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**Article — Published Version**

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Economic Inquiry

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*Suggested Citation:* Qi, Shusen; Kleimeier, Stefanie; Sander, Harald (2019) : THE TRAVELS OF A BANK DEPOSIT IN TURBULENT TIMES: THE IMPORTANCE OF DEPOSIT INSURANCE DESIGN FOR CROSS-BORDER DEPOSITS, *Economic Inquiry*, ISSN 1465-7295, Wiley Periodicals, Inc., Boston, USA, Vol. 58, Iss. 2, pp. 980-997,  
<https://doi.org/10.1111/ecin.12845>

This Version is available at:

<https://hdl.handle.net/10419/230041>

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## THE TRAVELS OF A BANK DEPOSIT IN TURBULENT TIMES: THE IMPORTANCE OF DEPOSIT INSURANCE DESIGN FOR CROSS-BORDER DEPOSITS

SHUSEN QI, STEFANIE KLEIMEIER and HARALD SANDER\*

*We examine the impact of the existence on an explicit deposit insurance (DI) scheme and its design features on bilateral cross-border deposits (CBD) in a gravity model setting. We find that both the absolute quality of a country's DI and its relative quality vis-à-vis other countries' DI generally affect depositor behavior. However, during systemic banking crises, cross-border depositors primarily seek countries with the best DI schemes. Similarly, during the 2008–2009 great financial crisis, the emergency actions taken by the governments, which supply and maintain these safe havens, have led to substantial relocations of CBD. (JEL F34, G18)*

### I. INTRODUCTION

The history of deposit insurance (DI) systems goes back to the nineteenth century, yet only in

\*We would like to thank Steven Ongena (editor), an anonymous referee, Bent Vale (Norges Bank), Evren Damar (Bank of Canada), Hibiki Ichiiue (IMF), Jean Roy (HEC Montreal), and Tyler K. Jensen (Iowa State University), as well as participants of the 2017 Biennial International Association of Deposit Insurers Research Conference “Designing an Optimal Deposit Insurance System in the wake of the Financial Crisis” (Bank for International Settlements, Basle, June 1–2, 2017), Third BIS-CGFS Workshop on Research on Global Financial Stability (Bank for International Settlements & Committee on the Global Financial System, Basle, May 7, 2016), 14th INFINITI Conference on International Finance (Trinity College Dublin, June 13–14, 2016), and the 2016 FMA Annual Meeting (FMA, Las Vegas, October 19–22, 2016), National Bank of Poland Research Seminar (Warsaw, November 18, 2015) for valuable comments and suggestions. S.Q. would like to acknowledge financial support from the National Natural Science Foundation of China (71903164 and 71790601), Social Science Foundation of Fujian Province (FJ2019B140) as well as the Fundamental Research Funds for the Central Universities (20720181028).

The copyright line for this article was changed on 12 December 2019 after original online publication.

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the late twentieth century DI systems got adopted more widely (Eisenbeis and Kaufman 2015). By 2006, just before the great financial crisis (GFC) of 2008–2009, 79 of the countries surveyed by the World Bank had an explicit DI scheme. The fundamental idea of a DI system is to avoid bank runs by guaranteeing deposits (Diamond and Dybvig 1983). Otherwise, doubts about the safety of bank deposits may induce attempts to withdraw deposits and reinvest them into safer assets such as cash. In closed economies, reinvestments go into domestic assets. Under the conditions of financial globalization, savers also have access to foreign deposit markets. According to the Bank for International Settlements (BIS), cross-border depositing increased rapidly until the GFC not only in the interbank market, but also in the retail market. After a short period of retrenchment during the crisis, cross-border depositing started growing again and by the end of 2017 rose to U.S.\$ 26 trillion, of which almost U.S.\$ 9 trillion constitute cross-border liabilities to non-banks. Global deregulation, regional integration initiatives such as the introduction of the Euro, and the elimination of capital controls in many developing countries enabled banks to expand their cross-border financial services rapidly.

### ABBREVIATIONS

BIS: Bank for International Settlements  
CBD: Cross-Border Deposits  
DI: Deposit Insurance  
DID: Difference-In-Differences  
FTA: Free Trade Agreement  
GFC: Great Financial Crisis  
OLS: Ordinary Least Square

Foreign deposit markets offer not only return opportunities and product diversity but foreign DI schemes provide cross-border depositors with an opportunity to access a better or even the best protection globally for their deposits. But do bank depositors really seek the best DI protection that is globally available? Or are they content to simply deposit in countries with DI protection that is better compared to their home countries? These issues are of high political relevance, especially in times of financial crises. If a national banking system is hit by a crisis, depositors may look for protections and (more) stable banking systems abroad and hence deepen the domestic banking crisis. Can a DI scheme prevent or at least mitigate the capital outflow? Here, the devil is in the detail. DI schemes need to be credible to be efficient and like all the insurance systems they are beset with moral hazard problems. Therefore, not only simply the existence of a DI scheme but also its detailed features which finally determine the DI's credibility matter.

This paper provides an in-depth investigation of the relationship between cross-border nonfinancial depositing and national DI schemes and their specific design and credibility. On the base of this analysis, we scrutinize the impact of systemic banking crises on this nexus before and after the GFC. This distinction is essential as the GFC threatened the credibility of DI schemes even in the traditional safe haven countries, of which many subsequently adopted emergency actions like government guarantees. By evaluating these emergency actions, we also provide a unique analysis of the impact of crisis policies on cross-border banking.

The paper is structured as follows. Section II reviews the existing literature and specifies our contribution. Section III develops our gravity model for analyzing the impact of DI on cross-border depositing. Section IV details the various extensive databases we are using. Section V reports results and Section VI concludes.

## II. LITERATURE REVIEW AND CONTRIBUTIONS

Our study fills a number of gaps in the empirical literature regarding the impact of DI schemes on cross-border deposits (CBD). This literature does not yet offer evidence on the direct link between DI schemes and CBD. For example, Lane and Sarisoy (2000) examine the relationship between the existence of an explicit DI and several measures of private capital inflows to the developing countries but find no significant link.

However, their measures of capital inflows are mainly composed of funds that are not insured. Huizinga and Nicodème (2006) focus more closely on international liabilities including deposits.<sup>1</sup> While they find that nonbank external liabilities increase after the introduction of an explicit DI, they do not find any role for specific DI features. Similar to Lane and Sarisoy (2000), their results are biased by the inclusion of uninsured liabilities. Furthermore, due to the aggregate level of their data at the bank country level, they are only able to explore whether a DI system makes a given country more attractive to *all* foreign depositors in general. In contrast, we employ a uniquely suitable dataset of *bilateral* CBD provided confidentially by the BIS. Our data are based on the Locational Banking Statistics covering CBD between 22 bank and 131 depositor countries from 1998 to 2011. We are—to the best of our knowledge—the first to use such detailed data to scrutinize role of DI for cross-border depositing and therefore contribute to the literature in numerous ways.

First, our study advances the empirical literature by analyzing deposits of households and nonfinancial corporations, for example, deposits that are actually covered by DI schemes. Hence, we investigate the dual effect of the insurance and the perceived impact on banking market stability in the light of the Diamond-Dybvig argument. The latter is especially important for CBD in excess of the coverage limit, especially those from corporations and wealthy individuals. However, unlike other studies we do not need to make any inference about the implications of DI systems on overall financial system stability.

Second, we investigate not only the effect of an explicit DI but also consider its specific features. As argued by Eisenbeis and Kaufman (2015), the effectiveness of a DI scheme depends crucially on its design and implementation. Theoretically, as a DI scheme may contribute to a more stable banking system by preventing bank runs as argued by Diamond and Dybvig (1983), the existence of a DI scheme can make a banking market more attractive to cross-border depositors. However, this effect is disputed as

1. Lane and Sarisoy (2000) analyze gross private capital flows, net private capital flows, international syndicated loans, and international bond issues in developing countries. Huizinga and Nicodème (2006) analyze the impact of the existence of an explicit DI scheme on external liabilities in developed countries. They differentiate interbank and nonbank liabilities. However, interbank liabilities are generally not insured and nonbank liabilities include insured deposits but also a certain amount of uninsured funds.

moral hazard can induce banks to engage in riskier activities thereby increasing the likelihood of a banking crisis (Demirgüç-Kunt and Detragiache 1997, 2002; Rossi 1999). The degree of moral hazard heavily depends on how a DI system is designed. Therefore, our analysis can provide in-depth insights into which features of a DI scheme are relevant for international depositors.<sup>2</sup>

Third, the existing literature focuses exclusively on the role of DI in the bank country, for example, the foreign country that receives the cross-border deposit (Huizinga and Nicodème 2006; Lane and Sarisoy 2000). In this literature, a “safe haven” is a country that is able to attract a substantial amount of CBD by means of its DI. Despite the internationalization of the deposit market, significant heterogeneity still exists across national DI schemes.<sup>3</sup> Thus, the attractiveness of such a country might not only depend on the *absolute* strengths of its DI scheme but also on its *relative* superiority vis-à-vis the DI scheme of the depositor’s home country. The latter motive constitutes a form of “regulatory arbitrage.” Our bilateral dataset allows us to investigate not only the absolute attractiveness of the bank countries’ DI, but also the importance of DI differences compared to the depositor’s home country which enriches the literature.

Fourth, we provide a novel analysis of the potentially changing importance of DI design when depositor countries are undergoing a systemic banking crisis. Extending Kleimeier, Sander, and Heuchemer (2013), who find that during systemic banking crises, depositors discipline their home banking system by relocating deposits to foreign safe havens,<sup>4</sup> we specifically investigate the impact of various DI features on

the relocation decision of depositors in tranquil and turbulent times.

Finally, we provide a unique investigation of the impact of emergency actions taken by many countries in response to the severity of the GFC, which included explicit and often enhanced government guarantees over and above the regular DI coverage.

We find that the quest for safe havens and the engagement in regulatory arbitrage are both important drivers of cross-border depositing in stable times. However, in times of a financial crisis, the safe haven motive persists while regulatory arbitrage behavior can only be observed with respect to a few specific DI features. Searching for a safe haven was especially important during the GFC. The emergency actions taken to enhance DI schemes, in particular the introduction of government guarantees, have been major drivers of global cross-border deposit relocations towards safe havens.

### III. METHODOLOGY

Our paper scrutinizes the impact of DI schemes on bilateral, nonfinancial cross-border depositing. This bilateral view allows us to examine cross-border depositing for all pairs of bank and depositor countries and differentiate between the effects of home and foreign DI schemes.

The gravity model is the gold standard for dealing with bilateral datasets. Based on Tinbergen (1962) and Pöyhönen (1963), it has been successful in explaining international trade by the trading partners’ economic masses and geographical distances. Later studies utilize this model to investigate the impact of other bilateral characteristics, including joint trade agreements, common currency memberships, or cultural distances. Following Portes and Rey (2005), who argue that the gravity model is a powerful work horse for asset trade as well, gravity modeling has more recently been extended to international finance, in general, and to cross-border depositing, in particular (Sander, Kleimeier, and Heuchemer 2016).<sup>5</sup>

We thus apply a gravity model framework to empirically analyze the impact of DI schemes on

2. We thereby contribute indirectly to the literature on DI design, optimal DI schemes, and implications on the banking systems and financial markets (Demirgüç-Kunt and Detragiache 2002; Demirgüç-Kunt, Kane, and Laeven 2008, 2014; Demirgüç-Kunt, Karacaovali, and Laeven 2005; Demirgüç-Kunt and Sobaci 2001; García 1999; Ioannidou and Penas 2010; Laeven and Beck 2006).

3. See Dale, Bruni, and De Boissieu (2000) and Eisenbeis and Kaufman (2006, 2008).

4. Kleimeier, Sander, and Heuchemer (2013) build on the literature on the disciplining role of (domestic) depositors pioneered by Berger (1991). Ding, Domac, and Ferri (1998) document a flight to safety by depositors during the Asian crisis of 1997–1998. Rochet (2004) reports empirical evidence for direct market discipline during crises when depositors are able to “vote with their feet.” Park and Peristiani (1998) and Martínez Pería and Schmukler (2001) find similar effects during banking crises in United States in the 1980s and Argentina, Chile, Mexico in the 1980s and 1990s, respectively.

5. See Aviat and Coeurdacier (2007), Baltagi, Egger, and Pfaffermayr (2003), Baxter and Kouparitsas (2006), Buch (2005), Buch and Lipponer (2007), Coeurdacier and Martin (2009), Helpman and Krugman (1985), Heuchemer, Kleimeier, and Sander (2009), Kleimeier, Sander, and Heuchemer (2013), Krugman (1980), Lane and Milesi-Ferretti (2008), Martin and Rey (2004), Okawa and Van Wincoop (2012), and Portes and Rey (2005).

bilateral CBD. In its most basic form, the gravity regression equation is as follows:

$$(1) \quad \text{Dep}_{ijt} = \alpha_{ij} + \alpha_t + \beta \text{DI}_t + \gamma X_{ijt} + \epsilon_{ijt}$$

where  $\text{Dep}_{ijt}$  is the natural log of the exchange rate adjusted stock of CBD from depositors in country  $j$  to banks in country  $i$  in year  $t$ .  $\text{DI}_t$  is our variable of interest and captures the time-varying characteristics of the DI scheme in the bank country  $i$  and/or depositor country  $j$ .  $X_{ijt}$  represents a set of control variables that are commonly used in a gravity model.

Following Baldwin and Taglioni (2006), we include country-pair and year fixed effects given by  $\alpha_{ij}$  and  $\alpha_t$ , respectively. Hence, instead of controlling for bilateral transactional frictions such as geographical and culture distance, differences in legal origin, or common language, the country-pair fixed effects control for all observable and unobservable time-invariant determinants that may affect CBD.<sup>6</sup> These country-pair fixed effects also serve as controls for multilateral resistance as argued by Anderson and Van Wincoop (2003). We employ year fixed effects to control for common time-varying factors such as global banking market integration. As in Bekaert et al. (2013), our gravity model represents a difference-in-differences (DID) specification which allows us to identify changes in cross-border depositing due to changes in DI and help us to deal with potential concerns regarding endogeneity.

The main purpose of estimating model (1) is to replicate the results of the existing literature and to link our analysis with most common estimation strategies. Therefore, and in accordance with the DI literature, we first focus exclusively on the role of the bank country's DI scheme,  $\text{DI}_{it}$ . According to this literature, depositors are attracted to countries with better DI schemes. These countries are commonly labeled as *safe havens*. Second, economic reasoning suggests that DI, similar to other economic variables such as prices or interest rates, should matter in a relative rather than absolute sense. A typical gravity model therefore

includes instead the difference between the bank and depositor country DI schemes,  $\text{DI}_{ijt}$ , as a relative measure and therefore relaxes the parameter restriction of the safe haven literature that implicitly sets the coefficient of  $\text{DI}_{jt}$  to zero. We call this behavior *regulatory arbitrage*. Third, employing  $\text{DI}_{ijt}$  imposes the parameter restriction that the coefficient estimates for the bank and depositor country DI are identical but with opposite sign. This parameter restriction is not fully convincing. In fact, the pull factor of a good DI in a foreign safe haven might be stronger than the push factor of a weak DI at home. Consequently, we also include  $\text{DI}_{it}$  and  $\text{DI}_{jt}$  separately as pull and push factors in our model.

By allowing the coefficients of  $\text{DI}_{it}$  and  $\text{DI}_{jt}$  to differ, it is possible to decompose the impact of both into a safe haven effect attributed to  $\text{DI}_{it}$  and a regulatory arbitrage effects attributed to  $\text{DI}_{ijt}$ . Hence, a model including  $\text{DI}_{it}$  and  $\text{DI}_{jt}$  is equivalent to a model including  $\text{DI}_{it}$  and  $\text{DI}_{ijt}$ . The rationale for this equivalent transformation<sup>7</sup> is that we can simultaneously examine the relative importance of both safe haven and regulatory arbitrage motives of cross-border depositors. In this way, we can link to both the safe haven literature as well as the regulatory arbitrage gravity literature without imposing any parameter restrictions. Our preferred version of model (1) thus becomes

$$(2) \quad \text{Dep}_{ijt} = \alpha_{ij} + \alpha_t + \beta_1 \text{DI}_{it} + \beta_2 \text{DI}_{ijt} + \gamma X_{ijt} + \epsilon_{ijt}$$

We find the simultaneous estimation and identification of safe haven and regulatory arbitrage effects of particular importance in times of systemic banking crises. Do the effects of safe haven and regulatory arbitrage hold when the depositor experiences a systemic banking crisis at home, and if so, which effects are more pronounced? We adjust model (2) to differentiate between crisis and stable period as follows:

$$(3) \quad \begin{aligned} \text{Dep}_{ijt} = & \alpha_{ij} + \alpha_t + \beta_{1S} \text{DI}_{it} * \text{Stable}_{jt} \\ & + \beta_{1C} \text{DI}_{it} * \text{Crisis}_{jt} + \beta_{2S} \text{DI}_{ijt} \\ & * \text{Stable}_{jt} + \beta_{2C} \text{DI}_{ijt} * \text{Crisis}_{jt} \\ & + \gamma X_{ijt} + \epsilon_{ijt} \end{aligned}$$

6. Our focus does not lie on the general determinants of international deposits. Regarding specific determinants of CBD, Grilli (1989) finds that nonfinancial deposits are driven by interest taxes and bank secrecy, while interbank deposits are determined by dividend taxes and economic size. Alworth and Andresen (1992) use a gravity model to explain CBD with reserve ratios. Huizinga and Nicodème (2004) find a weak linkage between bilateral bank liabilities held by nonbanks and income taxes. Sander, Kleimeier, and Heuchemer (2016) find that cultural differences act as barriers to cross-border depositing in the Eurozone.

7. Starting with a simplified push and pull factor model and omitting the time subscripts, we have  $\text{Dep}_{ij} = a \text{DI}_i - b \text{DI}_j$  where  $a$  and  $b$  are both positive. We extend this equation by adding  $(b \text{DI}_i - b \text{DI}_j)$ . After rearranging, we obtain  $\text{Dep}_{ij} = a \text{DI}_i - b \text{DI}_i + b \text{DI}_i - b \text{DI}_j = (a - b) \text{DI}_i + b (\text{DI}_i - \text{DI}_j) = \beta_1 \text{DI}_i + \beta_2 \text{DI}_{ij}$ . From this notation it can easily be seen that for the parameter restriction  $a = b$  the coefficient  $\beta_1$  will be zero, leaving  $\text{DI}_{ij}$  as the only explanatory DI variable.

where  $\text{Stable}_{jt}$  is a dummy variable equal to one when there is no systemic banking crisis in depositor country  $j$  in year  $t$ . Similarly,  $\text{Crisis}_{jt}$  is a dummy variable equal to one when there is a systemic banking crisis in depositor country  $j$  in year  $t$ . As there are no systemic banking crises in bank countries which are reporting to the BIS, our data source for CBD, we have to restrict our analysis to systemic banking crises in depositor countries.

Compared to the majority of historic banking crises, the 2008–2009 GFC is however different. First, the GFC was not limited to a single country but spilled over into numerous countries and became an almost global crisis. Second, the GFC affected bank countries as well as depositor countries. Third, in response to the severity of the GFC, many countries revised their DI schemes. According to International Association of Deposit Insurers, at least 49 countries enhanced depositor protection, including 20 countries with maximum coverage increases (e.g., full guarantees), 22 countries with permanent coverage increases and 7 countries with temporary increases. These actions were initiated in Europe but quickly spread to nearly every continent, for example, most actions took effect between September 2008 and March 2009. These emergency actions to enhance DI systems provide us with a unique opportunity to investigate how these emergency actions affect CBD. Before the GFC, the main goal of DI agencies was protecting small depositors, as they did not have the ability to understand and monitor the risks taken by financial institutions. However, after the crisis, maintaining and strengthening the stability of the financial system has been set as the primary goal, delegating the protection of small depositors to secondary importance (Bernet and Walter 2009). For the emergency actions, we adjust our gravity model to the following DID setting:

$$(4) \text{Dep}_{ijt} = \alpha_{ij} + \alpha_t + \beta(\text{Official government guarantee} * \text{GFC})_{it} + \gamma X_{ijt} + \epsilon_{ijt}$$

where Official government guarantee is a dummy variable equal to one if a bank country introduced an official government guarantee to enhance its DI scheme. GFC is a dummy variable equal to one for the period from 2008 to 2011 when the emergency actions were taken. Our model already includes country-pair and year fixed effects, thus the effects of Official government guarantee and GFC drop out.

#### IV. DATA

Our paper is unique in that it utilizes all major recent databases on global DI schemes in a systematic manner and investigate their effects on cross-border depositing using a custom made, confidential, and bilateral country-level dataset provided by BIS. We only consider nonfinancial deposits, which are mainly held by individuals and businesses, as DI schemes tend to only cover nonfinancial deposits but exclude inter-bank deposits from coverage.<sup>8</sup> While our data are provided on a restricted basis by the BIS, they are consistent with table A6.2 of the BIS' new Locational Banking Statistics introduced following the 2013 revision to the *Guidelines for reporting the BIS international banking statistics*. Table A6.2, however, does not fully overlap with the country- and time-coverage of our restricted data.

The BIS Locational Banking Statistics are perfectly suited to analyze such cross-border banking activities as they are compiled using principles that are consistent with the balance of payments and thus the principle of residence. A cross-border deposit is made when a resident of country A deposits money at a bank's office that is located in country B. Such a deposit is classified as cross-border independent of the location of the bank's headquarters and depositor's nationality. Critically, our definition is based on residence and therefore the residents' deposits into local branches of foreign banks count as domestic deposits. Thus, we are exactly examining the cases where a depositor crosses a national border.<sup>9</sup>

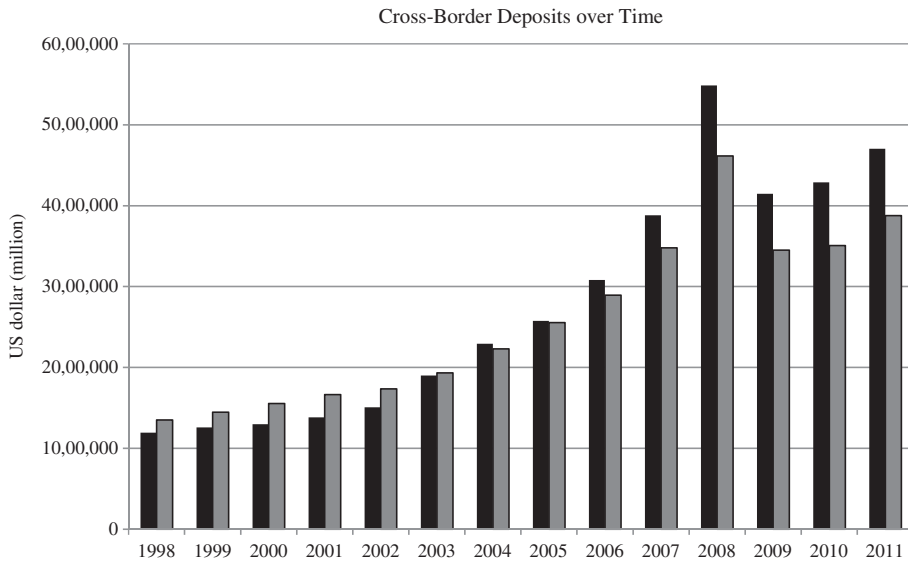
The BIS reports unadjusted stocks and exchange rate adjusted flows of CBD. To eliminate exchange rate valuation effects, we calculate annual exchange rate adjusted stocks by taking the initial nominal stocks and successively adding exchange rate adjusted flows.

Our sample covers 22 bank countries and 131 depositor countries from 1998 to 2011 but not all

8. The BIS also aims to improve the sectoral breakdown, that is, reporting bank countries are encouraged to distinguish between different nonfinancial counterparties. However, the reporting of this breakdown is very incomplete and does not allow us to differentiate between CBD of nonfinancial corporations versus households in our analyses.

9. While banks need to adhere to anti money laundering rules and know-your-customer obligations, depositors are generally able to open a deposit account from abroad without being physically present at the bank. Subsequently, CBD can be managed via internet banking, phone banking, or in person.

**FIGURE 1**  
CBD over Time



*Note:* This figure shows the total amount of CBD between all 22 bank countries and all 131 depositor countries in our sample. Black bars represent unadjusted volumes of CBD, grey bars represent CBD volumes that are adjusted for exchange rate movements.

bilateral CBD are available for all years.<sup>10</sup> We would like to investigate what happens when a bank country experiences a crisis. However, we observe systemic banking crises only in depositor countries with a single exception: The GFC also affected bank countries. Due to its unique features, that is, the fact the countries adjusted their DI schemes in response to the GFC, we decided to study the GFC separately in the context of emergency actions. Therefore, our main analysis will focus on the period from 1998 to 2007, when systemic banking crises only occur in the depositor countries. Leaving out the post-2007 period enables us to separate the “old” crises from the “new” crisis, which is more complicated and also

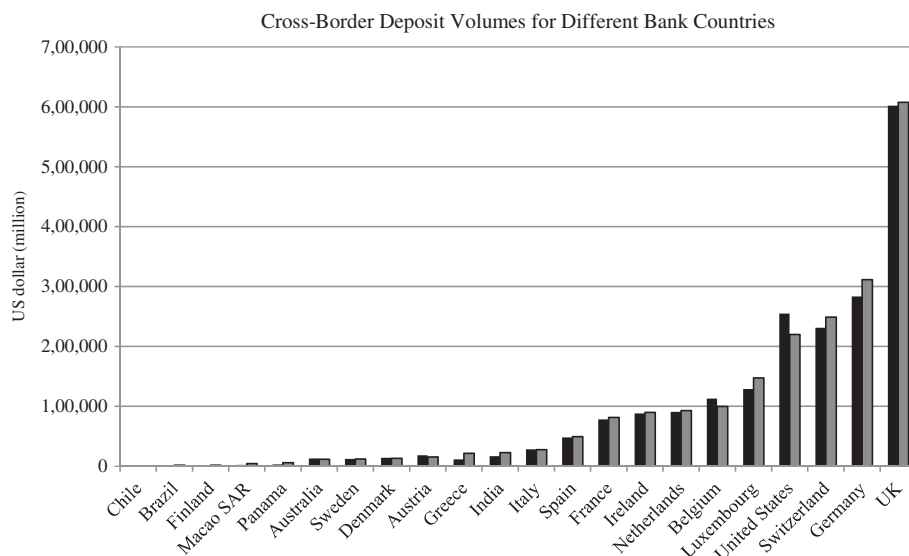
occurred in our bank countries. When testing the emergency actions during the GFC, we rely on an extended sample period of 1998 to 2011.

Figure 1 provides a first impression of the development of CBD over time. Both the unadjusted and adjusted stocks grow rapidly from U.S.\$ 1.3 trillion in 1998 to around U.S.\$ five trillion in 2008, before dropping by almost 25% as a consequence of the GFC. Importantly, about 16% of the deposit stock volume in 2008 can be attributed to exchange rate valuation effects. Therefore, it is necessary to adjust for exchange rate valuation effects. Furthermore, our sample is quite heterogeneous as it covers a wide range of countries with different levels of economic and financial development. Figure 2 plots the total annual volume of CBD that a given bank country receives from all depositor countries, averaged across years and reveals how substantial the differences across countries are. For example, in an average year, Chile receives the least CBD of only U.S.\$ 307 million while banks in the United Kingdom receive the most CBD amounting to U.S.\$ 607 billion.

Our main DI data source is “Chapter 8: Depositor (Savings) Protection Schemes” in the World Bank’s Bank Regulation and Supervision

10. Our bank and depositor countries are listed in Table S1. Among our 22 bank countries the following countries start reporting to the BIS only after 1998: India (2002); Brazil, Chile, and Panama (2003); Greece and Macao SAR (2004). Our maximum possible sample would amount to 28,820 observations (22 bank countries  $\times$  131 depositor countries  $\times$  10 years). However, our largest sample includes only 20,820 observations due to (1) post-1998 reporting, (2) missing values for our control variables or DI proxies. The latter is the case when depositor countries do not participate in the DI surveys. Thus, the sample for bank country DI is larger than the sample that also includes depositor country DI. Hence, our panel is unbalanced.

**FIGURE 2**  
CBD Volumes for Different Bank Countries



*Note:* This figure shows the average annual volume of CBD that each of the 22 bank countries in our sample receives from all 131 depositor countries. Black bars represent unadjusted volumes of CBD, grey bars represent CBD volumes that are adjusted for exchange rate movements.

Database due to its indicator consistency and high survey frequency (e.g., Barth, Caprio, and Levine 2001; Cihak et al. 2012). Regarding the survey frequency, we fill the gap between two consecutive surveys with the most recent past information. Specifically, 1998–2001 is filled with data in the survey held in 1998. Similarly, 2002–2005 and 2006–2007 are filled with data from the surveys conducted in 2002 and 2006, respectively. We only expand the survey data forward in time so that CBD are regressed on the predetermined designs of DI systems, which mitigates concerns of reverse causality.

Regarding DI features, we not only analyze the impact of an explicit DI on CBD but also contribute to the literature by investigating the relevance of specific DI characteristics. The existence of an Explicit DI is our most fundamental measure. It is defined as a dummy variable equal to one if a country has an explicit DI in place and zero if no DI or only an implicit DI exists in the country. As discussed before, it captures the dual and thus quantitatively indistinguishable effects of the attractiveness of the insurance and the contribution to banking market stability. Clearly, the latter is more important for large-scale depositors such as nonfinancial corporation and wealthy individuals. However, only a well-designed DI

scheme can provide credible depositor protection and financial stability. Consequently, specific design features of the DI scheme should also matter for cross-border depositing decisions. Based on our data source, we construct indices for DI power, DI moral hazard mitigation, DI coverage intensity, and DI coverage limit. For countries without an explicit DI, these DI features are coded as missing values.

The construction of our measure for DI power follows Barth, Caprio, and Levine (Barth, Caprio, and Levine 2004). This index considers whether the DI agency has the power to make the decision to intervene in a bank or to cancel/revoke DI for any participating bank, has the power to take legal action against bank directors or officials, or has ever taken any legal action against the bank directors or officers. The index ranges from zero to four, depending on whether the DI agency has none or all four of these powers.<sup>11</sup> A DI agency without these powers might be ineffective, that is, in cases of political interference or weak relationships between DI agency and the bank supervisors, who instead of the DI agency have the power to resolve bank failures (Garcia 1999).

11. For details regarding all our variable definitions and sources see Tables S2 and S3.

To be effective and credible, a DI scheme must limit the moral hazard problems for example by requiring bank funding or risk-based insurance fees (Barth, Caprio, and Levine 2004; Diamond and Dybvig 1983, 1986; Merton and Thakor 2015). Demirgüç-Kunt and Detragiache (2002) argue that moral hazard is stronger under government funding but weaker under bank funding when banks bear the cost of their moral hazard. Our measure for DI moral hazard mitigation consequently considers whether a DI scheme is funded by banks rather than the government and whether the insurance fees charged to banks vary based on risk assessment. In each case, a value of one is assigned such that the DI moral hazard mitigation index can range from zero to two. Thus, higher values for DI moral hazard mitigation index imply greater ability to mitigate moral hazard.

Our remaining DI features reflect to what extent depositors are covered by the DI scheme. On the one hand, Garcia (1999) argues that limited or restricted DI coverage reduces moral hazard as large, sophisticated depositors remain uninsured and thus have an incentive to monitor and discipline banks by demanding higher deposit rates or refusing to deposit funds altogether. On the other hand, depositors might be more attracted to a banking market where the DI coverage is more extensive as the responsibility for monitoring and disciplining is shifted to the DI agency. We therefore construct two measures. DI coverage intensity reflects whether there is a coverage limit per person and whether formal coinsurance explicitly insures depositors for less than 100% of their deposits. A value of one is assigned if the coverage is unlimited and if there is no coinsurance, respectively. The DI coverage intensity index thus ranges from zero to two. As the range of this measure is rather limited, we also consider the maximum amount up to which depositors are covered by the DI. In order to test the impact of such a coverage limit, we measure the DI coverage limit as the natural logarithm of U.S. dollar amount at which the coverage is limited. This measure only exists for countries with DI schemes that impose a coverage limit per person.

DI schemes change substantially over time and vary across countries.<sup>12</sup> This is illustrated by the heat maps provided in Figure S1. Panel A reveals that the number of countries with an Explicit DI increases from 62 in 1998 to 75 in

2006. None of our 131 sample countries removed its Explicit DI scheme during our sample period. For those countries with an Explicit DI, Panels B–E reveal that the depositor protection also has substantial variation over time. Among countries with Explicit DI, 64%, 33%, and 45% experienced changes in DI power, DI moral hazard mitigation, and DI coverage intensity, respectively. For example, in Sweden DI moral hazard mitigation steadily deteriorated over time while DI power increased between 1998 and 2002 only to decrease again by 2006. While a detailed investigation of these country-specific trends is beyond the scope and focus of this study, we conclude that the variation in DI schemes across countries and over time is substantial enough to investigate their potential effect on cross-border depositing.

In times of banking crises or failures, countries might provide implicit DI or increase existing insurance. In particular, during the GFC, many countries responded quickly by taking various emergency actions in 2008. All emergency actions enhance DI coverage. In particular, we focus on the extension of an Official government guarantee, covering both limited and unlimited government guarantees. The data are taken from World Bank's Deposit Insurance Database (see Demirgüç-Kunt, Kane, and Laeven 2014), which covers 20 of our 22 initial bank countries. We thus need to drop Panama and Macao from our sample. Fifteen of these 20 countries have undergone the GFC. During the GFC, Australia, Austria, Denmark, Germany, Ireland, and United States extended official government guarantees on their deposits, as listed in Table S5.<sup>13</sup>

To test the effects of historic banking crises on CBD before the GFC, we employ the Systemic Banking Crises Database developed by Laeven and Valencia (2008, 2010, 2012). They define a systemic banking crisis as a situation where “a country's corporate and financial sectors experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time, ... non-performing loans increase sharply and all ... banking system capital is exhausted.” We

12. Summary statistics are available in Table S4.

13. During the GFC, the United Kingdom changed its DI substantially in response to the depositors' run on Northern Rock. According to the World Bank's Deposit Insurance Database (Demirgüç-Kunt, Kane, and Laeven 2014), the United Kingdom increased its DI coverage limit, but did not extend any government guarantee on the deposits. The UK government planned to offer guarantees conditional on banks' recapitalization but as some banks resisted this recapitalization, the guarantee was ultimately not extended.

consider all banking crises during our pre-GFC sample period, that is, 1998–2007. Importantly, the database identifies the starting and ending year of the systemic banking crises which enables us to analyze the behavior of CBD during the full duration of the crisis.<sup>14</sup>

Finally, we include a large set of control variables that are specific for each bank and depositor country pair and vary over time.  $Size_{ijt}$  reflects the economic mass of the country pair while  $Credit_{ijt}$  measures the combined size of their banking markets. By including  $Deposit_{ijt}$ , we recognize differences in rates of return on deposits as an important determinant of CBD (Acharya and Mora 2015). We include  $Internet_{ijt}$  access as Sander, Kleimeier, and Heuchemer (2016) argue that in countries with high internet penetration, banks have a strong incentive to develop online banking portals and depositors can easily and inexpensively deposit across borders.  $Governance_{ijt}$  captures the differences in the institutional quality between the bank and depositor country. We employ four measures of openness:  $Globalization_{ijt}$  reflects de jure openness,  $Trade_{ijt}$  measures de facto openness,  $Financial\ openness_{ijt}$  indicates capital account openness,  $FTA_{ijt}$  and  $Currency\ union_{ijt}$  indicate that both countries belong to the same free trade area or currency union, respectively. Moreover, we control for banking market characteristics including the share of Foreign banks $_{ijt}$  and Net interest margin $_{ijt}$ . The former follows Heuchemer, Kleimeier, and Sander (2009) who find that foreign banks promote cross-border lending within the Eurozone. The latter serves as a proxy of banking market competition. Lastly, we also include a Financial center control as financial centers might be fundamentally different from other countries. The construction of the financial center control is based on Lane and Milesi-Ferretti (2018) who classify a country as a financial center based on the level of its net external assets to GDP.<sup>15</sup> We explore the

impact by employing two different controls. First, in all regressions without country-pair fixed effects, we employ a financial center fixed effect which indicates whether a bank country is a financial center. Second, as a robustness check, we construct a set of fixed effects which include bank country, only the depositor country, both or none are financial centers. In sum, this large set of control variables serves two purposes. First, it captures the effects of changes of potential determinants of cross-border depositing that are not controlled for by the country-pair fixed effects employed in our models. Second, it controls for the fact that a country's choice of DI might well be endogenous to the country's economic, political or financial characteristics.

## V. RESULTS

In this section we scrutinize the impact of DI schemes on CBD. As a starting point, we first follow model (1) to link our analysis to the existing literature before estimating our preferred model (2) that includes both safe haven and regulatory arbitrage motives in one estimation. All our estimates are obtained from a log-linear gravity model estimation using country-pair and time fixed effects and an extensive set of time-variant control variables, which includes all those variables that are found to be of particular relevance in the gravity literature such as economic size, trade relations, interest rate differentials, membership of trade agreements and currency unions, etc. This setting allows us to address potential endogeneity and omitted-variables concerns by controlling for all time-invariant pair characteristics, time-variant observable pair characteristics, and common time-varying trends like global financial integration. As we study CBD from non-residents, we do not perceive endogeneity as a major concern.<sup>16</sup> As in Bekaert et al. (2013), our

14. The annual number of systemic banking crises are available in Table S5.

15. Financial centers are Bahrain, Belgium, Cyprus, Hong Kong SAR of China, Ireland, Luxembourg, Macao SAR of China, Malta, Netherlands, Singapore, Switzerland, United Kingdom, Andorra, Bahamas, Barbados, Bermuda, British Virgin Islands, Cayman Islands, Curaçao, Gibraltar, Guernsey, Isle of Man, Jersey, Mauritius, the Netherlands Antilles, Panama, San Marino, Turks, and Caicos. Of these countries, eight are BIS-reporting bank countries, namely Belgium, Ireland, Luxembourg, Macao SAR of China, the Netherlands, Switzerland, United Kingdom, and Panama. See Table S1 for a list of all bank and depositor countries and their financial center status.

16. First, the purpose of a DI is to protect domestic rather than nonresident, CBD. The changes to the Australia's depositor protection mechanisms provide anecdotal evidence for this belief. Historically, Australia relied on "depositor preference" which required banks to "hold sufficient assets in Australia at all time to meet their Australian deposit liabilities" (Turner 2011, 54). In 2008, the FCS was introduced which later became Australia's DI scheme. Similar to depositor preference, the DI's objective is to protect depositors in the *domestic* banking market, for example, deposits at foreign banks operating in Australia, deposits in foreign branches of Australian banks and foreign currency deposits are not covered. Second, any causality is likely to work against us as the DI authority is more likely to improve its DI features when it experiences an outflow of CBD. Third, we fill the DI survey data forward so that CBD are regressed on predetermined designs of DI systems.

gravity model represents a DID approach which allows us to identify *changes* in cross-border depositing due to changes in DI. The only exemptions are the regression models estimating the impact of the existence of an explicit DI. The reason is that Explicit DI does not change during our sample period from 1998 to 2007 for any given bank country. Consequently, we need to drop the country-pair fixed effects and compensate for this by adding an extensive set of typical gravity country-pair controls, for example, proxies for geographical distance, common border, common language, colony, and common legal system.<sup>17</sup>

#### A. *Dissecting the Motives for Cross-Border Depositing*

Table 1 reports our results with respect to model (1).<sup>18</sup> In panel A we report the results that link our research to the safe haven literature. In regression (1), we can confirm the well-documented finding that the impact of an Explicit DI is highly significant and positive, indicating that bank countries with explicit DI attract more CBD than bank countries without explicit DI. The adjusted  $R^2$  is almost .4, which is a good fit given that country-pair fixed effects could not be included. Controlling for financial centers in the regressions for the Explicit DI where we could not employ directional country-pair fixed effects is important as financial centers are attracting deposits for a variety of reasons ranging from history over bank secrecy to taxation. Generally speaking, a DI as well as differences in DI are more important when we control for Financial Center effects. In other words, cross-border depositing is more reactive to the existence of an Explicit DI when the bank countries are not financial centers or—to put it the other way around—financial centers are less dependent on a DI scheme to signal banking market stability and attract CBD above the actual coverage

levels.<sup>19</sup> With respect to the various features of a DI scheme, the adjusted  $R^2$  improves dramatically due to the including of country pair-fixed effects. Here, we contribute to the safe haven literature by showing that not only the mere existence of a DI, but also its features are indeed important for attracting CBD. Regression (2) shows that more deposits flow to countries whose DI agencies have more power. Similarly, countries that design their DI scheme in a way to mitigate moral hazard are more attractive as reported in regression (3). Regressions (4) and (5) indicate that countries with better coverage intensity or with a higher coverage limit, respectively, also attract more deposits from outside. These results are not only statistically significant but also economically relevant. For example, the existence of an Explicit DI is associated with 49% higher CBD. As the shift from an implicit DI or nonexistence to an explicit DI constitutes a fundamental change in the country's banking system, such a substantial impact in CBD is not surprising. But we have to notice that in this regression, we exclude country-pair fixed effects. Furthermore, a one-unit increase in bank country DI power, moral hazard mitigation, and coverage intensity increases CBD by 3.0%, 5.1%, and 7.3%, respectively. Given the size of the average bilateral CBD of U.S.\$ 18 million, these percentages reflect increases by U.S.\$ 0.5 million, U.S.\$ 0.9 million, and U.S.\$ 1.3 million, respectively. Lastly, a 1% increase in the coverage limit increases CBD by 0.68%. In sum, we are able to replicate on the base of a bilateral dataset what the existing safe haven literature concludes from employing bank country statistics only. That is, depositors are seeking safe havens with best DI schemes. Moreover, we additionally show the relevance of our DI features for providing the safe haven function.

However, when deciding where to deposit, depositors may use the DI schemes in their home countries as a benchmark. As always in economics, the relative rather than absolute quality of a DI scheme between the bank and depositor country matters. Our bilateral dataset is best suited to investigate this regulatory arbitrage effect. The gravity model typically investigates these effects—in analogy to the treatment of physical distance—by employing measures of

17. In Table S9, we show the coefficient estimates of these gravity country pair controls, which have gravity-model typical expected coefficients. Specifically, we find that if the depositor and the bank country are geographically closer to each other, share a common border, share a common language or have a historic colonial relationship, then CBD holdings will be higher.

18. In the discussion of Tables 1–4 we focus on the DI features as our variables of interest. The unreported results for the control variables generally have the expected coefficients. In particular, CBD are higher when bank and depositor country are larger, are linked by trade flows or share a common currency.

19. We also use a set of fixed effects which indicates on a country pair level whether only the bank country, only the depositor country, both or none are financial centers. The results are generally robust, though coefficients and significance levels are slightly lower (see Table S9).

TABLE 1  
Dissecting the Motives for Cross-Border Depositing

Dependent Variable	CBD									
	Panel A: Bank Country Deposit Insurance					Panel B: Difference Between Bank and Customer Country Deposit Insurance				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Explicit $DI_{it}$	0.75*** (14.80)					0.69*** (13.61)				
Explicit $DI_{jt}$						-0.31*** (-9.32)				
Explicit $DI_{ijt}$										
$DI\ power_{it}$		0.03*** (3.44)					0.03*** (2.37)			
$DI\ power_{jt}$							-0.02* (-1.73)			
$DI\ power_{ijt}$										
$DI\ moral\ hazard\ mitigation_{it}$			0.05** (2.37)					0.10*** (3.27)		
$DI\ moral\ hazard\ mitigation_{jt}$								0.01 (0.25)		
$DI\ moral\ hazard\ mitigation_{ijt}$										
$DI\ coverage\ intensity_{it}$				0.07*** (2.59)					0.11*** (3.36)	
$DI\ coverage\ intensity_{jt}$									0.03 (1.17)	
$DI\ coverage\ intensity_{ijt}$										
$DI\ coverage\ limit_{it}$					0.55*** (11.43)					0.55*** (7.56)
$DI\ coverage\ limit_{jt}$										0.00 (0.30)
$DI\ coverage\ limit_{ijt}$										
Size	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Gravity country pair controls	Yes	No	No	No	No	Yes	No	No	No	No
Financial center fixed effect	Yes	No	No	No	No	No	Yes	No	No	No
Country pair fixed effects	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted $R^2$	.571	.946	.946	.946	.952	.572	.946	.946	.946	.951
Observations	17,874	16,135	16,135	16,135	14,063	17,874	10,445	10,445	10,445	7,437

Notes: This table presents the estimates of OLS regressions of CBD from depositor country  $j$  to bank country  $i$  in year  $t$  based on model (1) for a sample period of 1998–2007. Gravity country pair controls include distance, common border, common language, common colony, and common legal system. Other controls include credit, deposit rate, Internet, governance, globalization, trade, financial openness, FTA, currency union, foreign banks, and net interest margin. Coefficients are reported in the top row, t-statistics are below in brackets. \*, \*\*, \*\*\* represent statistical significance at 10%, 5% and 1% levels, respectively.

differences between all pairs of bank and depositor countries—in our case differences in DI features. Results are presented in Panel B of Table 1 and show that depositors tend to hold more funds in bank countries with DI schemes that are better than the ones in the depositors' home countries. Depositors from countries without an Explicit DI tend to deposit their money in bank countries with an Explicit DI while depositors from countries with an Explicit DI are less likely to deposit their money in bank countries without an Explicit DI. Similarly, cross-border depositors prefer bank countries whose DI authorities have relatively more power than the DI authorities at home. The same applies to the bank countries with DI schemes designed to mitigate moral hazard more effectively than DI schemes in the depositor countries. In contrast, the coefficient estimates of the coverage-related DI features are insignificant. One possible explanation is that DI coverage is more meaningful in absolute terms than in relative terms. In other words, depositors care more about “enough coverage” than “more coverage.” Overall, the results indicate that cross-border depositors do engage in regulatory arbitrage searching for a DI with a relatively more credible design.

As argued in the methodology section, the gravity model specification imposes a parameter restriction by requiring the quantitative impact of home and host country DI schemes to be equivalent. However, it may well be that the pull factor from a safe haven are relatively more important than the push factor from a weak home country depositor protection, for example, when despite the absence of a DI, residents of a country do not deposit abroad because they believe in the stability of the domestic banking system. In Panel C of Table 1, we therefore remove the parameter restrictions in the gravity model and include both bank and depositor country DI proxies separately in the same regression. The estimates show that all bank country DI features matter significantly for cross-border depositing indicating that bank countries with better DI attract more deposits. In contrast, depositor country DI features only matter for Explicit DI and DI power. In other words, the main push factors are the absence of a DI and the weak power of the regulatory bodies.

Our analysis so far has shown that cross-border depositors always seek the best DI schemes in safe havens, but sometimes they also engage in regulatory arbitrage and look for DI schemes that are better than the ones in their home country. Consequently, a simple

safe haven approach such as in Panel A is not sufficient. Moreover, our analysis in Panel C has also shown that the coefficients on bank and depositor country DI features are not exactly the opposite or even near to it. Hence it indicates that the parameter restrictions in Panel B are incorrect. Thus, it is sensible to examine both safe haven and regulatory arbitrage motives at the same time in one regression.

### *B. Safe Haven and Regulatory Arbitrage in Cross-Border Depositing*

In this section, we use the decomposition derived in Section III to examine both safe haven and regulatory arbitrage. To do this, we follow model (2) that includes both the bank country  $DI_{it}$  and the difference in DI schemes between the bank and depositor country  $DI_{ijt}$  at the same time. The model is equivalent to the regression with push and pull factors in Panel C of Table 1, but allows us to identify the relative strength of both motives. Table 2 presents our results. Looking first at the coefficients for all “safe haven” regressors (with the bank country subscript  $i$ ), we find that all but one of safe haven motives remain significant even when taking into account regulatory arbitrage behavior: Depositors are looking for the best DI schemes in bank countries. The only exemption is DI power. Thus, we conclude that the existing literature is correct in highlighting the importance of bank country DI schemes. However, and in line with the results above, we also find that regulatory arbitrage simultaneously matters with respect to Explicit DI and DI power. In these cases, cross-border depositors are more willing to deposit their money in countries with better DI schemes than their own. This is rational because moving from implicit DI or even no DI at all to an explicit DI constitutes a fundamental change to the banking market in a country. At the same time, the power of the DI agency is key for the DI schemes to work effectively and efficiently.

However, we find the insignificance of DI power as a pull factor to a safe haven not fully plausible. A potential problem is that  $DI_{it}$  and  $DI_{ijt}$  are positively correlated by construction with correlation coefficients above 0.5, which may induce a multicollinearity problem. However, except for our Explicit DI regression, these correlation coefficients are below the adjusted  $R^2$  of the regressions. Nevertheless, to address this issue we orthogonalize the difference in DI schemes between the bank and depositor country  $DI_{ijt}$  with respect to the bank country  $DI_{it}$

**TABLE 2**  
Haven and Regulatory Arbitrage in Cross-Border Depositing

Dependent Variable	CBD				
	(1)	(2)	(3)	(4)	(5)
Explicit $DI_{it}$	0.38*** (5.95)				
Explicit $DI_{ijt}$	0.31*** (9.32)				
DI power $_{it}$		0.01 (0.46)			
DI power $_{ijt}$		0.02* (1.73)			
DI moral hazard mitigation $_{it}$			0.10*** (2.63)		
DI moral hazard mitigation $_{ijt}$			-0.01 (-0.25)		
DI coverage intensity $_{it}$				0.14*** (3.39)	
DI coverage intensity $_{ijt}$				-0.03 (-1.17)	
DI coverage limit $_{it}$					0.55*** (7.49)
DI coverage limit $_{ijt}$					-0.00 (-0.30)
Size	Yes	Yes	Yes	Yes	Yes
Other controls	No	Yes	Yes	Yes	Yes
Gravity country pair controls	Yes	No	No	No	No
Financial center fixed effect	Yes	No	No	No	No
Country pair fixed effects	No	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted $R^2$	.573	.946	.946	.946	.951
Observations	17,874	10,445	10,445	10,445	7,437

*Notes:* This table presents the estimates of OLS regressions of CBD from depositor country  $j$  to bank country  $i$  in year  $t$  based on model (2) for a sample period of 1998 to 2007. Gravity country pair controls include distance, common border, common language, common colony, and common legal system. Other controls include credit, deposit rate, Internet, governance, globalization, trade, financial openness, FTA, currency union, foreign banks, and net interest margin. Coefficients are reported in the top row,  $t$ -statistics are reported below in brackets. \*, \*\*, \*\*\* represent statistical significance at the 10%, 5% and 1% levels, respectively.

and reestimate model (2) with  $DI_{it}$  and orthogonalized  $DI_{ijt}$ . Results are robust and DI power in the bank country is now a statically significant pull factor at the 5% confidence level.<sup>20</sup> In sum, we confirm that depositors are predominantly attracted by safe havens. Regulatory arbitrage plays an important role for cross-border depositors who reside in countries with no explicit DI and a marginal role for cross-border depositors who reside in countries with relatively powerless DI agencies.

### C. Crisis Versus Stable Periods

Now we investigate whether the relationships between DI schemes and CBD change when the depositor countries experience a systemic banking crisis. Our preferred model is based on model

(2) but differentiates between crisis and stable periods as defined in Equation (3). Table 3 reports the results.<sup>21</sup> The existence of an explicit DI in the bank country and most design features of the bank country's DI scheme matter during both stable and crisis times. In other words, depositors continue to trust foreign DI systems and search for the best when their home country is undergoing a systemic banking crisis. Thus, they value safe havens even when their home countries are undergoing a systemic banking crisis. The point estimates of the coefficients generally increase in crises times, though not always statistically

20. Regression results are presented in Table S7.

21. Similar to our analyses in Section V.B, we again want to address potential multicollinearity concerns. Now,  $DI_{ijt}$  is orthogonalized with respect to  $DI_{it}$  for the stable and crisis period separately. Note that correlations between  $DI_i$  and  $DI_{ij}$  are above .5 during stable periods but only around .2 during crisis period. Results are reported in Table S8 and are robust.

**TABLE 3**  
Safe Haven and Regulatory Arbitrage during Crisis Versus Stable Periods

Dependent Variable	CBD				
	(1)	(2)	(3)	(4)	(5)
Explicit $DI_{it} \times Stable_{jt}$	0.38*** (5.84)				
Explicit $DI_{it} \times Crisis_{jt}$	0.49*** (4.87)				
Explicit $DI_{ijt} \times Stable_{jt}$	0.32*** (9.50)				
Explicit $DI_{ijt} \times Crisis_{jt}$	0.11 (0.90)				
DI power $_{it} \times Stable_{jt}$		0.00 (0.21)			
DI power $_{it} \times Crisis_{jt}$		0.08** (2.33)			
DI power $_{ijt} \times Stable_{jt}$		0.02* (1.96)			
DI power $_{ijt} \times Crisis_{jt}$		-0.02 (-0.78)			
DI moral hazard mitigation $_{it} \times Stable_{jt}$			0.10** (2.55)		
DI moral hazard mitigation $_{it} \times Crisis_{jt}$			0.14*** (2.70)		
DI moral hazard mitigation $_{ijt} \times Stable_{jt}$			-0.01 (-0.21)		
DI moral hazard mitigation $_{ijt} \times Crisis_{jt}$			-0.02 (-0.33)		
DI coverage intensity $_{it} \times Stable_{jt}$				0.13*** (3.06)	
DI coverage intensity $_{it} \times Crisis_{jt}$				0.22*** (4.15)	
DI coverage intensity $_{ijt} \times Stable_{jt}$				-0.02 (-0.86)	
DI coverage intensity $_{ijt} \times Crisis_{jt}$				-0.06 (-1.37)	
DI coverage limit $_{it} \times Stable_{jt}$					0.55*** (7.47)
DI coverage limit $_{it} \times Crisis_{jt}$					0.56*** (7.51)
DI coverage limit $_{ijt} \times Stable_{jt}$					-0.00 (-0.29)
DI coverage limit $_{ijt} \times Crisis_{jt}$					-0.00 (-0.10)
Size	Yes	Yes	Yes	Yes	Yes
Other controls	No	Yes	Yes	Yes	Yes
Gravity country pair controls	Yes	No	No	No	No
Financial center fixed effect	Yes	No	No	No	No
Country pair fixed effects	No	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted $R^2$	.514	.946	.946	.946	.951
Observations	17,874	10,445	10,445	10,445	7,437

*Notes:* This table presents the estimates of OLS regressions of CBD from depositor country  $j$  to bank country  $i$  in year  $t$  based on model (3) for a sample period of 1998–2007. Gravity country pair controls include distance, common border, common language, common colony, and common legal system. Other controls include credit, deposit rate, Internet, governance, globalization, trade, financial openness, FTA, currency union, foreign banks, and net interest margin. Coefficients are reported in the top row,  $t$ -statistics are reported below in brackets. \*, \*\*, \*\*\* represent statistical significance at the 10%, 5% and 1% levels, respectively.

significant at conventional levels. Unreported *F*-statistics also show that for bank country DI power and DI coverage intensity, there is significant difference between stable and crisis times. The stronger impact during crisis periods indicates that depositors are induced to search for better safe havens where coverage intensity is better and the DI authority has more power. Next to the statistical significance, the economic significance of our results is also pronounced. For example, a one-unit increase in DI coverage intensity is associated with 13.9% more CBD during stable times compared to 24.6% during a crisis. In contrast, when it comes to DI scheme differences between the bank and depositor countries, both Explicit DI and DI power only matter during stable times. Possibly, depositors consider regulatory arbitrage during stable times, but when they are hit by a crisis, they care less about the arbitrage opportunities. Instead of seeking somewhat “better” protection than at home, they only care about the best safety for their deposits. In sum, the evidence indicates that safe havens remain important during crises while regulatory arbitrage is more a luxury that depositors can afford during stable times.

#### *D. Emergency Actions During the GFC*

Our analysis so far suggests that during a systemic banking crisis in the home country, foreign safe havens are important to depositors. However, during the GFC, safe havens were in short supply, as bank countries which during our early sample period from 1998 to 2007 had not experienced any banking crisis are now subject to a crisis as well. During the GFC, many bank countries took emergency actions including implementing explicit DI schemes or providing government guarantees. Figure 3 provides a vivid illustration by comparing cross-border deposit volumes of bank countries that extend government guarantees to those bank countries that do not extend such guarantees. Under such a DID setting, we show that before the GFC, both groups of countries have a similar and parallel trend in CBD. Afterward, however, the extensions of government guarantees resulted in a substantial increase in cross-border deposit. In contrast, the CBD remain relatively stable for countries that extend no guarantees. Therefore, our setting fits perfectly into the DID framework.

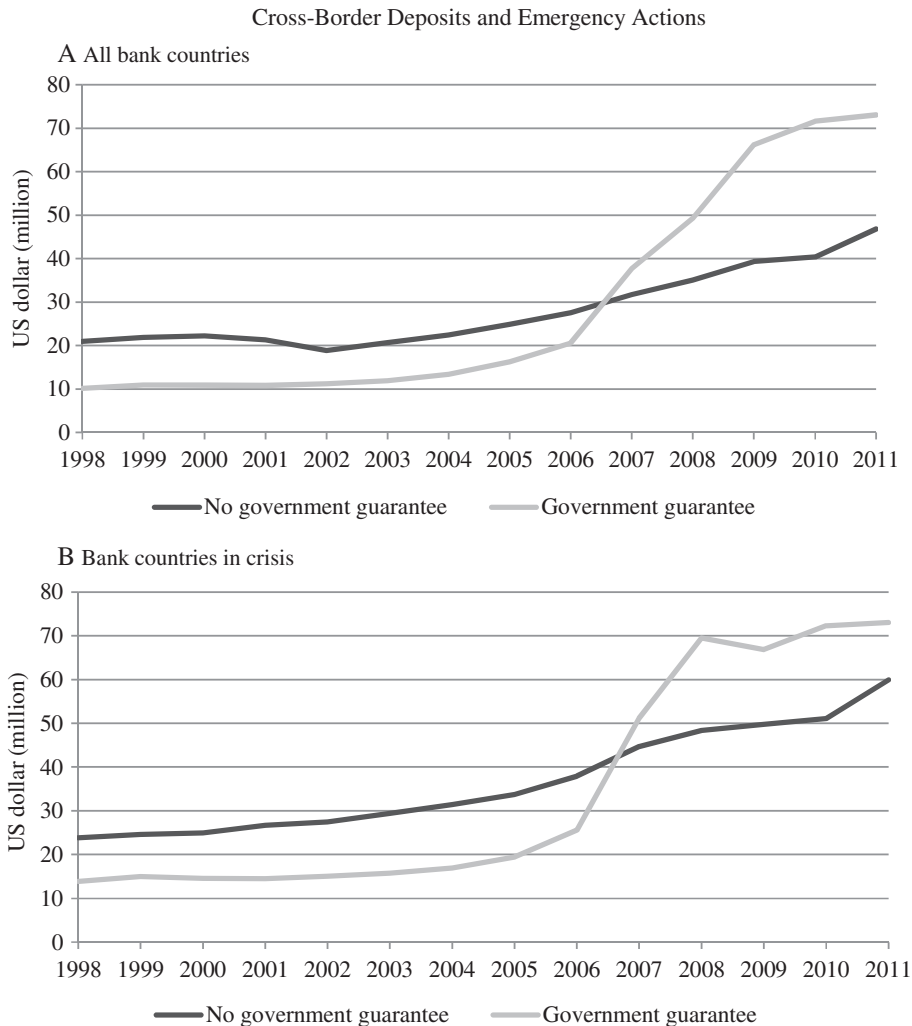
To check the impact of such emergency actions on cross-border depositing with our data, we employ the DID analysis of model (4).

Table 4 presents results. Importantly, we not only rely on the full sample of bank countries, but also conduct the analysis for a subsample of only those bank countries that experienced the GFC. By doing so, we can further narrow down our control group, thus making our results more precise, that is, countries that experienced the GFC might have similar characteristics and this similarity should be higher within this subgroup than compared to noncrisis countries. We start in regression (1) to examine the impact of extending Official government guarantee and find that this emergency measure significantly increases CBD. Regression (1) is based on our full sample of 20 bank countries. In regression (2) we narrow down our sample to include only those bank countries that have experienced the GFC. We find almost identical results. In addition, besides the full time period from 1998 to 2011, we also check the treatment effect with a narrower time window from 2006 to 2009 which captures the 4 years surrounding the introduction of emergency actions in 2008. Results are shown in regressions (3) and (4) and are robust albeit with smaller coefficients. This shorter period mitigates the time trend concerns in the sense that the early years of the sample period (1998–2005) may be—for reasons unrelated to the crisis—substantially different from the more recent years. In sum, the emergency actions appear to be very successful in terms of providing the safe havens that depositors were looking for during the GFC.

## VI. CONCLUSIONS

Our paper shows that the existence of an explicit DI, as well as other DI design features, affect cross-border depositing and thus the geography of global banking. The existence of an explicit DI is attractive to foreign depositors in the sense that it provides a higher level of deposit safety. But the design of the DI plays an important role, too. DI power, moral hazard mitigation, which encompasses credibility and effective monitoring, as well as coverage-related DI features matter for cross-border depositing. Our findings regarding specific DI design features underline the importance of credibility. We further demonstrate that the relationship between DI systems and CBD is influenced by banking crises in depositor countries. In crises times depositors tend to chase a safe haven rather than to engage in regulatory arbitrage. Thus, our results indicate

**FIGURE 3**  
 CBD and Emergency Actions. (A) All bank countries. (B) Bank countries in crisis



*Note:* This figure visualizes the DID setting for the emergency actions taken by national governments during the GFC. The black lines represent CBD volumes for countries that did not extend a government guarantee, the grey lines represent CBD volumes for countries that extended a government guarantee.

that in the design of an effective DI, policy makers must take the DI's impact on cross-border activities of depositors into account.

When it comes to the GFC it is the emergency actions of bank country governments, which supply and maintain these safe havens, that can induce substantial relocations of CBD. As such, these actions do not only rescue the banks and domestic depositors of the countries taking (credible) emergency actions. They also have sizeable effects on other countries in a financially interdependent world, which may call

for coordinated emergency actions to react to potential spillovers across countries.

In a broader context, our findings add to the debate on the design of macroprudential instruments in globalized financial markets. This discussion, currently focused on bank lending, questions their effectiveness when banks and borrowers are able to circumvent these measures via regulatory arbitrage and thus calls for coordination among national regulators (Houston, Lin, and Ma 2012; Ongena, Popov, and Udell 2013; Reinhart and Sowerbutts 2015). Our

**TABLE 4**  
Emergency Actions during the Great Financial Crisis

	Sample Period 1998–2011		Sample Period 2006–2009	
	All Bank Countries 1	Bank Countries in Crisis 2	All Bank Countries 3	Bank Countries in Crisis 4
Official government guarantee $\times$ GFC	0.23*** (8.96)	0.22*** (8.29)	0.10*** (3.27)	0.09*** (2.87)
Size	Yes	Yes	Yes	Yes
Country pair fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adjusted $R^2$	.925	.929	.951	.956
Observations	25,218	21,378	9,223	7,588

Notes: This table presents the estimates of OLS regressions of CBD from depositor country  $j$  to bank country  $i$  in year  $t$  based on model (4). Regressions (1)–(4) and (8)–(11) are based on a full sample of country-pairs including all 20 bank countries, while regressions (5)–(7) and (12)–(14) are based on a subsample of country-pairs including only those bank countries that have experienced the GFC. The coefficients are reported in the first row,  $t$ -statistics are reported below in brackets. \*, \*\*, \*\*\* represent statistical significance at the 10%, 5% and 1% levels, respectively.

documented patterns of cross-border depositor behavior in stable and crisis times can inform policy makers on the need of international coordination of regulation with respect to DI schemes.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

**Table S1.** Bank and Depositor Countries

**Table S2.** Variable Definitions and Sources

**Table S3.** Deposit Insurance Indices

**Table S4.** Summary Statistics

**Table S5.** Emergency Actions during the GFC

**Table S6.** System Banking Crises

**Table S7.** Robustness Check for Safe Haven and Regulatory Arbitrage in Cross-Border Depositing

**Table S8.** Robustness Check for Safe Haven and Regulatory Arbitrage during Crisis Versus Stable Periods

**Table S9.** Robustness Check for Financial Centers

**Figure S1.** Heat Maps of Deposit Insurance Schemes