though it is unspecific to the Global Financial Crisis.

Finally, the choice of an exchange rate regime has no noticeable influence on the indirect impact of sovereign debt crises on GDP growth arising from trade relationships between countries. In all cases, the estimated impulse response functions look the same with a high (95 percent) level of confidence.

4. Conclusion

In this study, we have adapted the econometric specification of Cerra and Saxena (2008) to assess the real consequences of financial crises. Impulse response functions have been estimated using seemingly unrelated regression equations. This is an original framework to address cross-country dependencies arising from trade relationships. Our new approach allows a nice decomposition into the direct effects and the indirect effects weighted by trade links in the event of financial turmoil. Our econometric approach has been applied to a sample of annual data for 49 countries from 1978 to 2011. We have studied the real aftermath of 292 financial crises. Adding to Furceri and Mourougane (2012), we have distinguished here currency collapses, banking crises, and sovereign defaults and their potential cross-border spillover impact through trade with foreign partners.

First, we find substantial heterogeneity in terms of real output losses in the first years after a crisis event. The responses of output also follow contrasting paths in the medium run. It is observed at a country level and across regions when we aggregate these individual effects. All these findings are consistent with previous empirical works. Second, an assessment of the aftermath of financial crises should consider cross-country indirect effects more carefully. Our estimates clearly show their decisive influence on the resulting recessions and recoveries resulting from financial shocks. The impulse response functions cause sustained foreign demand from trade partners to dampen the negative impact of financial shocks for 33 countries of the 49 in our sample. This impact appears statistically significant in most of the instances according to our simulations. Third and finally, we have checked the robustness of our empirical findings to various decompositions into country groups and types of financial crisis. The contribution of foreign output growth in the country's trading partners to the crisis' aftermath varies across geographical areas. It also depends on the level of development of countries that belong to them. In the case of currency crises, the results show that the foreign component mitigates output losses mainly for the low-income group, for financially closed economies and for countries with fixed exchange rates. For those countries and in the case of a banking crisis, the effects are markedly different: foreign growth magnifies

or at least has no impact on domestic growth.

An important lesson for policymakers is that cross-border spillover effects arising from trade relationships cannot be neglected during the aftermath of financial crises. In a majority of cases, economic growth abroad can limit the recession and speed the recovery of domestic activity in the threatened country. It would be interesting to extend our framework in order to account for the mutual dependency between the dynamics of trade and economic activity after a financial crisis. Collecting data on a larger set countries at a higher frequency would give a better idea of these issues. But a further problem lies in that the response of output growth to a financial shock also encompasses the policy reaction triggered by the crisis and its consequences on the real economy. Future works should disentangle the pure crisis effect from the policy response.

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Appendix A. Data

Table A1. List of countries

	America	Europe	Asia and Pacific	Africa
Emerging	Argentina	Hungary	China	Algeria
	Bolivia	Turkey	Indonesia	Egypt
	Brazil		Malaysia	Morocco
	Chile		Philippines	Tunisia
	Colombia		Thailand	
	Costa Rica			
	Equator			
	Guatemala			
	Jamaica			
	Mexico			
	Panama			
	Paraguay			
	Peru			
	Salvador			
	Uruguay			
Venezuela				
Advanced	Canada	Austria	Australia	
	United States	Belgium-Luxemburg	Japan	
		Denmark	Singapore	
		Finland	South Korea	
		France		
		Germany		
		Greece		
		Iceland		
		Ireland		
		Italy		
		Netherlands		
		Portugal		
		Spain		
	Sweden			
	Switzerland			
	United Kingdom			