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# The Role of U.S. Monetary Policy in Global Banking Crises*

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**Abstract**

We examine the role of U.S. monetary policy in banking crises globally by using a cross-country database spanning 1870-2010 across 69 countries. U.S. monetary policy tightening increases the probability of a banking crisis for those countries with direct linkages to the United States, either in the form of trade links or significant share of USD-denominated liabilities. Conversely, if a country is integrated globally, rather than having a direct exposure, the effect is ambiguous. One possible channel we identify is capital flows: if the correction in capital flows is disorderly (e.g., sudden stops), the probability of a banking crisis increases. These findings suggest that the effect of U.S. monetary policy in global banking crises is not uniform and largely dependent on the nature of linkages with the United States.

**JEL Classification:** *E44, E52, F42, G15*

**Keywords:** banking crises, financial stability, monetary policy shocks, sudden stops

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# 1 Introduction

Do U.S. monetary policy actions affect financial stability in foreign economies? Past experience suggests that they do, as in the early 1980s international debt crises preceded by the 1980-82 Volcker tightening and the Mexican Peso Crisis preceded by the 1994 Greenspan tightening. Additionally, during the last five years, since the current U.S. monetary policy easing cycle started, we have seen the "taper tantrum" in the spring of 2013, the strengthening of the dollar and the fall in commodity prices in mid-2014, the RMB shock in mid-2015, and the turbulence in Argentina and Turkey in mid-2018. Motivated by these observations on earlier international financial crises and the recent attention in academic and policy circles on the topic, we raise the following questions in this paper: What are the effects of U.S. monetary policy on foreign banking crises? Are there differential effects depending on country characteristics and the nature of linkages with the United States and the rest of the world?

To answer these questions, we examine how the interaction of U.S. monetary policy with a country's exposure to the United States and the rest of the world affects the probability of a banking crisis in those countries by using various macroeconomic, financial, and trade indicators. To this end, we construct a historical cross-country database covering 69 countries over the 1870-2010 period. We capture banking sector stress using the systemic banking crisis database of Reinhart and Rogoff (2009).[1]

On one hand, extant literature shows that *local* monetary policy decisions affect financial stability. Financial markets may react to monetary policy changes as they influence the pricing of risky assets, including equity and bonds. Bernanke and Kuttner (2005) and Gilchrist et al. (2015), among others, show that monetary policy decisions affect equity and corporate bond risk premiums, respectively. Moreover, an accommodative monetary policy can increase financial instability by leading to buildups of financial vulnerabilities, such as credit booms or excessive financial leverage (Adrian and Liang, 2018). Such booms are generally associated with over-optimistic investors and lower loan quality. When booms reverse, increasing number of defaults may stress the financial system and

[1]We check the sensitivity of our findings by employing other systemic crisis databases of Bordo et al. (2001); Laeven and Valencia (2012); Gourinchas and Obstfeld (2012); Schularick and Taylor (2012) . The results discussed in Section 4.4 are qualitatively similar to those using Reinhart and Rogoff's (2009) definition.

increase the likelihood of a banking crisis (See Schularick and Taylor, 2012; Baron and Xiong, 2017; Danielsson et al., 2018). However, this literature does not address how *external* monetary policy decisions (e.g., monetary policy decisions in an hegemon country) could affect domestic financial stability.

On the other hand, in a recent influential paper, Rey (2015) argues that there is a global financial cycle, which is driven by U.S. monetary policy decisions. Gourinchas (2017) shows in the context of an estimated DSGE model that the degree of financial spillovers between the United States and emerging market economies matters for the transmission of U.S. monetary policy, a potential transmission mechanism of Rey's (2015) global financial cycles. Jorda et al. (2018) outline another potential linkage by showing that U.S. monetary policy plays an important role in shaping risk appetite across global equity markets.

Our paper fills the gap between the two aforementioned strands of literature. From a historical view, we study whether U.S. monetary policy is a uniform driver of financial vulnerabilities abroad or its effects are dependent on the country's integration with the United States and the rest of the world.

Examining logit regressions in our panel of countries, we find that U.S. monetary policy tightening has a significant and positive contemporaneous effect on the probability of a banking crisis for those countries with direct exposures to the United States. The impact is statistically significant and economically meaningful. A 1% tightening in U.S. monetary policy increases the default probability by about 1% to 7% for a given level of exposure to the U.S. However, if a county is integrated globally rather than having a primary direct exposure to the United States, U.S. monetary policy has an ambiguous effect on that country's probability of crisis. The results are robust to alternative definitions of monetary policy stance and monetary policy shocks as well as country specific macroeconomic and financial indicators such as GDP growth, inflation, and institutional quality of a country.

Since crises are rare events – a typical OECD country suffers a banking crisis once every 37 years on average according to the banking crisis database of Reinhart and Rogoff (2009) – focusing on long-time-series panel data helps to derive statistically meaningful relationships. However, using such historical data comes at the expense of limited data availability. The biggest challenge for this time period is to proxy U.S. monetary policy decisions. In baseline specifications, we proxy U.S. monetary policy stance by using the changes in the U.S. 3-month Treasury rates. For the more recent period starting in 1990, we use monetary policy shocks based on three-month-ahead fed-funds futures rate (Gertler and Karadi, 2015) or six-month Euro-Dollar contracts (Rogers et al., 2014), and the FED Greenbook forecasts of output growth and inflation along with the fed-funds rates to estimate shocks (Romer and Romer, 2004), and we reach similar conclusions.

To identify the implications of a country's being integrated with the United States and globally, we interact U.S. monetary policy proxies with measures of integration. In our baseline regressions, we use a country's bilateral trade intensity with the United States as a proxy for direct economic integration. We measure the economic integration of a country with the rest of the world by using a trade openness ratio (exports plus imports as a percentage of GDP). In addition to those two measures, we also use the gravity instrument of trade intensity and openness ratio proposed by Frankel and Romer (1999). As discussed in Frankel and Romer (1999), the effects of trade on income or crises is expected to be endogenous and hence, one can question the causality. Gravity instruments, however, are derived via countries' geographic characteristics. Such characteristics are expected to be correlated with trade as they have important effects on trade and are plausibly uncorrelated with other determinants of economic and financial stability measures.

In our analysis of the more recent time period, in addition to the exposure measures introduced above, we use each country's debt liabilities in USD (in net of assets) as a percent of GDP (Lane and Shambaugh, 2010; Benetrix et al., 2015), and Chinn-Ito's capital account openness index. The former is used as another proxy to measure the direct spillovers from the United States, whereas the latter index measures each country's capital account integration with the rest of the world.

What are the channels through which U.S. monetary policy affects global banking crises? U.S. monetary policy may affect other countries through capital flows. Since U.S. monetary policy stance affects relative return on investment in foreign economies, it would also influence credit cycles and in turn financial sector leverage. Avdjiev et al. (2018) shows that capital flows are linked to boom-bust cycles and how such flows could in turn affect the banking sector. A negative monetary policy shock can lead to a credit boom in foreign economies since it is likely that capital would flow out of the U.S. due to an increase in reach for yield incentives. During a credit boom, loan quality decreases (Greenwood and Hanson, 2013), which eventually increases the likelihood of a banking crisis. Schularick and Taylor (2012) and Baron and Xiong (2017) find that excessive lending adversely affects the likelihood of a banking crisis and bank equity crash risk, respectively. Hence, the findings of this literature suggest that a tight U.S. monetary policy could help rein in excesses and reduce the probability of a crisis (e.g., leaning-against-the wind channel). Another line of literature finds that a tightening U.S. monetary policy might increase vulnerabilities, especially in emerging economies, since it might lead to a sudden reversal of capital flows (see Neumeyer and Perri, 2005; Uribe and Yue, 2006, etc.). In our analysis of the drivers of capital flows and how U.S. monetary policy affects these flows, we ask which one of these effects is dominant.

We find evidence that the latter effect dominates. In particular, an increase in U.S. monetary policy rates significantly reduces capital flows to foreign economies for those countries with direct exposure to the United States. When the adjustment becomes disorderly, the crisis probability indeed increases. By splitting our sample into emerging market and developed countries, we find that the increase in the probability of a crisis due to disorderly adjustments in capital flows or sudden stops is an emerging market phenomenon.

This paper is related to three strands of the literature: The first strand is literature on the spillovers of monetary policy. Rey (2015) builds on the empirical framework in Bekaert et al. (2013) and shows that U.S. monetary policy is a key driver of stock market volatility as measured by the VIX, which, in turn, is an important driver of the global financial cycle. Bruno and Shin (2015) study the relationship between capital flows and monetary policy. Jorda et al. (2018) study the synchronization of global markets and its relationship to a global financial cycle. They find that global financial cycles are closely related to changes in risk premiums, with changes in U.S. monetary policy driving risk appetite and thus serving as a transmission mechanism. In this framework, the variability in exchange rate regimes among countries is one significant explanation of the differential effects of U.S. monetary policy on other countries. We contribute to this literature on global financial cycles by providing empirical evidence in support of the hypothesis that the degree of financial spillovers matters. However, we rather argue that U.S. monetary policy affects global financial stability only to the extent that foreign countries have direct exposure to the United States. Those countries with indirect exposure do not always face an increase in their financial stability risks.

The second strand is literature on the determinants of financial crises. Prominent early examples include Demirguc-Kunt and Detragiache (1998) and Kaminsky and Reinhart (1999). Demirguc-Kunt and Detragiache (1998) consider the factors affecting the probability of a banking crisis for 65 countries for the period of 1980 to 1994. By constructing a data set of banking and currency crises spanning 120 years, Bordo et al. (2001) document that capital controls affect the probability of a crisis. Broner et al. (2013) look at the behavior of capital flows during business cycles and economic crises. Several authors have made use of the Reinhart and Rogoff (2009) database, focusing on banking crises and relevant variables affecting their likelihood. Finally, Danielsson et al. (2018) show that domestic risk appetite–proxied by low financial volatility–is an important predictor of banking crises. We contribute to this literature by providing evidence that U.S. monetary policy decisions play a significant role in foreign banking crises. Moreover, we identify the domestic factors that play a role in determining how U.S. monetary policy affects financial stability risks of foreign countries.

The third strand is the literature on the role of integration in probability of crises. In this literature, there are two opposing views on the relationship between a country's exposure to the world and whether such integration makes the country more or less prone to crises. On one hand, high integration may increase the probability of a crisis through propagation, as the country is more exposed to shocks from abroad, as in Stiglitz (2010). In a multi-country model, Azzimonti et al. (2014) argue that government debt increases with economic integration. Therefore, a policy implication of the model is that integration increases the vulnerability to a crisis. On the other hand, countries that are open to international financial and trade markets could be less vulnerable to shocks, per Ayhan et al. (2006); Cavallo and Frankel (2008). Cavallo and Frankel (2008) point out that a number of channels could reduce vulnerability to a crisis for countries with higher trade integration. First, countries that rely more on trade would be less prone to default, as they are heavily incentivized to maintain trade. Hence, international investors would be less likely to pull out of countries with high trade integration. In addition, trade integration helps countries better absorb shocks. We contribute to this literature by distinguishing the integration with the center country and globally.

The rest of the paper is organized as follows. Section 2 details the data we use. Section 3 describes the empirical methodology. Section 4 summarizes our results. Section 5 offers concluding remarks.

# 2 Data and Descriptive Analysis

## 2.1 Banking crises data

For the analysis, we create an annual panel dataset on 69 countries spanning 1870-2010, as available. The sample includes 24 developed and 45 emerging countries (based on the IMF's classification). Appendix B lists the countries included in our sample with their coverage. We base our analysis on the systemic banking crises of Reinhart and Rogoff (2009). A crisis is defined as an event with a closure, merger, or public takeover of one or more financial institutions or large scale government assistance of a systemically important financial institution. The unbalanced panel contains a binary indicator of whether a banking crisis *starts* in a given year and country and includes 239 distinct banking crises.

Figure 1 plots the unconditional probability of banking crises for each country in our sample, defined as the number of crises divided by the available sample period. The figure also contains the unconditional probability of banking crises for the United States, for comparison purposes only, as the United States is not included in our sample. Within the developed countries, Italy has the highest annual crisis probability at 6.38%; New Zealand has the lowest, 0.96%. For emerging countries, the annual unconditional crisis probability ranges from 0% for Mauritius to 7.8% for Brazil. Given the differences in the probability of banking crises for emerging and developed countries, it is important to explore how our analysis on the likelihood of banking crises differs in these two groups of countries.

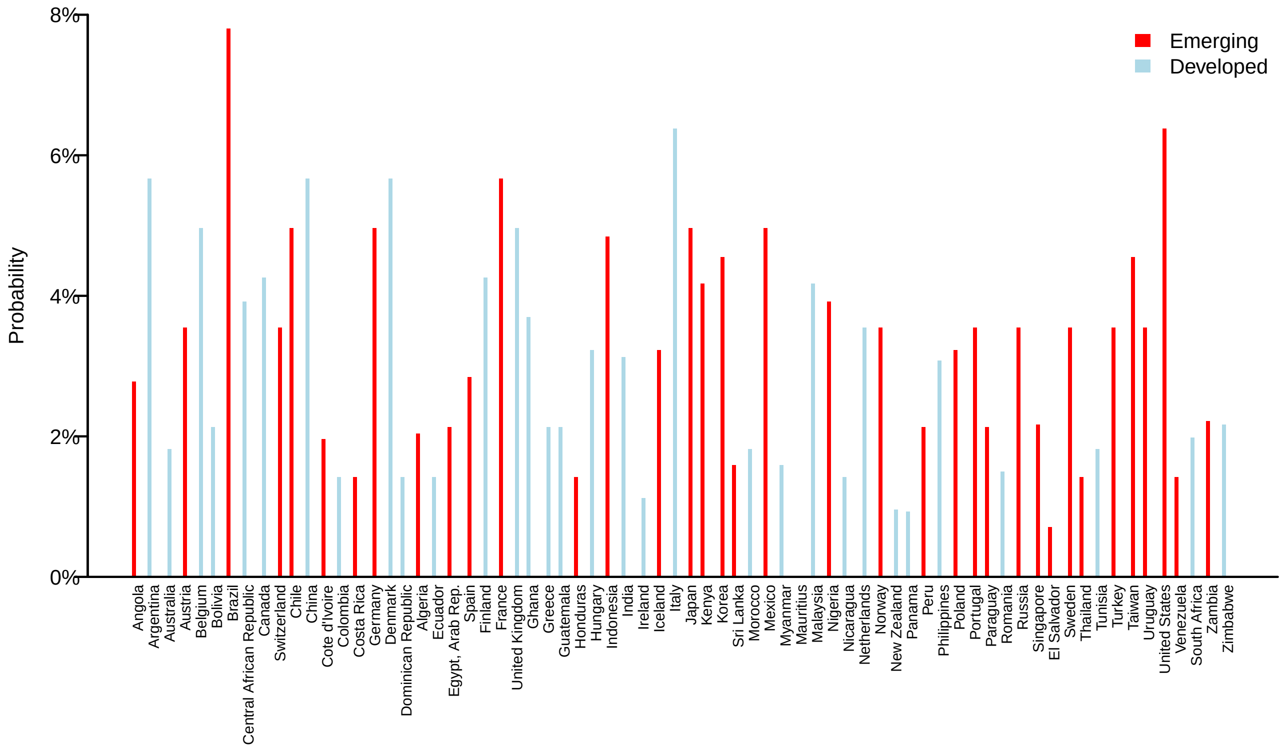


Figure 1: **Unconditional annual probability of banking crises**
The figure presents the probability of banking crises for emerging and developed countries. For a given country, the probability of a banking crisis is calculated as the number of crises divided by the available sample period.

## 2.2 U.S. Monetary policy decisions

We proxy U.S. monetary policy decisions as the change in short term interest rates from the Jorda et al. (2017) macrohistory database. In the more recent period, it is possible to disentangle monetary policy surprises from expected changes. We pursue this approach as a robustness to our main findings in 4.3. In particular, we use surprise series constructed by Gertler and Karadi (2015), Romer and Romer (2004) and Rogers et al. (2014).

Romer and Romer (2004) narratively identify changes in the federal funds rate targets surrounding FOMC meetings. By regressing these target changes on the current rate and the Greenbook forecasts for output growth and inflation in the following two quarters, they are able to separate the natural policy response of the economy from the exogenous monetary policy surprise. The residuals from this estimation can be used as a proxy for monetary policy shocks in regression analysis. Gertler and Karadi (2015) construct a measure of monetary policy surprise using the change in high-frequency interest-rate futures, limited to a 30-minute period surrounding the publication of a monetary policy decision. They then compute a measure of monetary policy shocks by taking the monthly average of these monetary policy surprises. Rogers et al. (2014) use a similar method to Gertler and Karadi (2015), but applied to the eurodollar contracts, where monetary policy surprises are calculated using the fourth eurodollar futures contract in a more limited time period, defined as 15 minutes prior to an FOMC announcement to 1 hour and 45 minutes after.

Table 1 Panel A presents the descriptive statistics for the monetary policy proxies. We find that all four measures of U.S. monetary policy proxies are significantly correlated with each other, with correlation ranging from 0.52 to 0.83. Of these, the Romer and Romer (2004) shocks have the most dispersion, while the Gertler and Karadi (2015) and Rogers et al. (2014) shocks have similar and relatively small standard deviations, in addition to similar means. This is not surprising given the similarity in the way they are constructed.

## 2.3 Exposure variables

We include different exposure proxies that can be grouped into *direct exposure* and *indirect exposure* measures. Direct exposure measures include the ratio of a country's trade with the United States to its total trade. One can think of the measure as the country's trade intensity with the United States. Additionally, in the recent sample (post-1990s), we include a country's debt liabilities in USD (% of GDP) as a proxy of direct exposure with the U.S.(Lane and Shambaugh, 2010; Benetrix et al., 2015).

As indirect exposure measure, we calculate country's total exports and imports as a share of GDP (trade openness) to proxy the economic globalization of a country with the rest of the world. In the recent sample (post-1970s), we also include the capital account openness index of Chinn and Ito (2006).

Table 1, Panel B, columns I to IV list the summary statistics of the exposure variables for the whole sample as well as for the developed and emerging economies. Developed countries on average are more globally integrated than emerging countries, irrespective of the way we measure. In contrast, emerging economies, on average, hold higher U.S.-

denominated debt and have higher trade intensity with the U.S. compared to developed economies.

Both trade intensity and trade openness can affect the macroeconomic outlook and financial stability of a country, suggesting a possible endogeneity problem. To address this issue, we use gravity estimates to construct instrumental variables for trade intensity and openness, following the methodology first introduced by Frankel and Romer (1999). The gravity estimates would serve as a robust instrument as argued by the authors. To this end, we instrument a country's bilateral trade by means of its distance (to its partners), population, common language, land-border, land-area, landlocked status, and their colonial relationship. Gravity estimates are expected to be good instrumental variables because they are based on variables that are plausibly exogenous and yet highly correlated with a country's overall trade.

To estimate gravity instruments for the trade intensity of a country with the U.S., for each year $t$, we first run the following regressions:

$$\begin{aligned} \log(T_{i,US}/T_i) &= c + \beta_1 \log dist_{i,US} + \beta_2 pop_{US} + \beta_3 comlang_{i,US} + \beta_4 border_{i,US} \\ &+ \beta_5 areap_{i,US} + \beta_6 landlocked_i + \beta_7 colony_{i,US} + \varepsilon_{i,US} \end{aligned} \tag{1}$$

$T_{i,US}$ is the total trade of country $i$ with the United States, $T_i$ is the total trade with the whole trade partners. $pop_{US}$ is the population of the United States, $\log dist_{i,US}$ is the log of the weighted-distance between the economic centers of the two countries, $comlang_{i,US}$ is a dummy variable that takes value 1 if $i$ and the United States share the same common language, and is 0 otherwise; $border_{i,US}$ is a dummy variable that takes value 1 if the two countries share a border and is 0 otherwise; $areap_{i,US}$ is the log of the product of the areas (in km$^2$) of countries $i$ and U.S., $landlock_i$ equals to 1 if $i$ is landlocked (i.e., entirely enclosed by land), and 0 otherwise, and finally $colony_{i,US}$ takes the value 1 if the country has ever had a colonial link with the United States and 0 otherwise. The intensity gravity estimates are the exponential of the fitted values of (1).

Similarly, following Cavallo and Frankel (2008), we run the following regression to estimate the gravity of trade openness:

$$\begin{aligned}\log(T_{i,j}/GDP_i) &= c + \beta_1 \log distwi,j + \beta_2 pop_j + \beta_3 comlang_{i,j} + \beta_4 border_{i,j} \\ &+ \beta_5 areap_{i,j} + \beta_6 landlocked_{i,j} + \beta_7 colony_{i,j} + \varepsilon_{i,j} \qquad (2)\end{aligned}$$

where, $T_{i,j}$ is the bilateral trade value between countries $i$ and $j$ and $GDP_i$ is the real GDP level of country $i$. $landlock_{i,j}$ equals to 2 if both $i$ and $j$ are landlocked (i.e., entirely enclosed by land), 1 if either $i$ or $j$ are landlocked, and 0 otherwise. The rest of the variables are constructed as above.

The gravity estimates (or predicted trade to GDP ratios used in the regressions) are then calculated as the exponential of the fitted values, summing across bilateral trading partners $j$. For the sake of brevity, we do not present the estimates for the gravity equations (1) and (2).

## 2.4 Control variables

While testing the effects of monetary policy decisions on crises, we include a number of variables known to be predictors of crises as control variables. We first include per-capita gross domestic product growth. Second, inflation affects the likelihood of a financial crisis (see e.g., Demirguc-Kunt and Detragiache, 1998). We calculate inflation as the annual percentage change in the consumer price index. Lastly, to control for institutional quality, which can affect political and macroeconomic stability (see, e.g., Cerra and Saxena, 2008), we use the POLCOMP variable from the Polity IV Project database as a proxy for institutional quality.[2]Details of the variables constructed can be found in appendix A.

Table 1, Panel B, Columns V through X detail selected descriptive statistics for the control variables. Most notably, developed countries have much higher institutional quality and much lower inflation than their emerging counterparts. In addition, the variability

[2]Local monetary policy decisions and changes in the exchange rates are also expected to affect the economic and financial conditions. However, historical coverage for both series for many of the countries are poor. When we include changes in the short-term interest rates and exchange rate in our baseline specification, the sample size shrinks by three quarters, hence we do not include these local variables in our baseline regressions and instead present them as part of robustness analysis in section 4.4.

of GDP growth and the variability of inflation are also low for developed countries relative to emerging ones.

## 3 Empirical Methodology

We hypothesize that U.S. monetary policy affects a country's financial system only to the extent that the country has direct linkages with the United States. To test this hypothesis, for country $i$ and year $t$, we estimate the following logit-panel regressions:

$$\begin{aligned} \text{logit}(C_{i,t}) &= \beta_1 \text{Exposure}_{i,t} + \beta_2 \text{Exposure}_{i,t} \times MP_t + \beta_3 \text{Exposure}_{i,t-1} \times MP_{t-1} \\ &+ \gamma_1 \times X_{i,t} + \gamma_2 \times X_{i,t-1} + \eta_i + \nu_t + \varepsilon_{i,t}, \end{aligned} \tag{3}$$

where $\text{logit}(C) = \log(C/(1-C))$ is the log of the odds ratio of the binary banking crisis indicator $C_{i,t}$.[3] Exposure is the measure of a country's exposure to the U.S. and the world, introduced in Section (2), and $MP$ is the change in the U.S. monetary policy decisions, defined as the change in U.S. 3-month Treasury yields. $X$ are the control variables, namely: inflation rate, GDP growth rate, and political competition. $\eta_i$ and $\nu_t$ are cross-sectional and time-series fixed effects, respectively. Throughout the analysis, we dually cluster standard errors both at the country and year levels to address possible time-series and cross-country correlation of residuals.

## 4 Results

This section first establishes how U.S. monetary policy affects banking crises and how the nature of linkages affects these results. Subsequently, we provide some evidence on the transmission mechanisms, and explore the robustness of our results in various dimensions.

[3]Using an interaction term is also necessary from an econometric standpoint. U.S. monetary policy shocks do not vary by country, so including is as a stand-alone variable in a panel regression would be akin to adding time-series fixed effects.

## 4.1 Effects of U.S. Monetary Policy on Banking Crises

Table 2 shows our baseline panel-logit regression results with the historical data. Column I shows the effect of the interaction of monetary policy with direct exposure measures of trade intensity. U.S. monetary policy tightening has a positive and statistically significant effect on the probability of a banking crisis for those countries that have direct trade linkages with the United States. Column II uses the gravity instrument for the trade intensity to correct potential endogenity that occurs when using trade intensity as the dependent variable. The contemporaneous interaction term for U.S. monetary policy with the exposure variable remains positive and becomes more significant both statistically and economically. The estimated marginal effects (MEs) show that the impact of U.S. monetary policy on the probability of a crisis is economically meaningful: a 1 % tightening in monetary policy increases the probability of a crisis by 1.0-6.8% for a given level of direct exposure to the United States.

As we formally explore below, when U.S. monetary policy tightens, foreign countries could experience capital outflows, leading to an adjustment in external accounts and domestic vulnerabilities. If this correction is sudden, and sizable, it might lead to a sudden stop. Indeed, the countries that have direct exposure to the U.S. appear to be more prone sudden stops, hence for these countries, the probability of a banking crisis increases.

Columns III and IV explore the role of U.S. monetary policy for those countries that are open and globally integrated but do not necessarily have direct, primary exposure to the United States. We measure such integration using the trade openness indicator (in column III) and its gravity instrument (in column IV). For those countries without direct exposure to the United States, the role of U.S. monetary policy is ambiguous. In column III, the coefficient for the contemporaneous interaction term is negative and statistically significant, suggesting that the contemporaneous rate changes for these countries might decrease the probability of a banking crisis. Our interpretation of this result is that, for these countries, openness helps with diversification, and these countries might be the immediate beneficiaries of the funds flowing from those other countries which have direct exposure with the United States. In addition, even if these countries are not the direct beneficiaries of capital flowing out of countries that have direct exposure to the

United States, a more orderly reversal of capital flows might help correct imbalances that might have accumulated in the run-up period. With an orderly correction of imbalances, the probability of a banking crisis drops, as indicated by the negative marginal effects. However, the impact diminishes when we correct for the endogeneity.

Our control variables have expected signs. Higher GDP growth has a negative coefficient, suggesting higher growth reduces the probability of a banking crisis. Higher institutional quality of a country (POLCOMP) lowers the probability of a banking crisis (albeit not significant). It could be that governance is better for countries with better quality scores, where it is more difficult for politicians to distort bank lending decisions.

## 4.2 Transmission Mechanisms

Our results so far show that U.S. monetary policy rates affect the likelihood of banking crises in foreign countries, to the extent that these countries have direct links to the U.S. economy. In this section, we explore possible mechanisms as to why U.S. monetary policy may lead to financial instability abroad.

U.S. monetary policy may affect other countries through capital flows, credit growth, and bank leverages. Since U.S. monetary policy stance affects relative return on investment in foreign economies, it may affect credit flows across countries. A loosening stance of U.S. monetary policy can lead to a credit boom in foreign economies since it is likely that capital would flow out of the United States due to an increase in reach-for-yield incentives. With large capital inflows to these countries, the quality of loans becomes poor (Greenwood and Hanson, 2013), which eventually increases the likelihood of a banking crisis. Caballero and Simsek (2018a,b) show that asymmetric capital flows can be destabilizing in these reach-for-yield scenarios. Schularick and Taylor (2012) and Baron and Xiong (2017) find that excessive lending adversely affects the likelihood of a banking crisis and the bank equity crash risk, respectively. Conversely, a tightening of the stance of U.S. monetary policy can lead to reversal of capital flows. If the correction in capital flows becomes sudden and disorderly, it can lead to an increase in the probability of a banking crisis (see Neumeyer and Perri, 2005; Uribe and Yue, 2006, among others).

To examine if U.S. monetary policy tightening could cause a reversal of capital flows in foreign economies, we run the following regression

$$\begin{aligned}\Delta \text{CF}_{i,t} &= \beta_1 \text{Exposure}_{i,t} + \beta_2 \text{Exposure}_{i,t} \times MP_t + \beta_3 \text{Exposure}_{i,t-1} \times MP_{t-1} \\ &+ \gamma_1 \Delta \text{CF}_{i,t-1} + \gamma_2 \times X_{i,t} + \gamma_3 \times X_{i,t-1} + \eta_i + \nu_t + \varepsilon_{i,t}, \qquad (4)\end{aligned}$$

where, $\Delta\text{CF}_{i,t}$ is the change in total portfolio investment flows (% of GDP) for country $i$ in year $t$. We include all of the control variables introduced in (3). In addition, we control for the change in domestic interest rates to account for the local monetary policy decisions. In addition, as the sample coverage starts in the 1970's, we can use two additional exposure measures, which are not available at our original historical sample period. The first one is the difference between the debt liabilities and debt assets denominated in U.S. dollar, and the second one is the capital account openness.

We consider countries with dollar-denominated liabilities as having direct exposures to U.S. monetary policy, since changes in U.S. monetary policy directly affect the debt servicing costs. As thoroughly discussed in the literature (See Calvo, 2002; Choi and Cook, 2004; Mendoza, 2002, among others), liability dollarization is a significant source of financial stability risk. When dollar denominated liabilities are financed by income derived in local currency, any changes in exchange rate fluctuations could make the debt servicing cost higher. When U.S. monetary policy tightens, the cost of holding dollar-denominated debt for foreign economies rises through two channels. First, the rate at which the borrowers roll over their debt would be higher. Second, a higher U.S. monetary policy rate would drive up the value of the dollar relative to other currencies. We consider countries with more open capital accounts as being globally integrated but not necessarily having direct exposure with the United States. Therefore, we consider capital account openness as an indirect exposure measure.

Table 3 shows that the interaction term is negative and significant for the direct exposure measures but insignificant for indirect exposure measures. That is, a positive shock to, or a tightening stance in, the U.S. monetary policy is followed by reduction in capital flows to these countries only if the country has direct economic exposure to the U.S. However, if the country is globally integrated, then the effect of U.S. monetary policy is ambiguous. This finding suggests that when U.S. monetary policy tightens, countries with direct exposure to the United States will face capital outflows. If the outflows are disorderly (e.g., sudden stops), the probability of a banking crisis increases.

### 4.3 Monetary policy surprises and crises

The literature has offered various proxies for monetary policy shocks. To explore the effects of policy surprises, rather than changes in the decisions, in Table 4, we use the monetary policy surprise series constructed by Gertler and Karadi (2015), Romer and Romer (2004) and Rogers et al. (2014). These indicators of monetary policy surprises, however, are available only for the more recent period, hence we have to restrict our sample in these regressions to the 1990–2010 period. In these regressions, we can use two additional exposure variables: dollar denominated liabilities, as a proxy for direct exposure, and Chinn-Ito's capital account openness indicator, as a proxy for indirect exposure.

Table 4 shows that our main findings in the historical sample hold. U.S. monetary policy shocks increase the probability of a banking crisis for countries with direct trade links with the United States. (columns I to VI) or countries that hold more dollar-denominated liabilities (columns VII to IX). For countries integrated globally, results are again ambiguous but statistically stronger compared to using monetary policy stances. U.S. monetary policy shocks decrease the probability of a banking crisis for countries that have strong trade links globally, even controlled for the endogeneity (columns X to XV). Whereas, we failed to document a robust relationship between the policy surprises and banking crises probability using the Chinn-Ito index as the exposure variable (columns XIX to XXI).

To sum up, our results in this section reinforces our earlier finding that U.S. monetary policy shocks lead to a contemporaneous increase in probability of a banking crisis only for those countries with a direct exposure to the U.S. For other countries with indirect exposure, the effect of monetary policy shocks is ambiguous. The results in these cases point to a reduction in probability of a banking crisis with some exposure measures and point to an ambiguous effect with some other exposure measures.

## 4.4 Robustness

We examine the robustness of our findings in two main dimensions. First, we look at sub-samples. Second, we examine alternative econometric specifications and alternative data. In the interest of space, we exclusively present robustness results for our regression results for the gravity instrument for trade intensity, e.g., our main direct exposure variable shown in column II of Table 2, and leave robustness for all the other columns to an online appendix.

Table 5 shows our results with different sub-samples. In particular, we look at post-WWII period (column II), a sample that excludes the Great Depression and the Great Recession, and both WWI and WWII periods (column III), a sample with emerging markets only (column IV), a sample with developed countries only (column V), a sample controlling for countries that anchor their exchange rates to the U.S. dollar (column VI). In all these sub-samples, the interaction variable for U.S. monetary policy and exposure variable remains positive and statistically significant, with the exception of the sample for developed countries. This finding suggests that the effect of U.S. monetary policy on the probability of a banking crisis (due to increased risk of a sudden stop) is mainly an emerging market phenomena.

It is also worth highlighting the results with exchange rate anchors, countries who directly anchor their exchange rate to the U.S. dollar. In this exercise, we add the contemporaneous and lagged interaction of U.S. monetary policy with a dummy for exchange rate anchor countries, which takes a value of 1 if the country anchors its exchange rate to the U.S. dollar and 0 otherwise. We find that U.S. monetary policy has a positive effect on the probability of a banking crisis for those countries with direct exposure to the United States, regardless of their anchor policy. However, the impact is economically more meaningful for the countries that anchor their exchange rate to the dollar.

In Table 6, we present additional robustness analyses with alternative econometric specifications and alternative data. In columns II and III, we examine the robustness of our findings with the use of simple OLS and probit regressions, respectively. In column IV, we investigate whether our results are sensitive to the inclusion of local monetary policy changes and changes in the exchange rates. Local monetary policy decisions, not only the U.S. monetary policy ones, are expected to affect the economic conditions. We proxy local monetary policy changes as the changes in the short-term local interest rates.

In column V, we test the sensitivity of our findings by considering alternative crisis databases. Our motivation in doing this to see if our results are sensitive to the critiques raised in the literature (see, e.g., Romer and Romer, 2015) regarding Reinhart and Rogoff (2009). In particular, following Danielsson et al. (2018) we merged the databases of Bordo et al. (2001); Laeven and Valencia (2012); Gourinchas and Obstfeld (2012); Schularick and Taylor (2012) with that of Reinhart and Rogoff (2009) for banking by using consistent definitions of crises and then use it as the dependent variable. Finally, we re-estimate the baseline equation with non-winsorized variables (column VI).

Overall, we find that the results are qualitatively similar under the various robustness checks. There are small changes in different specifications, but the main conclusions hold.

# 5 Conclusion

In this paper we examine the role of U.S. monetary policy in global financial stability. We find that positive U.S. monetary policy shocks leads to an increase in the probability of a banking crisis for those countries with direct linkages to the U.S., either in the form of trade links or significant share of USD-denominated liabilities. However, if a country is integrated globally, rather than having a direct exposure to the U.S., the effects of U.S. monetary policy shocks are ambiguous.

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# 6 Appendix A: Definition of variables

## 6.1 Monetary policy shocks

- MP: US monetary policy change, defined as the change in US short-term interest rates from the Jorda et al. (2017) macrohistory database.
- GK: US monetary policy shocks introduced in Gertler and Karadi (2015), and defined as the surprises in the three months ahead federal funds rate futures.
- RSW: US monetary policy shocks introduced in Rogers et al. (2014), and constructed through the surprises on the six-month Euro-Dollar contracts.
- RR: US monetary policy shocks introduced in Romer and Romer (2004). The authors use the FED Greenbook forecasts of output growth and inflation along with the fed-funds rates to estimate shocks.

## 6.2 Exposure variables

- UStradeIntensity: Trade intensity to U.S., calculated as total trade to US divided by total trades of the country. Data is from COW trade project.
- Gravity–UStradeIntensity: The instrument of trade intensity, introduced in (1).
- Debt_in_USD: Debt liabilities minus debt assets in USD (% of GDP) in log terms, constructed by using data from the IMF's Coordinated Portfolio Investment Survey (CPIS) and the BIS locational banking statistics as detailed by Lane and Shambaugh (2010); Benetrix et al. (2015).
- EconInteg: Economic integration, calculated as a country's total exports and imports as a % of GDP (trade openness). Trade data is from COW trade project and GDP data is from Maddison project.
- Gravity–EconInteg: The instrument of trade openness, introduced in (2).
- KAOPEN: The Chinn-Ito financial openness index. It measures a country's degree of capital account openness, introduced in Chinn and Ito (2006). KAOPEN is based

on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

## 6.3 Capital flows

- $\Delta CF$: The change in total portfolio flows as a percentage of the local country's GDP, taken from the IMF Balance of Payments statistics (BPM5).

## 6.4 Control variables

- GDPgrowth: Real GDP per capita growth rate. Data from the Maddison project.
- INF: Inflation rate calculated as the annual percentage change of the CPI index. Data from the Global Financial Data.
- POLCOMP: Political competition as a proxy for institutional quality. Data is from the Polity IV Project database. POLCOMP is the combination of the degree of institutionalization or regulation of political competition and the extent of government restriction on political competition. The higher the value of the POLCOMP, the better the institution quality of a given country.
- Δ INT_RATES: Change in local 3-month Treasury yields. Used as a proxy for the local monetary policy surprises. Data from the Global Financial Data.
- $\Delta XR$: The change in the exchange rate of the local currency to the dollar, from Global Financial Data.
- ANCHOR: A dummy variable equal to 1 if a country's currency is pegged to the U.S. Dollar in year $t$ and 0 otherwise. Data from Ilzetzki et al. (2017).
- **Gravity variables**
  - *areap* is the log of the product of the areas in km2 of two countries. Data is from the GeoDist database–CEPII (Mayer and Zignago, 2011)
  - $T_{i,j}$ is the bilateral trade value between countries $i$ and $j$. Data is from the COW project

– *pop* is the population of a country. Data from the Maddison project

– *distw* is the bilateral distances between the biggest cities of two countries, those inter-city distances being weighted by the share of the city in the overall country's population (see Mayer and Zignago, 2011, for details).

– *areap* is the log of the product of the areas (in squared kilometers) of countries i and U.S.

– *comlang* is equals to 1 if the countries share the same official language and 0 otherwise

– *border* if equals to 1 if the countries share a border and 0 otherwise

– *landlocked* equals to 1 if the local country is landlocked (i.e., entirely enclosed by land) and 0 otherwise

– *colony* equals 1 if the countries have ever had a colonial link with the U.S

# 7 Appendix B: Sample details

Table B1: This table lists the countries in our sample and sample coverage, divided into panels by IMF Classification.

Panel A: Developed Countries

| Country | Coverage | Country | Coverage | Country | Coverage |
|---|---|---|---|---|---|
| Australia | 1901-2010 | France | 1870-2010 | Norway | 1870-2010 |
| Austria | 1870-2010 | Greece | 1870-2010 | New Zealand | 1907-2010 |
| Belgium | 1870-2010 | Ireland | 1922-2010 | Portugal | 1870-2010 |
| Canada | 1870-2010 | Iceland | 1918-2010 | Singapore | 1965-2010 |
| Switzerland | 1870-2010 | Italy | 1870-2010 | Spain | 1870-2010 |
| Germany | 1870-2010 | Japan | 1870-2010 | Sweden | 1870-2010 |
| Denmark | 1870-2010 | Korea | 1945-2010 | Taiwan | 1945-2010 |
| Finland | 1917-2010 | Netherlands | 1870-2010 | United Kingdom | 1870-2010 |

Panel B: Emerging Countries

| Country | Coverage | Country | Coverage | Country | Coverage |
|---|---|---|---|---|---|
| Algeria | 1962-2010 | Guatemala | 1870-2010 | Philippines | 1946-2010 |
| Angola | 1975-2010 | Honduras | 1870-2010 | Poland | 1918-2010 |
| Argentina | 1870-2010 | Hungary | 1918-2010 | Paraguay | 1870-2010 |
| Bolivia | 1870-2010 | Indonesia | 1949-2010 | Romania | 1878-2010 |
| Brazil | 1870-2010 | India | 1947-2010 | Russia | 1870-2010 |
| Central African Republic | 1960-2010 | Kenya | 1963-2010 | El Salvador | 1870-2010 |
| Chile | 1870-2010 | Morocco | 1956-2010 | South Africa | 1910-2010 |
| China | 1870-2010 | Mexico | 1870-2010 | Sri Lanka | 1948-2010 |
| Cote d'Ivoire | 1960-2010 | Myanmar | 1948-2010 | Thailand | 1870-2010 |
| Colombia | 1870-2010 | Mauritius | 1968-2010 | Tunisia | 1956-2010 |
| Costa Rica | 1870-2010 | Malaysia | 1963-2010 | Turkey | 1870-2010 |
| Dominican Republic | 1870-2010 | Nigeria | 1960-2010 | Uruguay | 1870-2010 |
| Ecuador | 1870-2010 | Nicaragua | 1870-2010 | Venezuela | 1870-2010 |
| Egypt, Arab Rep. | 1870-2010 | Panama | 1903-2010 | Zambia | 1966-2010 |
| Ghana | 1957-2010 | Peru | 1870-2010 | Zimbabwe | 1965-2010 |

Table 1: **Selected Descriptive Statistics**

| Panel A | | | | | |
|---|---|---|---|---|---|
| | | I | II | III | IV |
| MP Shocks | | MP | GK | RSW | RR |
| | Average | 0.000 | -0.158 | -0.090 | -0.030 |
| | Std. Dev. | 0.013 | 0.289 | 0.235 | 1.102 |
| | Obs. | 8400 | 1610 | 2170 | 2730 |

| Panel B | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | IX | X |
| | | UStradeIntensity | EconInteg | Debt_in_USD | KAOpen | CapFlows | GDPgrowth | POLCOMP | INF | ΔIntRates | ΔXR |
| Whole | Average | 0.197 | 1.852 | 2.671 | 0.240 | 0.086 | 0.020 | 6.182 | 8.068 | -0.285 | 1.184 |
| | Std. Dev. | 0.192 | 3.055 | 0.973 | 1.593 | 1.171 | 0.051 | 3.339 | 14.810 | 4.349 | 7.564 |
| | Obs. | 6134 | 5790 | 1101 | 2821 | 808 | 7063 | 7422 | 6077 | 2026 | 8325 |
| Developed | Average | 0.127 | 2.495 | 2.259 | 1.251 | 0.096 | 0.022 | 7.839 | 4.480 | -0.147 | 0.447 |
| | Std. Dev. | 0.127 | 4.010 | 0.943 | 1.336 | 0.998 | 0.048 | 3.171 | 8.877 | 1.786 | 4.878 |
| | Obs. | 2442 | 2428 | 334 | 1003 | 560 | 3051 | 2787 | 2915 | 1119 | 3293 |
| Emerging | Average | 0.244 | 1.387 | 2.851 | -0.317 | 0.063 | 0.019 | 5.187 | 11.375 | -0.456 | 1.667 |
| | Std. Dev. | 0.212 | 1.986 | 0.931 | 1.442 | 1.491 | 0.054 | 3.028 | 18.060 | 6.187 | 8.861 |
| | Obs. | 3692 | 3362 | 767 | 1818 | 248 | 4012 | 4635 | 3162 | 907 | 5032 |

This table shows the average, standard deviation, and number of observations for the data we use in the regressions. Panel A highlights monetary policy change or surprise measures, which represent U.S. monetary policy and do not vary by country. MP is the change in 3-month federal funds rates, GK is the measure of monetary surprise in three-month federal funds rates as in Gertler and Karadi (2015), RSW is the measure of monetary policy surprise in the fourth eurodollar contract as in Rogers et al. (2014), and RR is the measure of monetary surprise as in Romer and Romer (2015). Panel B gives descriptive statistics for variables used as measures of exposure and controls, which do vary by country. Variable definitions are given in Appendix A.

Table 2: **Role of US Monetary Policy in Financial Crises: Historical Sample**

| $Y : C_{i,t}$ | I | II | III | IV |
|---|---|---|---|---|
| Exp: | UStradeIntensity | Gravity–UStradeIntensity | EconInteg | Gravity |
| $\text{Exp}_{i,t}$ | 0.33 | -3.45** | -0.26 | -4.91* |
| | (0.329) | (1.351) | (0.259) | (2.816) |
| $(\text{Exp*MP})_{i,t}$ | 23.68** | 162.88*** | -29.61*** | -96.94 |
| | (11.930) | (55.724) | (8.766) | (93.510) |
| $(\text{Exp*MP})_{i,t-1}$ | -10.66 | -4.12 | 15.14 | 39.64 |
| | (11.747) | (56.419) | (11.181) | (63.851) |
| $\text{GDPgrowth}_{i,t}$ | -10.84*** | -9.63*** | -9.86*** | -9.48*** |
| | (2.682) | (2.705) | (2.659) | (2.832) |
| $\text{POLCOMP}_{i,t}$ | -0.07 | -0.00 | -0.05 | 0.01 |
| | (0.075) | (0.091) | (0.073) | (0.092) |
| $\text{INF}_{i,t}$ | -0.01 | -0.00 | -0.00 | -0.00 |
| | (0.010) | (0.009) | (0.009) | (0.009) |
| $\text{GDPgrowth}_{i,t-1}$ | 0.62 | 0.08 | 0.26 | 0.15 |
| | (2.306) | (2.141) | (2.023) | (2.238) |
| $\text{POLCOMP}_{i,t-1}$ | -0.00 | -0.06 | -0.01 | -0.06 |
| | (0.065) | (0.078) | (0.067) | (0.079) |
| $\text{INF}_{i,t-1}$ | 0.01 | 0.01 | 0.01 | 0.00 |
| | (0.010) | (0.010) | (0.010) | (0.009) |
| Obs. | 1,496 | 1,541 | 1,555 | 1,541 |
| Pseudo R2 | 0.168 | 0.203 | 0.185 | 0.191 |
| MFX | | | | |
| $(\text{Exp*MP})_{i,t}$ | 0.998 | 6.825 | -1.216 | -4.692 |
| $(\text{Exp*MP})_{i,t-1}$ | -0.450 | -0.173 | 0.539 | 2.223 |

The table shows the estimated coefficients of the panel-logit regressions introduced in (3). The dependent variable is a dummy variable that equals to 1 at the beginning year of a systemic banking crises, defined in Reinhart and Rogoff (2009). MP is the U.S. monetary policy decisions, defined as the change in US 3-month Treasury yields. The exposure variable used (Exp) is listed at the column header. UStradeIntensity is a country's total trade to U.S. divided by its total trades. Gravity–UStradeIntensity is the instrument of trade intensity, introduced in (1). EconInteg is economic integration proxied by the trade openness (exports+imports as a ratio of GDP), Gravity is the instrumented trade measure as introduced in (2). GDPgrowth is the GDP growth rate, POLCOMP is the degree of political competition, and INF is the annual inflation rate. All of the specifications include country and year fixed effects, where the estimated coefficients are omitted for the sake of brevity. The panel covers 69 countries and spans 1870–2010. The standard errors, reported in parentheses, are robust and dually clustered at the year and country level. Estimated marginal effects of the interaction term and lagged interaction term are reported in the last two rows.

Table 3: **The Role of U.S. Monetary Policy in Capital Flows to Foreign Countries**

| $Y : \Delta CF_{i,t}$ | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Exp: | UStradeIntensity | Gravity–UStradeIntensity | Debt_in_USD | EconInteg | Gravity | KAOpen |
| $\text{Exp}_{i,t}$ | -0.51 | 0.12 | -0.15 | -0.10 | -0.25 | 0.06 |
| | (0.466) | (1.244) | (0.142) | (0.167) | (0.905) | (0.107) |
| $(\text{Exp*MP})_{i,t}$ | -5.62** | -28.96*** | -9.68* | -0.12 | -8.53 | -3.16 |
| | (2.196) | (5.479) | (4.669) | (3.108) | (22.228) | (2.813) |
| $(\text{Exp*MP})_{i,t-1}$ | 0.59 | -16.51 | -1.59 | 1.47 | -26.94 | 4.29 |
| | (1.470) | (17.183) | (4.962) | (1.638) | (22.258) | (3.367) |
| $\Delta CF_{i,t-1}$ | -0.46*** | -0.46*** | -0.50*** | -0.44*** | -0.44*** | -0.43*** |
| | (0.075) | (0.067) | (0.080) | (0.071) | (0.061) | (0.072) |
| $\text{GDPgrowth}_{i,t}$ | 3.86 | 2.96 | 6.51* | 3.30 | 2.65 | 3.63 |
| | (2.906) | (2.804) | (3.693) | (2.993) | (2.587) | (2.590) |
| $\text{POLCOMP}_{i,t}$ | -0.18* | -0.18** | -0.02 | -0.17** | -0.17** | -0.18** |
| | (0.095) | (0.079) | (0.194) | (0.077) | (0.077) | (0.072) |
| $\text{INF}_{i,t}$ | 0.02 | 0.02 | -0.04* | 0.02 | 0.02 | 0.02 |
| | (0.022) | (0.018) | (0.022) | (0.018) | (0.020) | (0.018) |
| $\Delta\text{IntRates}_{I,t}$ | -0.02 | -0.01 | -0.00 | -0.03 | -0.02 | -0.02 |
| | (0.032) | (0.029) | (0.027) | (0.028) | (0.030) | (0.029) |
| $\text{GDPgrowth}_{i,t-1}$ | 13.41*** | 12.48*** | 14.64*** | 13.95*** | 12.16*** | 13.11*** |
| | (3.065) | (3.607) | (3.016) | (3.121) | (2.869) | (3.056) |
| $\text{POLCOMP}_{i,t-1}$ | 0.20*** | 0.22** | -0.09 | 0.20*** | 0.23*** | 0.18** |
| | (0.067) | (0.085) | (0.257) | (0.067) | (0.075) | (0.076) |
| $\text{INF}_{i,t-1}$ | -0.01 | -0.01 | 0.05** | -0.01 | -0.01 | -0.01 |
| | (0.028) | (0.020) | (0.024) | (0.019) | (0.022) | (0.019) |
| $\Delta\text{IntRates}_{i,t-1}$ | -0.01 | -0.00 | -0.01 | -0.01 | -0.01 | -0.01 |
| | (0.017) | (0.014) | (0.020) | (0.013) | (0.014) | (0.015) |
| Obs. | 446 | 464 | 229 | 459 | 464 | 463 |
| R2 | 0.364 | 0.365 | 0.444 | 0.350 | 0.355 | 0.352 |

The table shows estimated coefficients of the panel-logit regressions introduced in (4). The dependent variable is the change in total portfolio flows as a percentage of the local country's GDP, taken from the IMF Balance of Payments statistics (BPM5). The exposure variable used (Exp) is listed at the column header, and are as introduced in Table 2. Sample includes 69 countries and spans from 1951 to 2010, as available. ΔIntRates, which is the change in a country's short term interest rates from Global Financial Data. All of the other control variables are introduced in Table (2). All specifications include country and year fixed effects. The standard errors, reported in parentheses, are robust and dually clustered at the year and country level.

Table 4: **Role of US Monetary Policy in Financial Crises: MP surprises**

| $Y: C_{i,t}$ | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|
| Exp: | UStradeIntensity | | | Gravity–UStradeIntensity | | | Debt_in_USD | | |
| MP: | GK | RSW | RR | GK | RSW | RR | GK | RSW | RR |
| $\text{Exp}_{i,t}$ | 13.93** | 13.96** | 3.12 | 0.27 | -0.17 | -2.15** | 1.66* | 1.67** | 1.47* |
| | (5.592) | (6.561) | (3.579) | (1.240) | (1.240) | (1.013) | (0.880) | (0.828) | (0.815) |
| $(\text{Exp*MP})_{i,t}$ | 8.51*** | 14.86*** | 1.04** | 1.50 | 2.66** | 1.00*** | 0.73** | 1.28 | -0.00 |
| | (2.240) | (4.867) | (0.477) | (1.353) | (1.123) | (0.386) | (0.322) | (0.844) | (0.250) |
| $(\text{Exp*MP})_{i,t-1}$ | -6.11*** | -6.14*** | -0.74 | 0.03 | 0.79 | -0.37 | -1.31 | -1.38 | 2.74* |
| | (1.747) | (2.249) | (0.621) | (1.107) | (1.062) | (0.506) | (1.323) | (2.109) | (1.529) |
| $\text{GDPgrowth}_{i,t}$ | -13.35 | -15.98* | -12.29* | -20.33*** | -19.84*** | -22.33*** | -13.20 | -13.36 | -12.62 |
| | (8.735) | (8.258) | (6.844) | (2.979) | (3.169) | (6.254) | (9.847) | (9.806) | (15.411) |
| $\text{POLCOMP}_{i,t}$ | -1.25*** | -1.16*** | -0.70*** | -0.67*** | -0.62*** | -0.55** | -0.49 | -0.49 | -0.70** |
| | (0.247) | (0.348) | (0.239) | (0.127) | (0.163) | (0.230) | (0.366) | (0.374) | (0.338) |
| $\text{INF}_{i,t}$ | -0.03 | -0.03 | -0.02 | -0.02 | -0.02 | -0.01 | -0.03 | -0.03 | -0.04 |
| | (0.055) | (0.049) | (0.048) | (0.049) | (0.047) | (0.048) | (0.048) | (0.047) | (0.064) |
| $\Delta\text{IntRates}_{I,t}$ | 0.04 | 0.03 | 0.05 | 0.03 | 0.03 | 0.04 | 0.11** | 0.11* | 0.20** |
| | (0.094) | (0.096) | (0.094) | (0.105) | (0.107) | (0.108) | (0.053) | (0.058) | (0.089) |
| $\text{GDPgrowth}_{i,t-1}$ | -5.87 | -7.08 | -8.32 | -6.32 | -6.76 | -4.69 | -29.94* | -30.70* | -33.07 |
| | (12.988) | (13.613) | (9.268) | (9.878) | (10.050) | (10.082) | (17.545) | (17.719) | (21.597) |
| $\text{POLCOMP}_{i,t-1}$ | 0.43 | 0.41 | 0.24 | 0.72*** | 0.76*** | 0.76*** | 0.47 | 0.46 | 0.56 |
| | (0.276) | (0.337) | (0.211) | (0.224) | (0.196) | (0.286) | (0.463) | (0.433) | (0.382) |
| $\text{INF}_{i,t-1}$ | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 |
| | (0.060) | (0.059) | (0.050) | (0.048) | (0.047) | (0.050) | (0.042) | (0.042) | (0.091) |
| $\Delta\text{IntRates}_{I,t-1}$ | -0.08* | -0.07 | -0.04 | -0.06* | -0.06* | -0.06* | -0.11** | -0.11** | -0.10 |
| | (0.047) | (0.055) | (0.036) | (0.032) | (0.032) | (0.034) | (0.048) | (0.049) | (0.122) |
| Observations | 235 | 235 | 235 | 220 | 220 | 220 | 146 | 146 | 146 |
| Pseudo R2 | 0.381 | 0.398 | 0.269 | 0.284 | 0.293 | 0.307 | 0.409 | 0.409 | 0.431 |
| MFX | | | | | | | | | |
| $(\text{Exp*MP})_{i,t}$ | 0.201 | 0.184 | 0.067 | 0.104 | 0.112 | 0.059 | 0.035 | 0.046 | -0.001 |
| $(\text{Exp*MP})_{i,t-1}$ | -0.145 | -0.064 | -0.048 | 0.002 | 0.044 | -0.022 | -0.063 | -0.062 | 0.060 |

The table shows estimated coefficients of the panel-logit regressions introduced in (3), using the sample after 1990. The dependent variable is a dummy variable that equals to 1 at the beginning year of a systemic banking crises, defined in Reinhart and Rogoff (2009). The exposure variable used (Exp) is listed at the column header as well as the definition of the monetary policy shocks. GK, RSW, and RR are the shocks defines by Gertler and Karadi (2015); Rogers et al. (2014); Romer and Romer (2004), respectively. Debt_in_USD is countries' debt liabilities minus debt assets in USD (% of GDP), introduced in Lane and Shambaugh (2010). KAOPEN is the Chinn-Ito Index openness index. The rest of the variables are introduced in Table 2. Sample includes 69 countries. All of the specifications include country and year fixed effects. The standard errors, reported in parentheses, are robust and dually clustered at the year and country level. Estimated marginal effects of the interaction term and the lagged interaction term are reported in the last two rows.

Table 4: **Role of US Monetary Policy on Financial Crises: MP surprises (Cont.)**

| $Y : C_{i,t}$ | X | XI | XII | XIII | XIV | XV | XIX | XX | XXI |
|---|---|---|---|---|---|---|---|---|---|
| Exp: | | Econ Integ | | | Gravity | | | KAOpen | |
| MP: | GK | RSW | RR | GK | RSW | RR | GK | RSW | RR |
| $\text{Exp}_{i,t}$ | 2.21** | 1.37** | 0.49 | -19.57*** | -16.88*** | -12.50* | 0.09 | -0.54 | 0.01 |
| | (0.870) | (0.651) | (1.784) | (6.847) | (6.369) | (6.505) | (0.868) | (0.870) | (0.832) |
| $(\text{Exp*MP})_{i,t}$ | -1.24* | -3.26* | -0.95* | -21.57*** | -33.22** | -2.43 | -0.24 | -2.33* | -0.71 |
| | (0.657) | (1.741) | (0.510) | (8.184) | (14.773) | (4.439) | (0.766) | (1.256) | (0.536) |
| $(\text{Exp*MP})_{i,t-1}$ | 1.90 | 2.18 | 0.54 | 19.55*** | 22.88** | 1.78 | 0.15 | -1.41 | 0.20 |
| | (2.010) | (3.572) | (0.549) | (6.681) | (10.914) | (2.672) | (0.850) | (1.577) | (0.504) |
| $\text{GDPgrowth}_{i,t}$ | -13.82*** | -11.84*** | -10.68** | -12.69*** | -13.95*** | -16.08*** | -13.26*** | -13.97*** | -11.86*** |
| | (3.888) | (4.036) | (4.882) | (3.182) | (3.887) | (5.159) | (3.415) | (3.896) | (3.354) |
| $\text{POLCOMP}_{i,t}$ | -0.93*** | -0.91*** | -0.77* | -0.67*** | -0.66** | -0.52** | -0.79*** | -0.65** | -0.66** |
| | (0.342) | (0.344) | (0.426) | (0.260) | (0.263) | (0.227) | (0.302) | (0.268) | (0.290) |
| $\text{INF}_{i,t}$ | -0.02 | -0.03 | -0.03 | -0.01 | -0.01 | -0.02 | -0.02 | -0.02 | -0.03 |
| | (0.049) | (0.047) | (0.049) | (0.040) | (0.040) | (0.043) | (0.048) | (0.045) | (0.046) |
| $\Delta\text{IntRates}_{I,t}$ | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 | 0.07 | 0.05 | 0.07 | 0.08 |
| | (0.106) | (0.101) | (0.094) | (0.100) | (0.103) | (0.097) | (0.093) | (0.081) | (0.082) |
| $\text{GDPgrowth}_{i,t-1}$ | -16.44 | -16.35 | -12.92 | -8.94 | -8.89 | -9.11 | -7.98 | -9.16 | -9.81 |
| | (10.773) | (11.709) | (9.583) | (10.455) | (10.929) | (10.629) | (8.884) | (8.829) | (9.214) |
| $\text{POLCOMP}_{i,t-1}$ | 0.36 | 0.42 | 0.41 | 0.69** | 0.70** | 0.70** | 0.31 | 0.29 | 0.39 |
| | (0.231) | (0.262) | (0.360) | (0.329) | (0.341) | (0.285) | (0.209) | (0.233) | (0.260) |
| $\text{INF}_{i,t-1}$ | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | -0.00 | 0.00 |
| | (0.044) | (0.042) | (0.045) | (0.049) | (0.048) | (0.045) | (0.050) | (0.043) | (0.044) |
| $\Delta\text{IntRates}_{I,t-1}$ | -0.02 | -0.03 | -0.02 | -0.05 | -0.05 | -0.05 | -0.03 | -0.02 | -0.04* |
| | (0.027) | (0.028) | (0.032) | (0.045) | (0.048) | (0.033) | (0.021) | (0.015) | (0.022) |
| Observations | 235 | 235 | 235 | 220 | 220 | 220 | 232 | 232 | 232 |
| Pseudo R2 | 0.269 | 0.287 | 0.289 | 0.345 | 0.353 | 0.290 | 0.218 | 0.246 | 0.245 |
| MFX | | | | | | | | | |
| $(\text{Exp*MP})_{i,t}$ | -0.087 | -0.147 | -0.050 | -1.154 | -1.437 | -0.150 | -0.013 | -0.091 | -0.052 |
| $(\text{Exp*MP})_{i,t-1}$ | 0.103 | 0.179 | 0.013 | 1.015 | 0.975 | 0.010 | 0.013 | -0.004 | 0.020 |

This table is continued from the previous page.

Table 5: **Robustness: Subsample Analysis**

| $Y : C_{i,t}$ | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Exp: Gravity–UStradeIntensity | Whole Sample | 1946-2010 | Without Major Crises | Emerging Economies | Developed Economies | Control for Anchor Currency |
| $\text{Exp}_{i,t}$ | -3.45** | -0.52 | -3.83** | -5.15** | -4.14*** | -1.53 |
| | (1.351) | (0.709) | (1.491) | (2.359) | (1.305) | (2.812) |
| $(\text{Exp*MP})_{i,t}$ | 162.88*** | 38.88** | 152.64** | 243.78*** | 105.02 | 164.42** |
| | (55.724) | (17.339) | (61.238) | (85.801) | (90.822) | (76.902) |
| $(\text{Exp*MP})_{i,t-1}$ | -4.12 | -13.43 | -43.48 | 25.61 | -31.82 | -67.58 |
| | (56.419) | (13.203) | (57.339) | (76.698) | (92.856) | (59.193) |
| $\text{GDPgrowth}_{i,t}$ | -9.63*** | -17.43*** | -10.84*** | -12.36*** | -4.43 | -18.81*** |
| | (2.705) | (3.808) | (2.944) | (3.448) | (5.144) | (3.729) |
| $\text{POLCOMP}_{i,t}$ | -0.00 | -0.04 | 0.01 | -0.04 | 0.16 | -0.06 |
| | (0.091) | (0.095) | (0.094) | (0.093) | (0.298) | (0.114) |
| $\text{INF}_{i,t}$ | -0.00 | -0.02 | -0.00 | -0.01 | -0.03 | -0.01 |
| | (0.009) | (0.012) | (0.010) | (0.013) | (0.029) | (0.013) |
| $\text{GDPgrowth}_{i,t-1}$ | 0.08 | 3.32 | -0.92 | -1.01 | 4.29 | 4.34 |
| | (2.141) | (4.532) | (2.350) | (2.754) | (4.884) | (5.292) |
| $\text{POLCOMP}_{i,t-1}$ | -0.06 | -0.02 | -0.05 | -0.04 | -0.25 | -0.00 |
| | (0.078) | (0.086) | (0.085) | (0.073) | (0.319) | (0.102) |
| $\text{INF}_{i,t-1}$ | 0.01 | 0.02 | 0.01 | 0.00 | -0.00 | 0.02 |
| | (0.010) | (0.013) | (0.010) | (0.013) | (0.027) | (0.012) |
| $\text{ANCHOR}_{I,t}$ | | | | | | 0.69 |
| | | | | | | (0.451) |
| $(\text{ANCHOR*MP})_{I,t}$ | | | | | | 40.20* |
| | | | | | | (23.515) |
| $(\text{ANCHOR*MP})_{I,t-1}$ | | | | | | 7.96 |
| | | | | | | (22.549) |
| Observations | 2,068 | 1,541 | 1,875 | 934 | 620 | 1,513 |
| R2 | 0.203 | 0.186 | 0.160 | 0.195 | 0.244 | 0.201 |

The table shows the estimated coefficients of the panel-logit regressions introduces in (3). Gravity–UStradeIntensity as defined in Table 2. Variables are as defined in Tables (2) and (4), with the addition of Anchor, which is equal to 1 if a country is pegged to the U.S. Dollar in a given year $t$ and the interaction and lagged interaction of Anchor and MP. Results labeled whole sample are the same as presented in Table 2.Column II presents results for the model estimated post-WWII. Column III estimates the model without the observations dating to the Great Depression, the Great Recession, and two world wars. Columns IV and V present estimates for developing and emerging economies, respectively. Column VI is estimated for the whole sample but with the additional Anchor controls.

Table 6: **Robustness: Alternative specifications**

| $Y: C_{i,t}$ | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Exp: Gravity–UStradeIntensity | Baseline | OLS | Probit | IntRate & XR added | Merged BKCrises | Without winsorization |
| $\text{Exp}_{i,t}$ | -3.45** | -0.04* | -1.92*** | -3.69 | -2.83** | -3.49** |
| | (1.351) | (0.025) | (0.527) | (2.384) | (1.150) | (1.366) |
| $(\text{Exp*MP})_{i,t}$ | 162.88*** | 4.83** | 75.25*** | 192.39** | 141.85** | 163.31*** |
| | (55.724) | (1.916) | (23.908) | (93.560) | (56.163) | (56.900) |
| $(\text{Exp*MP})_{i,t-1}$ | -4.12 | 0.43 | -10.24 | -95.98 | -12.08 | 0.24 |
| | (56.419) | (2.456) | (22.637) | (72.353) | (55.153) | (56.967) |
| $\text{GDPgrowth}_{i,t}$ | -9.63*** | -0.35*** | -5.51*** | -13.77*** | -9.75*** | -8.59*** |
| | (2.705) | (0.095) | (1.085) | (5.141) | (2.581) | (2.702) |
| $\text{POLCOMP}_{i,t}$ | -0.00 | 0.00 | -0.00 | 0.10 | -0.00 | -0.00 |
| | (0.091) | (0.004) | (0.050) | (0.248) | (0.083) | (0.091) |
| $\text{INF}_{i,t}$ | -0.00 | 0.00 | -0.00 | -0.03 | -0.00 | -0.01 |
| | (0.009) | (0.000) | (0.004) | (0.027) | (0.009) | (0.007) |
| $\text{GDPgrowth}_{i,t-1}$ | 0.08 | 0.00 | -0.20 | -5.32 | -1.48 | -0.09 |
| | (2.141) | (0.067) | (1.096) | (7.853) | (2.089) | (2.091) |
| $\text{POLCOMP}_{i,t-1}$ | -0.06 | -0.00 | -0.03 | -0.11 | -0.08 | -0.06 |
| | (0.078) | (0.004) | (0.042) | (0.238) | (0.072) | (0.078) |
| $\text{INF}_{i,t-1}$ | 0.01 | 0.00 | 0.00 | 0.03 | 0.01 | 0.01 |
| | (0.010) | (0.000) | (0.005) | (0.025) | (0.009) | (0.008) |
| $\Delta\text{IntRates}_{I,t}$ | | | | 0.07 | | |
| | | | | (0.049) | | |
| $\Delta\text{IntRates}_{I,t-1}$ | | | | -0.03 | | |
| | | | | (0.037) | | |
| $\Delta\text{ExchRates}_{I,t}$ | | | | 0.03 | | |
| | | | | (0.034) | | |
| $\Delta\text{ExchRates}_{I,t-1}$ | | | | 0.02 | | |
| | | | | (0.042) | | |
| Obs. | 2,068 | 4,251 | 2,068 | 559 | 2,130 | 2,068 |
| R-squared | 0.203 | 0.154 | 0.205 | 0.217 | 0.204 | 0.200 |

The table shows the estimated coefficients of the panel-logit regressions in terms of modifications to (3). Results labeled Baseline are the same as presented in Table 2. The OLS and Probit columns show the results as estimated with OLS and probit, respectively, instead of logit. In column IV, we include ΔIntRates, the change in local 3-month Treasury yields, and ΔExchRates, the change in the exchange rate of the local currency to the dollar, from Global Financial Data, as control variables. In column V, we use an alternative definition of banking crises formed by merging the systemic crises databases of Bordo et al. (2001); Laeven and Valencia (2012); Gourinchas and Obstfeld (2012); Schularick and Taylor (2012). We also show results for our main model estimated without applying winsorization in column VI.