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Bédhat Jean-Marc Atsebi, Jean-Louis Combes, Alexandru Minea

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### The trade costs of financial crises

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## **Abstract**

The “Great Trade Collapse” triggered by the 2008-09 crisis calls for a careful assessment of the trade costs of financial crises. Compared with the existing literature that mainly focuses on the total trade of goods and, in the context of the recent great recession, on manufacturing trade, we adopt a more detailed perspective by looking at the response of different types of trade (i.e. agricultural, mining, and manufactured goods, and services) following various types of financial crises (i.e. debt, banking, currency, and inflation crises). Estimations performed on the 1980-2014 period using a combination of impact assessment and local projections to capture a causal dynamic effect running from financial crises to the trade activity unveil the complex panorama of the trade costs of financial crises. Through illustrating the contribution of three sources that drive these complex effects, namely the type of financial crisis, the considered type of goods or services, and countries’ key structural characteristics, our analysis contributes to the general understanding of the trade effects of financial crises, and may provide insightful support for the design and implementation of policies aimed at coping with these effects.

## **Keywords**

Trade costs, Financial crises, Impact assessment, Local projections.

## **JEL Codes**

F14, F41, G01.

# 1 Introduction

The recent 2008-09 crisis can be qualified as the “Great Trade Collapse” due to its profound effects on international trade.<sup>1</sup> Indeed, according to the WTO and IMF, the drop in world trade flows (around 12% of world GDP in 2009) exceeded that of world GDP (about 5% in 2009). Given the worldwide benefits of trade,<sup>2</sup> this severe downturn brought back into the spotlight the issue of the trade costs of financial crises.

By adopting a macroeconomic perspective, most existing studies focus on gravity models estimated on data of bilateral trade of goods between countries. In a panel of 150 countries, [Rose \(2005\)](#) finds a negative effect of debt crises on the trade between a debtor (defaulting country) and its creditors (the countries affected by the default), a result extended by [Martinez and Sandleris \(2011\)](#) to all trading partners of a defaulting country (i.e. both creditors and non-creditors), and confirmed more recently by [Asonuma et al. \(2016\)](#) in a treatment effect analysis. Such a detrimental effect on trade is equally emphasized for banking crises by [Berman and Martin \(2012\)](#), while [Ma and Cheng \(2005\)](#) find that currency crises reduce (foster) imports (exports) in line with the predictions of standard international macro textbooks. Altogether, despite some exceptions,<sup>3</sup> there exists a fairly strong consensus on the detrimental consequences of financial crises at the macroeconomic level.

From a microeconomic perspective, most studies on trade and financial crises analyzed the recent “Great Trade Collapse” following the 2008-09 crisis. In a nutshell, these studies, see e.g. [Freund \(2009\)](#); [Iacovone and Zavaka \(2009\)](#); [Amiti and Weinstein \(2011\)](#); [Minetti and Zhu \(2011\)](#); [Chor and Manova \(2012\)](#) and [Manova \(2013\)](#), show that credit conditions (for example, financial development weakness) and trade credit (for example, external finance dependency) are the main channels through which financial crises decrease international trade. However, these results are mainly established by focusing on the recent period (i.e. from 2008 onwards; exceptions include [Borensztein and Panizza \(2010\)](#) and [Zymek \(2012\)](#) who restrict their analysis to debt crises exclusively), and on trade in the industry sector.<sup>4</sup>

Taking stock of the existing literature, the goal of our paper is to assess the trade costs of financial crises by adopting a granular perspective. Indeed, except for the aggregate trade of goods and trade in

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<sup>1</sup>[Baldwin \(2011\)](#) reports that global trade fell for at least three quarters only in three of the worldwide recessions that occurred between 1965 and 2008: the oil-shock recession of 1974-75, the inflation-defeating recession of 1982-83, and the Tech-Wreck recession of 2001-02. However, the “Great Trade Collapse” of 2008-09 is by far the largest trade collapse since the WWII.

<sup>2</sup>Early studies by [Dollar \(1992\)](#); [Sachs and Warner \(1995\)](#); [Edwards \(1998\)](#), and [Frankel and Romer \(1999\)](#) suggest that trade increases income, a result confirmed more recently by [Rodriguez and Rodrik \(1999\)](#) and [Feyrer \(2009a,b\)](#). In addition, international trade was also found to support overall and firms productivity or real consumption, and to reduce poverty (see e.g. [Bernard and Jensen, 1999](#); [Pavcnik, 2002](#); [Trefler, 2004](#); [Burststein and Cravino, 2015](#); [Edmond et al., 2015](#); [Johns et al., 2015](#)).

<sup>3</sup>In addition to the favorable effect of currency crises on exports previously emphasized (see, [Ma and Cheng, 2005](#)), [Abiad et al. \(2014\)](#) conclude that debt and banking crises do not significantly affect exports.

<sup>4</sup>For example, the descriptive analysis of the dynamics of trade in goods and services during the recent crisis of [Borchert and Mattoo \(2010\)](#) outlines that the focus on the trade of goods has obscured the quiet resilience of the trade of services.

manufactured goods, the literature has so far remained fairly silent regarding the patterns of trade in agricultural or mining goods, or services, following financial crises. Moreover, compared with the recent literature that mainly focuses on the 2008-09 crisis, we draw upon a wide sample of 99 countries over the period 1980-2014 to analyze the trade effects of several types of financial crises, namely 106 debt crises, 96 banking crises, 277 currency crises, and 123 inflation crises. To treat potential endogeneity issues and provide a dynamic view of the trade costs of financial crises, we employ a novel method that combines local projections *à la* Jordà (2005) and impact assessment with the Augmented Inverse Propensity Weighted estimator.

Our results are as follows. First, consistent with the existing literature, we find that aggregate exports and imports fall by 6 to 12 percentage points of 2010 real GDP cumulated in the five years following a financial crisis, with the notable exception of exports following currency crises.

Second, we go beyond existing studies, and disaggregate trade costs by type of goods and services. While we find that trade in manufactured goods drives the collapse of trade during financial crises, they leave unexplained between 8 and 55% of the drop of the total trade. A detailed look at the other types of goods and services reveals, however, important heterogeneities. For mining goods, inflation (debt and currency) crises trigger a significant decrease in exports and imports (imports). For services, all crises except inflation (debt and banking) crises significantly reduce exports (imports). For agricultural goods, debt (inflation) crises significantly increase exports and imports (imports). These results emphasize the importance of moving beyond aggregate measures of trade, and considering different types of crises when assessing their trade costs. On this last point, our analysis highlights that combined crises trigger significantly higher trade costs compared with single crises (i.e. taken separately). At the aggregated level, quadruple crises are associated with a decrease of exports (imports) of 22 (19) percentage points of 2010 real GDP, significantly above the losses related with individual crises. At the disaggregated level, the costs of trade are enforced for manufactured and mining goods, and for services, while most combined crises significantly increase (decrease) exports (imports) of agricultural goods.

Third, we show that our findings are fairly robust to a wide range of alternative specifications, including considering additional control variables, alternative assumptions for the estimation of our model, alternative samples, sources, and definitions of financial crises, and alternative estimators. In particular, considering placebo crises shows that our results are not spurious and driven by the research methodology.

Fourth, we explore the sensitivity of our results to several countries' key structural characteristics. We find that the level of development is an important determinant of the trade costs of financial crises, and the group of middle-income countries seems to experience different patterns in their trade costs across crises and type of goods and services compared with low-income and high-income countries. Next, the phase of the business cycle sometimes influences the trade costs of financial crises, with significant differences

being related to the type of financial crisis and of the considered type of goods or services. Moreover, the cyclicity of fiscal policy appears as an important determinant of the trade costs of financial crises; in particular, in several cases, trade costs are stronger in countries with procyclical fiscal policy compared with countries with acyclical or countercyclical fiscal policy (although the opposite can equally arise). In addition, the trade costs of banking and currency crises were generally not found to significantly differ between countries with fixed and flexible exchange rate regimes; however, in some cases, the trade costs of countries with flexible exchange rates are significantly weaker following debt and inflation crises. Finally, the presence of an IMF program following financial crises leads to contradictory trade effects, depending on the type of financial crises and the considered type of goods or services. Altogether, these rich and detailed results unveil the complex panorama of the trade costs of financial crises.

The rest of this paper is structured as follows. [Section 2](#) details the methodology, [Section 3](#) describes the data, [Section 4](#) presents the main results, [Section 5](#) analyzes their robustness, [Section 6](#) discusses potential heterogeneities, and [Section 7](#) concludes the paper.

## 2 Methodology

The causal effect going from financial crises to international trade is likely to be polluted by endogeneity, arising from different characteristics between countries that experience or not financial crises,<sup>5</sup> or from reverse causality between trade and financial crises.<sup>6</sup> We tackle these issues using a combined method of impact assessment methodology (IAM) and local projections (LP) *à la* [Jordà \(2005\)](#), following [Asonuma et al. \(2016\)](#); [Forni et al. \(2016\)](#); [Jordà and Taylor \(2016\)](#) and [Kuvshinov and Zimmermann \(2016\)](#), which consists of three steps. First, we estimate the likelihood of financial crises (i.e. the propensity score) based on their determinants. Second, we fit an outcome model in which changes in trade flows at each horizon scaled by 2010 real GDP are explained by the determinants of international trade. Third, we compute a semi-parametric estimator of the average treatment effect (ATE), namely the Augmented Inverse Propensity Weighted (AIPW), using the predicted propensity scores obtained from the first stage, and the observed and the potential (predicted in the second stage) values of the change in trade flows. In the following, we describe the LP model and the AIPW estimator.

### 2.1 Local projection model

LP was extensively used to estimate fiscal multipliers, the effects of fiscal consolidations, and the consequences of financial crises, see e.g. [Auerbach and Gorodnichenko \(2011, 2012\)](#); [Owyang et al.](#)

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<sup>5</sup>Tables C.6 to C.9 in [Appendix C.1](#) reveal that countries that experience financial crises present different fundamentals compared with countries that do not.

<sup>6</sup>The literature has by now emphasized that trade may lead to financial crises and play an important role in their contagion; see e.g. [Krugman \(1979\)](#); [Eichengreen and Rose \(1999\)](#); [Glick and Rose \(1999\)](#); [Forbes \(2001\)](#) and [Ma and Cheng \(2005\)](#).

(2013); Asonuma et al. (2016); Forni et al. (2016); Jordà and Taylor (2016); Kuvshinov and Zimmermann (2016), and its popularity is supported by several aspects. First, being a flexible, semi-parametric method to estimate dynamic effects, it captures both the direct and indirect (i.e. through changes in fundamentals) effect of financial crises on trade. Second, LP easily accounts for a nonlinear response of trade, which may be potentially at work in our analysis devoted to the effects of financial crises. Third, it can be estimated through standard regression models, and easily combined with IAM. Based on the standard setup in the literature, we estimate the following LP model

$$\Delta y_{i,t+h}^k = \alpha_i^{k,h} + \Lambda^{k,p,h} D_{i,t}^p + \theta_{L1}^{k,h} \Delta y_{i,t-1}^k + \theta_{L2}^{k,h} \Delta y_{i,t-2}^k + \sum_{\substack{o=1 \\ o \neq p}}^3 \Lambda^{k,o,h} D_{i,t}^o + X_{i,t-1}^x \beta^{k,h} + \nu_{i,t+h}^k \quad (1)$$

for the time-horizon  $h \in \llbracket 0; 5 \rrbracket$ , where  $\Delta y_{i,t+h}^k = (y_{i,t+h}^k - y_{i,t-1}^k) / GDP_{i,2010} \times 100$  is the cumulative change between  $t-1$  and  $t+h$  in 100 times the trade flows of variable  $k$  of country  $i$  scaled by 2010 real GDP.  $k$  denotes exports/imports of agricultural, mining, and manufactured goods, and services.  $D_{i,t}^p$  is a dummy measure of the financial crisis of type  $p$  (i.e.  $p$  is either a debt, banking, currency, or inflation crisis) equal to 1 if country  $i$  is suffering the crisis of type  $p$  at time  $t$ , and 0 otherwise, whose effect is captured through  $\Lambda^{k,p,h}$ .  $\Delta y_{i,t-1}^k$  and  $\Delta y_{i,t-2}^k$  are respectively the change in the trade flows (of trade variable  $k$ ) one and two years prior to the financial crisis.  $D_{i,t}^o$  are dummies for crises other than  $p$  that may also affect trade flows. Finally,  $X_{i,t-1}^x$  is a set of lagged control variables,  $\alpha_i^{k,h}$  stands for country fixed effects, and  $\nu_{i,t+h}^k$  is the error term.

## 2.2 The augmented inverse propensity weighted (AIPW) estimator

Our impact assessment considers that financial crises are the treatment variable, and changes in trade flows at each horizon  $h$  are the outcome variable. Simplifying the algebra by dropping the indexes  $k$  and  $p$ , the average treatment effect (ATE) is defined as

$$ATE = \Lambda^h = \mathbb{E}[y_{i,t+h}(1) - y_{i,t-1} | D_{i,t} = 1] - \mathbb{E}[y_{i,t+h}(1) - y_{i,t-1} | D_{i,t} = 0], \forall h. \quad (2)$$

Since  $\mathbb{E}[y_{i,t+h}(1) - y_{i,t-1} | D_{i,t} = 0]$  is not observable, we use a counterfactual. Under the independence assumption  $[y_{i,t+h}^\phi(d) - y_{i,t-1}] \perp D_{i,t} | Z_{i,t}; \forall h; d \in \{0, 1\}$ , i.e. an independent financial crises allocation of potential outcomes conditional on a set of covariates  $Z_{i,t}$ , we estimate the ATE by comparing trade in countries with and without financial crises conditional on the set of variables  $Z_{i,t}$

$$ATE = \Lambda^h = \mathbb{E}[y_{i,t+h}(1) - y_{i,t-1} | D_{i,t} = 1; Z_{i,t}] - \mathbb{E}[y_{i,t+h}(0) - y_{i,t-1} | D_{i,t} = 0; Z_{i,t}]; \forall h. \quad (3)$$

In this study, we use the AIPW estimator that requires estimating two models, namely the treatment and the outcome model. Regarding the former, we estimate a pooled probit for each crisis on variables



$Z_{i,t}$ , and obtain the propensity score for country  $i$  at time  $t$  to be in the treated,  $\hat{p}_{i,t} = p_1(Z_{it}; \hat{\Psi})$ , and control,  $1 - \hat{p}_{i,t} = p_0(Z_{it}; \hat{\Psi})$ , group. Introduced by [Rosenbaum and Rubin \(1983\)](#), the propensity score is particularly appealing for our analysis to eliminate the biases between the treated and the control group, and we use weighting by propensity scores to mimic a situation where financial crises happen randomly.<sup>7</sup> Regarding the latter, the outcome model [eq. \(1\)](#) is estimated separately on both treated and control groups, and we predict the potential outcome  $\widehat{\mathbb{E}}[y_{i,t+h} - y_{i,t-1} | D_{i,t} = d; X_{i,t}]$ ;  $\forall d \in \{0, 1\}$  for the entire sample,<sup>8</sup> based on the characteristics of each group. This provides the potential trade for countries in the treated (control) group if they have not (have) experienced crises, conditional on the set of control variables  $X_{i,t}$ .<sup>9</sup> Following the general expression of the AIPW provided by [Lunceford and Davidian \(2004\)](#), we compute the estimated ATE of financial crises on international trade for  $h$  year-horizon as

$$\widehat{\Lambda}_{AIPW}^h = \frac{1}{n} \sum_i \sum_t \left( \left[ \frac{D_{i,t}(y_{i,t+h} - y_{i,t-1})}{\hat{p}_{i,t}} - \frac{(1 - D_{i,t})(y_{i,t+h} - y_{i,t-1})}{1 - \hat{p}_{i,t}} \right] - \frac{D_{i,t} - \hat{p}_{i,t}}{\hat{p}_{i,t}(1 - \hat{p}_{i,t})} \times [(1 - \hat{p}_{i,t})\widehat{\mathbb{E}}[y_{i,t+h} - y_{i,t-1} | D_{i,t} = 1; X_{i,t}] + \hat{p}_{i,t}\widehat{\mathbb{E}}[y_{i,t+h} - y_{i,t-1} | D_{i,t} = 0; X_{i,t}]] \right). \quad (4)$$

This semi-parametric estimator has the distinctive property of being the most efficient doubly robust estimators, namely it is unbiased when at least the outcome or the treatment model is correctly specified (see e.g. [Leon et al., 2003](#); [Imbens, 2004](#); [Lunceford and Davidian, 2004](#); [Tsiatis and Davidian, 2007](#); [Wooldridge, 2007](#); [Kreif et al., 2013](#)). In addition, compared with the inverse propensity weighted (IPW) estimator, it includes an additional adjustment term consisting of the weighted average of the two predicted potential outcomes, which stabilizes the estimator when the propensity scores get close to zero or one, and has expectation zero when either the treatment or the outcome model is correctly specified (see, [Glynn and Quinn, 2009](#)). Finally, [Glynn and Quinn \(2009\)](#) conclude that the AIPW estimator displays comparable or lower mean square error than competing estimators when the treatment and outcome models are both properly specified, and outperforms them when one of these models is misspecified.

<sup>7</sup>Following [Imbens \(2004\)](#) and [Cole and Hernán \(2008\)](#), we truncated the maximum weight, defined by  $\hat{p}_{i,t}^{-1}$  for the treated group and  $(1 - \hat{p}_{i,t})^{-1}$  for the control group, to 10. In the robustness analysis we change the maximum weight to 5.

<sup>8</sup>We restrict coefficients  $\theta_{L1}^{k,h}$ ,  $\theta_{L2}^{k,h}$  and  $\beta^{k,h}$  to be identical in the treated and control groups, so that they only differ according to crises. In the robustness analysis we lift this restriction.

<sup>9</sup>Following [Asonuma et al. \(2016\)](#); [Jordà and Taylor \(2016\)](#) and [Kuvshinov and Zimmermann \(2016\)](#), we use a larger set of controls in the treatment compared with the outcome model; indeed, [Lunceford and Davidian \(2004\)](#) suggests including as many variables as collected in the treatment model.

### 3 Data, and preliminaries

#### 3.1 Data

Our unbalanced panel covers 106 debt crises, 96 banking crises, 277 currency crises, and 123 inflation crises in 99 developed, emerging, and developing countries that experienced at least one of these crises during the period 1980-2014. Regarding financial crises, data for debt crises come from [Reinhart and Rogoff \(2009\)](#), data for currency and inflation crises are built using the definition of [Reinhart and Rogoff \(2009\)](#), and data on banking crises are from [Laeven and Valencia \(2012\)](#).<sup>10</sup>

Trade data on goods come from UN Comtrade, via the World Trade Integrated Solution (WITS)–World Bank, which provides exports and imports at the 3-digit code of the Standard International Trade Classification (SITC). We classify this disaggregated data into three types of goods, namely agricultural, mining, and manufactured goods, following the WTO classification. Compared with most studies that focus exclusively on the export of goods, we also consider the import of goods, which can improve firms' productivity and export competitiveness. In addition, we equally consider the trade of services (data comes from United Nations Conference on Trade and Development–UNCTAD), which represents as large as one-quarter of total exports and imports in our sample; besides, since they mostly concern intermediate inputs,<sup>11</sup> their decrease may have strong (negative) effects on the economy. Total trade is obtained by aggregating the four categories of goods and services (agriculture, mining, manufacturing, and services), and nominal trade measured in US dollars is deflated using the US consumer price index (base 2010) from the World Development Indicators–World Bank.

Finally, we consider two sets of control variables. The first set is used in the treatment model, and includes those variables that influence the likelihood of financial crises and are correlated with international trade, namely, following the related literature: (i) financial crises except the one of interest, (ii) the cyclical component of the log of real GDP per capita (obtained from a Hodrick-Prescott filter with a smoothing parameter of 100), (iii) the average of real GDP per capita growth, (iv) the log of real GDP per capita and its square, (v) a floating exchange rate regime dummy, (vi) an IMF program dummy, (vii) a central bank independence score, (viii) the intensity of conflicts measured by the Major Episodes of Political Violence (MEPV) score, (ix) the polity score, (x) the level of public debt and the average of its

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<sup>10</sup>Debt crises are defined as the failure of the government to meet a principal or interest payment on the due date and/or the episodes of debt restructuring. Banking crises are defined as events where there are signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations) and/or banking policy intervention measures in response to significant losses in the banking system. Currency crises are defined as an annual depreciation versus the US dollar of 15 percent or more. Inflation crises are defined as an annual inflation rate of 20 percent or more. Alternative definitions and sources for crises are considered in the robustness analysis.

<sup>11</sup>According to [Borchert and Mattoo \(2010\)](#), trade in services accounts for over one-fifth of global cross-border trade, and up to one third of exports in some large countries (including US or India); and [Miroudot et al. \(2009\)](#) conclude that roughly three-fourth of trade in services in OECD are intermediate inputs.

change, (xi) the level of foreign reserves and the average of its change, (xii) the level of domestic credit and the average of its change, (xiii) the level of the real exchange rate with the US dollar and the average of its change, (xiv) the level of the terms of trade and the average of its change, (xv) the level of trade openness and the average of its change, (xvi) the level of broad money and the average of its change, and (xvii) the level of the current account and the average of its change. These predictors of financial crises are included one-year lagged, and averages are computed over two years lags. The second set of control variables is used in the outcome model [eq. \(1\)](#) to predict the changes in trade at each horizon  $h$  for each type of good and for services, namely: (i) the change of trade flows one and two years prior to the onset of financial crises, (ii) other crises, (iii) the average of the change of export/import prices, (iv) the share of the type of trade flows in the total exports/imports of goods and services, (v) the cyclical component of the log of real GDP per capita, and (vi) the average of real GDP per capita growth. Definitions, sources, statistics, and unit root tests for all these variables are provided in [Appendix A.2](#) and [Appendix B](#).

## 3.2 A preliminary look at the data

In this section, we discuss three features of financial crises: their occurrence, the connections between different types of financial crises, and their link with international trade.

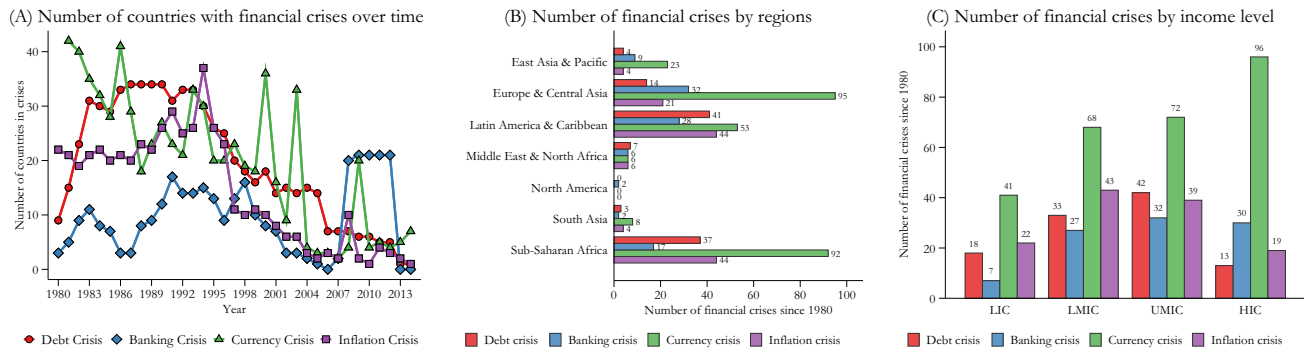
### 3.2.1 *The occurrence of financial crises*

The evolution of financial crises during the period 1980-2014 can be summarized by the charts reported in [Figure 1](#). According to (A), currency crises tend to occur more than other crises. Despite a downward trend in the number of countries affected by crises since the beginning of the 2000s, the 2008-09 contraction has been characterized by an increase in the incidence of banking, currency, and inflation crises. Moreover, as shown by (B), financial crises strike the economies by clusters and spread within the regions, with Europe & Central Asia, Latin America & Caribbean, and Sub-Saharan Africa being the most affected. Finally, (C) suggests that debt and inflation crises occur mostly in lower-middle, and upper-middle countries, currency crises are recorded more often in high-income countries, and banking crises are less recorded in low-income countries.

### 3.2.2 *The connections between financial crises*

We analyze potential connections between financial crises using the standard nonparametric Kaplan-Meier estimator. The main message of [fig. 2](#) is that financial crises of a new type occur significantly quicker after a crisis of another type: (i) after a debt crisis hits a country, a banking or a currency crisis follows in one-quarter of cases in two years, and an inflation crisis in one year; (ii) after a banking crisis, a debt or a currency crisis follows in one-half of cases in three years, and an inflation crisis in two years; (iii) after a currency crisis, an inflation crisis follows in one-half of cases in one year, a debt crisis in two years, and a banking crisis in four years; and (iv) after an inflation crisis, a debt or a currency

Figure 1: Financial crises over time, by regions, and by income level



Notes: Sample: 1980-2014. LIC, LMIC, UMIC, and HIC denote Low-, Lower-middle-, Upper-middle-, and High-income countries, respectively. Authors' calculations based on data from Reinhart and Rogoff (2009) and Laeven and Valencia (2012), World Development Indicators, and Penn World Tables.

crisis follows in one-half of cases in three years, and a banking crisis in four years. Consequently, the takeaway for the design of our empirical analysis is that when estimating the effect of a crisis one should systematically control for other crises to avoid overestimating its trade cost.

### 3.2.3 Financial crises and international trade

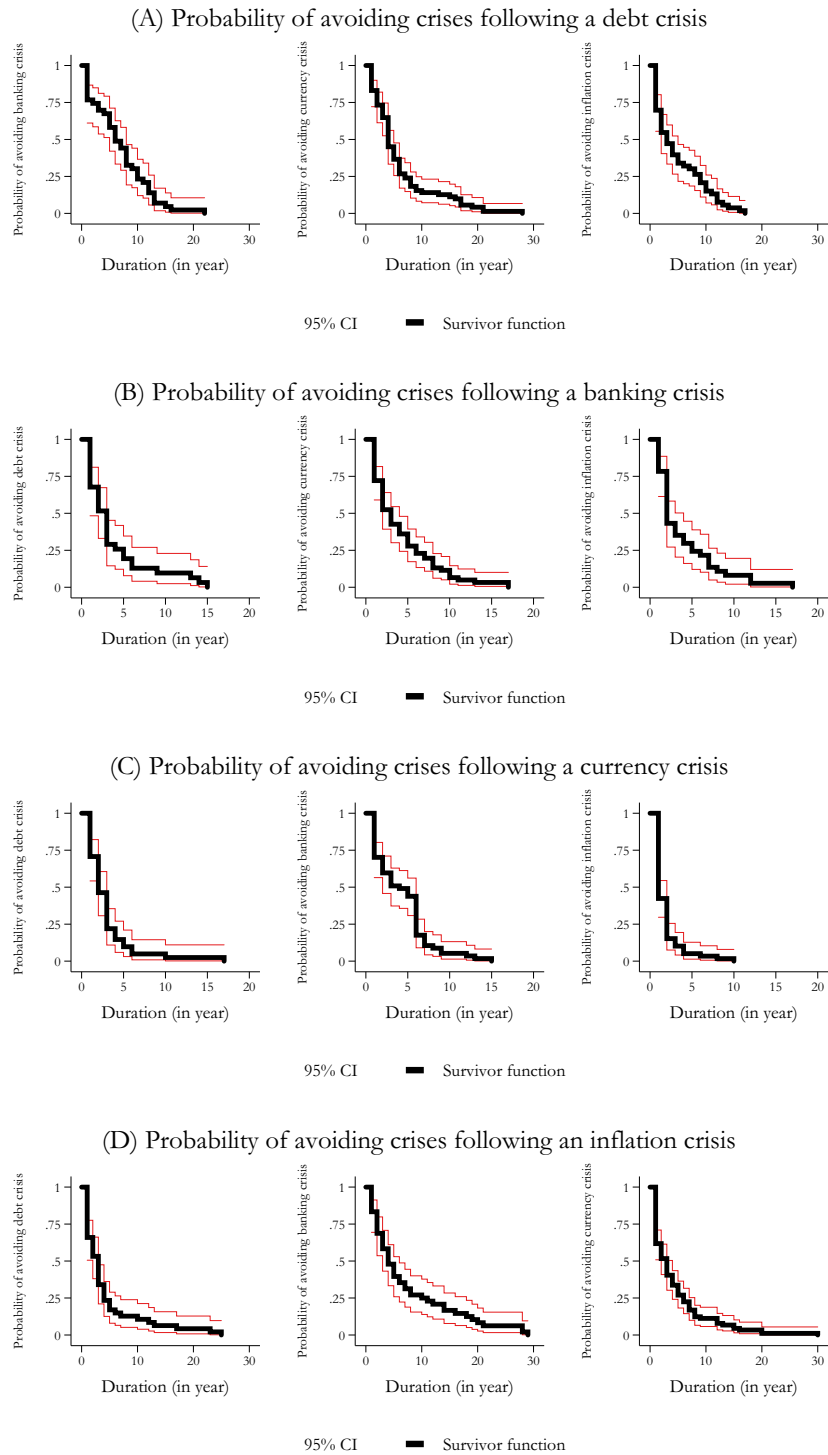
As a foretaste of the potential trade costs of crises, fig. 3 plots the cumulative change of trade flows from the year before the onset of each crisis to 5-year ahead. The overall picture supports the collapse of international trade. Total exports and imports decline sharply during all types of financial crises (for example, exports and imports decline respectively by around 20 and 32 percentage points of 2010 real GDP during a banking crisis), mainly driven by the contraction of trade in manufactured goods, followed by the one in services, mining goods, and agricultural goods. In sum, the trade costs of financial crises seem important. However, various issues may lead to an overestimation of these costs. Consequently, we develop in the following a formal econometric analysis to provide a robust estimation of the trade costs of financial crises.

## 4 Results

### 4.1 Estimation of propensity scores

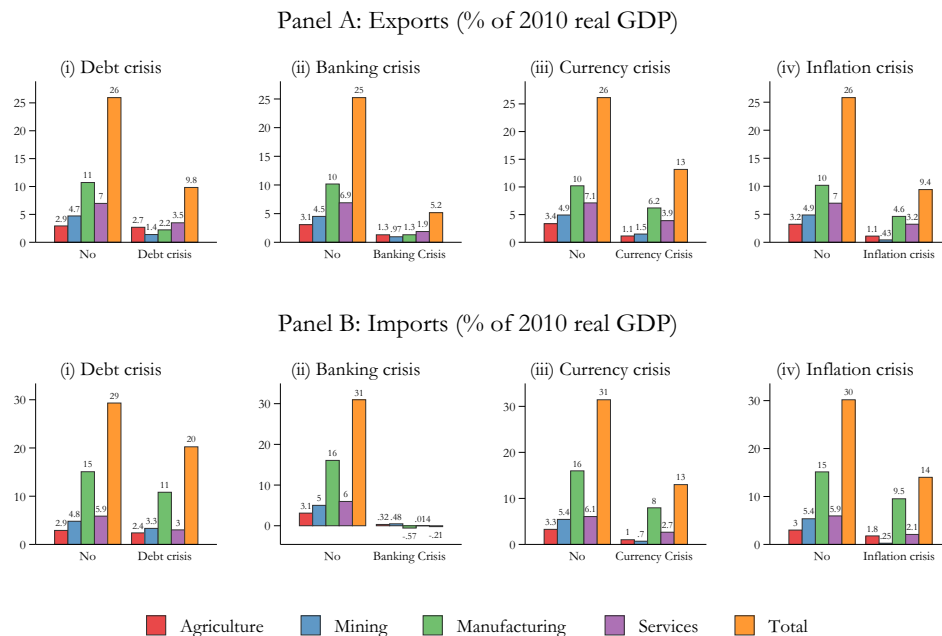
As previously indicated, the first step of our analysis is devoted to the estimation of propensity scores (PS). Table 1 reports the marginal effects at the means of covariates in a pooled probit model for each type of crisis, and confirms that financial crises are not random but endogenous to several countries'

Figure 2: Survival models of the duration between the onset of different financial crises



Notes: The figure plots the estimated Kaplan-Meier survival functions for the duration between the start of one type of crisis and the start of another type of crisis. The y-axis denotes the compound probability that countries avoid crises. From the top row to the bottom row, we describe the probability of avoiding crises on y-axis following debt, banking, currency, and inflation crises, respectively. The bands are 95% confidence intervals. Authors' calculations based on data from [Reinhart and Rogoff \(2009\)](#) and [Laeven and Valencia \(2012\)](#).

Figure 3: Evolution of the average international trade in financial crises



Notes: The figure plots the dependent variables of our empirical models for the horizon  $h=5$ . The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services, and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. The dependent variables are plotted during debt, banking, currency, and inflation crises, and in the absence of crises. The first (second) row refers to exports (imports).

characteristics.<sup>12</sup> Based on these models, [fig. C.2](#) in [Appendix C](#) illustrates the smooth kernel density of the distribution of the PS for the treated and control groups, for each financial crisis. Given the high classification power, countries in the treated (control) group receive a high (low) likelihood of financial crises, while countries in the treated (control) group with PS close to zero (one) receive higher weights. Besides, [fig. C.2](#) also shows considerable overlaps between the distributions of PS for the treated and control groups; thus, we weighted the covariates using PS.<sup>13</sup> As shown by [tables C.6](#) to [C.9](#), according to the criteria of [Rubin \(2002\)](#), weighting the covariates by the estimated PS eliminates most of the differences in covariates between the treated and the control group. Since our weighting strategy mimics a situation where financial crises occur randomly, it allows to properly identify the ATE of crises.

<sup>12</sup>In a nutshell, estimations show that: the likelihood of one crisis is increasing with the occurrence of other crises; banking and currency crises are most likely during economic booms but when economic growth decelerates; there is an inverted-U link between debt and inflation crises, and the level of development; the likelihood of debt and banking crises increases with the level of government debt and domestic credit; the likelihood of debt and inflation crises decreases with the terms of trade; the incidence of all types of crises decreases with the level of broad money in the economy; and currency crises are more likely in a floating exchange regime with a less independent central bank. Besides, standard diagnostic tests reported at the bottom of the table show that our models present a large classification power (above 85%) and Area Under Receiver Operating Characteristic curve (around 0.8 or more).

<sup>13</sup>Following [Imbens \(2004\)](#) and [Cole and Hernán \(2008\)](#), we truncate the maximum weight to 10 to reduce the influence of outliers on our ATE estimates.

Table 1: Treatment models predicting the likelihood of financial crises, marginal effects

Dependent variables	(1)		(2)		(3)		(4)	
	Debt crisis (t)		Banking crisis (t)		Currency crisis (t)		Inflation crisis (t)	
Debt crisis (t-1)			0.009	(0.032)	-0.006	(0.038)	0.054*	(0.030)
Banking crisis (t-1)	0.028	(0.021)			0.112***	(0.031)	0.098***	(0.024)
Currency crisis (t-1)	0.060**	(0.028)	0.077**	(0.039)			0.119***	(0.034)
Inflation crisis (t-1)	0.004	(0.031)	0.097***	(0.030)	0.243***	(0.041)		
Cyclical component of the log real GDP per capita (t-1)	0.055	(0.088)	0.459***	(0.145)	0.319***	(0.098)	-0.148	(0.094)
Growth (average t-1 & t-2)	-0.001	(0.001)	-0.005***	(0.001)	-0.004***	(0.001)	0.001	(0.001)
Log of real GDP per capita (t-1)	1.038***	(0.309)	-0.046	(0.126)	0.094	(0.148)	0.421**	(0.195)
Log of real GDP per capita squared (t-1)	-0.065***	(0.020)	0.004	(0.007)	-0.005	(0.009)	-0.026**	(0.011)
Public debt/GDP (t-1)	0.003***	(0.001)	0.001*	(0.000)	-0.000	(0.000)	0.000	(0.000)
Foreign reserves/GDP (t-1)	-0.001	(0.002)	-0.001	(0.002)	0.001	(0.002)	-0.002	(0.002)
Domestic credit/GDP (t-1)	0.002**	(0.001)	0.002***	(0.001)	-0.000	(0.001)	-0.002	(0.001)
Real exchange rate with US dollar (t-1)	0.000	(0.000)	0.000**	(0.000)	0.000	(0.000)	-0.000*	(0.000)
Terms of trade (t-1)	-0.371**	(0.160)	0.044	(0.166)	0.104	(0.161)	-0.341**	(0.148)
Trade openness (t-1)	0.001	(0.001)	0.000	(0.000)	-0.001	(0.001)	-0.002***	(0.001)
Broad Money/GDP (t-1)	-0.008***	(0.002)	-0.001*	(0.001)	-0.002**	(0.001)	-0.004***	(0.001)
Current account/GDP (t-1)	-0.003	(0.004)	0.004	(0.003)	-0.002	(0.002)	-0.003	(0.002)
Floating exchange regime dummy (t-1)	0.033	(0.033)	-0.010	(0.033)	0.063**	(0.026)	0.009	(0.030)
IMF Program dummy (t-1)	0.061***	(0.019)	0.112***	(0.031)	-0.021	(0.027)	-0.005	(0.022)
Central bank independence score (t-1)	-0.054	(0.069)	0.084	(0.080)	-0.282***	(0.095)	-0.171	(0.115)
Intensity of conflicts measured by MEPV score (t-1)	-0.010	(0.020)	-0.004	(0.013)	0.007	(0.017)	-0.000	(0.014)
Polity score (t-1)	-0.000	(0.003)	-0.003	(0.002)	-0.002	(0.003)	-0.000	(0.003)
Change in public debt/GDP (average t-1 & t-2)	0.001*	(0.001)	0.001	(0.001)	0.002**	(0.001)	0.000	(0.001)
Change in foreign reserves/GDP (average t-1 & t-2)	0.001*	(0.000)	0.000	(0.000)	-0.001***	(0.000)	-0.000	(0.000)
Domestic credit/GDP (average t-1 & t-2)	-0.001	(0.001)	-0.000	(0.001)	0.000	(0.001)	-0.001	(0.001)
Change in real exchange rate with US dollar (average t-1 & t-2)	0.000**	(0.000)	0.000**	(0.000)	0.000	(0.000)	0.000	(0.000)
Change in terms of trade (average t-1 & t-2)	0.003	(0.002)	-0.001	(0.003)	0.003	(0.002)	-0.001	(0.002)
Change in trade openness (average t-1 & t-2)	-0.000	(0.001)	-0.003**	(0.001)	0.001	(0.001)	0.002*	(0.001)
Change in broad Money/GDP (average t-1 & t-2)	0.001	(0.001)	0.000*	(0.000)	0.001**	(0.000)	0.002**	(0.001)
Change in current account/GDP (average t-1 & t-2)	0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)	0.000	(0.000)
Observations	1262		1262		1262		1262	
Classification	88.748		87.797		85.024		87.460	
Model AUC	0.919		0.798		0.851		0.905	
s.e. AUC	0.009		0.019		0.014		0.009	
pseudo R <sup>2</sup>	0.435		0.189		0.296		0.394	

Notes: Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . Pooled probit model. The coefficients are the marginal effects at the mean. AUC denotes Area Under Receiver Operating Characteristic curve.

## 4.2 Financial crises and aggregated trade

We first focus on aggregated trade, namely exports and imports, and then look at the trade balance.

### 4.2.1 Exports

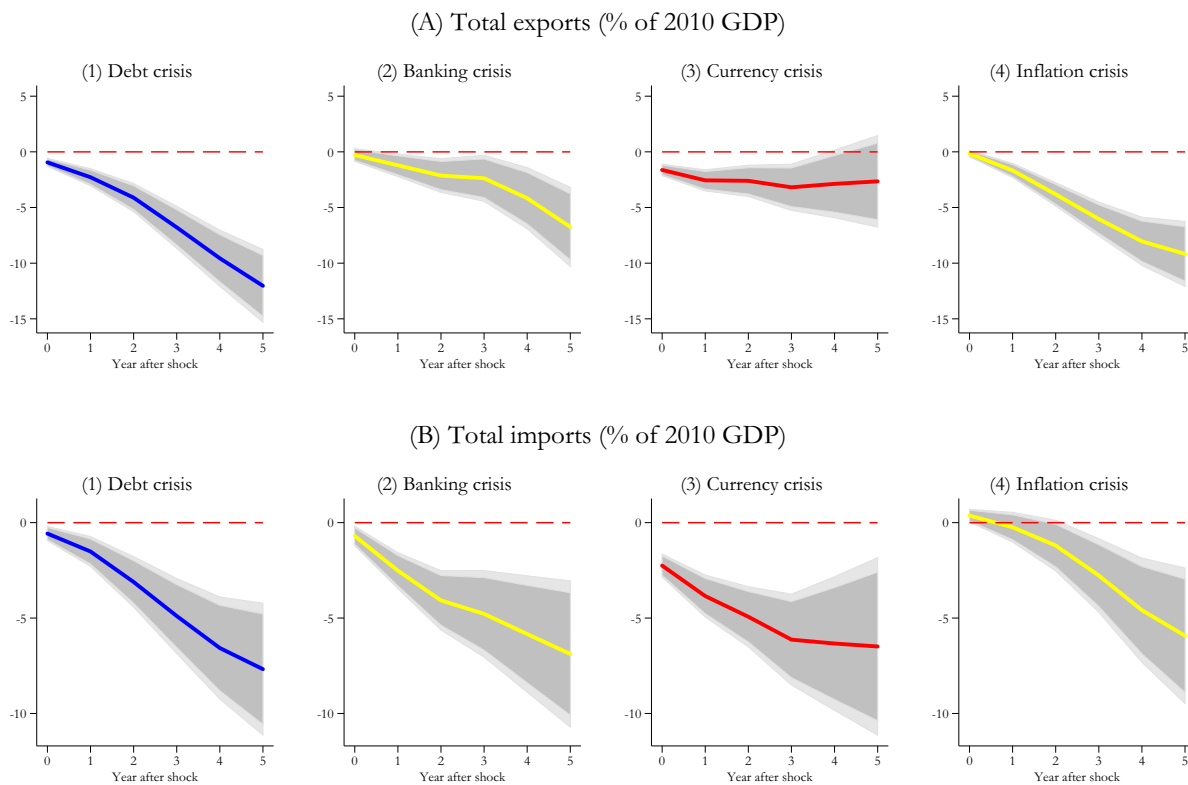
The ATE reported in column (1) of [table 2](#) and the cumulative impulse response of AIPW estimates depicted by panel (A) of [fig. 4](#) show that financial crises reduce exports both on impact and cumulated over five years in countries affected by crises compared with those unaffected, except for currency crises whose effect on exports turns into not significant around year four. As shown by [fig. 4](#), export costs are relatively small just after the occurrence of crises, but then intensify (with the exception of a U-pattern for currency crises). Finally, the magnitude of this negative effect is economically meaningful, ranging between a 12 percentage points (pp) contraction in terms of 2010 real GDP for debt crises, and 6.7 pp for banking crises.

Table 2: Cumulative trade costs over five years after financial crises

	(I) Exports					(II) Imports				
	(1) Total	(2) Agri	(3) Mini	(4) Manu	(5) Serv	(6) Total	(7) Agri	(8) Mini	(9) Manu	(10) Serv
<b>Panel A: Debt crisis</b>						<b>Panel E: Debt crisis</b>				
ATE	-12.035*** (1.670)	3.375*** (0.696)	-1.603 (1.344)	-8.039*** (0.985)	-1.599*** (0.575)	-7.677*** (1.764)	0.884*** (0.247)	-0.799** (0.374)	-7.058*** (1.225)	-0.694* (0.359)
<b>Panel B: Banking crisis</b>						<b>Panel F: Banking crisis</b>				
ATE	-6.742*** (1.815)	0.381 (0.813)	-1.657 (1.259)	-3.006** (1.347)	-2.507*** (0.698)	-6.882*** (1.956)	-0.243 (0.303)	-0.165 (0.463)	-3.673*** (1.278)	-1.835*** (0.500)
<b>Panel C: Currency crisis</b>						<b>Panel G: Currency crisis</b>				
ATE	-2.652 (2.100)	-0.674 (0.763)	-0.189 (1.781)	-0.270 (1.334)	-1.505** (0.767)	-6.489*** (2.375)	-0.465 (0.391)	-0.911* (0.553)	-3.794*** (1.466)	-0.790 (0.521)
<b>Panel D: Inflation crisis</b>						<b>Panel H: Inflation crisis</b>				
ATE	-9.171*** (1.491)	-0.531 (0.611)	-3.475*** (1.124)	-3.768*** (0.957)	0.345 (0.599)	-5.925*** (1.812)	1.108*** (0.345)	-1.936*** (0.431)	-3.625*** (1.101)	-0.297 (0.355)
Observations	907	907	907	907	907	961	961	961	961	961

Notes: Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services, and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. Total denotes total trade of exports or imports; Agri denotes trade of agricultural goods; Mini denotes trade of mining goods; Manu denotes trade of manufactured goods; Serv denotes trade of services.

Figure 4: Cumulative trade costs over five years after financial crises



Notes: Conditional cumulative change of total exports and imports from the start of the various crises (debt, banking, currency, and inflation crises). Each colored path shows local projections of the cumulative change relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis. These costs describe the difference in the change of trade between the treated and control groups after re-randomization using the predicted propensity scores. The thinner and thicker bands are 90% and 95% confidence intervals, respectively. The top (bottom) row refers to the costs for exports (imports).



### 4.2.2 Imports

The ATE reported in column (6) of [table 2](#) and the cumulative impulse response of AIPW estimates depicted by panel (B) of [fig. 4](#) confirm that imports are equally negatively affected by financial crises. Compared to their effect on exports, all types of crises exert significantly negative cumulated effects after five years, and only inflation crises do not significantly decrease imports in years one and two after their occurrence. Finally, similar to exports, the magnitude of the effect is important, ranging between a 7.7 pp of 2010 real GDP decrease over five years for debt crises, and 5.9 pp for inflation crisis.

### 4.2.3 Trade balance

We look at the costs of financial crises on the trade balance by comparing their costs on exports and imports (see [table D.11](#) in [Appendix D](#)). Debt and inflation crises exert a negative effect on the trade balance over five years (around 4 pp of 2010 real GDP), due to the stronger decrease of exports compared with imports. Given their comparable negative effect on both exports and imports, banking crises are not found to significantly affect the trade balance five years after their burst. Finally, the trade balance improves following currency crises (by around 3.8 pp of 2010 real GDP), because of the absence of a significant effect on exports and the decline of imports.

Summing up, at the aggregated level we find that financial crises reduce the exports and imports of countries over five years. However, there are some differences across crises: (i) debt and inflation crises induce a higher reduction in exports than in imports, which deteriorates the trade balance; (ii) banking crises have comparable costs on exports and imports; (iii) currency crisis have no costs on exports but they reduce imports, which enhances the trade balance. Keeping these results in mind as a benchmark, we now look at the effects of financial crises at a more disaggregated level.

## 4.3 The trade costs of financial crises: getting granular

We now look at the costs of financial crises on the trade of agricultural, mining, and manufactured goods, and of services. As detailed in the introduction, this is, as far as we are aware, the first analysis that disentangles the aggregate trade costs of financial crises on all categories of goods and services traded. Estimated cumulative ATE over five years are reported in [table 2](#), and [fig. 5](#) provides a graphical illustration.<sup>14</sup>

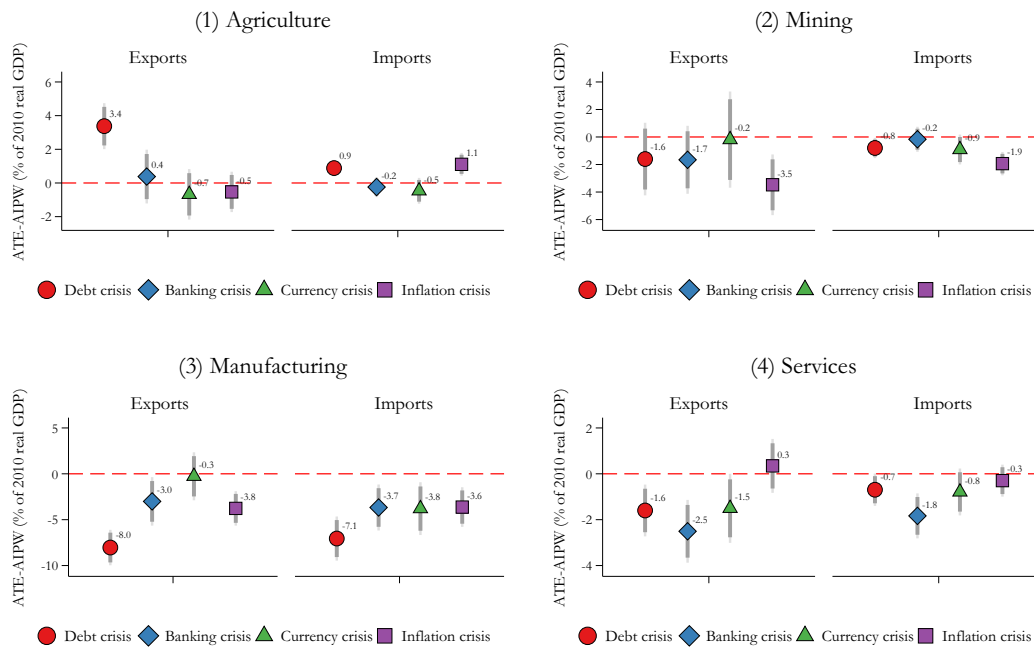
### 4.3.1 Agricultural trade

As shown by the panel (1) of [fig. 5](#), although financial crises mostly leave unchanged the exports and imports of agricultural goods, there are two important exceptions. Countries that experience debt crises

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<sup>14</sup>To simplify the exposition, we focus hereafter on the cumulated costs over five years (the dynamics of the costs from the onset of the financial crises until five years ahead are available upon request).

Figure 5: Cumulative trade costs over five years after financial crises, granular level



Notes: Robust standard errors clustered at the country-level in parentheses.  $*p < 0.10$ ,  $**p < 0.05$ ,  $***p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural (1), mining (2), manufacturing (3), and services (4) exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Point estimates and confidence intervals at 90% and 95% for the accumulated costs of the crises on international trade. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10.

present larger exports and imports of agricultural goods by 3.4 and 0.9 pp of 2010 real GDP over five years respectively, compared with countries unaffected by crises. This is equally the case for imports in countries experiencing inflation crises (the effect equals 1.1 pp of 2010 real GDP). These findings suggest that trade in agricultural goods exhibits a great resilience during financial crises and can even intensify, which may signal a substitution effect in favor of agricultural goods.

### 4.3.2 Mining trade

The panel (2) of fig. 5 reveals that, except for inflation crises, the other financial crises do not significantly affect the exports of mining goods. However, countries affected by inflation crises experience a five-year cumulated loss of 3.5 pp of 2010 real GDP, which represents around 38% percent of the total exports decrease. On the contrary, most financial crises significantly reduce the imports of mining goods, and the cumulative loss over five years in terms of 2010 real GDP ranges between 1.9 (0.8) pp for inflation (debt) crises, which represents around 33% (10%) of the total decrease of imports. Consequently, contrary to agricultural goods, trade in mining goods sometimes significantly declines following the occurrence of financial crises.

### 4.3.3 *Manufacturing trade*

Financial crises are systematically found to reduce the trade of exports and imports of manufactured goods (except for the lack of a significant effect of currency crises on exports). According to the panel (3) of [fig. 5](#), the magnitude of the effect is fairly important, ranging between 8 pp of 2010 real GDP for debt crisis and 3 pp for banking crises for exported manufactured goods (namely, between 67% and 45% of the total decrease of exports), and between 7.1 pp of 2010 real GDP for debt crises and 3.6 pp for inflation crises for imported manufactured goods (namely, between 92% and 61% of the total decrease of imports). However, despite being strongly affected by the occurrence of financial crises, the analysis of the trade of manufactured goods leaves unexplained between 8 and 55% of the trade costs at the aggregated level.

### 4.3.4 *Services trade*

Finally, the panel (4) in [fig. 5](#) displays the results for the trade of services. Similar with manufacturing trade, services trade is significantly reduced by the most types of financial crises. Indeed, with the exception of inflation and currency crises for imports, and inflation crises for exports, both services exports and imports significantly decline. Yet again, the effect is sizable, ranging between 2.5 pp of 2010 real GDP for banking crises and 1.5 pp for currency crises for services exports (namely, between 37% and 57% of the total decrease in exports), and between 1.8 pp of 2010 real GDP for banking crises and 0.7 pp for debt crises for services imports (namely, between 27% and 9% of the total decrease in imports).

To summarize, our granular analysis reveals that, while manufactured traded goods are the most affected in terms of magnitude, the impact of financial crises on the other types of traded goods and on services is far from being negligible. Trade in both mining goods and services significantly declines following several types of financial crises, while trade in agricultural goods seems to benefit from a possible substitution effect particularly following debt crises.

## 4.4 **The trade costs of combined financial crises**

The analysis performed so far focused on the effect of each financial crisis, when controlling for the other types of crises in the prediction of the potential outcome and in the computation of propensity scores. Given that financial crises seem to be connected (see the previous section), we now look at the trade effects of combined crises. However, our methodology of impact assessment and local projections does not allow seizing the effect of combined crises using interactive terms. Consequently, we draw upon a total of eleven dummy variables that define double, triple, and quadruple crises occurring in a given country. Following [Glick and Hutchison \(2001\)](#) and [Hutchison and Noy \(2005\)](#), these dummies are based on a two-year band around single financial crises, such as a combined crisis occurs if, given a crisis that spans between  $t$  and  $t + T$ , another type of crisis occurs in any of the years spanning between  $t - 2$  and  $t + T + 2$ . In this case, our dummy variable is equal to one from the beginning of the first crisis until the

end of the last crisis. In addition, we remove from the control group all country-year observations with at least one crisis to ensure that countries in this group did not experience any crisis.

The results reported in [table 3](#) show that combined financial crises trigger more significant and of a higher magnitude aggregated trade costs. Indeed, equality tests show that the trade effects of combined crises are statistically higher than those of a single crisis (see [tables D.12](#) and [D.13](#)). For instance, the five-year cumulated ATE measuring the decline of total exports for the 44 cases of quadruple crises equals 21.6 pp of 2010 real GDP (see the bottom of [table 3](#)), namely well above their individual effect (equal to 12 pp, 6.7 pp, and 9.2 pp for debt, banking, and inflation crises, respectively).

Going granular, [table 3](#) reveals that the magnitude of the decline of the trade of manufactured goods due to combined crises is reinforced compared with a single crisis, as the effect is above 10 pp of 2010 real GDP in most cases (in 15 out of 22 estimated ATE, see columns 4 and 9 in [table 3](#)). Moreover, combined financial crises always significantly reduce the trade of mining goods and services (all estimated 44 ATE are negative and significant in columns 3, 5, 8, and 10). Finally, as illustrated by [table 3](#), most combined financial crises significantly reduce agricultural goods imports (9 out of 11 ATE are negative and significant in column 7), and foster agricultural goods exports (7 out of 11 ATE are positive and significant in column 2). Altogether, results based on combined financial crises unveil more severe trade costs.

## 5 Robustness

We further investigate the robustness of our findings using a wide variety of alternative specifications. To save space, we report in [table 4](#) only the trade costs of aggregated exports and imports, and manufacturing trade. The results for agricultural and mining trade, and for combined crises are available upon request.

### 5.1 Additional controls in the outcome model

We draw upon additional controls to reduce a potential bias related to omitted variables. To this end, we extend the common number of variables of the treatment and outcome models by adding in the latter the average (computed over two years lags) of the change in public debt, foreign reserves, domestic credit, real exchange rate with the US dollar, terms of trade, trade openness, broad money, and current account. As illustrated by column B in [table 4](#), except for the effect of currency crises on total exports that is now significant (a decrease of 4.1 pp of 2010 real GDP in the countries affected by currency crises), accounting for additional controls leaves our main results qualitatively unchanged.

Table 3: Cumulative trade costs over five years after financial crises, combined crises

(I) Exports					(II) Imports						
	(1) Total	(2) Agri	(3) Mini	(4) Manu	(5) Serv		(6) Total	(7) Agri	(8) Mini	(9) Manu	(10) Serv
<b>Panel A: Debt crisis &amp; Banking crisis</b>					<b>Panel L: Debt crisis &amp; Banking crisis</b>						
ATE	-17.780*** (1.850)	2.533*** (0.768)	-4.080*** (1.194)	-11.222*** (1.180)	-3.965*** (0.649)	ATE	-11.887*** (2.287)	-0.802** (0.371)	-2.263*** (0.602)	-10.042*** (1.477)	-1.025** (0.465)
Observations	798	798	798	798	798	Observations	842	842	842	842	842
<b>Panel B: Debt crisis &amp; Currency crisis</b>					<b>Panel M: Debt crisis &amp; Currency crisis</b>						
ATE	-19.900*** (1.985)	1.996** (0.784)	-3.055** (1.261)	-12.473*** (1.205)	-3.409*** (0.718)	ATE	-21.111*** (2.833)	-0.814** (0.357)	-4.488*** (0.873)	-13.712*** (1.637)	-2.713*** (0.582)
Observations	873	873	873	873	873	Observations	920	920	920	920	920
<b>Panel C: Debt crisis &amp; Inflation crisis</b>					<b>Panel N: Debt crisis &amp; Inflation crisis</b>						
ATE	-21.413*** (1.973)	1.249* (0.744)	-4.251*** (1.377)	-12.890*** (1.318)	-2.506*** (0.729)	ATE	-24.000*** (2.903)	-0.955** (0.386)	-6.765*** (0.907)	-15.067*** (1.643)	-2.257*** (0.575)
Observations	861	861	861	861	861	Observations	911	911	911	911	911
<b>Panel D: Banking crisis &amp; Currency crisis</b>					<b>Panel O: Banking crisis &amp; Currency crisis</b>						
ATE	-9.669*** (2.798)	0.627 (1.005)	-3.093* (1.606)	-1.885 (2.071)	-5.135*** (0.878)	ATE	-15.308*** (3.038)	-2.190*** (0.455)	-2.280*** (0.847)	-6.355*** (1.854)	-4.255*** (0.665)
Observations	828	828	828	828	828	Observations	867	867	867	867	867
<b>Panel E: Banking crisis &amp; Inflation crisis</b>					<b>Panel P: Banking crisis &amp; Inflation crisis</b>						
ATE	-10.208*** (2.620)	2.910*** (0.958)	-4.604*** (1.321)	-4.987*** (1.793)	-2.795*** (0.807)	ATE	-11.150*** (3.001)	-0.581 (0.422)	-3.127*** (0.923)	-4.676** (1.890)	-2.650*** (0.553)
Observations	799	799	799	799	799	Observations	844	844	844	844	844
<b>Panel F: Currency crisis &amp; Inflation crisis</b>					<b>Panel Q: Currency crisis &amp; Inflation crisis</b>						
ATE	-16.947*** (2.048)	0.681 (0.716)	-3.992*** (1.439)	-8.783*** (1.243)	-3.130*** (0.592)	ATE	-22.731*** (2.686)	-1.266*** (0.312)	-5.055*** (0.997)	-12.032*** (1.476)	-3.923*** (0.540)
Observations	903	903	903	903	903	Observations	941	941	941	941	941
<b>Panel G: Debt crisis &amp; Banking crisis &amp; Currency crisis</b>					<b>Panel R: Debt crisis &amp; Banking crisis &amp; Currency crisis</b>						
ATE	-18.212*** (2.036)	2.259** (0.894)	-4.298*** (1.278)	-10.809*** (1.245)	-4.566*** (0.644)	ATE	-18.890*** (2.312)	-1.102*** (0.390)	-4.632*** (0.644)	-12.502*** (1.502)	-2.298*** (0.479)
Observations	769	769	769	769	769	Observations	807	807	807	807	807
<b>Panel H: Debt crisis &amp; Banking crisis &amp; Inflation crisis</b>					<b>Panel S: Debt crisis &amp; Banking crisis &amp; Inflation crisis</b>						
ATE	-23.314*** (2.086)	1.523* (0.866)	-6.125*** (1.385)	-11.685*** (1.292)	-5.331*** (0.666)	ATE	-22.424*** (2.462)	-1.438*** (0.408)	-6.529*** (0.623)	-13.581*** (1.601)	-2.799*** (0.494)
Observations	771	771	771	771	771	Observations	813	813	813	813	813
<b>Panel I: Debt crisis &amp; Currency crisis &amp; Inflation crisis</b>					<b>Panel T: Debt crisis &amp; Currency crisis &amp; Inflation crisis</b>						
ATE	-20.712*** (2.051)	0.907 (0.789)	-5.731*** (1.324)	-11.745*** (1.326)	-2.015*** (0.733)	ATE	-24.723*** (3.010)	-0.755* (0.415)	-6.819*** (0.945)	-15.320*** (1.724)	-2.498*** (0.570)
Observations	837	837	837	837	837	Observations	879	879	879	879	879
<b>Panel J: Banking crisis &amp; Currency crisis &amp; Inflation crisis</b>					<b>Panel U: Banking crisis &amp; Currency crisis &amp; Inflation crisis</b>						
ATE	-12.023*** (2.693)	2.103** (0.989)	-5.285*** (1.346)	-5.655*** (1.829)	-2.931*** (0.812)	ATE	-14.705*** (2.902)	-0.743* (0.437)	-4.684*** (0.857)	-6.023*** (1.871)	-2.387*** (0.553)
Observations	786	786	786	786	786	Observations	822	822	822	822	822
<b>Panel K: Debt crisis &amp; Banking crisis &amp; Currency crisis &amp; Inflation crisis</b>					<b>Panel V: Debt crisis &amp; Banking crisis &amp; Currency crisis &amp; Inflation crisis</b>						
ATE	-21.609*** (2.077)	0.553 (0.882)	-5.301*** (1.322)	-11.664*** (1.262)	-3.747*** (0.671)	ATE	-18.931*** (2.374)	-0.237 (0.416)	-4.780*** (0.638)	-13.416*** (1.540)	-2.140*** (0.490)
Observations	760	760	760	760	760	Observations	796	796	796	796	796

Notes: Robust standard errors clustered at the country-level in parentheses.  $*p < 0.10$ ,  $**p < 0.05$ ,  $***p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services, and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. Total denotes total trade of exports or imports; Agri denotes trade of agricultural goods; Mini denotes trade of mining goods; Manu denotes trade of manufactured goods; Serv denotes trade of services.

## 5.2 Alternative assumptions

Compared to the maximum weight of 10 for our treated and control groups used in the benchmark model, we now use a maximum weight of 5 to reduce the influence of country-year observations in the treated (control) group that receive a low (high) likelihood of financial crises. Results reported in column C of in [table 4](#) confirm the robustness of the significance and the size of the effect of financial crises on total and manufacturing trade. Moreover, we relax the assumption of an identical impact of covariates in the outcome model for the treated and control groups. As such, in addition to financial crises, covariates are now equally allowed to impact international trade differently during and outside financial crises. As shown by column D, except for the significant (not significant) effect of currency (inflation) crises on total (manufacturing) exports, relaxing this restriction yields results that are comparable with our benchmark findings.

## 5.3 Sample selection

We alter the benchmark sample in two ways. First, we drop the period from 2008 onwards, given the collapse in international trade and the rise of banking, currency, and inflation crises. Removing this period does not affect our main results for debt and inflation crises. However, adding to our previous analysis, results in column E in [table 4](#) show that the events that occurred during this period are indeed an important driver of the trade effects of banking crises (their effect on both total and manufacturing trade is no longer significant starting around year two, see [fig. D.3](#)), and, to some extent, of currency crises (their effect on imports is no longer significant starting around year four, see [fig. D.3](#)). Second, following [Trebesch and Zabel \(2017\)](#), we increase the homogeneity of our sample by removing small countries (i.e. with a population below one million at the end year of our sample) and developed countries. Estimations reported in column F confirm our benchmark results, except for the loss of significance in the effect of inflation crises on manufacturing exports.

## 5.4 Alternative sources and definitions of crises

We consider alternative sources and definitions of financial crises. Following [Cruces and Trebesch \(2013\)](#), debt crises now exclusively capture debt restructurings with private creditors (i.e. we drop restructurings with official creditors). Banking crises have the same definition but now come from the dataset of [Reinhart and Rogoff \(2009\)](#) (instead of [Laeven and Valencia, 2012](#)). Currency crises are re-defined based on [Frankel and Rose \(1996\)](#), namely by at least a 25% nominal depreciation of the local currency against the US dollar that is also at least a 10% increase in the rate of depreciation. Finally, inflation crises are signalled by inflation rates of 40% or more, following [Bruno and Easterly \(1998\)](#) and [Reinhart and Rogoff \(2009\)](#). Except for the effect of currency crises on total and manufacturing exports that is now significant, results in column G of [table 4](#) are consistent with our benchmark findings.

## 5.5 Alternative ATE estimators

Compared with our benchmark analysis that draws upon the Augmented Inverse Propensity Weighted (AIPW) estimator, we use alternative methods that are popular in the existing literature, namely the Inverse Propensity Weighting (IPW) and the Propensity score matching (PSM). As illustrated by columns H and I in [table 4](#), the use of these alternative estimators confirms our main findings,<sup>15</sup> except now currency crises significantly reduce total and manufacturing exports, and the effect of banking and inflation crises on manufacturing exports is no longer significant when using the IPW.

## 5.6 Placebo crises

Finally, we look if our results are not spurious and driven by the employed methodology. To this end, we drop all country-year observations with financial crises, and randomly assign the same number and duration of crises to the remaining sample that never experienced a financial crisis. Results based on repeating this procedure 500 times are reported in [table 5](#), and show that the percentage of significant ATE estimates for the trade costs is fairly low (always below 10%, and only in 6 out of 80 cases above 5%). This finding supports, yet again, the robustness of our benchmark findings.

# 6 Sensitivity

As previously emphasized, our results are confirmed by several robustness tests. In the following, we explore whether the trade costs of financial crises differ with respect to several key structural characteristics of countries. [Tables 6 to 10](#) report the cumulated trade costs over five years.

## 6.1 The level of development

We look at the trade costs of financial crises at various levels of development. Indeed, the level of development is related to the structure of the economy, including specialization, and diversification of exports and imports, as well as its resilience to shocks, including financial crises. To this end, we draw upon the average real GDP per capita over 1980-2014, and define three groups corresponding to low-, middle-, and high-income countries.<sup>16</sup> [Table 6](#) provides the results for each group of countries, provided

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<sup>15</sup>PSM is performed with five neighbors, and we report that estimations with an alternative number of neighbors are comparable (results are available upon request).

<sup>16</sup>The two thresholds separating the three groups are set at 3,000 and 10,000 USD, as these levels take into account countries' specialization according to the types of goods and services they export (import) to (from) the rest of the world. In particular, the use of the average real GDP per capita may better capture income dynamics compared with a single year gross national income per capita (see, for example, World Bank's classification). The list of countries by level of development is reported in [table D.10](#) in [Appendix D](#). We report that variations in the threshold values did not reveal qualitative changes in our findings. In addition, using other indicators of development, such as the human development index or the economic complexity index to define the income groups, leads to comparable findings (results are available upon request).

Table 4: Robustness checks, cumulative trade costs over five years after financial crises, total and manufacturing trade (exports and imports)

Exports																		
	(A) Benchmark		(B) Additional controls		(C) Maximum W=5		(D) Unrestricted coeffs		(E) Drop period 2008-2014		(F) Sample restricted		(G) Definition crises		(H) IPW		(I) PSM	
	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total
<b>Panel I: Debt crisis</b>																		
ATE	-8.039*** (0.985)	-12.035*** (1.670)	-9.170*** (0.943)	-11.425*** (1.620)	-7.918*** (0.931)	-11.739*** (1.471)	-13.903*** (0.962)	-15.306*** (1.538)	-8.081*** (0.932)	-11.716*** (1.524)	-10.643*** (1.175)	-14.420*** (1.982)	-7.082*** (0.879)	-14.999*** (1.819)	-7.505*** (1.150)	-13.795*** (2.667)	-8.512*** (0.136)	-15.478*** (4.086)
<b>Panel II: Banking crisis</b>																		
ATE	-3.006** (1.347)	-6.742*** (1.815)	-2.182* (1.271)	-4.530*** (1.720)	-3.992*** (1.074)	-7.117*** (1.449)	-3.189** (1.291)	-8.429*** (1.740)	0.543 (1.413)	-1.377 (1.933)	-8.764*** (1.676)	-10.185*** (2.915)	-3.494*** (1.257)	-13.505*** (2.001)	-1.290 (1.448)	-7.796*** (2.313)	-4.101** (1.613)	-7.938*** (1.248)
<b>Panel III: Currency crisis</b>																		
ATE	-0.270 (1.334)	-2.652 (2.100)	-1.659 (1.354)	-4.120** (2.083)	-0.432 (1.067)	-1.767 (1.615)	-1.858 (1.282)	-5.613*** (2.134)	1.176 (1.535)	1.041 (2.200)	-0.161 (1.325)	-2.549 (2.120)	-4.275*** (0.935)	-12.519*** (1.604)	-3.270*** (1.266)	-7.417*** (2.428)	-2.046 (1.437)	-3.944 (4.398)
<b>Panel IV: Inflation crisis</b>																		
ATE	-3.768*** (0.957)	-9.171*** (1.491)	-2.778*** (0.929)	-6.923*** (1.465)	-3.837*** (0.936)	-9.274*** (1.367)	-0.516 (0.889)	-11.972*** (1.401)	-3.960*** (0.915)	-7.006*** (1.490)	-2.400 (1.727)	-10.826*** (2.512)	-4.944*** (0.764)	-12.008*** (1.244)	-1.665 (1.014)	-7.299*** (2.264)	-5.251*** (0.841)	-12.296*** (3.312)
Observations	907	907	907	907	907	907	907	907	648	648	352	352	907	907	730	730	979	979
<b>Imports</b>																		
	(A) Benchmark		(B) Additional controls		(C) Maximum W=5		(D) Unrestricted coeffs		(E) Drop period 2008-2014		(F) Sample restricted		(G) Definition crises		(H) IPW		(I) PSM	
	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total	Manu	Total
<b>Panel I: Debt crisis</b>																		
ATE	-7.058*** (1.225)	-7.677*** (1.764)	-7.092*** (1.215)	-6.570*** (1.761)	-6.837*** (1.048)	-6.858*** (1.533)	-4.605*** (1.151)	-6.153*** (1.659)	-5.113*** (1.094)	-4.165*** (1.598)	-8.418*** (1.582)	-9.411*** (2.237)	-8.248*** (1.262)	-9.308*** (2.108)	-6.114*** (2.066)	-9.150*** (3.092)	-5.777*** (1.549)	-10.026*** (3.802)
<b>Panel II: Banking crisis</b>																		
ATE	-3.673*** (1.278)	-6.882*** (1.956)	-2.233* (1.285)	-4.362** (2.013)	-4.042*** (1.034)	-5.660*** (1.556)	-6.495*** (1.172)	-12.822*** (1.733)	-0.436 (1.288)	-2.875 (2.019)	-8.258*** (1.378)	-14.205*** (2.913)	-7.604*** (1.559)	-15.620*** (2.250)	-5.097*** (1.744)	-10.552*** (2.566)	-5.167*** (1.551)	-11.439*** (2.251)
<b>Panel III: Currency crisis</b>																		
ATE	-3.794*** (1.466)	-6.489*** (2.375)	-3.689** (1.473)	-6.776*** (2.325)	-2.373** (1.133)	-3.407* (1.771)	-6.041*** (1.439)	-10.729*** (2.181)	-0.686 (1.522)	-0.446 (2.327)	-3.767** (1.468)	-6.443*** (2.351)	-9.901*** (1.227)	-15.834*** (1.935)	-5.745*** (1.817)	-10.221*** (2.899)	-3.878*** (1.462)	-7.496** (3.324)
<b>Panel IV: Inflation crisis</b>																		
ATE	-3.625*** (1.101)	-5.925*** (1.812)	-3.586*** (1.113)	-5.773*** (1.853)	-3.451*** (0.996)	-5.463*** (1.534)	-3.355*** (1.072)	-7.864*** (1.697)	-3.112*** (1.109)	-6.280*** (1.780)	-3.498* (2.084)	-7.381** (3.086)	-8.280*** (0.978)	-10.557*** (1.494)	-3.365* (1.784)	-7.106** (2.858)	-3.913*** (1.191)	-7.983*** (0.845)
Observations	961	961	961	961	961	961	961	961	697	697	398	398	961	961	771	771	1027	1027

Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of manufacturing, and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Column (A): benchmark results. Column (B): additional controls. Column (C): maximum weight set to 5. Column (D): unrestricted coefficients. Column (E): drop the period 2008-2014; Column (F): drop of small and developed countries. Column (G): change the definitions and sources of crises. Column (H): Inverse propensity weighting (IPW) estimator. Column (I): Propensity score matching (PSM) estimator.



Table 5: Robustness checks, placebo crises

<b>Debt crisis</b>										
	Exports					Imports				
<b>Dependent variables (cumulative change of trade between t-1 and t+5)</b>	Agri	Mini	Manu	Serv	Total	Agri	Mini	Manu	Serv	Total
<b>Percentage of negative and significant coefficients over 500 estimations</b>	1.40	3.00	2.60	2.80	2.00	1.00	3.80	1.60	1.20	1.20
<b>Percentage of positive and significant coefficients over 500 estimations</b>	1.60	0.80	1.20	1.40	0.80	0.60	0.60	1.20	0.40	1.20
<b>Banking crisis</b>										
	Exports					Imports				
<b>Dependent variables (cumulative change of trade between t-1 and t+5)</b>	Agri	Mini	Manu	Serv	Total	Agri	Mini	Manu	Serv	Total
<b>Percentage of negative and significant coefficients over 500 estimations</b>	2.60	9.20	5.20	3.20	6.40	0.00	2.20	5.80	4.60	3.00
<b>Percentage of positive and significant coefficients over 500 estimations</b>	0.60	0.20	0.20	2.00	1.20	8.60	2.40	1.20	1.80	2.40
<b>Currency crisis</b>										
	Exports					Imports				
<b>Dependent variables (cumulative change of trade between t-1 and t+5)</b>	Agri	Mini	Manu	Serv	Total	Agri	Mini	Manu	Serv	Total
<b>Percentage of negative and significant coefficients over 500 estimations</b>	2.60	4.40	2.20	3.00	2.60	0.60	2.80	2.20	2.00	2.20
<b>Percentage of positive and significant coefficients over 500 estimations</b>	1.00	0.60	0.60	0.60	0.80	0.60	0.40	0.60	0.20	0.00
<b>Inflation crisis</b>										
	Exports					Imports				
<b>Dependent variables (cumulative change of trade between t-1 and t+5)</b>	Agri	Mini	Manu	Serv	Total	Agri	Mini	Manu	Serv	Total
<b>Percentage of negative and significant coefficients over 500 estimations</b>	3.20	7.60	2.20	2.60	3.00	0.20	1.20	2.80	2.00	1.20
<b>Percentage of positive and significant coefficients over 500 estimations</b>	0.40	0.40	0.60	0.60	0.20	1.80	0.60	0.80	0.00	0.20

Notes: 500 simulations of the trade costs of financial crises in a sample that never experienced a financial crisis. We drop all country-year observations with financial crises and randomly assign the same number and duration of crises to the remaining sample that never experienced a financial crisis. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services, and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP.

that they experienced a sufficient number of crises; thus, for high-income countries, results for debt crises (4 crises) and inflation crises (8 crises) are not reported as they may be affected by the small number of observations. Disaggregating the trade costs of financial crises by level of development reveals the following results. First, while they are unaffected by currency crises in low- and high-income countries, imports significantly decrease in middle-income countries. The same holds for exports in middle-income countries (except for mining goods), while in some cases exports are fostered by currency crises (agricultural and mining goods in low-income countries, and services in high-income countries). Second, exports and imports in middle-income countries are relatively less affected by banking crises compared with low- and high-income countries, and exports of agricultural goods are even significantly higher. Third, whenever statistical differences are at work, debt crises are associated with stronger trade costs in middle-income compared with low-income countries, while they improve exports in agricultural goods in both groups of countries. Fourth, the trade costs of inflation crises for manufactured goods, services, and total trade are significantly higher in middle-income countries compared with low-income countries; in addition, except for mining imports and exports, inflation crises either do not significantly affect or increase the trade of goods and services in low-income countries. In sum, the level of development is an important determinant of the trade costs of financial crises, and the group of middle-income countries seems to experience different patterns in their trade costs across crises and goods and services compared with low-income and high-income countries.

Table 6: Sensitivity, by level of income, cumulative trade costs over five years after financial crises

	(I) Exports					(II) Imports				
	(1) Agri	(2) Mini	(3) Manu	(4) Serv	(5) Total	(6) Agri	(7) Mini	(8) Manu	(9) Serv	(10) Total
<b>Panel A: Debt crisis</b>						<b>Panel E: Debt crisis</b>				
ATE_LI	4.903*** (1.212)	-6.187*** (1.224)	-8.218*** (1.541)	-0.317 (1.006)	-11.131*** (2.632)	0.686 (0.505)	-1.760*** (0.584)	-7.618*** (1.994)	-0.531 (0.648)	-5.814** (2.819)
ATE_MI	1.803* (1.025)	-3.866*** (1.035)	-11.293*** (1.303)	-3.453*** (0.850)	-18.137*** (2.225)	0.303 (0.413)	-1.853*** (0.477)	-10.141*** (1.631)	-2.115*** (0.530)	-13.899*** (2.305)
ATE_HI	-	-	-	-	-	-	-	-	-	-
P-value test of equality LI-MI	0.107	0.199	0.166	-	0.072	-	0.915	0.396	-	0.053
P-value test of equality LI-HI	-	-	-	-	-	-	-	-	-	-
P-value test of equality MI-HI	-	-	-	-	-	-	-	-	-	-
<b>Panel B: Banking crisis</b>						<b>Panel F: Banking crisis</b>				
ATE_LI	-0.994 (1.319)	-1.154 (1.208)	-2.461 (1.983)	-5.428*** (1.024)	-10.307*** (2.813)	-0.067 (0.529)	-1.663*** (0.638)	-3.504* (2.037)	-3.715*** (0.778)	-11.104*** (3.142)
ATE_MI	2.100* (1.115)	0.022 (1.021)	-4.277** (1.677)	-1.114 (0.866)	-5.564** (2.378)	-0.372 (0.433)	-0.467 (0.522)	-4.283** (1.666)	-1.302** (0.636)	-6.929*** (2.569)
ATE_HI	-1.026 (1.711)	-2.095 (1.567)	-5.575*** (2.573)	-5.763*** (1.329)	-12.973*** (3.650)	-0.459 (0.698)	-1.992** (0.842)	-8.827*** (2.686)	-3.627*** (1.026)	-15.127*** (4.143)
P-value test of equality LI-MI	-	-	-	-	0.184	-	-	0.759	0.024	0.305
P-value test of equality LI-HI	-	-	-	0.827	0.513	-	0.700	0.033	0.949	0.359
P-value test of equality MI-HI	-	-	0.626	-	0.084	-	-	0.106	0.047	0.061
<b>Panel C: Currency crisis</b>						<b>Panel G: Currency crisis</b>				
ATE_LI	2.342* (1.269)	3.947* (2.090)	-1.934 (2.060)	-1.745 (1.099)	1.400 (3.465)	-0.133 (0.683)	-0.393 (0.803)	-0.910 (2.366)	-0.783 (0.824)	-0.278 (3.876)
ATE_MI	-2.459** (1.073)	-2.759 (1.767)	-5.777*** (1.742)	-3.741*** (0.929)	-14.749*** (2.929)	-1.034* (0.559)	-2.041*** (0.657)	-10.914*** (1.935)	-2.581*** (0.673)	-17.347*** (3.170)
ATE_HI	0.995 (1.647)	-1.058 (2.712)	4.241 (2.673)	2.724* (1.426)	5.121 (4.496)	0.747 (0.901)	-1.075 (1.059)	0.139 (3.120)	0.369 (1.086)	-1.338 (5.111)
P-value test of equality LI-MI	0.013	-	-	-	-	-	-	-	-	-
P-value test of equality LI-HI	-	-	-	-	-	-	-	-	-	-
P-value test of equality MI-HI	-	-	-	0.001	-	-	-	-	-	-
<b>Panel D: Inflation crisis</b>						<b>Panel H: Inflation crisis</b>				
ATE_LI	0.667 (1.058)	-5.845*** (0.988)	1.218 (1.508)	3.414*** (0.947)	-2.642 (2.523)	3.171*** (0.641)	-2.103*** (0.788)	0.729 (1.935)	2.825*** (0.660)	2.548 (3.398)
ATE_MI	-1.227 (0.894)	-3.386*** (0.835)	-5.770*** (1.275)	-1.348* (0.800)	-11.379*** (2.133)	0.158 (0.524)	-2.190*** (0.644)	-3.165** (1.583)	-1.256** (0.540)	-6.729*** (2.779)
ATE_HI	-	-	-	-	-	-	-	-	-	-
P-value test of equality LI-MI	-	0.083	-	0.001	-	-	0.944	-	0.000	-
P-value test of equality LI-HI	-	-	-	-	-	-	-	-	-	-
P-value test of equality MI-HI	-	-	-	-	-	-	-	-	-	-
Observations	907	907	907	907	907	961	961	961	961	961

Notes: Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. LI, MI, and HI denotes Low-income, Middle-income, and High-income countries, respectively. For debt and inflation crises in high-income countries, we do not report the estimated coefficients as they may be affected by the small number of crises of this type. P-values are reported for the Wald statistical equality tests of coefficients (only when coefficients are significant).

## 6.2 The phase of the business cycle

We investigate if the trade costs of financial crises are mainly driven by what is happening during recessions. By applying the Hodrick-Prescott filter (with a smoothing parameter of 100) to the logarithm of real GDP per capita, we differentiate between the two major phases of the business cycle, namely economic boom and slump. Table 7 reports the effect of financial crises on trade in booms and slumps. First, in some cases, the trade cost of financial crises is significantly stronger in slumps compared with booms. This is sometimes the case for banking and currency crises, for both exports and imports, and for different types of traded goods, and services. Second, whenever differences related to the business cycle are at work, the decrease of trade is stronger during booms for inflation crises. Third, the effect of crises on agricultural exports does not significantly vary with the business cycle, contrary to their effect on agricultural imports, which is positive for inflation crises occurring in booms, and negative (positive)

for currency (debt) crises occurring in slumps. Consequently, the phase of the business cycle is found to influence sometimes the effect of financial crises on trade, depending on the type of financial crises and the considered type of goods or services.

Table 7: Sensitivity, booms versus slumps, cumulative trade costs over five years after financial crises

	(I) Exports					(II) Imports					
	(1) Agri	(2) Mini	(3) Manu	(4) Serv	(5) Total	(6) Agri	(7) Mini	(8) Manu	(9) Serv	(10) Total	
<b>Panel A: Debt crisis</b>						<b>Panel E: Debt crisis</b>					
ATE Boom	3.712*** (0.968)	-1.791 (1.834)	-7.205*** (1.439)	-1.822** (0.818)	-11.275*** (2.422)	ATE Boom	0.472 (0.349)	-2.047*** (0.529)	-4.256** (1.724)	-0.759 (0.525)	-7.882*** (2.507)
ATE Slump	3.566*** (0.937)	-3.473* (1.776)	-7.740*** (1.393)	-1.433* (0.792)	-12.919*** (2.346)	ATE Slump	1.486*** (0.337)	-0.412 (0.510)	-8.713*** (1.662)	-0.901* (0.506)	-7.651*** (2.418)
P-value test of equality	0.914	-	0.789	0.730	0.626	P-value test of equality	-	-	0.064	-	0.947
<b>Panel B: Banking crisis</b>						<b>Panel F: Banking crisis</b>					
ATE Boom	0.684 (1.177)	-1.832 (1.814)	-1.628 (1.969)	-0.683 (1.003)	-3.206 (2.595)	ATE Boom	-0.067 (0.445)	0.711 (0.691)	-1.362 (1.748)	-1.218* (0.699)	-2.322 (2.618)
ATE Slump	0.372 (1.140)	-0.852 (1.757)	-4.728** (1.907)	-3.103*** (0.971)	-8.524*** (2.514)	ATE Slump	-0.114 (0.429)	-0.665 (0.666)	-4.459*** (1.686)	-2.340*** (0.674)	-8.001*** (2.524)
P-value test of equality	-	-	-	-	-	P-value test of equality	-	-	-	0.244	-
<b>Panel C: Currency crisis</b>						<b>Panel G: Currency crisis</b>					
ATE Boom	-1.053 (1.050)	-1.338 (2.533)	0.514 (1.888)	0.612 (1.112)	-0.658 (2.944)	ATE Boom	0.902 (0.555)	-0.716 (0.807)	-4.509** (2.004)	-0.353 (0.744)	-7.705** (3.184)
ATE Slump	-0.521 (1.017)	0.272 (2.453)	-2.045 (1.829)	-3.409*** (1.077)	-5.536* (2.852)	ATE Slump	-1.401*** (0.535)	-1.294* (0.779)	-4.627** (1.933)	-1.210* (0.718)	-7.806** (3.070)
P-value test of equality	-	-	-	-	-	P-value test of equality	-	-	0.966	-	0.982
<b>Panel D: Inflation crisis</b>						<b>Panel H: Inflation crisis</b>					
ATE Boom	-0.824 (0.880)	-2.977** (1.516)	-4.977*** (1.314)	-1.240 (0.841)	-13.172*** (2.015)	ATE Boom	1.876*** (0.487)	-2.005*** (0.593)	-4.023*** (1.493)	-1.136** (0.494)	-7.195*** (2.459)
ATE Slump	-0.524 (0.852)	-2.301 (1.468)	-2.772** (1.273)	0.918 (0.814)	-5.772*** (1.952)	ATE Slump	0.272 (0.469)	-2.129*** (0.572)	-3.125** (1.439)	0.301 (0.477)	-5.003** (2.371)
P-value test of equality	-	-	0.226	-	0.008	P-value test of equality	-	0.880	0.663	-	0.518
Observations	907	907	907	907	907	Observations	961	961	961	961	961

Notes: Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. The Boom bin is for observations where the cyclical component of real GDP per capita is greater than zero, and the Slump bin is for observations where the cyclical component is less than or equal to zero. P-values are reported for the Wald statistical equality tests of coefficients in Boom and Slump (only when both coefficients are significant).

### 6.3 Fiscal policy cyclicality

In the aftermath of the recent great recession, there has been support for the adoption of countercyclical fiscal policies to mitigate its detrimental costs (for example, on economic growth or employment). To capture the cyclicality of fiscal policy for each country, we estimate a model in which the primary balance is explained by the lag of the cyclical component of the real GDP per capita (obtained using the Hodrick-Prescott filter), the lag of inflation, the lag of the current account, and country-fixed effects. A positive and significant coefficient of the cyclical real GDP signals a countercyclical fiscal policy (27 countries), a negative and significant coefficient indicates a procyclical fiscal policy (63 countries), and a non-significant coefficient suggests an acyclical fiscal policy (9 countries). We then oppose countries with either countercyclical or acyclical fiscal policy, and countries with procyclical fiscal policy. Estimations in [table 8](#) reveal several interesting patterns in countries with procyclical compared with countries

with countercyclical or acyclical fiscal policy. First, the costs of banking crises are significantly higher in several cases. Second, there is a significantly less favorable response of agricultural exports (for debt and inflation crises) and imports (for debt, currency, and inflation crises). Third, the import costs of manufactured goods are significantly higher for all except debt crises. Fourth, debt crises generate significantly larger export costs in countries with procyclical fiscal policy (for example, for mining goods and services), and larger import costs in countries with acyclical or countercyclical fiscal policy (for mining and manufactured goods). Fifth, the response of trade in total exports does not significantly differ with fiscal policy cyclicity, except for banking crises. Finally, except for debt crises, the trade costs of total imports are significantly higher in countries with procyclical fiscal policy. Consequently, the phase of the business cycle is found to be an important determinant of the trade costs of financial crises.

Table 8: Sensitivity, acyclical & countercyclical versus procyclical fiscal policy, cumulative trade costs over five years after financial crises

(I) Exports						(II) Imports					
	(1) Agri	(2) Mini	(3) Manu	(4) Serv	(5) Total	(6) Agri	(7) Mini	(8) Manu	(9) Serv	(10) Total	
<b>Panel A: Debt crisis</b>						<b>Panel E: Debt crisis</b>					
ATE Acyclical Contracyclical	6.017*** (1.108)	0.531 (2.189)	-8.037*** (1.683)	-0.631 (1.013)	-8.270*** (2.805)	ATE Acyclical Contracyclical	2.434*** (0.409)	-1.557** (0.618)	-10.162*** (2.053)	-0.074 (0.574)	-5.978** (2.975)
ATE Procyclical	2.448*** (0.824)	-3.462** (1.628)	-7.534*** (1.251)	-1.541** (0.753)	-12.813*** (2.086)	ATE Procyclical	0.371 (0.306)	-0.091 (0.463)	-5.999*** (1.536)	-0.820* (0.429)	-7.638*** (2.227)
P-value test of equality	0.002	-	0.792	-	0.133	P-value test of equality	-	-	0.000	-	0.291
<b>Panel B: Banking crisis</b>						<b>Panel F: Banking crisis</b>					
ATE Acyclical Contracyclical	-0.088 (1.253)	2.375 (1.848)	-0.402 (2.202)	-3.027** (1.215)	-0.839 (3.050)	ATE Acyclical Contracyclical	-0.009 (0.502)	0.066 (0.792)	-1.518 (2.148)	-3.469*** (0.865)	-3.292 (3.189)
ATE Procyclical	0.667 (0.932)	-3.854*** (1.374)	-3.998** (1.638)	-1.914** (0.904)	-8.333*** (2.269)	ATE Procyclical	-0.422 (0.376)	0.007 (0.593)	-5.324*** (1.608)	-0.623 (0.647)	-8.193*** (2.386)
P-value test of equality	-	-	-	0.488	-	P-value test of equality	-	-	-	-	-
<b>Panel C: Currency crisis</b>						<b>Panel G: Currency crisis</b>					
ATE Acyclical Contracyclical	0.081 (1.175)	1.198 (2.836)	-2.410 (2.248)	-1.142 (1.315)	-3.722 (3.505)	ATE Acyclical Contracyclical	1.483** (0.644)	-2.245** (0.926)	-2.381 (2.433)	0.348 (0.966)	-1.571 (3.964)
ATE Procyclical	-1.064 (0.874)	-1.075 (2.109)	0.264 (1.672)	-1.562 (0.978)	-2.824 (2.607)	ATE Procyclical	-1.550*** (0.482)	-0.706 (0.693)	-5.126*** (1.821)	-1.085 (0.723)	-8.518*** (2.966)
P-value test of equality	-	-	-	-	-	P-value test of equality	0.000	-	-	-	-
<b>Panel D: Inflation crisis</b>						<b>Panel H: Inflation crisis</b>					
ATE Acyclical Contracyclical	3.131*** (0.937)	-6.084*** (1.854)	-5.742*** (1.648)	1.790* (1.076)	-9.876*** (2.510)	ATE Acyclical Contracyclical	2.667*** (0.585)	-4.345*** (0.694)	1.952 (1.814)	-0.397 (0.552)	1.594 (3.020)
ATE Procyclical	-2.163*** (0.697)	-2.841** (1.379)	-2.728** (1.226)	-0.004 (0.800)	-9.018*** (1.867)	ATE Procyclical	0.660 (0.438)	-1.369*** (0.519)	-4.560*** (1.357)	-0.605 (0.413)	-7.273*** (2.260)
P-value test of equality	0.000	0.092	0.101	-	0.765	P-value test of equality	-	0.000	-	-	-
Observations	907	907	907	907	907	Observations	961	961	961	961	961

Notes: Robust standard errors clustered at the country-level in parentheses.  $*p < 0.10$ ,  $**p < 0.05$ ,  $***p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. The Acyclical & Countercyclical bin is for countries exhibiting an acyclical and a countercyclical fiscal policy over 1980-2014, and the Procyclical bin is for countries exhibiting a procyclical fiscal policy over 1980-2014. P-values are reported for the Wald statistical equality tests of coefficients in Acyclical & Countercyclical and Procyclical (only when both coefficients are significant).

## 6.4 Exchange rate regime

The adoption of a fixed exchange rate regime, lacking exchange rate-driven automatic stabilizers, may amplify countries' trade vulnerability to financial crises. Using the database of [Ilzetzi et al. \(2017\)](#), we construct a dummy variable to differentiate between floating and fixed exchange rate regimes. The

results reported in table 9 reveal that, from a general perspective, the type of exchange rate regime is not associated with significant differences in the trade costs of banking and currency crises, except for significantly higher total and manufacturing export (manufacturing import) costs for banking (currency) crises under a fixed (floating) exchange rate regime. Moreover, the increase in traded agricultural goods is significantly stronger under a floating exchange rate regime following debt and inflation crises (except for agricultural exports following inflation crises). Finally, the effects of inflation crises are significantly better for all types of imported goods and services under a floating exchange rate regime (i.e. trade either increases or is not significantly affected). Consequently, in some cases, and particularly regarding debt and inflation crises, our analysis reveals significant differences in the trade costs of crises related with the exchange rate regime in place.

Table 9: Sensitivity, fixed versus floating exchange rate regime, cumulative trade costs over five years after financial crises

	(I) Exports					(II) Imports				
	(1) Agri	(2) Mini	(3) Manu	(4) Serv	(5) Total	(6) Agri	(7) Mini	(8) Manu	(9) Serv	(10) Total
<b>Panel A: Debt crisis</b>						<b>Panel E: Debt crisis</b>				
ATE Fixed regime	2.419*** (0.878)	1.131 (1.537)	-8.956*** (1.290)	-3.579*** (0.715)	-14.252*** (2.089)	0.142 (0.291)	-0.629 (0.473)	-7.577*** (1.478)	-1.704*** (0.463)	-8.918*** (2.147)
ATE Floating regime	5.284*** (1.258)	-3.978* (2.203)	-11.399*** (1.848)	0.980 (1.025)	-8.007*** (2.994)	2.148*** (0.434)	-0.369 (0.704)	-4.706** (2.200)	0.706 (0.688)	-1.781 (3.194)
P-value test of equality	0.082	-	0.313	-	0.098	-	-	0.265	-	-
<b>Panel B: Banking crisis</b>						<b>Panel F: Banking crisis</b>				
ATE Fixed regime	-0.018 (1.010)	-0.517 (1.490)	-6.280*** (1.747)	-2.352*** (0.872)	-9.090*** (2.355)	-0.385 (0.366)	-0.642 (0.618)	-3.886** (1.552)	-1.386** (0.538)	-6.989*** (2.403)
ATE Floating regime	1.601 (1.448)	-3.047 (2.135)	3.208 (2.504)	-3.866*** (1.250)	-2.614 (3.375)	0.102 (0.545)	0.028 (0.920)	-3.911* (2.309)	-2.092*** (0.800)	-6.275* (3.576)
P-value test of equality	-	-	-	0.369	-	-	-	0.993	0.472	0.849
<b>Panel C: Currency crisis</b>						<b>Panel G: Currency crisis</b>				
ATE Fixed regime	-0.604 (0.965)	-1.431 (2.050)	-0.153 (1.752)	-1.187 (0.862)	-3.133 (2.614)	-0.296 (0.433)	-1.105 (0.694)	-2.469 (1.709)	-0.134 (0.589)	-4.692* (2.706)
ATE Floating regime	-1.189 (1.383)	1.957 (2.938)	0.797 (2.510)	-0.381 (1.235)	-1.505 (3.746)	-0.995 (0.644)	-0.764 (1.033)	-4.584* (2.542)	-1.343 (0.877)	-9.073** (4.027)
P-value test of equality	-	-	-	-	-	-	-	-	-	0.315
<b>Panel D: Inflation crisis</b>						<b>Panel H: Inflation crisis</b>				
ATE Fixed regime	-0.693 (0.767)	-2.597** (1.173)	-4.947*** (1.260)	0.059 (0.730)	-10.279*** (1.842)	0.438 (0.408)	-2.141*** (0.549)	-6.546*** (1.266)	-1.085** (0.440)	-10.545*** (2.147)
ATE Floating regime	0.542 (1.099)	-3.087* (1.681)	-2.287 (1.805)	0.784 (1.046)	-5.162* (2.640)	2.001*** (0.607)	-0.766 (0.817)	-0.747 (1.884)	2.425*** (0.655)	4.066 (3.195)
P-value test of equality	-	0.775	-	-	0.100	-	-	-	0.000	-
Observations	907	907	907	907	907	961	961	961	961	961

Notes: Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. The Fixed regime bin is for observations where the exchange rate is fixed or peg, and the Floating regime bin is for observations where the exchange rate is floating. P-values are reported for the Wald statistical equality tests of coefficients in Fixed regime and Floating regime (only when both coefficients are significant).

## 6.5 IMF-supported programs

The IMF has a long tradition of international lender of last resort and assistance for countries in economic turmoil. For example, based on data in our sample, the IMF intervenes in 50% of cases during banking and currency crises, and in more than 60% of cases during debt and inflation crises. Given the

debates on the consequences of IMF interventions,<sup>17</sup> we look at their effect on the trade costs of financial crises using data for IMF programs from [Reinhart and Trebesch \(2016\)](#). The results reported in [table 10](#) show contradictory effects of IMF programs on the trade costs of financial crises. In terms of total trade, IMF programs are associated with significantly higher exports and imports trade costs for debt crises, but the opposite is true for inflation crises (such an opposite effect is at work for total imports following currency crises, and total exports following banking crises). Moreover, the presence of IMF programs is often associated with significantly higher trade costs for agricultural and mining exports (while the effects on agricultural and mining imports are more sensitive to the type of financial crisis). Finally, IMF programs are associated with significantly higher trade costs for imports under currency crises (except for mining imports), but they are appealing for avoiding export and import trade costs for inflation crises (except for agricultural exports). Consequently, from a general perspective, IMF programs are found to exert contradictory effects on the trade costs of financial crises.

Table 10: Sensitivity, IMF versus non-IMF program, cumulative trade costs over five years after financial crises

	(I) Exports					(II) Imports					
	(1) Agri	(2) Mini	(3) Manu	(4) Serv	(5) Total	(6) Agri	(7) Mini	(8) Manu	(9) Serv	(10) Total	
<b>Panel A: Debt crisis</b>						<b>Panel E: Debt crisis</b>					
ATE IMF	4.165*** (1.138)	-7.510*** (2.351)	-7.063*** (1.436)	-0.082 (0.927)	-14.161*** (2.474)	ATE IMF	-0.494 (0.436)	-2.038*** (0.657)	-8.808*** (1.904)	0.617 (0.541)	-12.784*** (2.751)
ATE Non IMF	2.723*** (0.894)	7.290*** (1.846)	-8.198*** (1.128)	-3.561*** (0.728)	-8.333*** (1.943)	ATE Non IMF	3.425*** (0.346)	3.880*** (0.521)	-8.772*** (1.510)	0.017 (0.429)	-0.321 (2.182)
P-value test of equality	0.382	0.000	0.535	-	0.088	P-value test of equality	-	0.000	0.988	-	-
<b>Panel B: Banking crisis</b>						<b>Panel F: Banking crisis</b>					
ATE IMF	0.889 (1.275)	-7.909*** (2.256)	5.633*** (2.023)	-0.818 (1.032)	-0.189 (2.521)	ATE IMF	-1.503*** (0.515)	-0.398 (0.765)	-3.095 (1.913)	-2.573*** (0.865)	-8.030*** (3.008)
ATE Non IMF	-1.076 (1.001)	1.708 (1.772)	-7.897*** (1.589)	-3.745*** (0.811)	-10.153*** (1.980)	ATE Non IMF	-0.214 (0.409)	-0.810 (0.606)	-7.823*** (1.517)	-2.785*** (0.686)	-11.010*** (2.385)
P-value test of equality	-	-	0.000	-	-	P-value test of equality	-	-	-	0.863	0.492
<b>Panel C: Currency crisis</b>						<b>Panel G: Currency crisis</b>					
ATE IMF	-2.207* (1.261)	1.125 (3.052)	0.174 (2.047)	-1.796 (1.138)	-2.831 (3.345)	ATE IMF	-1.028* (0.606)	-0.532 (0.902)	-7.131*** (2.303)	-1.454* (0.802)	-11.850*** (3.729)
ATE Non IMF	-0.254 (0.991)	-2.036 (2.397)	-0.923 (1.608)	-0.624 (0.893)	-3.204 (2.627)	ATE Non IMF	-0.409 (0.481)	-1.762** (0.715)	-2.226 (1.826)	-0.114 (0.636)	-4.208 (2.957)
P-value test of equality	-	-	-	-	-	P-value test of equality	-	-	-	-	-
<b>Panel D: Inflation crisis</b>						<b>Panel H: Inflation crisis</b>					
ATE IMF	-2.821*** (1.010)	-2.714 (1.882)	1.755 (1.454)	2.166** (0.917)	-1.700 (2.237)	ATE IMF	1.050* (0.566)	0.227 (0.678)	2.092 (1.712)	1.881*** (0.540)	4.356 (2.768)
ATE Non IMF	0.061 (0.793)	-6.654*** (1.478)	-6.317*** (1.142)	-0.476 (0.720)	-15.526*** (1.757)	ATE Non IMF	0.266 (0.449)	-4.083*** (0.537)	-9.547*** (1.357)	-2.635*** (0.428)	-16.361*** (2.195)
P-value test of equality	-	-	-	-	-	P-value test of equality	-	-	-	0.000	-
Observations	907	907	907	907	907	Observations	961	961	961	961	961

Notes: Robust standard errors clustered at the country-level in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . AIPW estimates. The dependent variables are 100 times the cumulative change of agricultural, mining, manufacturing, services and total exports and imports relative to the year prior to the onset of the crisis for years 1-5 after the onset of the crisis, scaled by 2010 real GDP. Accumulated costs over five years. Restricted coefficients associated with controls to be equal for the treated and control groups. Observations in the treated and control groups are weighted by the propensity scores predicted in the treatment model. Maximum weights truncated at 10. The IMF bin is for observations where the IMF-supported program occurred during financial crises, and the Non-IMF bin is for observations without any IMF-supported program occurred during financial crises. P-values are reported for the Wald statistical equality tests of coefficients in IMF and Non-IMF (only when both coefficients are significant).

<sup>17</sup>Studies that discuss IMF interventions include e.g. [Edwards \(1986\)](#); [Bordo and James \(2000\)](#); [IMF \(2002\)](#); [Joyce \(2005\)](#); [Mody and Saravia \(2006\)](#), and more recently [Reinhart and Trebesch \(2016\)](#).

## 7 Concluding remarks

This paper assesses the trade costs of financial crises. Compared with the existing literature that mainly focuses on the total trade of goods and, in the context of the recent great recession, on manufacturing trade, we adopt a more detailed perspective by looking at the response of different types of trade (i.e. agricultural, mining, and manufactured goods, and services) following various types of financial crises (i.e. debt, banking, currency, and inflation crises). To this end, we draw upon a methodology that combines impact assessment and local projections to capture a causal dynamic effect running from financial crises to the trade activity.

While we confirm that aggregate exports and imports significantly decrease following most financial crises, our granular analysis reveals interesting patterns at the disaggregated level. Manufacturing goods are the most affected by financial crises; yet they leave unexplained between 8 and 55% of the contraction of the total trade, which can be attributable to the decrease of trade in services, and in mining goods. Interestingly, in some cases, trade in agricultural goods can significantly increase, a result that is confirmed for exports when considering the effects of combined financial crises. Robust to a wide set of alternative specifications, these findings are nevertheless found to be sensitive to several countries' key structural characteristics, such as the level of development, the phase of the business cycle, the fiscal policy cyclicity, and the exchange rate regime, and also the presence of an IMF program following financial crises.

Consequently, our paper unveils the complex panorama of the trade costs of financial crises. As thoroughly emphasized, we reveal three sources that contribute to this complexity: the type of financial crisis, the considered type of goods or services, and countries' key structural characteristics. Through illustrating the contribution of each of these sources, our analysis contributes to the general understanding of the trade effects of financial crises, and may provide insightful support for the design and implementation of policies aimed at coping with these effects.

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SUPPLEMENTARY MATERIAL

Appendix A Sample, variables descriptions and sources

Appendix A.1 Sample and financial crises since 1980

Figure A.1: Sample of countries and the starting date of the various financial crises since 1980



Notes : The graph reports the starting date of the various crises since 1980 in the 99 countries used in our analysis.

## Appendix A.2 Data description and sources

Table A.1: Data sources and descriptions

Variables	Sources	Descriptions
<b>Trade variables</b>		
International trade in goods	World Integrated Trade Solution (WITS) code at 3-digit SITC classification	Deflated by US GDP consumer price index. Changes in trade (both exports and imports) from the year prior financial crises to an ahead horizon h, in percentage of 2010 real GDP, for each category of products and services and for total trade
International trade in services	United Nations Conference on Trade and Development (UNCTAD)	
<b>Financial crises</b>		
Debt crises	<a href="#">Reinhart and Rogoff (2009)</a> and <a href="#">Cruces and Trebesch (2013)</a>	Dummy equals 1 during debt crises and 0 otherwise
Banking crises	<a href="#">Laeven and Valencia (2012)</a> and <a href="#">Reinhart and Rogoff (2009)</a>	Dummy equals 1 during banking crises and 0 otherwise
Currency crises	Authors' calculation based on exchange rate taken from Penn World Tables 9.0	Dummy equals 1 during currency crises and 0 otherwise based on the thresholds defined by <a href="#">Reinhart and Rogoff (2009)</a> and <a href="#">Frankel and Rose (1996)</a>
Inflation crises	Authors' calculation based on inflation rate taken from World Development Indicators	Dummy equals 1 during debt crises and 0 otherwise based on the thresholds defined by <a href="#">Reinhart and Rogoff (2009)</a> and <a href="#">Bruno and Easterly (1998)</a>
<b>Other variables</b>		
Changes of trade one and two years prior financial crises	Authors' calculations based on trade data	In percentage of 2010 real GDP, for each category of products and services and for total trade
Growth of export price (2-year average)	Authors' calculations based on export price level from Penn World Tables 9.0	Average of the growth of export price over the last two years; in percentage
Growth of import price (2-year average)	Authors' calculations based on import price level from Penn World Tables 9.0	
Shares of each trade by categories in total trade	Authors' calculations based on trade data	Percentage of total trade (both exports and imports)
Cyclical component of the log of real GDP per capital	Authors' calculations based on real GDP per capita taken from World Development Indicators (WDI)	Obtained from an Hodrick-Prescott with a smoothing parameter of 100
Real GDP per capita growth (2-year average)	Authors' calculations based on GDP taken from WDI	Average of the growth of real GDP per capita over the last two years; in percentage
Log of real GDP per capita	Authors' calculations based on GDP of taken from WDI	Logarithm of GDP
Log of real GDP per capita squared	Authors' calculations based on GDP of taken from WDI	Squared of the logarithm of GDP
Public debt (level and change)	IMF historical public debt database	Both the level in percentage of GDP and the average of the change over the last two years in percentage
Foreign reserves (level and change)	World Development Indicators	
Domestic credit (level and change)	World Development Indicators	
Real exchange rate with US dollar (level and change)	Penn World Tables 9.0	Both the level and the average of the change over the last two years in percentage
Terms of trade (level and change)	Penn World Tables 9.0	
Trade openness (level and change)	World Development Indicators	Both the level in percentage of GDP and the average of the change over the last two years in percentage
Broad Money (level and change)	World Development Indicators	
Current account (level and change)	World Development Indicators	
Exchange rate regime	<a href="#">Ilizetki et al. (2017)</a>	Equals 1 if floating regime and 0 if fixed regime
IMF program	<a href="#">Reinhart and Trebesch (2016)</a>	Equals 1 if IMF-supported program and 0 otherwise
Central bank independence score	<a href="#">Garriga (2016)</a>	Score between 0 and 1, with 1 indicating an absolute independence
Intensity of conflicts measured by MEPV score	Major episodes of political violence (MEPV)	Measure of degree of democracy; score between -10 (absolute autocracy) and 10 (absolute democracy)
Polity score	Polity VI	Measure of intensity of conflict between 0 and 10, where 0 means no political violence and 10 means the highest level of political violence
Fiscal policy stance	Authors' calculations	Equals 1 if countercyclical and acyclical fiscal policy and 0 if procyclical fiscal policy

II :

## Appendix B Summary statistics, correlations and unit root tests

Table B.2: Summary statistics for major variables

Variables	Obs.	Mean	Sd	Min	Max	Variables	Obs.	Mean	Sd	Min	Max
Change in exports of agricultural goods (h=5)	919	3.157	7.012	-21.924	61.275	Terms of trade	961	1.002	0.089	0.678	1.291
Change in exports of mining goods (h=5)	919	4.576	12.921	-76.505	98.608	Trade openness (% GDP)	961	63.271	33.308	12.346	220.407
Change in exports of manufacturing goods (h=5)	919	9.770	18.717	-59.459	186.378	Broad Money (% GDP)	958	93.212	825.032	10.159	18347.090
Change in exports of services (h=5)	919	5.494	8.618	-40.056	59.961	Current account (% GDP)	960	-1.368	5.911	-42.894	22.488
Change in total exports (h=5)	919	23.522	30.784	-76.184	242.551	Exchange rate regime dummy	961	0.311	0.463	0.000	1.000
Change in imports of agricultural goods (h=5)	961	2.136	3.650	-14.573	26.089	IMF program dummy	961	0.386	0.487	0.000	1.000
Change in imports of mining goods (h=5)	961	3.954	6.896	-21.344	41.046	Central bank independence score	959	0.514	0.214	0.135	0.904
Change in imports of manufacturing goods (h=5)	961	13.909	21.437	-65.701	211.603	Intensity of conflicts measured by MEPV score	961	0.754	1.147	0.000	5.000
Change in imports of services (h=5)	961	3.912	6.291	-34.447	33.748	Polity score	961	5.751	5.510	-9.000	10.000
Change in total imports (h=5)	961	24.573	33.319	-101.002	239.811	Change of export price (average two last years)	961	2.538	5.481	-11.456	36.283
Debt crisis dummy	961	0.199	0.399	0.000	1.000	Change of import price (average two last years)	961	2.200	5.367	-21.640	45.457
Banking crisis dummy	961	0.134	0.341	0.000	1.000	Share of agricultural exports (% total exports)	948	21.121	17.367	0.160	82.637
Currency crisis dummy	961	0.205	0.404	0.000	1.000	Share of mining exports (% total exports)	948	16.712	20.907	0.074	94.215
Inflation crisis dummy	961	0.177	0.382	0.000	1.000	Share of manufacturing exports (% total exports)	948	35.191	22.218	0.329	82.521
Cyclical component of the log real GDP per capita	961	-0.008	0.134	-0.771	0.384	Share of service exports (% total exports)	948	25.093	14.441	2.376	80.547
Log of real GDP per capita	961	8.455	1.275	5.818	11.493	Change of import price (average two last years)	961	2.200	5.367	-21.640	45.457
Public debt (% GDP)	945	59.048	42.986	3.890	448.590	Share of agricultural imports (% total imports)	961	9.793	4.213	3.124	35.459
Foreign reserves (% GDP)	961	12.747	9.802	0.772	113.046	Share of mining imports (% total imports)	961	11.182	6.529	0.738	45.230
Domestic credit (% GDP)	957	54.186	44.727	5.574	227.753	Share of manufacturing imports (% total imports)	961	56.360	9.227	26.081	78.068
Real exchange rate with US dollar	961	274.684	1210.178	0.000	10389.940	Share of service imports (% total imports)	961	20.522	6.566	6.068	40.164

Table B.3: Correlations for major variables

Variables	rho	p-value	Variables	rho	p-value	Variables	rho	p-value	Variables	rho	p-value
<b>Dummy debt crisis</b>			<b>Dummy banking crisis</b>			<b>Dummy currency crisis</b>			<b>Dummy inflation crisis</b>		
dumEDC	1.00		dumBC	1.00		dumCC	1.00		dumIC	1.00	
dumBC	0.19	0.00	dumCC	0.24	0.00	dumIC	0.53	0.00	expagri5	-0.09	0.01
dumCC	0.20	0.00	dumIC	0.21	0.00	expagri5	-0.11	0.00	expmini5	-0.12	0.00
dumIC	0.38	0.00	expagri5	-0.07	0.03	expmini5	-0.12	0.00	expmanu5	-0.11	0.00
expagri5	0.00	0.91	expmini5	-0.10	0.00	expmanu5	-0.11	0.00	expserv5	-0.12	0.00
expmini5	-0.16	0.00	expmanu5	-0.11	0.00	expserv5	-0.17	0.00	xptot5	-0.18	0.00
expmanu5	-0.18	0.00	expserv5	-0.20	0.00	xptot5	-0.19	0.00	impagri5	-0.10	0.00
expserv5	-0.12	0.00	xptot5	-0.18	0.00	impagri5	-0.18	0.00	impmini5	-0.21	0.00
xptot5	-0.21	0.00	impagri5	-0.18	0.00	impmini5	-0.22	0.00	impmanu5	-0.09	0.01
impagri5	-0.06	0.05	impmini5	-0.15	0.00	impmanu5	-0.15	0.00	impserv5	-0.15	0.00
impmini5	-0.15	0.00	impmanu5	-0.17	0.00	impserv5	-0.21	0.00	imptot5	-0.14	0.00
impmanu5	-0.09	0.01	impserv5	-0.24	0.00	imptot5	-0.21	0.00	loggdpcap_cyc	-0.25	0.00
impserv5	-0.15	0.00	imptot5	-0.21	0.00	loggdpcap_cyc	-0.29	0.00	loggdpcap	-0.19	0.00
imptot5	-0.12	0.00	loggdpcap_cyc	-0.17	0.00	loggdpcap	-0.10	0.00	pubdebt	0.14	0.00
loggdpcap_cyc	-0.16	0.00	loggdpcap	0.01	0.76	pubdebt	0.08	0.02	reserves	-0.16	0.00
loggdpcap	-0.26	0.00	pubdebt	0.16	0.00	reserves	-0.11	0.00	dcredit	-0.31	0.00
pubdebt	0.36	0.00	reserves	-0.08	0.01	dcredit	-0.18	0.00	exchrates	-0.04	0.17
reserves	-0.18	0.00	dcredit	0.05	0.14	exchrates	0.01	0.87	termstrade	-0.11	0.00
dcredit	-0.28	0.00	exchrates	0.03	0.31	termstrade	-0.05	0.14	tradeopen	-0.25	0.00
exchrates	-0.02	0.46	termstrade	0.00	0.95	tradeopen	-0.19	0.00	broadmon	0.08	0.01
termstrade	0.01	0.68	tradeopen	-0.04	0.25	broadmon	0.08	0.01	curaccbal	-0.08	0.02
tradeopen	-0.12	0.00	broadmon	-0.02	0.57	curaccbal	-0.03	0.40	floating	-0.03	0.37
broadmon	-0.04	0.25	curaccbal	0.01	0.87	floating	0.04	0.18	IMF_Program	0.27	0.00
curaccbal	-0.22	0.00	floating	0.10	0.00	IMF_Program	0.21	0.00	CBIw	0.01	0.83
floating	-0.02	0.44	IMF_Program	0.21	0.00	CBIw	-0.12	0.00	scoreMEPV	0.10	0.00
IMF_Program	0.42	0.00	CBIw	-0.02	0.47	scoreMEPV	0.06	0.07	polity	0.01	0.79
CBIw	-0.02	0.56	scoreMEPV	-0.04	0.24	polity	-0.01	0.76			
scoreMEPV	0.10	0.00	polity	-0.01	0.85						
polity	-0.06	0.08									

Table B.4: Summary statistics, single crisis and combined crises

Variables	Obs.	Mean	Sd	Min	Max
<b>Single crisis</b>					
Debt crisis	1182	0.202	0.402	0	1
Banking crisis	1182	0.113	0.317	0	1
Currency crisis	1182	0.195	0.397	0	1
Inflation crisis	1182	0.202	0.402	0	1
<b>Double crises</b>					
Debt crisis & Banking crisis	1182	0.043	0.203	0	1
Debt crisis & Currency crisis	1182	0.073	0.260	0	1
Debt crisis & Inflation crisis	1182	0.085	0.278	0	1
Banking crisis & Currency crisis	1182	0.051	0.220	0	1
Banking crisis & Inflation crisis	1182	0.043	0.203	0	1
Currency crisis & Inflation crisis	1182	0.107	0.310	0	1
<b>Triple crises</b>					
Debt crisis & Banking crisis & Currency crisis	1182	0.025	0.157	0	1
Debt crisis & Banking crisis & Inflation crisis	1182	0.030	0.170	0	1
Debt crisis & Currency crisis & Inflation crisis	1182	0.059	0.236	0	1
Banking crisis & Currency crisis & Inflation crisis	1182	0.031	0.174	0	1
<b>Quadruple crises</b>					
Debt crisis & Banking crisis & Currency crisis & Inflation crisis	1182	0.022	0.147	0	1

Table B.5: Panel unit root tests

Labels	Variables	Statistic	P-value	Labels	Variables	Statistic	P-value
<b>Dependant variables</b>							
Change in exports of agricultural goods (h=1)	expagri1	10.965	0.000	Change in imports of services (h=1)	impserv1	11.059	0.000
Change in exports of agricultural goods (h=2)	expagri2	9.127	0.000	Change in imports of services (h=2)	impserv2	11.600	0.000
Change in exports of agricultural goods (h=3)	expagri3	6.437	0.000	Change in imports of services (h=3)	impserv3	10.139	0.000
Change in exports of agricultural goods (h=4)	expagri4	5.911	0.000	Change in imports of services (h=4)	impserv4	9.128	0.000
Change in exports of agricultural goods (h=5)	expagri5	8.026	0.000	Change in imports of services (h=5)	impserv5	11.250	0.000
Change in exports of mining goods (h=1)	expmini1	10.517	0.000	Change in total imports (h=1)	imptot1	15.696	0.000
Change in exports of mining goods (h=2)	expmini2	10.695	0.000	Change in total imports (h=2)	imptot2	14.241	0.000
Change in exports of mining goods (h=3)	expmini3	7.112	0.000	Change in total imports (h=3)	imptot3	10.830	0.000
Change in exports of mining goods (h=4)	expmini4	2.485	0.006	Change in total imports (h=4)	imptot4	11.152	0.000
Change in exports of mining goods (h=5)	expmini5	6.274	0.000	Change in total imports (h=5)	imptot5	12.173	0.000
Change in exports of manufacturing goods (h=1)	expmanu1	14.447	0.000	<b>Financial crises variables</b>			
Change in exports of manufacturing goods (h=2)	expmanu2	12.379	0.000	Debt crisis dummy	dumEDC	16.950	0.000
Change in exports of manufacturing goods (h=3)	expmanu3	8.677	0.000	Banking crisis dummy	dumBC	20.706	0.000
Change in exports of manufacturing goods (h=4)	expmanu4	7.640	0.000	Currency crisis dummy	dumCC	21.478	0.000
Change in exports of manufacturing goods (h=5)	expmanu5	9.332	0.000	Inflation crisis dummy	dumIC	18.211	0.000
Change in exports of services (h=1)	expserv1	11.811	0.000	<b>Control variables</b>			
Change in exports of services (h=2)	expserv2	9.612	0.000	Cyclical component of the log real GDP per capita	loggdpac_cyc	37.313	0.000
Change in exports of services (h=3)	expserv3	9.497	0.000	Log of real GDP per capita	loggdpac	20.328	0.000
Change in exports of services (h=4)	expserv4	8.626	0.000	Public debt (% GDP)	pubdebt	14.133	0.000
Change in exports of services (h=5)	expserv5	10.770	0.000	Foreign reserves (% GDP)	reserves	14.625	0.000
Change in total exports (h=1)	exptot1	14.073	0.000	Domestic credit (% GDP)	dcredit	16.243	0.000
Change in total exports (h=2)	exptot2	14.039	0.000	Real exchange rate with US dollar	exchrte	-2.558	0.995
Change in total exports (h=3)	exptot3	11.699	0.000	Terms of trade	termstrade	15.480	0.000
Change in total exports (h=4)	exptot4	10.080	0.000	Trade openness (% GDP)	tradeopen	16.229	0.000
Change in total exports (h=5)	exptot5	9.866	0.000	Broad Money (% GDP)	broadmon	19.840	0.000
Change in imports of agricultural goods (h=1)	impagri1	14.381	0.000	Current account (% GDP)	curaccbal	16.993	0.000
Change in imports of agricultural goods (h=2)	impagri2	14.029	0.000	Exchange rate regime dummy	floating	19.865	0.000
Change in imports of agricultural goods (h=3)	impagri3	8.400	0.000	IMF program dummy	IMF_Program	20.833	0.000
Change in imports of agricultural goods (h=4)	impagri4	8.077	0.000	Central bank independence score	CB1w	17.626	0.000
Change in imports of agricultural goods (h=5)	impagri5	12.013	0.000	Intensity of conflicts measured by MEPV score	scoreMEPV	39.039	0.000
Change in imports of mining goods (h=1)	impmini1	11.904	0.000	Polity score	polity	30.494	0.000
Change in imports of mining goods (h=2)	impmini2	9.774	0.000	Change of export price (average two last years)	dexpprice2	30.160	0.000
Change in imports of mining goods (h=3)	impmini3	6.702	0.000	Change of import price (average two last years)	dimpprice2	30.835	0.000
Change in imports of mining goods (h=4)	impmini4	5.353	0.000	Share of agricultural exports (% total exports)	sh_expagri	16.191	0.000
Change in imports of mining goods (h=5)	impmini5	10.016	0.000	Share of mining exports (% total exports)	sh_expmini	14.756	0.000
Change in imports of manufacturing goods (h=1)	impmanu1	16.980	0.000	Share of manufacturing exports (% total exports)	sh_expmanu	11.503	0.000
Change in imports of manufacturing goods (h=2)	impmanu2	15.784	0.000	Share of service exports (% total exports)	sh_expserv	10.756	0.000
Change in imports of manufacturing goods (h=3)	impmanu3	13.019	0.000	Share of agricultural imports (% total imports)	sh_impagri	14.206	0.000
Change in imports of manufacturing goods (h=4)	impmanu4	11.962	0.000	Share of mining imports (% total imports)	sh_impmini	17.499	0.000
Change in imports of manufacturing goods (h=5)	impmanu5	13.466	0.000	Share of manufacturing imports (% total imports)	sh_impmanu	14.540	0.000
				Share of service imports (% total imports)	sh_impsevr	13.205	0.000

Notes: The statistics reported for the unit root tests and their associated p-value are obtained by doing Fisher-type tests with Augmented Dicker-Fuller. The statistics are drawn upon the modified version of the inverse chi-squared transformation proposed by Choi (2001). The null hypothesis that all panels contain a unit root can be rejected at the 1% statistical level for all variables except the real exchange rate with the US dollar. The dependent variables are cumulative changes of trade from the year prior to the onset of financial crises to the horizon h. We report here all the dependent variables.

## Appendix C Balance and overlap checks

### Appendix C.1 Balance Checks

Table C.6: Balance diagnostics between the treated and control groups, debt crisis

Variables	Debt crisis							
	Non weighted				Weighted			
	Treated	Control	Standardized mean	Variance ratio	Treated	Control	Standardized mean	Variance ratio
Cyclical component of the log real GDP per capita (t-1)	-0.049	0.006	-0.355	2.302	-0.020	-0.003	-0.118	1.684
Growth (average t-1 & t-2)	-1.811	3.429	-0.434	2.009	0.251	2.526	-0.203	1.396
Log of real GDP per capita (t-1)	7.703	8.459	-0.681	0.321	7.697	8.341	-0.571	0.376
Log of real GDP per capita squared (t-1)	59.929	73.407	-0.716	0.242	59.938	71.428	-0.606	0.293
Public debt/GDP (t-1)	98.763	50.939	0.440	25.404	72.425	56.650	0.211	5.752
Foreign reserves/GDP (t-1)	8.647	13.212	-0.530	0.290	9.414	12.532	-0.363	0.364
Domestic credit/GDP (t-1)	29.429	55.788	-0.748	0.177	32.151	52.279	-0.582	0.180
Real exchange rate with US dollar (t-1)	182.906	240.964	-0.051	1.202	269.824	230.823	0.030	2.102
Terms of trade (t-1)	0.987	1.000	-0.130	1.361	0.992	0.999	-0.072	1.495
Trade openness (t-1)	56.258	64.647	-0.279	0.686	57.998	63.602	-0.188	0.757
Broad Money/GDP (t-1)	31.782	92.664	-0.108	0.000	35.624	85.374	-0.094	0.000
Current account/GDP (t-1)	-4.314	-1.057	-0.475	2.040	-3.375	-1.489	-0.284	1.561
Floating exchange regime dummy (t-1)	0.301	0.301	0.000	1.004	0.338	0.317	0.043	1.036
IMF Program dummy (t-1)	0.711	0.324	0.841	0.941	0.580	0.370	0.428	1.048
Central bank independence score (t-1)	0.491	0.500	-0.042	0.918	0.502	0.497	0.026	0.948
Intensity of conflicts measured by MEPV score (t-1)	1.008	0.802	0.174	0.925	1.055	0.802	0.214	0.872
Polity score (t-1)	4.059	5.410	-0.234	0.981	3.991	5.154	-0.206	0.891
Change in public debt/GDP (average t-1 & t-2)	11.040	1.172	0.426	2.939	4.852	1.987	0.142	1.872
Change in foreign reserves/GDP (average t-1 & t-2)	16.525	5.134	0.303	4.687	9.010	6.785	0.061	2.137
Domestic credit/GDP (average t-1 & t-2)	2.327	4.568	-0.147	1.633	2.955	3.944	-0.073	1.037
Change in real exchange rate with US dollar (average t-1 & t-2)	277.505	10.541	0.338	271.017	122.536	22.772	0.198	27.875
Change in terms of trade (average t-1 & t-2)	0.574	0.406	0.040	2.420	0.836	0.585	0.063	1.460
Change in trade openness (average t-1 & t-2)	4.494	1.113	0.287	3.536	1.927	1.371	0.054	2.037
Change in broad Money/GDP (average t-1 & t-2)	3.032	83.341	-0.062	0.000	2.732	74.102	-0.059	0.000
Change in current account/GDP (average t-1 & t-2)	58.943	6.183	0.019	0.171	6.171	21.826	-0.006	0.074
Banking crisis (t-1)	0.255	0.103	0.406	2.070	0.179	0.128	0.140	1.318
Currency crisis (t-1)	0.109	0.029	0.317	3.417	0.085	0.041	0.178	1.955
Inflation crisis (t-1)	0.473	0.133	0.795	2.169	0.332	0.189	0.328	1.449

Notes: About the cutpoint on the absolute value of the standardized difference to define imbalance, [Rubin \(2002\)](#) suggests a cut-off of 0.25. As such, if the absolute value of the standardized difference for a variable is higher than 0.25, then there is a significant difference between the treated and control group for this variable. Moreover, [Rubin \(2002\)](#) proposes the use of the ratio of treated and control variances as a balance measure of the second moment, where balance is defined by values close to 1.0 and variables are out of balance if the variance ratio is greater than 2.0 or less than 0.5.

Table C.7: Balance diagnostics between the treated and control groups, banking crisis

Variables	Banking crisis							
	Non weighted				Weighted			
	Treated	Control	Standardized mean	Variance ratio	Treated	Control	Standardized mean	Variance ratio
Cyclical component of the log real GDP per capita (t-1)	-0.004	-0.005	0.006	2.702	0.011	-0.003	0.088	2.303
Growth (average t-1 & t-2)	-2.782	3.244	-0.505	1.690	1.147	2.683	-0.129	1.539
Log of real GDP per capita (t-1)	8.511	8.285	0.165	1.279	8.399	8.293	0.080	1.110
Log of real GDP per capita squared (t-1)	74.525	70.287	0.178	1.307	72.406	70.452	0.084	1.109
Public debt/GDP (t-1)	81.178	56.721	0.200	15.435	69.077	61.628	0.091	2.285
Foreign reserves/GDP (t-1)	10.606	12.617	-0.213	0.663	11.088	12.391	-0.140	0.673
Domestic credit/GDP (t-1)	62.247	49.025	0.259	2.244	49.318	49.278	0.001	1.353
Real exchange rate with US dollar (t-1)	240.284	228.374	0.010	1.250	219.359	218.210	0.001	1.016
Terms of trade (t-1)	0.990	0.999	-0.094	1.004	0.990	0.996	-0.068	1.104
Trade openness (t-1)	58.728	63.728	-0.150	1.240	59.153	63.180	-0.126	1.111
Broad Money/GDP (t-1)	54.519	85.249	-0.056	0.003	48.536	82.750	-0.065	0.002
Current account/GDP (t-1)	-1.797	-1.655	-0.021	1.572	-2.217	-1.849	-0.053	1.376
Floating exchange regime dummy (t-1)	0.337	0.296	0.090	1.079	0.283	0.295	-0.025	0.982
IMF Program dummy (t-1)	0.538	0.375	0.332	1.066	0.485	0.389	0.195	1.056
Central bank independence score (t-1)	0.489	0.499	-0.050	1.036	0.499	0.498	0.002	1.003
Intensity of conflicts measured by MEPV score (t-1)	0.716	0.860	-0.123	0.842	0.796	0.858	-0.051	1.052
Polity score (t-1)	4.521	5.252	-0.120	1.273	5.265	5.179	0.015	1.015
Change in public debt/GDP (average t-1 & t-2)	12.864	1.522	0.469	2.970	6.114	2.959	0.151	1.261
Change in foreign reserves/GDP (average t-1 & t-2)	11.842	6.588	0.149	2.480	5.961	7.426	-0.046	1.462
Domestic credit/GDP (average t-1 & t-2)	4.504	4.088	0.026	1.844	2.854	3.885	-0.069	1.500
Change in real exchange rate with US dollar (average t-1 & t-2)	235.394	34.150	0.257	10.187	127.173	102.520	0.035	0.814
Change in terms of trade (average t-1 & t-2)	0.060	0.496	-0.115	1.301	0.228	0.406	-0.049	1.034
Change in trade openness (average t-1 & t-2)	2.958	1.567	0.119	2.572	1.223	2.122	-0.077	1.088
Change in broad Money/GDP (average t-1 & t-2)	4.663	77.945	-0.059	0.000	2.987	72.660	-0.058	0.000
Change in current account/GDP (average t-1 & t-2)	-47.955	26.091	-0.029	0.010	-84.506	18.715	-0.041	0.016
Debt crisis (t-1)	0.314	0.191	0.284	1.399	0.276	0.209	0.155	1.213
Currency crisis (t-1)	0.112	0.034	0.305	3.066	0.059	0.041	0.082	1.414
Inflation crisis (t-1)	0.349	0.174	0.406	1.590	0.271	0.198	0.173	1.252

Notes: About the cutpoint on the absolute value of the standardized difference to define imbalance, [Rubin \(2002\)](#) suggests a cut-off of 0.25. As such, if the absolute value of the standardized difference for a variable is higher than 0.25, then there is a significant difference between the treated and control group for this variable. Moreover, [Rubin \(2002\)](#) proposes the use of the ratio of treated and control variances as a balance measure of the second moment, where balance is defined by values close to 1.0 and variables are out of balance if the variance ratio is greater than 2.0 or less than 0.5.

Table C.8: Balance diagnostics between the treated and control groups, currency crisis

Variables	Currency crisis							
	Non weighted				Weighted			
	Treated	Control	Standardized mean	Variance ratio	Treated	Control	Standardized mean	Variance ratio
Cyclical component of the log real GDP per capita (t-1)	-0.015	-0.002	-0.081	2.309	-0.006	-0.005	-0.009	1.871
Growth (average t-1 & t-2)	-2.020	3.655	-0.500	1.489	0.451	2.198	-0.155	1.057
Log of real GDP per capita (t-1)	8.008	8.400	-0.314	0.747	8.258	8.306	-0.036	1.032
Log of real GDP per capita squared (t-1)	65.449	72.333	-0.323	0.655	69.961	70.701	-0.033	0.972
Public debt/GDP (t-1)	71.253	56.917	0.140	12.669	61.205	57.763	0.051	5.037
Foreign reserves/GDP (t-1)	8.959	13.274	-0.487	0.354	10.219	12.396	-0.240	0.552
Domestic credit/GDP (t-1)	36.390	54.735	-0.460	0.574	46.209	50.849	-0.108	0.948
Real exchange rate with US dollar (t-1)	167.660	247.008	-0.077	0.627	214.006	229.170	-0.014	0.923
Terms of trade (t-1)	0.986	1.001	-0.152	1.167	0.994	0.998	-0.035	1.192
Trade openness (t-1)	50.407	66.518	-0.555	0.560	58.873	63.960	-0.170	0.764
Broad Money/GDP (t-1)	104.396	74.773	0.034	3.460	66.644	68.173	-0.003	1.296
Current account/GDP (t-1)	-3.095	-1.286	-0.292	1.023	-2.468	-1.654	-0.131	1.088
Floating exchange regime dummy (t-1)	0.336	0.292	0.095	1.083	0.372	0.306	0.138	1.102
IMF Program dummy (t-1)	0.513	0.365	0.300	1.080	0.417	0.400	0.034	1.015
Central bank independence score (t-1)	0.428	0.517	-0.465	0.635	0.478	0.503	-0.124	0.701
Intensity of conflicts measured by MEPV score (t-1)	0.930	0.816	0.095	0.957	0.830	0.832	-0.002	0.950
Polity score (t-1)	3.786	5.528	-0.290	1.293	4.977	5.263	-0.049	1.065
Change in public debt/GDP (average t-1 & t-2)	12.017	0.586	0.491	3.682	5.353	2.325	0.158	1.433
Change in foreign reserves/GDP (average t-1 & t-2)	5.125	7.884	-0.086	1.778	6.617	7.161	-0.017	1.584
Domestic credit/GDP (average t-1 & t-2)	4.134	4.146	-0.001	1.497	4.524	4.058	0.032	1.012
Change in real exchange rate with US dollar (average t-1 & t-2)	230.504	14.774	0.302	23.943	87.543	59.023	0.051	1.134
Change in terms of trade (average t-1 & t-2)	0.525	0.414	0.028	1.826	0.446	0.318	0.036	1.105
Change in trade openness (average t-1 & t-2)	3.903	1.165	0.232	3.974	2.368	1.440	0.098	1.742
Change in broad Money/GDP (average t-1 & t-2)	155.450	44.254	0.056	3.659	51.930	37.658	0.011	1.371
Change in current account/GDP (average t-1 & t-2)	-105.166	49.357	-0.057	0.019	-54.605	29.200	-0.033	0.012
Debt crisis (t-1)	0.339	0.172	0.392	1.582	0.247	0.209	0.089	1.126
Banking crisis (t-1)	0.269	0.094	0.467	2.321	0.182	0.134	0.133	1.290
Inflation crisis (t-1)	0.528	0.107	1.012	2.616	0.260	0.197	0.149	1.218

Notes: About the cutpoint on the absolute value of the standardized difference to define imbalance, Rubin (2002) suggests a cut-off of 0.25. As such, if the absolute value of the standardized difference for a variable is higher than 0.25, then there is a significant difference between the treated and control group for this variable. Moreover, Rubin (2002) proposes the use of the ratio of treated and control variances as a balance measure of the second moment, where balance is defined by values close to 1.0 and variables are out of balance if the variance ratio is greater than 2.0 or less than 0.5.

Table C.9: Balance diagnostics between the treated and control groups, inflation crisis

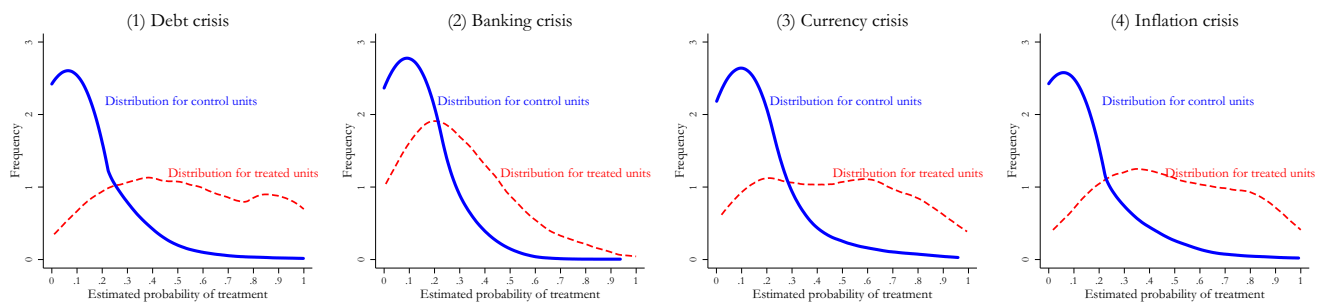
Variables	Inflation crisis							
	Non weighted				Weighted			
	Treated	Control	Standardized mean	Variance ratio	Treated	Control	Standardized mean	Variance ratio
Cyclical component of the log real GDP per capita (t-1)	-0.048	0.005	-0.343	2.210	-0.019	-0.009	-0.059	1.436
Growth (average t-1 & t-2)	-1.937	3.478	-0.460	1.744	0.350	1.824	-0.123	1.091
Log of real GDP per capita (t-1)	7.725	8.440	-0.631	0.401	7.692	8.320	-0.556	0.465
Log of real GDP per capita squared (t-1)	60.412	73.059	-0.662	0.293	59.973	70.973	-0.581	0.347
Public debt/GDP (t-1)	81.939	55.233	0.244	15.359	70.216	59.218	0.147	5.031
Foreign reserves/GDP (t-1)	8.275	13.334	-0.596	0.249	9.426	12.621	-0.382	0.328
Domestic credit/GDP (t-1)	24.473	56.706	-0.930	0.166	28.044	51.745	-0.690	0.207
Real exchange rate with US dollar (t-1)	92.850	263.069	-0.176	0.360	199.571	237.147	-0.035	0.880
Terms of trade (t-1)	0.971	1.004	-0.339	1.005	0.987	0.998	-0.109	0.979
Trade openness (t-1)	46.725	66.816	-0.739	0.346	51.941	63.570	-0.430	0.392
Broad Money/GDP (t-1)	187.621	57.532	0.109	2335.312	92.867	53.589	0.055	894.926
Current account/GDP (t-1)	-3.420	-1.285	-0.333	1.266	-2.838	-1.597	-0.207	0.856
Floating exchange regime dummy (t-1)	0.270	0.304	-0.077	0.933	0.301	0.304	-0.006	0.998
IMF Program dummy (t-1)	0.626	0.349	0.575	1.033	0.577	0.398	0.363	1.022
Central bank independence score (t-1)	0.472	0.506	-0.166	0.895	0.489	0.499	-0.044	0.972
Intensity of conflicts measured by MEPV score (t-1)	1.026	0.799	0.188	0.999	0.932	0.804	0.107	0.999
Polity score (t-1)	3.774	5.469	-0.292	1.050	3.874	5.253	-0.236	1.010
Change in public debt/GDP (average t-1 & t-2)	11.702	0.866	0.499	2.873	6.350	3.644	0.123	1.161
Change in foreign reserves/GDP (average t-1 & t-2)	9.896	6.804	0.086	3.070	8.025	7.054	0.028	2.613
Domestic credit/GDP (average t-1 & t-2)	2.419	4.404	-0.129	1.696	2.916	3.603	-0.047	1.307
Change in real exchange rate with US dollar (average t-1 & t-2)	279.936	12.332	0.348	30.888	134.095	56.471	0.128	1.623
Change in terms of trade (average t-1 & t-2)	0.197	0.473	-0.068	1.872	0.475	0.386	0.023	1.046
Change in trade openness (average t-1 & t-2)	4.931	1.045	0.321	3.999	3.042	2.105	0.080	1.266
Change in broad Money/GDP (average t-1 & t-2)	360.602	2.885	0.132	217845.230	133.700	2.893	0.080	65159.789
Change in current account/GDP (average t-1 & t-2)	67.527	5.508	0.021	0.354	-32.261	6.763	-0.015	0.206
Debt crisis (t-1)	0.487	0.145	0.790	2.024	0.335	0.199	0.310	1.402
Banking crisis (t-1)	0.287	0.098	0.493	2.326	0.201	0.138	0.167	1.351
Currency crisis (t-1)	0.152	0.021	0.481	6.432	0.084	0.051	0.132	1.593

Notes: About the cutpoint on the absolute value of the standardized difference to define imbalance, Rubin (2002) suggests a cut-off of 0.25. As such, if the absolute value of the standardized difference for a variable is higher than 0.25, then there is a significant difference between the treated and control group for this variable. Moreover, Rubin (2002) proposes the use of the ratio of treated and control variances as a balance measure of the second moment, where balance is defined by values close to 1.0 and variables are out of balance if the variance ratio is greater than 2.0 or less than 0.5.



## Appendix C.2 Overlap check

Figure C.2: Kernel density of the distribution of the propensity scores for the treated and control groups

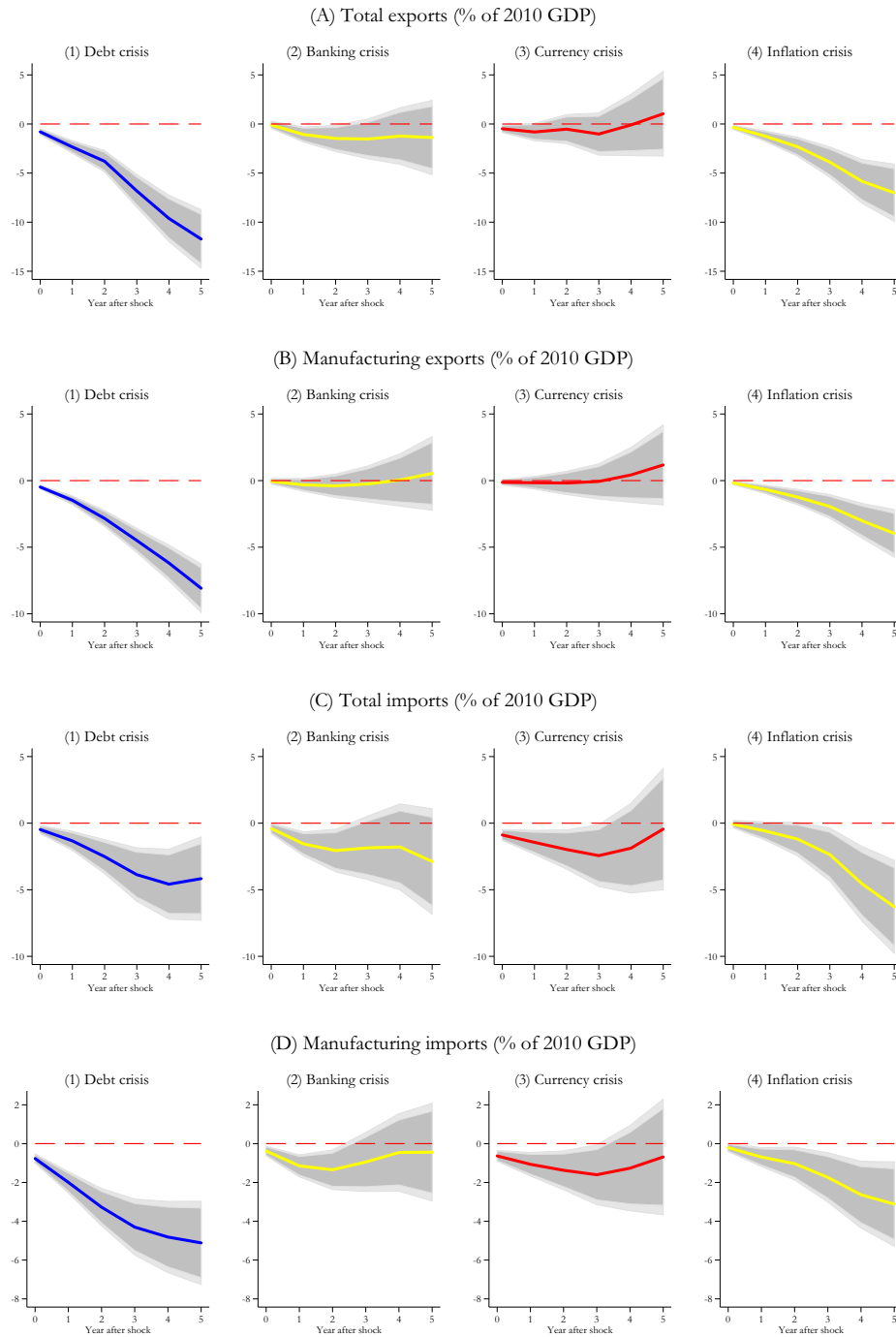


Notes: The predicted propensity scores in (1), (2), (3) and (4) are based respectively on the pooled probit models estimated in columns (1), (2), (3) and (4) in [table 1](#). The dependent variable equals to 1 during financial crises. We use the largest set of controls described in the data section, and included with lags to reduce potential issues of endogeneity. These figures display a high probability of financial crises for the treated groups and a low probability for the counterparts. Since some observations receive a large weight, we set the maximum weight to 10 for the ATE-AIPW estimates.

# Appendix D Supplementary graphs and tables

## Appendix D.1 Graphs

Figure D.3: Robustness checks, dynamics of trade costs after dropping the period 2008-2014



Notes: Point estimates, and 90% and 95% error bands for the estimated costs of the crises on international trade.

## Appendix D.2 Tables

Table D.10: Countries by level of development used in the section 6.1

Low-income; < 3,000 USD		Middle-income; 3,000 and 10,000 USD		High-income; > 10,000 USD	
Bolivia	Niger	Albania	Romania	Australia	
Cameroon	Nigeria	Algeria	Russia	Austria	
China	Pakistan	Argentina	Saint Kitts and Nevis	Belgium	
Congo	Paraguay	Belize	Seychelles	Croatia	
Cote d'Ivoire	Philippines	Brazil	South Africa	Denmark	
Egypt	Sao Tome and Principe	Bulgaria	Thailand	Finland	
El Salvador	Senegal	Chile	Tunisia	France	
Ethiopia	Sri Lanka	Colombia	Turkey	Germany	
Gambia	Sudan	Costa Rica	Uruguay	Greece	
Ghana	Tanzania	Dominica	Venezuela	Iceland	
Guatemala	Togo	Dominican Republic		Ireland	
Guinea	Uganda	Ecuador		Italy	
Guyana	Ukraine	Gabon		Japan	
Honduras	Viet Nam	Grenada		Netherlands	
India	Yemen	Hungary		New Zealand	
Indonesia	Zambia	Jamaica		Norway	
Kenya	Zimbabwe	Jordan		Portugal	
Madagascar		Macedonia		Slovenia	
Malawi		Malaysia		Spain	
Mauritania		Mauritius		Sweden	
Moldova		Mexico		Switzerland	
Morocco		Panama		Trinidad and Tobago	
Mozambique		Peru		United Kingdom	
Nicaragua		Poland		USA	
41 countries		34 countries		24 countries	

Table D.11: Paired difference tests in the 5-year cumulative costs of financial crises on total trade, baseline results

	Crisis1	coeff1	Crisis2	coeff2	chi2 (1)	P-value
<b>Difference in exports losses across crises</b>	<b>Exports</b>		<b>Exports</b>			
	Debt crisis	-12.035	Banking crisis	-6.742	5.616	0.018
	Debt crisis	-12.035	Currency crisis	-2.652	13.085	0.000
	Debt crisis	-12.035	Inflation crisis	-9.171	2.340	0.126
	Banking crisis	-6.742	Currency crisis	-2.652	3.017	0.082
	Banking crisis	-6.742	Inflation crisis	-9.171	1.601	0.206
	Currency crisis	-2.652	Inflation crisis	-9.171	8.435	0.004
<b>Difference in imports losses across crises</b>	<b>Imports</b>		<b>Imports</b>			
	Debt crisis	-7.677	Banking crisis	-6.882	0.109	0.741
	Debt crisis	-7.677	Currency crisis	-6.489	0.167	0.683
	Debt crisis	-7.677	Inflation crisis	-5.925	0.595	0.440
	Banking crisis	-6.882	Currency crisis	-6.489	0.023	0.880
	Banking crisis	-6.882	Inflation crisis	-5.925	0.167	0.683
Currency crisis	-6.489	Inflation crisis	-5.925	0.045	0.832	
<b>Difference in trade balance losses within crises</b>	<b>Exports</b>		<b>Imports</b>			
	Debt crisis	-12.035	Debt crisis	-7.677	15.498	0.000
	Banking crisis	-6.742	Banking crisis	-6.882	0.013	0.910
	Currency crisis	-2.652	Currency crisis	-6.489	6.627	0.010
<b>Difference in trade balance losses across crises</b>	Inflation crisis	-9.171	Inflation crisis	-5.925	8.365	0.004
	<b>Trade balance</b>		<b>Trade balance</b>			
	Debt crisis	-4.358	Banking crisis	0.139	8.702	0.003
	Debt crisis	-4.358	Currency crisis	3.837	20.824	0.000
	Debt crisis	-4.358	Inflation crisis	-3.246	0.579	0.447
	Banking crisis	0.139	Currency crisis	3.837	4.516	0.034
Banking crisis	0.139	Inflation crisis	-3.246	5.259	0.022	
Currency crisis	3.837	Inflation crisis	-3.246	15.680	0.000	

Table D.12: Paired difference tests in the 5-year cumulative costs of financial crises on total exports

Exports										
Combined crises	N	coeff1	sd1	Single crisis	N	coeff2	sd2	diff(coeff1-coeff2)	p-value	
Debt & banking crises	798	-17.78	3.42	Debt crisis	907	-12.04	2.79	-5.75	0.00	
Debt & banking crises	798	-17.78	3.42	Banking crisis	907	-6.74	3.50	-11.04	0.00	
Debt & currency crises	873	-19.90	3.94	Debt crisis	907	-12.04	2.79	-7.87	0.00	
Debt & currency crises	873	-19.90	3.94	Currency crisis	907	-2.65	4.41	-17.25	0.00	
Debt & inflation crises	861	-21.41	3.89	Debt crisis	907	-12.04	2.79	-9.38	0.00	
Debt & inflation crises	861	-21.41	3.89	Inflation crisis	907	-9.17	2.22	-12.24	0.00	
Banking & currency crises	828	-9.67	7.83	Banking crisis	907	-6.74	3.50	-2.93	0.00	
Banking & currency crises	828	-9.67	7.83	Currency crisis	907	-2.65	4.41	-7.02	0.00	
Banking & inflation crises	799	-10.21	6.86	Banking crisis	907	-6.74	3.50	-3.47	0.00	
Banking & inflation crises	799	-10.21	6.86	Inflation crisis	907	-9.17	2.22	-1.04	0.00	
Currency & inflation crises	903	-16.95	4.19	Currency crisis	907	-2.65	4.41	-14.30	0.00	
Currency & inflation crises	903	-16.95	4.19	Inflation crisis	907	-9.17	2.22	-7.78	0.00	
Debt & banking & currency crises	769	-18.21	2.04	Debt crisis	907	-12.04	2.79	-6.17	0.00	
Debt & banking & currency crises	769	-18.21	2.04	Banking crisis	907	-6.74	3.50	-11.47	0.00	
Debt & banking & currency crises	769	-18.21	2.04	Currency crisis	907	-2.65	4.41	-15.56	0.00	
Debt & banking & inflation crises	771	-23.31	2.09	Debt crisis	907	-12.04	2.79	-11.27	0.00	
Debt & banking & inflation crises	771	-23.31	2.09	Banking crisis	907	-6.74	3.50	-16.57	0.00	
Debt & banking & inflation crises	771	-23.31	2.09	Inflation crisis	907	-9.17	2.22	-14.14	0.00	
Debt & currency & inflation crises	837	-20.71	2.05	Debt crisis	907	-12.04	2.79	-8.68	0.00	
Debt & currency & inflation crises	837	-20.71	2.05	Currency crisis	907	-2.65	4.41	-18.06	0.00	
Debt & currency & inflation crises	837	-20.71	2.05	Inflation crisis	907	-9.17	2.22	-11.54	0.00	
Banking & currency & inflation crises	786	-12.02	2.69	Banking crisis	907	-6.74	3.50	-5.28	0.00	
Banking & currency & inflation crises	786	-12.02	2.69	Currency crisis	907	-2.65	4.41	-9.37	0.00	
Banking & currency & inflation crises	786	-12.02	2.69	Inflation crisis	907	-9.17	2.22	-2.85	0.00	
Debt & banking & currency & inflation crises	760	-21.61	2.08	Debt crisis	907	-12.04	2.79	-9.57	0.00	
Debt & banking & currency & inflation crises	760	-21.61	2.08	Banking crisis	907	-6.74	3.50	-14.87	0.00	
Debt & banking & currency & inflation crises	760	-21.61	2.08	Currency crisis	907	-2.65	4.41	-18.96	0.00	
Debt & banking & currency & inflation crises	760	-21.61	2.08	Inflation crisis	907	-9.17	2.22	-12.44	0.00	

Table D.13: Paired difference tests in the 5-year cumulative costs of financial crises on total imports

	Combined crises	N	coeff1	sd1	Single crisis	N	coeff2	sd2	diff(coeff1-coeff2)	p-value
	Debt & banking crises	842	-11.89	5.23	Debt crisis	961	-7.68	3.11	-4.21	0.00
	Debt & banking crises	842	-11.89	5.23	Banking crisis	961	-6.88	3.83	-5.01	0.00
	Debt & currency crises	920	-21.11	8.03	Debt crisis	961	-7.68	3.11	-13.43	0.00
	Debt & currency crises	920	-21.11	8.03	Currency crisis	961	-6.49	5.64	-14.62	0.00
	Debt & inflation crises	911	-24.00	8.43	Debt crisis	961	-7.68	3.11	-16.32	0.00
	Debt & inflation crises	911	-24.00	8.43	Inflation crisis	961	-5.93	3.28	-18.08	0.00
	Banking & currency crises	867	-15.31	9.23	Banking crisis	961	-6.88	3.83	-8.83	0.00
	Banking & currency crises	867	-15.31	9.23	Currency crisis	961	-6.49	5.64	-8.82	0.00
	Banking & inflation crises	844	-11.15	9.01	Banking crisis	961	-6.88	3.83	-4.27	0.00
	Banking & inflation crises	844	-11.15	9.01	Inflation crisis	961	-5.93	3.28	-5.23	0.00
	Currency & inflation crises	941	-22.73	7.21	Currency crisis	961	-6.49	5.64	-16.24	0.00
	Currency & inflation crises	941	-22.73	7.21	Inflation crisis	961	-5.93	3.28	-16.81	0.00
	Debt & banking & currency crises	807	-18.89	2.31	Debt crisis	961	-7.68	3.11	-11.21	0.00
	Debt & banking & currency crises	807	-18.89	2.31	Banking crisis	961	-6.88	3.83	-12.01	0.00
	Debt & banking & currency crises	807	-18.89	2.31	Currency crisis	961	-6.49	5.64	-12.40	0.00
	Debt & banking & inflation crises	813	-22.42	2.46	Debt crisis	961	-7.68	3.11	-14.75	0.00
	Debt & banking & inflation crises	813	-22.42	2.46	Banking crisis	961	-6.88	3.83	-15.54	0.00
	Debt & banking & inflation crises	813	-22.42	2.46	Inflation crisis	961	-5.93	3.28	-16.50	0.00
	Debt & currency & inflation crises	879	-24.72	3.01	Debt crisis	961	-7.68	3.11	-17.05	0.00
	Debt & currency & inflation crises	879	-24.72	3.01	Currency crisis	961	-6.49	5.64	-18.23	0.00
	Debt & currency & inflation crises	879	-24.72	3.01	Inflation crisis	961	-5.93	3.28	-18.80	0.00
	Banking & currency & inflation crises	822	-14.71	2.90	Banking crisis	961	-6.88	3.83	-7.82	0.00
	Banking & currency & inflation crises	822	-14.71	2.90	Currency crisis	961	-6.49	5.64	-8.22	0.00
	Banking & currency & inflation crises	822	-14.71	2.90	Inflation crisis	961	-5.93	3.28	-8.78	0.00
	Debt & banking & currency & inflation crises	796	-18.93	2.37	Debt crisis	961	-7.68	3.11	-11.25	0.00
	Debt & banking & currency & inflation crises	796	-18.93	2.37	Banking crisis	961	-6.88	3.83	-12.05	0.00
	Debt & banking & currency & inflation crises	796	-18.93	2.37	Currency crisis	961	-6.49	5.64	-12.44	0.00
	Debt & banking & currency & inflation crises	796	-18.93	2.37	Inflation crisis	961	-5.93	3.28	-13.01	0.00